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The double-edged sword: how cryptocurrency investments could undermine the anxiety-reducing benefits of rainy-day savings in times of economic turbulence

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Abstract

Purpose – Rainy-day savings have been an effective measure for maintaining financial stability in times of emergency. Motivated by the rapid expansion of cryptocurrencies, the present study examines how crypto investments could moderate the beneficial outcomes of rainy-day savings for alleviating financial anxiety during the most recent economic turbulence caused by the COVID-19 pandemic.

Design/methodology/approach – The present study carries out multivariate logistic regression with interaction effects on the most recent 2021 cohort data from the National Financial Capability Study (NFCS).

Findings – While rainy-day savings relate to less financial anxiety, the effect varies depending on whether an individual has invested in cryptocurrencies. Specifically, this paper finds that crypto investors experience less relief in financial anxiety from rainy-day savings than non-crypto investors. Additionally, crypto investors are more susceptible to financial stressors like job loss and financial fragility, likely due to the financial loss from investing in cryptocurrencies.

Practical implications – The findings highlight the necessity of implementing policies and regulations, such as the newly approved Markets in Crypto-Assets (MiCA) regulation, that could raise people's awareness of the high-risk nature of cryptocurrencies as well as offering targeted financial education for crypto investors, especially during times of market downturn.

Originality/value – This is the first attempt to study how crypto investments may weaken the benefits of rainy-day savings in reducing financial anxiety. The findings offer new insights into the beneficial outcomes of rainy-day savings for emergencies in light of individual crypto investment backgrounds. Additionally, findings from the present study also contain important implications given the rapid expansion of the cryptocurrency market as well as future economic turbulence.

Keywords Crypto investments, Financial planning, Economic downturns, Financial stability, Rainy-day savings

Paper type Research paper

1. Introduction

Savings for rainy days, or so-called rainy-day funds, are money set aside for emergencies (Netemeyer *et al.*, 2018), which is an important form of individual financial planning (Nam and Loibl, 2021). While rainy-day savings are beneficial for maintaining financial stability during emergencies (Chen and Livermore, 2020), the advice seems difficult to follow. According to the 2023 Economic Well-being of U.S. Households report, only about half of U. S. adults have enough rainy-day funds to cover three months of living expenses. This percentage has dropped from a high of 59% in 2021 (Federal Reserve Board, 2024). Meanwhile, the COVID-19 pandemic has exacerbated financial strain due to job loss and illness (Kim and Im, 2022; Truong and Truong, 2022). Therefore, it remains crucial to examine the benefits of rainy-day savings (Allanjawi *et al.*, 2024) to enhance individual financial resilience, especially in times of economic downturns (Johnson *et al.*, 2021).

As financial markets become more complex and digital transformations accelerate (Dvorak and Jia, 2016; Dwyer, 2015; Paul *et al.*, 2024), investment options for retail and institutional investors have expanded (Bryzgalova *et al.*, 2023). Cryptocurrencies, known for their high

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volatility and low entry barriers (Vega and Camarero, 2024), have gained a lot of attention due to the potential for achieving rapid returns compared to other investment options (Grobys and Junttila, 2021). Despite the popularity of cryptocurrencies, they remain extremely high-risk financial instruments (Arli *et al*., 2021; Steinmetz, 2023). According to Forbes Magazine in 2024, only 28% of the crypto investors made a profit, and 58% claimed understanding how cryptocurrencies work (Hooson and Michael, 2024). This provides evidence that cryptocurrencies may intensify the already high financial burden among individuals during economic downturns (Ballis and Verousis, 2022).

During the most recent economic downturn of the COVID-19 pandemic, an increase in consumer retail trading was observed in the cryptocurrency market. This is because individuals had more time and opportunities to expose themselves to online trading platforms (Ortmann *et al*., 2020) due to policies against the spread of the disease, such as the shelter-in-place order (Corbet *et al*., 2020). Moreover, the labor disruptions caused by the COVID-19 pandemic have forced many to seek alternative opportunities to maintain their income levels. As cryptocurrencies, such as Bitcoin, could be bought with a minimum order size of 0.00001 coin, the low trading barrier as well as its potential to yield fast rewards have attracted more speculative investors (Burggraf, 2021).

Nevertheless, the highly volatile nature of cryptocurrencies presents a significant risk, with the potential for investors to experience substantial losses. This is because returns of cryptocurrencies are largely driven by market news as well as their supply and demand in markets (Akin *et al*., 2023). Moreover, investor behaviors and sentiments, such as herding behavior and optimism, may also contribute to the volatility of cryptocurrencies (Akin and Akin, 2024). Overall, the additional losses from investing in cryptocurrencies during economic downturns could be detrimental, where financial stability is already strained (Egiyi *et al*., 2020). This could further increase financial anxiety, especially for individuals without adequate rainy-day savings for emergencies. Therefore, it is crucial to investigate how cryptocurrency investments might moderate the relationship between rainy-day savings and financial anxiety. This could provide insights into how those digital assets might affect individual financial stability in future economic turbulence, even with the preparation of rainy-day savings.

