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Compulsive Gambling in the Stock Market: Evidence from an Emerging Market

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Abstract: During the COVID-19 pandemic, many new individual investors globally entered the stock markets, often pursuing speculative investment strategies that resemble gambling. A concern is that trading as a form of gambling can become addictive for some people, as documented by several recent studies in developed markets. We contribute to this literature by adding new evidence from a large emerging market, Thailand, where most forms of traditional gambling are illegal. We field a diagnostic checklist from the American Psychiatric Association for compulsive gambling, changing the content of each item to refer to stock market trading instead of gambling. In a survey of 285 Thai investors, we document that 9.5% are potential problem gamblers, while 4.9% meet the stricter criteria for addiction. The trading addiction score explains speculative trading behavior such as frequent trading, day trading and buying high-risk "lottery" stocks, beyond common factors such as overconfidence and high risk-tolerance. Further, the trading addiction score is positively related to high levels of stress and alcohol use, problems often associated with gambling disorders. Our results raise awareness about investors whose objectives are more related to gambling than long-term investment, and the associated problems when such behavior becomes compulsive.

Keywords: individual investors; trading behavior; gambling; speculation; problem gambling

1. Introduction

Nowadays, retail investors can easily create well-diversified portfolios of domestic and foreign stocks with low expenses using online stock trading accounts and exchange-traded funds. Such investment strategies are well-suited for achieving financial resilience and accumulating retirement savings. However, many studies show that most individuals with a stock trading account behave very differently from this normative ideal (Barber and Odean 2013). Individual investors often hold stocks of only one or two companies in their portfolio (Polkovnichenko 2005; Dimmock et al. 2021), earning poor risk-adjusted returns. Further, many individual investors trade stocks too frequently, leading to high costs and poor performance (Barber and Odean 2000; Hoffmann and Shefrin 2014). Individual investors also often prefer lottery stocks (or penny stocks) that offer a small chance of a very high return (Statman 2002; Kumar 2009; Dimmock et al. 2021). However, because such lottery stocks are in high demand and tend to be too expensive, they earn negative returns on average (Bali et al. 2011; Eraker and Ready 2015; Bali et al. 2021).

The literature offers several explanations for the speculative and unprofitable trading behavior of individual investors. Active investors can be overconfident (Barber and Odean 2001), which means that they overestimate the accuracy of their financial information. Investors can also learn how to invest through their trading strategies (Seru et al. 2009). High demand for lottery stocks can be driven by a preference for skewed payoffs (Mitton and Vorkink 2007) and overweighting of small probabilities (Polkovnichenko 2005; Barberis and Huang 2008). Another explanation is that investors enjoy high-risk stock trading as a form of entertainment (Hoffmann 2007; Dorn and Sengmueller 2009), similar to gambling in casinos or sports betting.

Indeed, studies demonstrate that some investors use stock trading as a substitute for traditional forms of gambling, such as lotteries and casinos. Dorn et al. (2014) document that individual investors in the U.S. and Germany tend to trade less actively in the stock market during weeks with large lottery jackpots (e.g., Powerball and Mega Millions in the U.S.). Gao and Lin (2014) report similar evidence from Taiwan, where the trading volume of stocks preferred by retail investors drops by 5% to 10% on days with large lottery jackpots. Dorn and Sengmueller (2009) found that German investors who report that they enjoy gambling have significantly higher portfolio turnover. Related, Markiewicz and Weber (2013) found that a scale for gambling propensity positively predicts the trading volume of investors in an experimental market. Mosenhauer et al. (2021) found that problem gambling is associated with higher stock portfolio turnover in a survey of 795 U.S. active gamblers who also trade in the stock market.

If a subset of individual investors treats stock market trading as a substitute for gambling, the negative consequences might extend beyond poor investment performance. The reason is that excessive gambling (e.g., playing lotteries, slot machines, casinos, or sports betting) can become a behavioral problem for some people. Gambling disorder is defined as 'persistent and recurrent counter-productive gambling behavior' characterized by the inability to control gambling, leading to significant harmful consequences: personal, familial, financial, professional, and legal (American Psychiatric Association 2013; Blaszczynski and Nower 2002). In severe cases, it can cause problems such as poor health, depression, job loss, bankruptcy, divorce, and even imprisonment, which are costly for society (Latvala et al. 2018). People can also suffer from a less severe form of excessive gambling, called "problem gambling" (Volberg 2001). A meta-study by Stucki and Rihs-Middel (2007) estimates the rate of problem gambling and gambling disorder in the population as 1.2% and 1.9%, respectively.

