

# **Actual and self-reported risk-taking behavior of university students during the COVID-19 pandemic**

**Abstract** The COVID-19 has impacted self-reported and actual risk-taking in university students. Pre-pandemic students who report more tolerance for risk (economic and gambling) actually take more risk in a real-time trading simulation. In turn, the higher risks taken relate to higher returns. During the pandemic, we find that self-reported risk tolerance is no longer related to actual risk-taking and that overall risk-taking increases. The increase in actual risk-taking during the pandemic does not lead to higher returns even though the stock market has recovered.

**Keywords:** risk; gambling; university students; COVID-19

**Subject classification codes:**

## **1. Introduction**

Do our expectations of behaviour hold during a crisis? Risk attitudes and patterns of investor behaviour have been well documented over time. However, what happens when the global community faces an unprecedented crisis such as that presented by the COVID-19 pandemic? Does this have an effect on risk attitudes and investor behaviour? We combine survey and real-time trading simulation data to test whether the relationship between self-reported risk-taking and actual risk-taking behaviour was affected by the COVID-19 pandemic.

Prior studies have established a relationship between investor risk preferences and risk-taking behaviour using experimental data (Wong and Carducci (1991), Morse (1998), Keller and Sigrist (2006), Fellner and Maciejovsky (2007), Nasic and Weber (2010), Weber et al. (2013)) and by combining survey and actual brokerage data (Dorn and Huberman (2005), Merkle and Weber (2014), Hoffman et al. (2013), Guiso et al. (2018)). While the findings of these studies provide mixed results, the majority of studies have found that an increase in self-reported risk aversion is

related to a decrease in risk-taking. For example, Dorn and Huberman (2005) combine survey responses with brokerage trading records and find that investors who report being more risk tolerant hold less diversified portfolios and trade more aggressively. This relationship is so strong that they note that risk attitude is the most successful variable in explaining portfolio risk, more so than variables typically associated with risk taking, such as income, education and gender.

It has been well established that risk attitude and risk-taking behaviour can change depending on emotion and circumstance. Lowenstein (2000) demonstrates that emotion (fear) changes individuals' willingness to take risks. Kamstra et al. (2003) and Kramer and Weber (2012) find that risk aversion varies across seasons for individuals diagnosed with SAD (seasonal affective disorder). Kandasamy et al. (2014) find a physiological response (increases in cortisol) to market uncertainty, resulting in individuals becoming more risk averse. von Helversen and Rieskamp (2013) find that risk attitudes of stressed individuals varied depending on the riskiness of the outcomes. Porcelli and Delgado (2009) find the impact of stress on risk taking varies depending on whether individuals are operating in the domain of loss or gain. Malmendier and Nagel (2011) report that impactful experiences, such as the great depression, can impact investor perceptions and risk taking behaviour. During the 2008 financial crisis, Schooley and Drecnik Worden (2016) found households with less self-reported risk tolerance reduced the risk of their investment portfolios.

While prior studies have looked at the relationship between self-reported and actual risk-taking during the 2008 financial crisis (Bateman et al. (2011), Schooley and Drecnik Worden (2016)) it can be argued that the COVID-19 pandemic has characteristics that differ from prior times of financial uncertainty that make it important to investigate. The COVID-19 pandemic has

created a sense uncertainty that is being experienced by the entire population. Rather than being restricted to certain populations, the effects of this collective uncertainty and accompanying emotions (fear, stress, anxiety, etc.) are widespread. This provides an extreme environment in which to test the relationship between self-reported and actual risk.

In this paper we focus on whether the COVID-19 pandemic impacts individual self-reported risk and actual risk-taking behaviour. We do this by combining survey data with real-time stock simulation trading for university business students during two time frames: (1) pre-COVID-19 during the Fall 2019 semester; (2) COVID-19 during the Fall 2020 semester. Our main findings are that students during the pre-COVID-19 period report risk preferences that are significantly positively related to actual risk-taking. For these students, higher risks are also positively related to returns. Whereas, during the COVID-19 period, there is no relationship between self-reported and actual risk taking and students during this period took on more risk than students pre-COVID-19.

The results of this line of inquiry may be useful for theoretical reasons, for example financial decision-making models that include risk preference. They also provide a practical contribution. Many personal finance professionals make use of financial risk tolerance questionnaires as a tool to assist clients. Having a better understanding of how individuals report their risk tolerance versus how they actual behave can be very useful in providing advice and designing products that can help people to achieve better financial outcomes.

The remainder of our paper is organized as follows. Section 2 develops our hypotheses. Section 3 describes data and methodology. Results are presented in Section 4. Finally, Section 5 concludes.