Therefore, in the present study, I use the COVID-19 pandemic as a special timeframe to examine whether savings for rainy days could help reduce individual financial anxiety during an economic downturn. Furthermore, I investigate whether the benefits of rainy-day savings vary depending on whether an individual has invested in cryptocurrencies. Utilizing data from the National Financial Capability Study (NFCS), I find that rainy-day savings relate to less financial anxiety during the pandemic. This finding is in line with the theory of precautionary saving, which posits that individuals accumulate savings as a precaution against future uncertainties (Lusardi, 1998) and potentially reduce financial anxiety during economic downturns (Kimball, 1989). Additionally, I find that crypto investments mitigate this beneficial effect of rainy-day savings. This result adds to the existing precautionary saving framework by indicating that the diminished financial anxiety from precautionary savings may be undermined by participating in high-risk investments, such as cryptocurrencies. Moreover, I also find that crypto investors are more financially anxious when encountering job loss or financial fragility compared to non-crypto investors. My findings contrast with the existing literature, which has shown that cryptocurrencies are likely to be safe heaven during the COVID-19 pandemic (Marobhe, 2022; Melki and Nefzi, 2022). Overall, findings in this paper underscore the importance of offering customized advice for rainy-day savings based on individual investment backgrounds, as they may undermine the effectiveness of the proposed advice.

The present study makes the following contributions. First, to the best of my knowledge, the present study is the first attempt to investigate the moderating role of crypto investments in the relationship between rainy-day savings and individual financial well-being. This offers a novel perspective on how emerging financial instruments interact with traditional strategies

for alleviating financial stress during economic uncertainties. Moreover, I highlight the necessity of implementing policies and regulations that could raise people's awareness of the high-risk nature of cryptocurrencies, given their potential to increase financial anxiety when encountering financially turbulent events. For example, the newly approved Markets in Crypto-Assets (MiCA) regulation aims at maintaining financial stability in crypto markets by detailing who can create and offer crypto assets to the public along with other requirements for trading with cryptocurrencies (Poulle *et al*., 2024).

The rest of the paper is organized as follows: Section 2 introduces the existing literature regarding cryptocurrencies and individual financial outcomes. Section 3 introduces the hypotheses. Section 4 presents the methodology for the analysis. Section 5 shows the results. Section 6 discusses the findings, and section 7 concludes this paper.

2. Literature review

Rainy-day savings are important for maintaining financial stability and providing additional financial resilience in times of crisis (Chen *et al*., 2024). Recent literature in individual finance has shown that rainy-day savings are an effective measure for alleviating financial stress during the COVID-19 pandemic (Despard and Roll, 2024), when households encountered financial turbulences such as job losses and unexpected medical expenses (Okumu *et al*., 2024). This is because rainy-day funds not only provide a buffer against sudden income change, but they also help individuals avoid borrowing from high-interest debts or using alternative financial services to cover living expenses (Sowula and Seeleib-Kaiser, 2023). Additionally, prior research has also shown the psychological benefits of having rainy-day savings (Pomeranz and Kast, 2024). In general, having emergency funds set aside for unforeseeable events can significantly reduce depression, stress, and anxiety, as individuals feel more secure with a backup plan for changes in their finances (Orkin *et al*., 2023).

Recent literature attempts to further examine if emerging digital assets, such as cryptocurrencies, are safe investment options during market turbulences, thereby reducing the financial stress of individuals during an economic downturn (Hsu *et al*., 2024; Riahi *et al*., 2024). For example, Tarchella *et al*. (2024) suggest that cryptocurrencies could serve as a safe heaven, particularly during the COVID-19 pandemic when inflation is high. This is because cryptocurrencies can be used as an alternative to traditional currencies, which can lose value due to market inflation (Hamilton, 2024). Existing studies have shown that cryptocurrencies could achieve more desirable investment outcomes than conventional financial assets because they have the potential to bring additional diversification benefits to an investment portfolio (Jayawardhana and Colombage, 2024). For instance, their decentralized nature and limited correlation with financial markets may help reduce the exposure to systematic risk during periods of financial uncertainty (Kock and Tarkom, 2024). Nevertheless, there has been a general consensus that more financial literacy is required to gain profits from investing in cryptocurrencies due to their high volatility nature (Bai *et al*., 2024; Blue *et al*., 2024). Therefore, cryptocurrencies may also result in significant financial losses that can further intensify the already high financial burden people encounter in times of economic downturns.

Despite the existing studies documenting the beneficial outcomes of rainy-day savings and the potential of cryptocurrencies to achieve desirable investment outcomes, few have examined how crypto investments affect the benefits of rainy-day savings in reducing financial anxiety, particularly during an economic turbulence. Additionally, most studies examining the financial outcomes from investing in cryptocurrencies utilized a simulation approach based on different financial stochastic models (Fang *et al*., 2024; Singh *et al*., 2024). Those methods, however, often assume smooth market conditions and omit individual characteristics that could dramatically change the investment outcomes of an investment vehicle. Regression analysis is suitable for filling this gap because it allows us to use real data and incorporate variables such as financial conditions and individual demographic information.