Stock markets offer several products and trading strategies that share properties with conventional gambling activities, such as having highly skewed payoffs, a short investment horizon, and providing direct feedback about gains and losses (Cox et al. 2020; Newall and Weiss-Cohen 2022). Thus, a relevant issue is whether people can develop a gambling addiction to stock trading. Studies conducted in gambling clinics report that some patients sought treatment with stock market trading as their primary gambling problem (Granero et al. 2012; Shin et al. 2015; Grall-Bronnec et al. 2017). Only a few studies have been conducted among investors to assess how widespread trading addiction in the stock market is, apart from surveys by Youn et al. (2016) and Cox et al. (2020). Youn et al. (2016) report that 21.5% of Korean individual investors met the criteria for gambling disorder, while Cox et al. (2020) found that only 4.4% of Dutch retail investors satisfied the criteria for compulsive gambling in the stock market.

Since gambling behavior depends strongly on local norms and regulations (Kumar et al. 2011; Cox et al. 2020), collecting more evidence from other countries, especially emerging markets, is essential. This paper aims to gather evidence about trading addiction in Thailand. Thailand is a Southeast Asian country where most forms of gambling are illegal (apart from state lotteries) but with a developed stock market that those with wealth can easily access. Further, gambling is also against the values of Buddhism, the religion practiced by more than 90% of the Thai population. Thus, we expect that, especially in Thailand, people turn to stock trading as a socially acceptable substitute for gambling. Kumar et al. (2021) estimated the value of gambling-motivated stock market volume in 38 countries worldwide. Kumar et al. (2021) found that the Thai stock market has the highest proportion of gambling-motivated trading volume at 34%, which amounted to 7.2 trillion Thai Baht in 2021 (about USD 200 billion). Hence, Thailand is an excellent setting for studying stock trading addiction problems.

We fielded a survey to assess what proportion of Thai investors show symptoms of trading addiction. To measure trading addiction, we adapted a diagnostic checklist for gambling disorder from the American Psychiatric Association (APA) by changing the content of the questions to refer to stock trading instead of gambling, following Youn et al.

(2016) and Cox et al. (2020). We then tested if this scale for trading addiction can help explain a range of speculative trading behaviors commonly associated with poor outcomes for individual investors, such as high stock trading frequency, day trading, portfolio under-diversification, and buying so-called "lottery stocks". As a further validation, we tested if the trading addiction scale is related to a range of problems that people with gambling disorders often have, such as stress, depression, and substance use.

2. Literature and Hypotheses

In this section, we review the directly related empirical literature on the prevalence of compulsive gambling in the stock market. Studies in gambling treatment clinics in Spain (Granero et al. 2012), France (Grall-Bronnec et al. 2017), and Korea (Shin et al. 2015) report about patients seeking treatment for gambling disorders stemming from stock trading and other investment-related activities. Grall-Bronnec et al. (2017) found that 8 out of 221 patients (3.6%) seeking treatment for gambling problems were excessive traders. In Granero et al. (2012), stock market trading was the primary gambling problem for 18 (1.2%) out of 1470 patients in a gambling clinic, and trading was a secondary gambling problem for another 76 (5.2%). Shin et al. (2015) compared two groups of patients with gambling disorders in Korea, one trading in financial markets (N = 45) and another betting on horse races (N = 99). The evidence in these three studies shows that trading addicts seeking treatment are similar to other gambling addicts regarding the severity of their gambling-related problems and demographic characteristics such as age and gender. However, trading addicts tend to be better educated and report fewer relationship problems than other gamblers, which may stem from the fact that trading is more socially accepted.