## 2. Hypothesis Development

No risk, no reward has been the mantra of financial investing. The common philosophy is that risk should be taken by the young and avoided by the old. Applying these ideas, most university students are young enough to endure short-term risk. However, financial risk-taking behavior in university students is not a well-studied topic especially during the COVID-19 pandemic. Chan and Saqib (2015) explore the impact of social networks, such as Facebook, LinkedIn, and Twitter, on financial risk-taking. They find that these social networks provide support, sometimes financially, for individuals allowing them to take more risk. Larson, Eastman, Bock (2016) find that the Great Recession may have caused millennials to take less risky investment choices. Dachner, Miguel, and Patena (2017) look at risk behavior of students but from an intellectual risk-taking perspective. They find that students take more intellectual risk if they perceive there is more autonomy given by the instructor. Sjoberg and Engelberg (2009) explain that students studying finance and planning to have a career in finance report higher economic risk-taking and sensation seeking. Larson, Eastman, Bock (2016) find that millennials with low confidence in financial knowledge report taking fewer risks and that lower financial literacy skills increase the likelihood of using emotions as information. While these papers expand our knowledge of risk-taking in younger individuals, they do not make explicit links to how university students' self-reported risk is related to actual financial risk-taking.

There are three studies that are closely linked to ours. First, Wong and Carducci (1991) look at sensation seekers and daily financial decisions, such as personal investments, household affairs, and gambling. They find that undergraduate students who identify as high sensation seekers tend to self-report more financial risk-taking. Then, Morse (1998) studies non-student participants with a job and are at least 30 years of age. She finds that the level of self-reported risk of these older adults does not match the level of actual financial risk-taking. There is no

relationship between sensation seeking and the chosen risky investments in real life. In Dorn and Huberman (2005), they study the trades of retail stockbrokers in Germany along with surveys of risk tolerance, and they find that investors who report a higher level of risk tolerance have less diversified portfolios and are more aggressive in their stock selection. Interestingly, they find that the cross-sectional variation in portfolio turnover and diversification can be explained mostly by risk attitude. Finally, in Weber, Weber, and Nasic (2013) they explain that observed changes in risk-taking of affluent UK online-brokerage customers is related to perceived feelings about expected risk and return of the market portfolio and not so much to the changes in risk attitude. Their work suggests that individuals who take more or less risk may do so because of external circumstances, but the change in risk-taking is not from a change in risk appetite.

Considering the mixed results and that externalities could impact risk-taking behaviour, we focus our study around the COVID-19 pandemic as an external circumstance that can change an individual's view on risk. Before developing our tests around the pandemic, we review the 2008 financial crisis literature as it was a more recent event that had an impact on other countries. While there are significant differences between the COVID-19 pandemic and the financial crisis of 2008, we believe looking at how individuals perceive and take risk during the 2008 financial crisis might be the closest hint as to how we might expect our participants to behave during the pandemic. Bateman et al. (2011) look at the impact of the 2008 financial crisis on individuals' risk aversion and retirement savings investment choices. Interestingly, they find little change in stated risk preferences from early 2007 to late 2008. They do however find a preference for riskier investments in 2008 as well as a negative correlation between inferred risk preferences and the risk profile of portfolio choices. Our study differs from theirs in a number of ways. Bateman et al. (2011) restrict retirement savings choices to six investment options whereas

our subjects can create portfolios using any common stocks, trading at \$5.00 or more, on the NYSE, AMEX and NASDAQ. Their participants are individuals aged 18-65 with varying levels of education whereas our sample focuses on university business students. Their study is based on the 2008 financial crisis whereas ours focuses on the world-wide health crisis of COVID-19. Hoffman, Post and Pennings (2015) use survey data combined with actual trading data during the 2008 financial crisis. They find that investor risk tolerance and risk perceptions fluctuate significantly during the crisis. They find that changes in risk tolerance are positively significantly related to risk-taking behaviour, measured using the standard deviation of returns and buy-sell ratio. They also find that during the financial crisis, *“even as market volatility decreases, investor return volatility remains at a significantly higher level than that of the market. Towards the end of the crisis investor return volatility is even higher than at the beginning of the crisis.”* Guiso Sapienza and Zingales (2018) find risk aversion increases substantially following the 2008 financial crisis and that there is a negative relationship between risk aversion and ownership of risky assets (individuals with increased risk aversion decrease stock holdings). They test various explanations and find that emotion (fear) may be driving the changes in risk preference and the corresponding behaviour.

Based on these prior studies, we aim to fill the gap in the literature by merging their methodologies. We examine self-reported risk-taking behavior and actual financial risk-taking by university students with an age range of 19 to 49. The self-reported risk-taking is measured in two forms: (1) economic and (2) inclination towards gambling and speculation. The actual financial risk-taking is measured by the logged annualized standard deviation of returns of their investment portfolio. If these students perform well, they can recover the cost of their initial investment and potentially earn a maximum profit of 258%.

Although there are mixed results for the relationship between self-reported and actual financial risk-taking, the majority of studies indicate a positive relationship between the two. Actual financial risk-taking may be tempered by budget constraints and investor inertia. However, external circumstances, such as a world-wide health crisis, may affect how students perceive and take risk changing the relationship between self-reported and actual financial risk-taking. Hence, we set out to test the following hypotheses.