3. Hypotheses

3.1 Rainy-day savings and financial anxiety

Extensive studies have documented the important role of rainy-day savings in ensuring financial stability during times of unexpected emergencies (Beaman *et al*., 2014; Cusimano *et al*., 2023). It is evident that rainy-day savings can reduce debt borrowing and provide more financial flexibility when urgency arises (Hall, 2021; Mills and Amick, 2010). For instance, early retirement withdrawals have become a significant issue in many households in the United States (Kline and Pais, 2021). This is because households without rainy-day savings need to tap into their retirement savings to cover necessary expenses during life shocks and mitigate financial anxiety (Lee and Hanna, 2020). The early withdrawal from retirement accounts not only results in an immediate tax penalty but can also jeopardize their income stability in later life (Stuart and Bryant, 2024). Moreover, rainy-day savings can also help reduce borrowing from alternative financial services, a growing concern that could further increase individual financial burden and household income constraints due to their high interest rates and fees (Harvey, 2019; Robb *et al*., 2015). Therefore, it is evident that rainy-day savings can reduce financial anxiety by helping people reduce high-cost borrowing and better preserve their long-term financial stability. As a result, I believe that rainy-day savings can help alleviate financial anxiety, and the first hypothesis is as follows:

H1. Rainy-day savings related to a lower level of financial anxiety.

3.2 The moderating role of crypto investments

Rainy-day savings are traditionally seen as a key tool in mitigating financial anxiety, providing a buffer during times of economic uncertainty. However, the beneficial outcomes of rainy-day savings could differ when crypto investments are involved. Cryptocurrencies have emerged as a new investment option in the financial marketplace since the inception of the first cryptocurrency, Bitcoin, in 2009. Unlike fiat currencies, whose value depends on the overall economy of the issuing country, the prices of cryptocurrencies are purely determined by a principle of "supply and demand" and market attention (Yu, 2023), which makes their value extremely volatile from time to time (Yae and Tian, 2024; Kumar, 2021). In other words, outcomes from investing in cryptocurrencies are often highly uncertain (Alexander and Heck, 2020), especially during periods of economic turbulence such as the COVID-19 pandemic (Chen *et al*., 2022). Moreover, psychological research has shown that uncertainty is a major source of anxiety, worry, or even depression (Chen *et al*., 2018; Gu *et al*., 2020). As a result, the high volatility and unpredictability of crypto assets can introduce additional anxiety, undermining the psychological security usually afforded by savings.

Furthermore, despite the fact that cryptocurrencies have attracted many institutional and retail investors, a survey found that less than one-third of the investors have actually made a profit (Hooson and Michael, 2024). This suggests that crypto investment may intensify individual financial burden, which weakens the relationship between rainy-day savings and diminishing financial anxiety. Therefore, I hypothesize that crypto investments have a moderating effect as follows:

H2. Crypto investments positively moderate the association between rainy-day savings and financial anxiety.

4. Methodology

4.1 Data

I used data from the most recent 2021 cohort of the National Financial Capability Study (NFCS). The FINRA Foundation initiated the NFCS in 2009 and has since distributed it every two years. The goal of the NFCS is to collect sociodemographic information and financial background of U.S. adults, such as education level, employment status, financial literacy, and

investment behavior. I used the 2021 cohort of data because it captured a variety of information during the pandemic. My final sample contains 1,812 observations after removing 472 observations with missing values. After a careful review of the documentation for the data from the NFCS, I found that the missing values were mainly due to respondents being unwilling to answer certain questions. This could be considered as random reasons that should not cause systematic bias to the variables of interest in the present study. Also, after removing the missing values, I observed no significant changes in the data distribution. Therefore, I continue the analysis without using data imputation methods, such as average, bootstrap, or regression, which could change the distribution of data and introduce bias to the analysis.

The data utilized in this study comes from the 2021 cohort of the National Financial Capability Study (NFCS), which is designed to capture a representative sample of U.S. adults. While this sample allows us to make inferences about U.S. adults' financial situation, admittedly, some cautions should be taken into account when generalizing the results to other populations, particularly in a different economic context. For example, financial anxiety and the moderating role of cryptocurrency investments may differ in countries with less exposure to cryptocurrency markets or those with different trading regulations. Nevertheless, the increasing globalization of digital assets like cryptocurrencies and the broad benefits of rainy-day savings suggest that the main findings in this study may have broader applicability, especially in regions sharing similar economic conditions and digital finance ecosystems.

4.2 Variable measurements

In Section 3, I introduced how rainy-day savings may affect financial anxiety and how crypto investment may reduce the benefits of rainy-day savings in alleviating financial anxiety. In the present study, I follow the existing literature to select the survey questions and coding schemes for creating variable measurements (Bai, 2024; Friedline and West, 2016; Nam and Loibl, 2021). This section introduces the three variables and the measurements for the three key variables of interest: financial anxiety, rainy-day savings, and crypto investments, in detail.

4.2.1 Financial anxiety (FA). In the NFCS, respondents were asked to rate the following statement: "Thinking about my personal finances can make me feel anxious." on a scale from "1 = strongly disagree" to "7 = strongly agree". Thus, the variable, financial anxiety, takes a value from 1 to 7, where a larger value indicates a higher level of financial anxiety. The 1–7 Likert scale used for measuring financial anxiety is widely adopted in behavioral finance research due to its effectiveness in capturing variations in financial stress levels. This scale has been validated in prior studies as a reliable measure that reflects the levels of financial anxiety across diverse populations (Warmath and Zimmerman, 2019).