A detailed case study of eight patients in France by Grall-Bronnec et al. (2017) reveals the possible origins of trading addictions and the associated trading strategies. The traders in this study started with sizable initial wealth from inheritance or the sale of property or a business. After experiencing early gains from investing in financial markets, they chased subsequent losses with risky investment strategies and developed an obsession with trading. They followed their gains and losses in the market on a minute-by-minute basis, suggesting day trading and excessive turnover.[1] Eventually, they incurred large losses, and their obsessive trading activities caused great problems in their personal lives, prompting them to seek help in the gambling clinic. The patients in this case study traded high-risk individual stocks, foreign currencies, derivatives, and leveraged products.

Shin et al. (2015) compare two groups of patients with gambling addiction, those betting on horse races versus those trading in financial markets. Remarkably, both groups on average waited 10 years before seeking treatment for their gambling problems in the clinic. Survey studies suggest that less than 10% of people with gambling disorders seek formal treatment (Huberfeld and Dannon 2014). In addition, Shin et al. (2015) found that trading addicts are significantly less likely to participate in group therapy than horse race gamblers. This suggests that it is essential to develop screening instruments for detecting gambling disorders among individual investors early, before the problem escalates.

Youn et al. (2016) fielded three standard instruments for detecting gambling problems in a survey of 1005 Korean individual investors to develop a survey measure for trading addiction and to demonstrate the scale's reliability. In their sample, 21.5% of Korean individual investors met the criteria for gambling disorder, suggesting that the problem is potentially widespread in some countries. In a representative sample of Dutch retail investors, Cox et al. (2020) found that only 4.4% satisfied the criteria for compulsive gambling in the stock market, and another 3.6% met the criteria for problem gambling.

Since gambling behavior strongly depends on local norms and regulations (Kumar et al. 2011; Cox et al. 2020), it is essential to collect more evidence from other countries, especially emerging markets. Our study contributes to the literature by adding new evidence about trading addiction from Thailand, an emerging market where most forms of traditional gambling are illegal and against Buddhist religious values. In the Thai context, speculative stock trading can provide a socially acceptable and legal substitute for gambling to those

with wealth. Indeed, Kumar et al. (2021) estimated that the Thai stock market has the highest proportion of gambling-motivated trading volume among 38 countries in the world, at 34% (closely followed by China at 32%; for comparison, the global average is 16% in Kumar et al. 2021).

Thus, the main contribution of this paper is to present evidence of trading addiction from an emerging market with relatively high levels of gambling-motivated stock trading. A second contribution is that we further validate the trading addiction scale by testing whether it is positively related to substance use, stress, and depression—problems often associated with gambling disorder.[2]

Hypotheses

We now develop several hypotheses about how trading addiction relates to socio-demographic variables, stock trading strategies, and problems such as stress, depression, and substance use, based on previous literature and conceptual papers such as Arthur et al. (2016), Latvala et al. (2018), and Newall and Weiss-Cohen (2022).

The gambling literature has identified the following key socio-demographic risk factors for gambling disorder: young age, male gender, and low socio-economic status (Welte et al. 2015; Allami et al. 2021). We tested whether the same variables are associated with trading addiction in Thailand:

Hypothesis 1. *Trading addiction is negatively related to age.*

Hypothesis 2. *Trading addiction is positively related to male gender.*

Hypothesis 3. *Trading addiction is negatively related to income.*

Financial markets provide funding for companies and good investment opportunities for households, especially when investors buy and hold a well-diversified portfolio of stocks and bonds for the long term (Dimson et al. 2009). However, there are also speculative stock trading strategies available that share properties with conventional gambling activities, such as having a short investment horizon and offering a small chance to make a huge profit, while leading to losses with a high probability (Cox et al. 2020; Newall and Weiss-Cohen 2022). Specifically, Arthur et al. (2016) and Newall and Weiss-Cohen (2022) identify the following trading strategies and financial products as speculative and similar to gambling: trading stocks at a high frequency, day trading, buying lottery stocks, and using leverage and derivatives. In the Thai context, people could use these trading strategies as a substitute for conventional forms of gambling, such as casinos and sports betting, which are illegal and against Buddhist religious values. Trading addicts especially are expected to follow these strategies more often than other investors. Our hypotheses are as follows:

Hypothesis 4. *Trading addiction is positively related to trading frequency.*

Hypothesis 5. *Trading addiction is positively related to day trading.*

Hypothesis 6. *Trading addiction is negatively related to portfolio diversification.*

Hypothesis 7. *Trading addiction is positively related to lottery stocks trading.*

Hypothesis 8. *Trading addiction is positively related to trading derivatives and use of leverage (a margin account).*

We note in advance that some of the criteria for measuring trading addiction defined later in Section 3 refer to having difficulties with reducing or quitting stock trading. Therefore, a positive relationship between the trading addiction scale and a higher trading frequency and day trading is somewhat mechanical, making Hypotheses 4 and 5 less valid.