*Hypothesis 1a: Actual risk-taking is related to self-reported economic risk-taking.*

*Hypothesis 1b: Actual risk-taking is not related to self-reported economic risk-taking during the COVID-19 pandemic.*

Our second measure of self-reported risk-taking is the inclination towards gambling and speculation. Explained in prior studies (Keller and Siegrist, 2006; Kassinove, 1998), gambling is a special type of financial risk-taking that is related to sensation seeking and overall risk preference. Wong and Carducci (1991) study gambling in the form of self-reported decisions regarding the lottery, card games, and TV game shows. They find that tendencies towards gambling are related to everyday money matters, particularly if the subject is a sensation seeker. Olsen (2004) finds that unrealistic optimism and impulsive gambling habits can lead to financial problems. Considering that our subjects paid real money to participate in a stock trading game with the hopes of gaining actual money, we believe that gambling and speculation should be included in our self-reported risk-taking measure. As a special form of economic risk-taking, we believe self-reported gambling habits do materially impact actual risk-taking. The psychology of

winning big, and in our case, a prize that will more than double their initial investment could impact how aggressive they invest their funds. Similar to our first hypothesis, we believe the COVID-19 pandemic, an externality similar to the ones discussed in Weber, Weber, and Nasic (2013) can change the relationship between the optimism of winning big and actual financial risk-taking. The negative clout surrounding the pandemic could disassociate actual risk-taking from any inclination towards gambling.

*Hypothesis 2a: Actual risk-taking is related to self-reported inclination towards gambling and speculation.*

*Hypothesis 2b: Actual risk-taking is not related to self-reported inclination towards gambling and speculation during the COVID-19 pandemic.*

In our last set of tests, we want to see if higher risk-taking leads to a bigger reward, and if an externality like the COVID-19 pandemic can affect the students' ability to invest profitably. While there are plenty of historical evidence showing that higher risk investments can provide higher returns, our focus is on the students. We want to test if the students can successfully increase their returns when they actively decide to take on more risk. As with the other tests, we want to see how the social, economic, political, and environmental changes associated with the COVID-19 pandemic have impacted their ability to clearly assess risk and reward. We believe the health crisis may affect their ability to think clearly especially when it comes to risk-taking based on the prior research about insecurities (Wohl, Branscombe, and Lister, 2014;

Hammarström and Janlert, 1997; Rollins, 2007), higher depression levels and lower self-esteem (France, 2000), and apathy (Ahmed, Maqsood, and Waseer, 2018).

*Hypothesis 3a: Actual risk-taking is related to economic gains.*

*Hypothesis 3b: Actual risk-taking is not related to economic gains during the COVID-19 pandemic.*

### **3. Data and Methodology**

We base our analysis on data collected from a survey and a real-time trading simulation. Participants consisted of 181 undergraduate business students enrolled a Principals of Corporate Finance course during the Fall 2019 (pre-COVID-19) or Fall 2020 (COVID-19) semesters. A survey with questions taken from Sjöberg and Engelberg (2009) was used to determine participants' risk and gambling/speculation attitudes, along with other demographic information (gender, age, degree major and ethnicity). There are 22 risk attitude questions based on a 4-point scale. The average score of the 22 questions was used to measure of a participant's risk attitude with a higher score indicating a higher risk tolerance. Similarly a participant's gambling/speculation preference was determined using the average result of seven questions (4-point scale) with a higher value indicating a higher preference for gambling/speculation.

In order to examine how participant's self-reported risk attitudes are related to actual risk-taking decisions we made use of data from a real-time trading simulation. As part of the Principals of Corporate Finance course, students participate in a Stock-Trak trading competition. Stock-Trak is a real-time trading simulation. Students participated in the challenge for nine

weeks. September 9<sup>th</sup> to November 8<sup>th</sup> for the Fall 2019, and September 11<sup>th</sup> to November 6<sup>th</sup> of the Fall 2020. Each Stock-Trak account has an initial balance of \$100,000 and the ability to trade up to \$200,000 on margin. Participants are able to buy, sell, buy on margin and short all NYSE, AMEX and NASDAQ common stocks trading at a value of \$5.00 or more. Participants can place limit and stop orders. Day trading is not allowed and there is a limit of 200 total transactions over the nine week period. There were financial incentives associated with the trading competition. The top five portfolios earned cash rewards: \$100 (first place); \$60 (second place); \$30 (third-fifth places).

Participants in the Stock-Trak competition were introduced to the topics of risk, return and portfolio diversification as well as how to buy, sell and short stocks as part of the Principals of Corporate Finance. This ensured all participants had an opportunity to gain some knowledge in basic investment concepts.

During the trading period in the fall of 2019 the annualized return for the S&P 500 was 24.32% with an annualized standard deviation for 6.11%. During the trading period in the fall of 2020 the annualized return was 34.31% and the annualized standard deviation was 27.45%.

Actual risk-taking was measured using the annualized standard deviation of weekly portfolio returns (a higher standard deviation indicates a riskier portfolio).<sup>1</sup> Annualized portfolio returns were used to measure economic gains.