4.2.2 Rainy-day savings (RS). One of the main independent variables of interest is rainy-day savings, which measures if a respondent has set aside rainy-day funds that are enough to cover 3-month living expenses. Specifically, respondents were asked, "Have you set aside emergency or rainy-day funds that would cover your expenses for 3 months in case of sickness, job loss, economic downturn, or other emergencies?". Responses were recorded as "yes" or "no". Therefore, the variable, rainy-day savings, equals 1 if the respondent has set aside rainy-day funds and 0 otherwise.

4.2.3 Crypto investments (CI). The variable, crypto investments, measures if the respondent has invested in cryptocurrencies based on the following survey question: "Have you invested in cryptocurrencies, either directly or through a fund that invests in cryptocurrencies?". Responses were recorded as "yes" or "no". Thus, the variable is a binary one, which takes a value of 1 if the response is affirmative and 0 otherwise.

4.2.4 Control covariates (CC). Following the existing literature, I include a set of control covariates measuring three different aspects of respondents: basic demographic information, financial and investment background, and others (Bai, 2021; Kim *et al*., 2020; Nam and Loibl, 2021; Zhao and Zhang, 2021). Specifically, I include age, gender, education level, marital status, income level, and employment status as measurements for the demographic information

of respondents. For the financial and investment background, I control financial capability, financial knowledge, financial education, financial inclusion, and investment knowledge. Regarding other confounding factors that may affect financial anxiety, I include risk appetite, job loss, and financial fragility. Summaries and detailed measurements for those control covariates are presented in Appendix 1.

4.3 Empirical analysis strategy

In this paper, I adopt a three-step analysis strategy to investigate the relationship between rainy-day savings and financial anxiety as well as the moderating effect of crypto investments. In the first step, a baseline OLS model is carried out to examine how rainy-day savings and crypto investments correlate with financial anxiety separately since the dependent variable is measured in a 1–7 Likert scale. The same approach was adopted in Bai (2024). A logistic regression model that can capture non-linear patterns could be considered when the dependent variable is a binary one. The baseline OLS model can be described in the following functional form:

$$FA_i = \alpha_0 + \alpha_1 * RS_i + \alpha_2 * CI_i + \alpha_3 * CC_i + \varepsilon_i \quad (1)$$

where FA_i stands for the financial anxiety of individual i, RS_i and CI_i are the main independent variables, rainy-day savings and crypto investments, respectively, and CC_i stands for the set of control covariates.

When utilizing the OLS model for regression analysis, it is important to consider the potential presence of multicollinearity issues, which may undermine the accuracy of estimations as well as the interpretation of results. Therefore, I evaluate the variance inflation factor (VIF) of all variables after performing the regression analysis above. I find that all the variables have a VIF of less than 4, which is below the commonly used threshold of 5. Therefore, I conclude that the regression analysis does not suffer from the multicollinearity issue. Summaries about the VIF results can be found in Appendix 2.

In the second step, I add the interaction between rainy-day savings and crypto investments to study the moderate effect of crypto investments on the association between rainy-day savings and financial anxiety. The regression model is represented by the following equation:

$$FA_i = \beta_0 + \beta_1 * RS_i + \beta_2 * CI_i + \beta_3 * RS_i * CI_i + \beta_4 * CC_i + \epsilon_i \quad (2)$$

The final step of my analysis can be viewed as a robustness check. In this part of the analysis, I divide the sample into two subgroups based on crypto investments: crypto investors and non-crypto investors. Then, I regress financial anxiety against rainy-day savings and compare the results. The regression model can be explained by the following functional form:

$$FA_i = \gamma_0 + \gamma_1 * RS_i + \gamma_3 * CC_i + \tau_i \quad (3)$$

Similar approach for testing the robustness of moderating effect was used in Bai (2024).

5. Results

5.1 Summary statistics

Table 1 presents the summary statistics for all variables used in the present study, as well as the average financial anxiety score of respondents by outcomes of the two key independent variables: rainy-day savings and crypto investments.

The sample contains 1812 respondents in total, with a mean financial anxiety score of 3.497. Furthermore, based on the categorical levels of the two main independent variables, 87.86% of the respondents have set aside rainy-day funds for emergencies, and 22.52% of the respondents have invested in cryptocurrencies. From the summary statistics results, I also find

Table 1. Summary statistics

Summary statistics of all variables

Variable	Obs	Mean	SD	Min	Max
Financial anxiety	1,812	3.497	2.011	1	7
Rainy-day savings	1,812	0.879	0.327	0	1
Crypto investments	1,812	0.225	0.418	0	1
Age group	1,812	2.504	0.693	1	3
Gender	1,812	0.647	0.478	0	1
Education level	1,812	0.744	0.436	0	1
Marital status	1,812	0.679	0.467	0	1
Income level	1,812	2.705	0.875	1	4
Employment status	1,812	0.540	0.499	0	1
Financial capability	1,812	6.444	0.954	1	7
Financial knowledge	1,812	5.755	0.931	1	7
Financial education	1,812	0.085	0.279	0	1
Financial inclusion	1,812	0.937	0.244	0	1
Investment knowledge	1,812	4.928	1.303	1	7
Risk appetite	1,812	6.264	2.258	1	10
Job loss	1,812	0.143	0.351	0	1
Financial fragility	1,812	0.059	0.236	0	1

Mean financial anxiety score by rainy-day savings (yes or no) and crypto investments (yes or no)

	Mean financial anxiety score	Obs	Percent
Rainy-day savings			
Yes	3.274	1,592	87.86
No	5.109	220	12.14
Crypto investments			
Yes	4.561	408	22.52
No	3.188	1,404	77.48

Source(s): Authors' own work

that the mean financial anxiety score is lower among people with rainy-day savings (3.274) than those without (5.109). Meanwhile, crypto investors also showed a higher mean financial anxiety score (4.561) than non-crypto investors (3.188) during the pandemic in 2021. This could be attributed to the high volatility nature of cryptocurrencies and the lack of regulations in the market. While many investors participated in crypto trading during the pandemic, few actually gained from cryptocurrency investments, which may increase the financial anxiety of investors.