However, finding a positive relationship is not guaranteed because we use a self-reported survey instrument, and investors could try to hide their addiction symptoms and give false answers. Testing Hypotheses 4 and 5, therefore, helps to check if self-reported trading addiction symptoms relate to trading behavior in the expected way, to validate the measurement scale, similar to Cox et al. (2020).

Gambling disorders are a concern because they can negatively impact people's well-being, health, and finances. Addiction to conventional forms of gambling, such as slot machines and sports betting, is associated with a host of issues: stress, depression, social issues, substance use, financial problems, and unemployment (see, e.g., Cunningham-Williams et al. 1998). Apart from the personal impact, these problems can also lead to high costs for society, such as treatment costs, lost productivity, and crime (National Gambling Impact & Policy Commission (US) (1999); Latvala et al. 2018). We referred to Latvala et al. (2018) for a conceptual model and a recent literature review about the positive and negative effects of gambling. We tested the following hypotheses about problems associated with trading addiction using our survey fielded in Thailand:

Hypothesis 9. *Trading addiction is positively related to stress.*

Hypothesis 10. *Trading addiction is positively related to feeling depressed.*

Hypothesis 11. *Trading addiction is positively related to smoking cigarettes.*

Hypothesis 12. *Trading addiction is positively related to drinking alcohol.*

3. Data and Methods

The survey in Thailand was conducted online among a convenience sample of individual investors obtained via stock brokers and colleagues.[3] The questionnaire is shown in Appendix A. It is more cost-effective and informative to directly field a survey among investors rather than in the general population, because only about 3% of Thai adults have a stock trading account, making trading addiction a rare phenomenon. Assanangkornchai et al. (2016) conducted a representative survey study of gambling behavior in the Thai population, reporting rates of gambling disorder and problem gambling of 0.9% and 1.14%, respectively.[4] Moreover, only 33 out of 4727 respondents in Assanangkornchai et al. (2016) gamble on high-risk stocks (a proportion of 0.7%). For this reason, we targeted our survey directly at investors. We used a snowball approach via brokers and colleagues, asking them to forward our questionnaire to other investors.

3.1. Screening for Excessive Gambling

Gambling disorder is medically defined using the nine diagnostic criteria described in the American Psychiatric Association's (APA) latest version of the Diagnostic and Statistical Manual of Mental Disorders, DSM-5 (APA, 2013) shown in Table 1 below. The APA DSM-5 (APA, 2013) states that an individual must meet at least four out of nine criteria within a 12-month period to be diagnosed with a gambling disorder. Problem gambling is informally defined as a less severe form of gambling disorder (Volberg 2001), but still excessive. Welte et al. (2015) used a cut-off point of three out of nine DSM-5 criteria to define and measure the prevalence of problem gambling in the U.S.

Table 1. DSM-5 Criteria.

1. Needs to gamble with increasing amounts of money in order to achieve the desired excitement.
2. Is restless or irritable when attempting to cut down or stop gambling.
3. Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
4. Is often preoccupied with gambling (e.g., having persistent thoughts of reliving past gambling experiences, planning the next venture, thinking of ways to get money with which to gamble).
5. Often gambles when feeling distressed (e.g., helpless, guilty, anxious, depressed).
6. After losing money gambling, often returns another day to get even ("chasing" one's losses).
7. Lies to conceal the extent of involvement with gambling.
8. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling.
9. Relies on others to provide money to relieve desperate financial situations caused by gambling.

Following Youn et al. (2016) and Cox et al. (2020), we adapted the DSM-5 diagnostic checklist above to assess if investors in our survey sample display symptoms of trading addiction by replacing the word 'gambling' with 'stock trading'. The response scale for each question is "No" or "Yes", coded as 0 and 1. We summed all nine responses to create a scale from 0 to 9 for gambling addiction. Following the literature, a score of three was our cut-off for "problem trading" (problem gambling), and scores of four or higher indicate a "trading addiction" (gambling disorder).