We include gender, age, business major and ethnicity as variables as they have been previously found to be related to risk attitudes and behaviour.

Gender has been repeatedly linked to risk attitude and trading behaviour. Females are often reported to be more risk aversion than males and tend to make less risky financial decisions.

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<sup>1</sup> The standard deviation is skewed right and bounded by zero, we therefore use the logarithm of standard deviation

Felton et al. (2003) use a semester long investment contest, similar to ours, and find that female students are more risk averse and that male students make more risky choices and show greater variability in portfolios. Barber and Odean (2001) find male investors trade more aggressively than female investors. Fellner and Maciejovsky (2007) find that females are more risk averse, submit fewer offers and engage less often in trades than their male counterparts.

Arnett (1994) finds that adolescents aged 16-18 years are more sensation seeking than their adult counterparts and that males are higher sensation seeking than females. Haan et al. (2011) find that male university students exhibit a higher risk-taking level measured by impulsiveness and venturesomeness than female university students. Stenstrom and Saad (2011) find that high testosterone level is link to higher financial risk-taking and pathological gambling. Using a single-item investment game with real potential monetary payoffs, Apicella et al. (2008) showed that testosterone levels were positively correlated with financial risk-taking propensity in a sample of 98 healthy male students. Chan (2015) finds that financial risk-taking in men can be attributed to seeing more physically attractive men. The author argues that less attractive men take more financial risk to potentially reap more financial benefits to compete with the more attractive men for a partner.

Age has been associated with risk attitude and risk taking behavior. It has been found that younger investors tend to take more risk (Bateman et al. (2011) and be less risk averse (Dorn and Huberman (2005), Yao et al. 2011). Goetzmann and Kumar (2008) find that younger investors hold less diversified portfolios.

In terms of major, finance students have been shown to have a more positive attitude towards risk taking and gambling than their other business student counterparts (Sjöberg and Engelberg (2009)).

#### 4. Results

To assess self-reported financial risk-taking, we use the survey in Sjoberg and Engelberg (2009). We find that our results for economic risk attitude and gambling behavior are similar to those in their paper. Our average for economic risk attitude is 2.86 whereas theirs is 2.95. Our average for gambling behaviour is 1.85 and theirs is 1.82. The mean and median age of our student sample are 23.36 and 22 years, respectively. Male students make up approximately 52.48% of our sample and about 15.70% of our sample are finance majors. These results and other descriptive statistics are reported in Table 1.

*Insert Table 1 Here*

To formally test Hypothesis 1a and 1b, we apply the following specification.

$\text{Log}(\text{annualized\_std}) = \text{risk\_average gender age}$ <p>Finance Marketing Accounting Decision_Science Information_System African_American Asian Caucasian Hispanic;</p>	Eq. (1)
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In Table 2 Column 1, we show that the relationship between self-reported economic risk-taking and actual risk-taking for the full sample including the pre-pandemic and during the pandemic periods. In aggregate, we find that the relationship is positive and statistically significant. This means that students who report more risk take more risk. In Column 2 and 3, we divide the full sample into the pre-COVID and COVID periods and find that the positive relationship between self-reported and actual risk-taking is no longer significant during the pandemic. It appears that the global health crisis is a great example of an externality that can change risk behaviour evident by the disassociation between self-reported and actual risk-taking.

*Insert Table 2 Here*

To test Hypothesis 2a and 2b, we apply the following specification.

Log(annualized_std) = gamble_average gender age Finance Marketing Accounting Decision_Science Information_System African_American Asian Caucasian Hispanic;	Eq. (2)
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We find that there is a positive and significant relationship between actual risk-taking and self-reported inclination towards gambling and speculation in the full sample shown in Table 3 Column 1. This means that, in aggregate, those who report a higher level of inclination towards gambling and speculation do take more risk. However, when we test the same relationship during the COVID-19 period, it appears that the level of self-reported inclination towards gambling and speculation is not related to actual economic risk-taking.

*Insert Table 3 Here*

For our last set of hypotheses 3a and 3b, we want to understand if increase in actual risk-taking can lead to better returns. We question if the students are able to decide which risks are worth taking, especial during crisis time. To test these hypotheses, we apply the following specification.

annualized_return = log(annualized_std) gender age Finance Marketing Accounting Decision_Science Information_System African_American Asian Caucasian Hispanic;	Eq. (3)
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In Table 4 Column 1, we show that in aggregate students appear to be able to earn significant gains when they take on more risk. The aggregate result is driven by the pre-COVID

sample, which also shows that students can earn significant gains with actual risk-taking. So, it does appear that the students can properly gauge which risk is appropriate before the pandemic. However, during the pandemic, that is not the case. In Column 3, we show that additional risk taken does not lead to significant gains. We believe that the stresses associated with the pandemic affect their ability to assess risk properly.