5.2 Results from the baseline regression

Table 2 presents the results from the baseline regression model. From Columns (1) to (3), I add the control covariates related to the demographic information of respondents and their financial and investment backgrounds sequentially.

The baseline regression model shows a negative association between rainy-day savings and financial anxiety, with or without accounting for control variables related to demographic information and the financial and investment backgrounds of respondents. Specifically, after including all control covariates in Column (3), individuals with rainy-day savings have a 0.643 lower financial anxiety score compared to those without savings for rainy days, on average. The regression result supports the hypothesis that rainy-day savings help alleviate financial anxiety in times of economic downturn. On the other hand, crypto investments are positively

Table 2. Baseline regression results

Variables	(1) Financial anxiety	(2) Financial anxiety	(3) Financial anxiety
Rainy-day savings	−1.574***	−1.155***	−0.643***
	(0.136)	(0.133)	(0.138)
Crypto investments	1.157***	0.573***	0.537***
	(0.106)	(0.112)	(0.110)
Age group (35–44)		−0.462***	−0.233
		(0.149)	(0.143)
Age group (above 44)		−1.252***	−0.869***
		(0.155)	(0.152)
Gender		−0.371***	−0.257***
		(0.088)	(0.085)
Education level		−0.116	−0.032
		(0.099)	(0.094)
Marital status		0.104	0.122
		(0.098)	(0.093)
Income level (35k up to 75k)		−0.601***	−0.413***
		(0.159)	(0.151)
Income level (75k up to 150k)		−0.700***	−0.458***
		(0.163)	(0.156)
Income level (above 150k)		−1.165***	−0.780***
		(0.186)	(0.179)
Employment status		0.500***	0.354***
		(0.100)	(0.096)
Financial capability			−0.317***
			(0.046)
Financial knowledge			−0.213***
			(0.052)
Financial education			0.468***
			(0.144)
Financial inclusion			−0.020
			(0.162)
Investment knowledge			−0.069*
			(0.037)
Risk appetite			0.013
			(0.020)
Job loss			0.952***
			(0.117)
Financial fragility			0.773***
			(0.187)
Constant	4.620***	5.956***	8.240***
	(0.133)	(0.217)	(0.383)
Observations	1,812	1,812	1,812
R-squared	0.145	0.249	0.333

Note(s): This table reports the baseline regression model without accounting for the interaction between rainy-day savings and crypto investments. From Columns (1) to (3), I add the control covariates related to demographic information and financial and investment backgrounds of respondents sequentially
Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

correlated with financial anxiety. As shown in Column (3), crypto investors have a 0.537 higher average financial anxiety score than non-crypto investors, suggesting different levels of financial anxiety among individuals based on whether they invest in cryptocurrencies or not. Those findings support hypotheses 1.

5.3 Results from the regression with interaction effect

Table 3 presents the main regression model with an interaction between rainy-day savings and crypto investments.

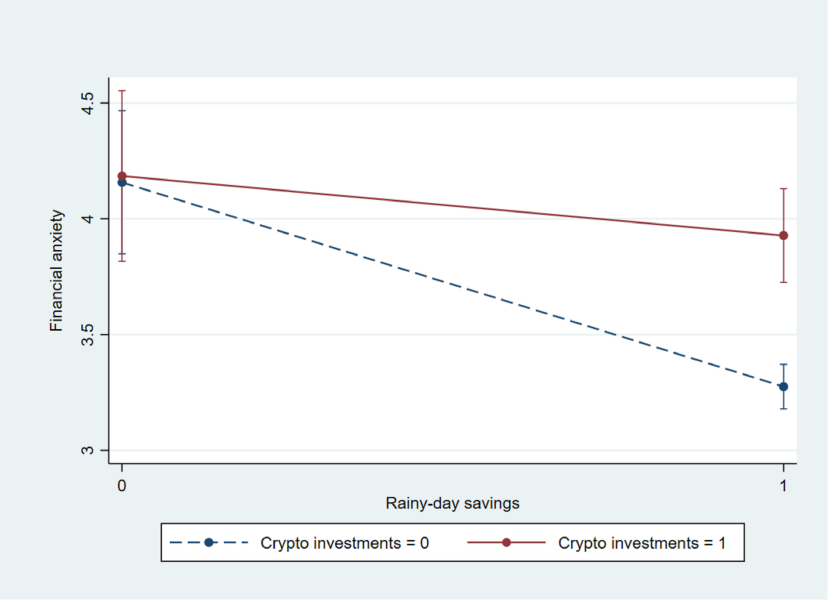
Table 3. Regression with an interaction effect