The reliability of the scale was confirmed in Youn et al. (2016). They conducted a survey among 1005 Korean individual investors that included the DSM-5 checklist above and two other standard scales for detecting gambling problems, with the wording of the items adjusted for stock market trading.[5] Youn et al. (2016) found that the trading addiction scales in general have good measurement reliability, indicated by high positive correlations between the three different scales.

3.2. Dependent Variables

To measure investor trading behavior, the survey includes questions on stock trading frequency, the number of individual stocks owned, day trading stocks (buying and selling the same stock within one day), and derivatives trading. The survey also asked whether investors owned "lottery stocks", a common expression for speculative stocks in Thailand. We refer the reader to Appendix A for the exact survey questions.

To test Hypotheses 9 to 12 about problems often associated with gambling disorders, we included questions about stress, feeling depressed, smoking habits, and alcohol consumption in the survey. Stress is measured with a 7-point scale ranging from 1 being "Not stressful at all" to 7 being "Terribly stressful". The response scale for feeling depressed ranges from 1 being "Not at all depressed" to 7 being "Terribly depressed".

3.3. Control Variables

Apart from gambling disorder, we also measured four other factors that explain speculative trading behavior in the literature to avoid omitted variable bias: (i) financial risk tolerance, (ii) financial literacy, (iii) overconfidence, and (iv) gambling propensity.

We assessed investor risk tolerance (aversion) with two survey questions about willingness to take financial risks and the ability to accept investment losses. We created a financial risk tolerance scale by averaging the two responses and rescaling the variable to a 1 to 10 score. Financial literacy was measured as the number of correct answers to three basic and six advanced financial literacy questions based on Van Rooij et al. (2011).

We measured the miscalibration form of overconfidence by asking the respondents to state a 90% confidence interval for the value of the Stock Exchange of Thailand (SET) index

in one month's time. Using the interval length, we created a scale such that higher values indicate more overconfidence (a narrower interval).[6]

The survey also includes four gambling propensity questions adopted from the domain-specific risk-attitude scale, the DOSPERT scale (Weber et al. 2002). The four questions ask how likely the respondent would bet a day's income (i) on lottery tickets, (ii) a card game, (iii) the outcome of a sporting event, and a week's income (iv) at a casino, with a 5-point response scale (1. "unlikely", 2. "rarely", 3. "sometimes", 4. "likely", 5. "very likely"). We took the average of the responses to the four gambling questions as a proxy for gambling propensity.

3.4. Methodology for Hypothesis Testing

We tested Hypotheses 1 to 3 about the relationship between socio-demographic variables and trading addiction with bi-variate correlation coefficients, and a multiple regression model that accounts for the overlap in the variables.

We tested Hypotheses 4 to 8 about the relation between the trading addiction score and speculative trading behavior by estimating multiple regression models, while controlling for gambling propensity, risk tolerance, overconfidence, financial literacy, and socio-demographic variables. As additional control variables for trading behavior, we included dummy variables for low investment experience (less than one year), high investment experience (more than five years), and having a relatively low or high amount of money to invest (low: less than 1 million baht, about USD 29,000, and high: more than 3 million baht, approximately USD 88,000).

Similarly, we tested Hypotheses 9 to 12 about the relationships between the trading addiction score and stress, depression, smoking, and alcohol consumption with multiple regression models, including the same control variables used for trading behavior.

4. Results

Our sample consists of 285 investors, with slightly more men (59%) than women (41%). As shown in Panel A of Table 2, the average respondent is 36 years old, with the majority being single (62%) and having completed a bachelor or master's degree (98%). The sample has a similar socio-demographic composition as the investor population in Thailand, as a large survey of 2276 investors by the Stock Exchange of Thailand and Nielsen in 2010 found that the average Thai investor is 38 years old, male (63%), single (54%), and holds a bachelor's degree or higher (95%). Most of our respondents are working as employees, or are business owners. The average income in our sample is THB 88,715 per month (about USD 31,000 per annum), which is considerably higher than the national average.[7] Relatively high incomes are expected among Thai stock market investors, given that most low-income earners in Thailand do not have sufficient liquid savings to make stock market investments.