*Insert Table 4 Here*

Finally, as a robustness check to the effect of COVID-19 on the relationships between actual and self-reported risk-taking, we matched the pre- and during COVID-19 samples by gender and age to assess the impact. In Table 5 Panel A, we show that the students take significantly more risk during the pandemic, but there is not difference in how much economic risk-taking they self-report. When we examine the relationship between actual risk-taking and gambling, we find very similar results. The levels of self-reported inclination towards gambling and speculation are the same pre- and during the COVID-19 pandemic. Finding that self-reported risk-taking did not change yet actual risk-taking increased confirms that self-reported preference does not capture actual risk taken by students during the pandemic.

*Insert Table 5 Here*

## **5. Conclusion**

In our study, we examine how the actual financial risk-taking of university students relates to their self-reported assessment of economic risk-taking and inclination towards gambling and speculation. We find that the level of self-reported economic risk-taking is related with actual financial risk-taking during non-crisis time. The level of self-reported inclination towards gambling is also a good predictor of actual financial risk-taking. However, during the COVID-19 pandemic the relationship between self-reported risk taking (both economic and gambling) and

actual risk taking disappears. Interestingly, when the students take more risk before the health crisis, they are able to earn a significant return. Yet, during the crisis, even as the stock market recovers, the students are not able to properly assess which risk is worth taking to earn higher returns.

Externalities, such as catastrophic events, can influence the relationship between the perception of risk and risk-taking. The disassociation between self-reported and actual risk-taking during crisis time has several practical implications. First, knowing that students take financial risk without earning the proper reward during crisis time means that educators need resources, such as a network of financial advisors, university's money management center, peer-to-peer financial aid counselling, to help students make better judgements, especially if they are increasingly helping the family financially. Second, financial advisors may not be able to rely on their clients' self-reported risk tolerance during crisis time because they may not be as meaningful as during normal time. The ability to properly assess risk tolerance can influence not only the client-advisor relationship but also the portfolio performance. Third, considering that risk-taking behaviour is not captured by self-reported risk preference during crisis time, researchers could examine other factors that can more accurately predict financial risk-taking when individuals are under stress.

## 6. References

Ahmed, S., F. Maqsood, and W. A. Waseer. "The role of apathy, personal insecurity, and socio-economic status in formation of risk-taking behavior among university students." *Journal of Human Behavior in the Social Environment*, Vol. 28 (2018), pp. 221-239. <https://doi.org/10.1080/10911359.2017.1388757>.

Apicella, C. L., Dreber, A., Campbell, B., Gray, P. B., Hoffman, M., and Little, A. C. "Testosterone and financial risk preferences." *Evolution and Human Behavior*, Vol. 29 (2008), pp. 384-390. <https://doi.org/10.1016/j.evolhumbehav.2008.07.001>.

Arnett, J. "Sensation seeking: A new conceptualization and a new scale." *Personality and Individual Differences*, Vol. 16 (1994), pp. 289-296. [https://doi.org/10.1016/0191-8869\(94\)90165-1](https://doi.org/10.1016/0191-8869(94)90165-1).

Barber, B. M. and T. Odean. "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment." *Quarterly Journal of Economics*, 116, (2001), pp. 261–292.

Bateman, H., J. Louviere, S. Satchell, T. Islam, and S. Thorp. "Retirement Investor Risk Tolerance in Tranquil and Crisis Periods: Experimental Survey Evidence." *Journal of Behavioral Finance*, 12, (2011), pp. 201–218.

Chan, E. "Physically-attractive males increase men's financial risk-taking." *Evolution and Human Behavior*, Vol. 36 (2015), pp. 407-413. <https://doi.org/10.1016/j.evolhumbehav.2015.03.005>.

Chan, E. and N. Saqib. "Online social networking increases financial risk-taking." *Computers in Human Behavior*, Vol. 51 (2015), pp. 224-231. <https://doi.org/10.1016/j.chb.2015.05.002>.

Dachner, A., R. Miguel, and R. Patena. "Risky business: Understanding student intellectual risk taking in management education." *Journal of Management Education*, Vol. 41 (2017), pp. 415-443. <https://doi.org/10.1177/1052562917695775>.

Dorn, D. and G. Huberman. "Talk and Action: What Individual Investors Say and What They Do." *Review of Finance*, 9, (2005), pp. 437–481.

Fellner, G. and B. Maciejovsky. "Risk Attitude and Market Behavior: Evidence from Experimental Asset Markets." *Journal of Economic Psychology*, 28, (2007), pp. 338–350.

Felton, J., Gibson, B and Sanbonmatsu, D. "Preference for Risk in Investing as a Function of Trait Optimism and Gender" *Journal of Behavioral Finance* 4(1) 2003, 33-40.