Variables	(1) Financial anxiety	(2) Financial anxiety	(3) Financial anxiety
Rainy-day savings	−1.923***	−1.399***	−0.882***
	(0.173)	(0.167)	(0.168)
Crypto investments	0.407	0.050	0.027
	(0.253)	(0.244)	(0.232)
Rainy-day savings*crypto investments	0.909***	0.639**	0.625**
	(0.279)	(0.265)	(0.251)
Age group (35–44)		−0.459***	−0.232
		(0.149)	(0.143)
Age group (above 44)		−1.244***	−0.861***
		(0.155)	(0.151)
Gender		−0.357***	−0.243***
		(0.088)	(0.085)
Education level		−0.133	−0.048
		(0.100)	(0.095)
Marital status		0.095	0.113
		(0.097)	(0.093)
Income level (35k up to 75k)		−0.598***	−0.409***
		(0.158)	(0.151)
Income level (75k up to 150k)		−0.699***	−0.455***
		(0.163)	(0.156)
Income level (above 150k)		−1.163***	−0.776***
		(0.186)	(0.179)
Employment status		0.486***	0.341***
		(0.100)	(0.096)
Financial capability			−0.311***
			(0.046)
Financial knowledge			−0.217***
			(0.052)
Financial education			0.472***
			(0.144)
Financial inclusion			−0.038
			(0.162)
Investment knowledge			−0.072**
			(0.037)
Risk appetite			0.013
			(0.020)
Job loss			0.949***
			(0.117)
Financial fragility			0.770***
			(0.187)
Constant	4.937***	6.188***	8.480***
	(0.165)	(0.237)	(0.394)
Observations	1,812	1,812	1,812
R-squared	0.150	0.251	0.335

Note(s): This table reports the regression model accounting for the interaction between rainy-day savings and crypto investments. From Columns (1) to (3), I add the control covariates related to demographic information and financial and investment backgrounds of respondents sequentially
Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

I find that while rainy-day savings relate to a lower level of financial anxiety, crypto investments positively moderate this association. Although the interaction term is significant at the 0.05 significance level only, a closer examination shows a precise *p*-value of 0.013. Therefore, I consider the interaction effect to be significant. This finding is rather important since it confirms the varying benefits of alleviating financial anxiety from savings for rainy days based on whether or not an individual invests in cryptocurrencies. Figure 1 further illustrates the interaction effect between rainy-day savings and crypto investments.

In Figure 1, the solid line and the dashed line represent crypto investors and non-crypto investors, respectively. The *y*-axis stands for the financial anxiety score, and the *x*-axis represents whether the respondents have set aside rainy-day savings (1 = yes and 0 = no). Based on the diagram, while rainy-day savings reduce financial anxiety in general, this effect is more pronounced among non-crypto investors than crypto investors, as indicated in the steeper dashed line. Also, the financial anxiety among individuals without rainy-day savings is roughly the same, but it varies dramatically with prepared rainy-day funds, which provides further evidence that rainy-day savings have different effects on financial anxiety between crypto investors and non-crypto investors. Together, the empirical findings support hypothesis 2. The individual characteristics of crypto investors could shed light on this finding. For instance, existing literature has shown that crypto investors are often younger, with a higher level of risk appetite, and are primarily those who seek short-term rewards (Vega and Camarero, 2024). Therefore, it is possible that crypto investors, due to their younger age and greater risk appetite, may exhibit a tendency to engage in speculative investments, resulting in a higher financial anxiety that non-crypto investors, even both share the same level of rainy-day savings.



Note(s): As indicated in a steeper dashed line, rainy-day savings show a more pronounced effect on reducing financial anxiety in non-crypto investors than among crypto investors

Source(s): Author's own work

Figure 1. Interaction effect between rainy-day savings and crypto investments

My findings are consistent with the prior research, which has shown that rainy-day savings are an effective measure for reducing financial anxiety, especially when encountering financial turbulence (Beaman *et al*., 2014), such as sudden income change and job loss (Cusimano *et al*., 2023). Extending the existing studies examining rainy-day savings, I find that the beneficial outcomes of rainy-day savings on reducing financial anxiety could be undermined by crypto investments. This finding is consistent with the market observation that, while cryptocurrencies are popular investment options, only a few have made an actual profit from them (Hooson and Michael, 2024). In other words, I support the existing literature showing that cryptocurrencies require sufficient financial literacy to properly manage their high volatility nature, and investors should take extra caution when choosing crypto investments.

For other demographic factors reported in Table 3, Column (3), age, gender, income level, and employment status are found to be significantly related to financial anxiety. Specifically, people above 44 are less financially anxious than those between 18 and 34, and males show a lower level of financial anxiety than females. Not surprisingly, people with higher income levels are less financially anxious. Interestingly, employment status is positively correlated with financial anxiety, indicating that people who are currently working are more financially anxious than their non-working counterparts. First, individuals who are working during the COVID-19 pandemic could be the people with greater financial pressures and responsibilities, such as supporting family, resulting in a higher level of financial anxiety (Wilson *et al.*, 2020). Moreover, employed individuals often have more immediate financial commitments, such as mortgages, bills, and other expenses that are tied to their current income levels (Mann *et al.*, 2020). Thus, they may be more anxious about the overall economic disruption that may affect their income levels during the COVID-19 pandemic.

In terms of variables related to financial and investment backgrounds, I find that while financial capability and financial knowledge both correlate to lower financial anxiety. Surprisingly, I find that financial education also relates to a higher level of financial anxiety. A couple of reasons could help explain this finding. First, people with financial education are often more aware of financial risks and uncertainties when making decisions during economic downturns (Klapper and Lusardi, 2020). This could lead to a higher level of anxiety as they can better recognize market volatility and potential pitfalls. Second, financial education may also entail expectations of financial success (Chen *et al*., 2021). Therefore, when these expectations are not achieved, individuals with financial education might experience a higher level of anxiety. Finally, forms of financial education may also play a role in either increasing or controlling financial anxiety (see Frisancho (2023), for example). For instance, studies have found that formal financial education, particularly those with a systematic design focusing on asset management, effectively enhances individual financial well-being. On the contrary, informal financial education, like those acquired from daily communication with peers, is less reliable and may even lead to misinformation. Future research may explore how different forms of financial education affect individual financial well-being.

5.4 Results from regression on subgroups

Recall that as the last step of the analysis, I divide the sample into two subgroups based on crypto investments: crypto investors and non-crypto investors. Then, I regress financial anxiety against rainy-day savings on the two subsamples separately and compare the results as a robustness check for the interaction effect between rainy-day savings and crypto investments. Columns (1) and (2) of Table 4 present the results based on crypto investors and non-crypto investors, respectively.

I find that while rainy-day savings relate to a lower level of financial anxiety in both the crypto investor subgroup and the non-crypto investor subgroup, the negative association is more pronounced among non-crypto investors. Specifically, within the crypto investor subgroup, people with rainy-day savings show a 0.686 lower financial anxiety score on

Table 4. Regression models on crypto investor and non-crypto investor subgroups

Variables	(1) Crypto investor subgroup Financial anxiety	(2) Non-crypto investor subgroup Financial anxiety
Rainy-day savings	−0.686***	−0.807***
	(0.243)	(0.169)
Age group (35–44)	−0.207	−0.251
	(0.211)	(0.204)
Age group (above 44)	−0.640**	−0.903***
	(0.283)	(0.199)
Gender	−0.168	−0.220**
	(0.209)	(0.092)
Education level	−0.118	0.003
	(0.199)	(0.106)
Marital status	0.272	0.049
	(0.208)	(0.102)
Income level (35k up to 75k)	−0.367	−0.477***
	(0.293)	(0.175)
Income level (75k up to 150k)	−0.450	−0.503***
	(0.326)	(0.178)
Income level (above 150k)	−0.679*	−0.856***
	(0.372)	(0.203)
Employment status	0.477*	0.336***
	(0.258)	(0.103)
Financial capability	−0.217**	−0.340***
	(0.093)	(0.053)
Financial knowledge	0.063	−0.332***
	(0.111)	(0.058)
Financial education	0.364	0.259
	(0.252)	(0.178)
Financial inclusion	−0.062	−0.032
	(0.314)	(0.188)
Investment knowledge	0.158*	−0.131***
	(0.082)	(0.041)
Risk appetite	−0.013	0.011
	(0.049)	(0.022)
Job loss	1.502***	0.539***
	(0.213)	(0.144)
Financial fragility	1.004***	0.665***
	(0.328)	(0.229)
Constant	5.115***	9.696***
	(0.732)	(0.453)
Observations	408	1,404
R-squared	0.326	0.301

Note(s): This table reports the regression analysis on two subsamples: crypto investors and non-crypto investors, reported in Columns (1) and (2), respectively
Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Source(s): Authors' own work

average. When looking at the non-investor subgroup, those with rainy-day savings have a 0.807 lower average financial anxiety score. Overall, results in Table 4 confirm the interaction effect identified in Section 4.3, and I conclude that results are robust.

Regression results from Table 4 also show that the association between financial anxiety and job loss, as well as financial fragility, is more pronounced among crypto investors than non-crypto investors. While job loss and financial fragility relate to 1.502 and 1.004 higher

financial anxiety scores among crypto investors, the same independent variables are correlated with a 0.539 and 0.665 increase in financial anxiety scores among non-crypto investors, respectively. This provides evidence that, due to the high-risk nature of cryptocurrencies and the uncertain investment outcomes, crypto investors are more vulnerable to the negative influence of job loss and fragility than non-crypto investors.

6. Discussion

In light of the recent economic downturn caused by the COVID-19 pandemic and the continuous expansion of cryptocurrencies in the financial sector (Panda *et al*., 2023; Zheng *et al*., 2023), I examine whether rainy-day savings could alleviate financial anxiety and the moderating role of crypto investments in this relationship. This allows us to better understand how high-risk digital assets, such as cryptocurrencies, can affect individual financial stability in times of future market turbulence, even with rainy-day savings in place. Overall, the findings in this paper have important implications for improving financial resilience. For example, strengthening policies that encourage cautious engagement with digital assets, such as the Markets in Crypto-Assets (MiCA) regulation, could enhance financial stability (Poulle *et al*., 2024). Similar to the MiCA regulation, mandatory disclosures of trading records for financial advisors managing crypto assets may also increase transparency, helping investors make more informed decisions and reducing the potential for fraud and mismanagement in volatile markets. In addition, implementing required financial literacy programs and risk assessments for investors prior to engaging in cryptocurrency investments could further enhance informed decision-making, ensuring that individuals better understand the risks and complexities of these digital assets before their participation.