- France, A. "Towards a sociological understanding of youth and their risk-taking." *Journal of Youth Studies*, Vol. 3 (2000), pp. 317–331. <https://doi.org/10.1080/713684380>.
- Goetzmann, W and Kumar A. "Equity Portfolio Diversification" *Review of Finance* 12(3) 2008 433-463.
- Guiso, L., P. Sapienza, and L. Zingales. "Time Varying Risk Aversion." *Journal of Financial Economics*, 128 (2018) 403-421.
- Hammarström, A. and U. Janlert. "Unemployment and sexual risk-taking among adolescents." *Scandinavian Journal of Public Health*, Vol. 25 (1997), pp. 266–270. <https://doi.org/10.1177/140349489702500409>.
- Hoffmann, A. O. I., T. Post, and J. M. E. Pennings. "Individual Investor Perceptions and Behavior during the Financial Crisis." *Journal of Banking and Finance*, 37(1), (2013), pp. 60–74.
- Kassinove, J. "Development of the gambling attitude scales: Preliminary findings." *Journal of Clinical Psychology*, Vol. 54 (1998), pp. 63–771. [https://doi.org/10.1002/\(SICI\)1097-4679\(199810\)54:6<763::AID-JCLP2>3.0.CO;2-I](https://doi.org/10.1002/(SICI)1097-4679(199810)54:6<763::AID-JCLP2>3.0.CO;2-I).
- Keller, C. and M. Siegrist. "Money attitude typology and stock investment." *Journal of Behavioral Finance*, Vol. 7 (2006), pp. 88–96. [https://doi.org/10.1207/s15427579jpfm0702\\_3](https://doi.org/10.1207/s15427579jpfm0702_3).
- Kamstra, M. , Kramer, L. , Levi, M. ,2003. Winter blues: a SAD stock market cycle. *Am. Econ. Rev.* 93 (1), 324–343.
- Kandasamy, N. , Hardy, B. , Page, L. , Schaffner, M. , Graggaber, J. , Powlson, A. , Fletcher, P. , Gurnell, M., Coates, J. ,2014. Cortisol shifts financial risk preferences. *Proce. Nat. Acad. Sci.* 111 (9), 3608–3613.
- Kramer, L. , Weber, M. , 2012. This is your portfolio on winter: seasonal affective disorder and risk aversion in financial decision making. *Soc. Psychol. Personal. Sci.* 3 (2), 193–199 .
- Loewenstein, G. , 2000. Emotions in economic theory and economic behavior. *Am. Econ. Rev.* 90 (2), 426–432
- Larson, L., J. Eastman, and D. Bock. "A multi-method exploration of the relationship between knowledge and risk: The impact on millennials' retirement investment decisions." *Journal of Marketing Theory and Practice*, Vol. 24 (2016), pp. 72-90. <https://doi.org/10.1080/10696679.2016.1089765>.
- Malmendier, U., Nagel, S., 2011. Depression babies: do macroeconomic experiences affect risk-taking? *Quarterly Journal of Economics* 126 (1), 373–416.

- Merkle, C., & Weber, M. (2014). Do investors put their money where their mouth is? Stock market expectations and investing behavior. *Journal of Banking & Finance*, 46, 372-386.
- Morse, W. "Risk taking in personal investments." *Journal of Business and Psychology*, Vol. 13 (1998), pp. 281-288. <https://doi.org/10.1023/A:1022915224863>.
- Nosic, A. and M. Weber. "How Riskily Do I Invest? The Role of Risk Attitudes, Risk Perceptions, and Overconfidence." *Decision Analysis*, 7,(2010), pp. 282–301.
- Olsen, R. "Research elsewhere: Optimism, pessimism and gambling: The downside of optimism." *Journal of Behavioral Finance*, Vol. 5 (2004), pp. 127–129.
- Porcelli, A. J., & Delgado, M. R. (2009). Acute stress modulates risk taking in financial decision making. *Psychological Science*, 20(3), 278-283.
- Rollins, N. "Food insecurity—A risk factor for HIV infection." *PLoS Medicine*, Vol. 4 (2007), pp. e301. <https://doi.org/10.1371/journal.pmed.0040301>.
- Schooley, D.K. and Drecnik Worden, D. (2016). Perceived and Realized Risk Tolerance: Changes During the 2008 Financial Crisis. *Journal of Financial Counseling and Planning*, 27(2), 265-276.
- Sjoberg, L. and E. Engelberg. "Attitudes to economic risk taking, sensation seeking and values of business students specializing in finance." *Journal of Behavior Finance*, Vol. 10 (2009), pp. 33-43. <https://doi.org/10.1080/15427560902728712>.
- Stenstrom, E. and G. Saad. "Testosterone, financial risk-taking, and pathological gambling." *Journal of Neuroscience, Psychology, and Economics*, Vol. 4 (2011), pp. 254-266. <https://doi.org/10.1037/a0025963>.
- Thaler, R. and C. Sunstein (2008), *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press.
- von Helverson, B., & Rieskamp, J. (2013). Does the influence of stress on financial risk taking depend on the riskiness of the decision?. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 35, No. 35).
- Wärneryd, K.-E. "Risk Attitudes and Risky Behavior." *Journal of Economic Psychology*, 17(6), (1996), pp. 749–770.
- Weber, M., E. Weber, and A. Nosic. "Who takes risks when and why: Determinants of changes in investor risk taking." *Review of Finance*, Vol. 17 (2013), pp. 847-883. <https://doi.org/10.1093/rof/rfs024>.
- Wohl, A., R. Branscombe, and J. Lister. "When the going gets tough: Economic threat increases financial risk taking in games of chance." *Social Psychological and Personality*

Science, Vol. 5 (2014), pp. 211–217. <https://doi.org/10.1177/1948550613490964>.