Regarding the specific findings in the present study, first and foremost, I find that rainy-day savings relate to a lower level of individual financial anxiety during the pandemic in 2021. This confirms prior research showing that rainy-day savings is an effective method for maintaining income stability in times of emergencies (Despard *et al*., 2020). More importantly, I find that the beneficial outcomes of rainy-day savings differ between crypto investors and non-crypto investors. This finding offers new insights into existing studies investigating measurements for improving financial resilience during an economic downturn (Allanjawi *et al*., 2024) and underscores the importance of offering customized rainy-day savings based on a person's investment background.

Moreover, the regression analysis based on the two subgroups: crypto investors and non-crypto investors has also revealed that crypto investors are more prone to job loss and financial fragility than non-crypto investors, as suggested by a more pronounced increase in financial anxiety when encountering those challenges (see Table 4 for details). This finding further highlights the importance of rainy-day savings when participating in high-risk financial investments such as cryptocurrencies (Baruah and Parikh, 2018).

Overall, findings in the present study add better understanding to the precautionary savings model by showing how rainy-day funds reduce financial anxiety with a consideration of investing in high-risk assets, such as cryptocurrencies. While precautionary savings theory suggests that individuals save to protect against uncertainty (Kimball, 1989), this study reveals that this beneficial outcome could be moderated by investment outcomes. Specifically, this perspective highlights how risky investments could reduce the financial stability typically provided by precautionary savings, especially during financial turbulence.

7. Conclusion

In this paper, I empirically investigated how rainy-day savings could help reduce financial anxiety in an economic downturn. Also, I examined whether crypto investments would weaken such benefits of rainy-day savings. This paper highlights the importance of increasing

individual awareness of investing in high-risk assets like cryptocurrencies, which may further intensify financial instability during financial turbulence.

The present study is not without limitations. First, the present study is based on data in a cross-sectional setting, which limits my analysis to association rather than causation. A future study may conduct causal analysis when panel data or a suitable instrumental variable is available. Second, data collected from the NFCS are self-reported, which means that responses could be under- or over-reported by respondents. Moreover, since crypto investors often share different personal traits than non-crypto investors, such as having a higher level of risk appetite, continuing to study how such characteristics affect financial anxiety during an economic downturn may provide additional insights to the empirical findings in the present study. Finally, the present study used binary measures for rainy-day savings and crypto investments. Future research may benefit from more specific measurements that capture the detailed amount of rainy-day savings and crypto investments.

Despite those limitations, the present study pinpoints the important role of crypto investments in the benefits of rainy-day savings for individual financial well-being. Following the findings of the present study, a future study may continue investigating how other factors interact with rainy-day savings and affect individual or household financial stability (Lin, 2021; Lopez-Martin, 2022) as I as the influence of cryptocurrency on tax collections (Goel and Mazhar, 2024). Moreover, the varying individual motives for crypto investments as well as personal traits for investment decision-making may also merit further investigation (Hossain, 2021).

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Appendix 1

Table A1. Variable measurement

Variable	Measurement
Age group	18–34 (reference group), 35–44, and above 44
Gender	Male (reference group) and female
Education level	Associate degree or higher and below associate degree (reference group)
Marital status	Married and others (reference group)
Income level	Below 35k (reference group), 35k up to 75k, 35k up to 150k, and above 150k
Employment status	Currently working and not currently working (reference group)
Financial capability	Self-reported financial capability on a scale of 1–7 (1 = least financially capable and 7 = most financially capable)
Financial knowledge	Self-reported financial knowledge on a scale of 1–7 (1 = very low and 7 = very high)
Financial education	Whether the respondent received financial education either from school or from workplace (1 = yes and 0 = no)
Financial inclusion	Whether the respondent have a savings account, money market account, or CDs (1 = yes and 0 = no)
Investment knowledge	Self-reported investment knowledge on a scale of 1–7 (1 = very low and 7 = very high)
Risk appetite	Respondents' willingness to take risks for financial investments on a scale of 1–10 (1 = not at all and 10 = very willing)
Job loss	Whether the respondent was laid off due to the pandemic (1 = yes and 0 = no)
Financial fragility	Whether the respondent could come up with $2,000 if an unexpected need arose next month (1 = certainly or probably could and 0 = certainly or probably could not)

Source(s): Authors' own work

Appendix 2

Table A2. VIF of variables in regression analysis

Variables	
Rainy-day savings	1.35
Crypto investments	1.39
Age group (35–44)	2.67
Age group (above 44)	3.60
Gender	1.10
Education level	1.13
Marital status	1.24
Income level (35k up to 75k)	1.09
Income level (75k up to 150k)	3.99
Income level (above 150k)	3.18
Employment status	1.53
Financial capability	1.30
Financial knowledge	1.56
Financial education	1.07
Financial inclusion	1.03
Investment knowledge	1.54
Risk appetite	1.40
Job loss	1.13
Financial fragility	1.29
Average VIF	1.82

Source(s): Authors' own work