Wong, A. and B. Carducci. “Sensation seeking and financial risk taking in everyday money matters.” *Journal of Business and Psychology*, Vol. 5 (1991), pp. 525-530. [www.jstor.org/stable/25092309](http://www.jstor.org/stable/25092309).

Yao, R, Sharpe D.L. and Wang, F. (2011) “Decomposing the age effect on risk tolerance. *Journal of Socio-Economics* 40(6), 879-887.

**Table 1 Descriptive Statistics**

Variable	Mean	Median	Std Dev	Minimum	Maximum
Risk_Average	2.86	2.82	0.23	2.27	3.55
Gamble_Average	1.85	1.86	0.45	1.00	3.00
log_std	1.66	1.88	1.22	-3.22	3.53
Annualized_Return	12.23	8.33	22.67	-60.33	128.54
Beta	0.42	0.29	0.48	-0.83	2.44
Sharpe_Ratio	1.58	1.12	3.19	-3.69	29.99
Age	23.39	22.00	4.97	19.00	49.00
Millenial	0.33	0.00	0.47	0.00	1.00
Gen_Z	0.65	1.00	0.48	0.00	1.00
Gen_X	0.03	0.00	0.16	0.00	1.00
gender	0.52	1.00	0.50	0.00	1.00
Finance	0.18	0.00	0.38	0.00	1.00
Marketing	0.25	0.00	0.43	0.00	1.00
Accounting	0.22	0.00	0.41	0.00	1.00
Decision_Science	0.02	0.00	0.15	0.00	1.00
Information_System	0.07	0.00	0.26	0.00	1.00
Management	0.21	0.00	0.41	0.00	1.00
Non_Business	0.02	0.00	0.13	0.00	1.00
Not_Declared	0.01	0.00	0.07	0.00	1.00
Other	0.02	0.00	0.13	0.00	1.00

African_American	0.04	0.00	0.19	0.00	1.00
Asian	0.20	0.00	0.40	0.00	1.00
Caucasian	0.29	0.00	0.45	0.00	1.00
Hispanic	0.44	0.00	0.50	0.00	1.00
Multi_ethnic	0.03	0.00	0.18	0.00	1.00
Native_American	0.00	0.00	0.00	0.00	0.00
Minority	0.71	1.00	0.45	0.00	1.00

**Table 2 Actual risk-taking and self-reported economic risk-taking**

/\*=====

Hypothesis 1a: Actual risk-taking is related to self-reported economic risk-taking.

Hypothesis 1b: Actual risk-taking is not related to self-reported economic risk-taking during the COVID-19 pandemic.=====\*/

	[1]		[2]		[3]	
	Full Sample		Pre-Covid		Covid	
	Estimate	Pr >  t	Estimate	Pr >  t	Estimate	Pr >  t
<b>Intercept</b>	-0.335	0.795	-1.10622	0.4366	-0.21775	0.9345
<b>Risk_Average</b>	<b>0.765</b>	<b>0.073</b>	<b>0.955996</b>	<b>0.0506</b>	0.811177	0.3201
<b>Gender</b>	0.136	0.485	0.320714	0.1531	-0.45554	0.2457
<b>Age</b>	0.022	0.302	0.027781	0.2656	0.028858	0.42
<b>Finance</b>	-0.174	0.543	-0.19452	0.5687	-0.26314	0.5839
<b>Marketing</b>	-0.379	0.149	-0.21897	0.4565	-0.32743	0.5408
<b>Accounting</b>	-0.222	0.416	-0.5132	0.111	-0.03218	0.9438
<b>Decision_Science</b>	0.297	0.645	0.108133	0.8776	0.912089	0.4548
<b>Information_System</b>	-0.723	0.065	-1.09009	0.0149	0.115403	0.8666
<b>African_American</b>	-1.250	0.090	-1.60338	0.0377	-0.07374	0.9659
<b>Asian</b>	-0.121	0.827	-0.30663	0.5917	0.561985	0.676
<b>Caucasian</b>	-0.553	0.310	-0.88855	0.1241	0.048584	0.9698
<b>Hispanic</b>	-0.700	0.189	-0.94806	0.0886	-0.46227	0.7112
<b>R-Square</b>	0.094		0.167		0.182	
<b>Observations</b>	180		126		54	

**Table 3 Actual risk-taking and self-reported inclination towards gambling and speculation**

/\*=====\*/  
Hypothesis 2a: Actual risk-taking is related to self-reported inclination towards gambling and speculation.

Hypothesis 2b: Actual risk-taking is not related to self-reported inclination towards gambling and speculation during the COVID-19 pandemic.

=====\*/

	<b>[1]</b>		<b>[2]</b>		<b>[3]</b>	
	<b>Full Sample</b>		<b>Pre-Covid</b>		<b>Covid</b>	
	<b>Estimate</b>	<b>Pr &gt;  t </b>	<b>Estimate</b>	<b>Pr &gt;  t </b>	<b>Estimate</b>	<b>Pr &gt;  t </b>
<b>Intercept</b>	0.79911	0.2999	0.242992	0.7714	2.39856	0.1244
<b>Gamble_Average</b>	0.52925	0.0146	0.703189	0.0047	-0.30009	0.4532
<b>Gender</b>	0.13991	0.4669	0.30186	0.1701	-0.33325	0.3743
<b>Age</b>	0.02589	0.216	0.032089	0.186	0.019128	0.589
<b>Finance</b>	-0.24602	0.3904	-0.26222	0.4347	-0.09046	0.8537
<b>Marketing</b>	-0.47658	0.0655	-0.38379	0.1745	-0.24515	0.6511
<b>Accounting</b>	-0.3277	0.2268	-0.66802	0.0344	0.056186	0.9023
<b>Decision_Science</b>	0.45984	0.4723	0.19588	0.7761	0.716752	0.5689
<b>Information_System</b>	-0.8303	0.0333	-1.14736	0.0088	0.292405	0.6843
<b>African_American</b>	-1.18983	0.1028	-1.4231	0.0594	0.320172	0.8566
<b>Asian</b>	-0.12528	0.8182	-0.33521	0.5471	0.981322	0.4712
<b>Caucasian</b>	-0.44384	0.4026	-0.62209	0.2524	0.316613	0.8095
<b>Hispanic</b>	-0.69073	0.1871	-0.88582	0.0989	-0.04992	0.9688
<b>R-Square</b>	0.109		0.198		0.174	
<b>Observations</b>	180		126		54	

**Table 4 Actual risk-taking and economic gains**

/\*-----  
Hypothesis 3a: Actual risk-taking is related to economic gains.

Hypothesis 3b: Actual risk-taking is not related to economic gains during the COVID-19 pandemic.

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	[1]		[2]		[3]	
	Full Sample		Pre-Covid		Covid	
	Estimate	Pr >  t	Estimate	Pr >  t	Estimate	Pr >  t
<b>Intercept</b>	-36.361	0.1013	-51.070	0.0861	0.0563	0.9985
<b>Log_Std</b>	<b>8.5272</b>	<b>0.0004</b>	<b>10.937</b>	<b>0.0022</b>	5.0965	0.1112
<b>Gender</b>	-3.95427	0.5111	-4.325	0.6095	1.1328	0.8817
<b>Age</b>	1.00249	0.128	1.422	0.1305	-0.0451	0.9495
<b>Finance</b>	-8.23929	0.3555	-15.338	0.235	4.1553	0.6658
<b>Marketing</b>	-8.82465	0.2783	-15.907	0.1452	6.3419	0.5603
<b>Accounting</b>	-10.5408	0.2137	-14.793	0.225	2.1236	0.8175
<b>Decision_Science</b>	-13.8106	0.4899	-18.823	0.4773	-5.5629	0.8229
<b>Information_System</b>	-5.59192	0.648	-7.653	0.6542	-3.9425	0.7774
<b>African_American</b>	12.7654	0.5776	13.576	0.6424	10.3673	0.7666
<b>Asian</b>	20.4947	0.2264	24.932	0.2387	12.0569	0.6556
<b>Caucasian</b>	30.1217	0.0706	39.831	0.0587	6.8906	0.7909
<b>Hispanic</b>	20.5324	0.2078	29.922	0.1466	0.1376	0.9956
<b>R-Square</b>	0.123		0.158		0.141	
<b>Observations</b>	180		126		54	

**Table 5 COVID-19 changing risk-taking behavior matched by gender and age**

/\*=====

Robustness Test: Match by gender and age

Take more actual risk during COVID \*\*\*Significant at the 1% level

No difference in self-reported economic risk-taking or inclination towards gambling and speculation between COVID and non-COVID times

Significant difference in actual risk taking during the COVID-19 pandemic  
=====\*/

**Panel A: Actual risk-taking and self-reported economic risk-taking**

Actual risk-taking during COVID 2.2690***	Actual risk-taking before COVID 1.3024***	Difference 0.9666***
Self-reported economic risk-taking during COVID 2.8470***	Self-reported economic risk-taking before COVID 2.8836***	Difference -0.0366

**Panel B: Actual risk-taking and self-reported inclination towards gambling and speculation**

Actual risk-taking during COVID 2.2468***	Actual risk-taking before COVID 1.2761***	Difference 0.9707***
Self-reported gambling & speculation during COVID 1.9640***	Self-reported gambling & speculation before COVID 1.8571 ***	Difference 0.0889