The descriptive statistics of the dependent variables for trading behavior are shown in Panel B of Table 2. Although about a third of the investors trade less than once a month, 25% say that they trade stocks almost daily, and 20% trade three to four times a week. Nearly 60% of the respondents have day-traded stocks in the last 12 months, while 62% traded lottery stocks. About half of the respondents have traded warrants or derivatives, while only 8% have a margin account that facilitates leverage.[8] In sum, more than half of the investors trade stocks actively and follow speculative strategies such as day trading and buying lottery stocks. Further, most investors (74%) own less than eight stocks, thus holding poorly diversified portfolios.[9]

Table 2. Summary Statistics of the Investor Dataset.

Panel A: Demographic Variables			
Variable	**Mean**	**Min**	**Max**
Age in years	35.56	23	70
Male	0.59	0	1
Single	0.62	0	1
Education			
No bachelor degree	0.02	0	1
Bachelor degree	0.42	0	1
Master degree	0.56	0	1
Income groups			
Low income (≤30,000 THB/month)	0.28	0	1
Medium income (30,001–99,000 THB/month)	0.40	0	1
High income (≥100,000 THB/month)	0.32	0	1
Occupation			
Employed	0.67	0	1
Business owner	0.29	0	1
Retired	0.01	0	1
Unemployed, or other	0.03	0	1
Panel B: Dependent Variables			
	Mean	**Min**	**Max**
Stock trading frequency			
Less than once a month	0.32	0	1
1–10 times/month	0.23	0	1
3–4 times/week	0.20	0	1
Almost every day	0.25	0	1
Day trading stocks	0.60	0	1
Trades lottery stocks	0.62	0	1
Trades derivatives	0.52	0	1
Has a margin account	0.08	0	1
Number of stocks owned	6.46	0	80
Smoking cigarettes	0.14	0	1
Drinks alcohol	0.42	0	1
Feeling stressed scale	3.49	1	7
Feeling depressed scale	3.66	1	7
Panel C: Independent Variables and Controls			
	Mean	**Min**	**Max**
Gambling propensity	1.28	1	4
Risk tolerance	6.52	1	10
Financial literacy	6.96	0	9
Overconfidence miscalibration	0.24	−18.0	1.9

Panel B of Table 2 shows summary statistics for the measures of stress, feeling depressed, smoking habits, and alcohol consumption. The average stress level is 3.5 on a 7-point scale ranging from 1 being "Not stressful at all" to 7 being "Terribly stressful". The average level for feeling depressed is 3.7, on a scale from 1 being "Not at all depressed" to 7 being "Terribly depressed". Almost half of the respondents drink alcohol (42.1%), but the majority are non-smokers (86%).

Panel C of Table 2 shows summary statistics of the control variables, namely gambling propensity, risk tolerance, financial literacy, and overconfidence. Investor risk tolerance is moderate on average (6.5 out of 10), but about 50% of the respondents are willing to take high to very high risks. Regarding financial literacy, the number of correct answers is 7.0 out of 9 on average, indicating that investors have relatively high financial literacy. Most investors are overconfident, stating confidence intervals for the SET index that are on average 25% narrower than historical estimates suggest.

Average gambling propensity is very low at 1.3 (on a scale from 1 to 5), because most respondents answer "unlikely" to all four gambling questions. An obvious explanation

is that in Thailand most forms of gambling are illegal and against religious norms, apart from state lotteries. For the same reason, some respondents may not report their gambling behavior. To partially circumvent this problem, one of the questions asked was about gambling in a casino when on holiday outside Thailand (e.g., in Macau). We expect that our trading addiction questions will be affected to a much lesser extent by such a social desirability bias, as they do not refer to gambling but only to stock trading, an activity that is socially accepted and legal. The following sub-section discusses the results for trading addiction in detail.

4.1. Trading Addiction Symptoms among Thai Investors

Table 3 summarizes how many symptoms of gambling disorder the investors display by counting the number of affirmative answers to the nine DSM-5 diagnostic screening questions. The results show that 4.9% of Thai investors (14 of 285) meet the criteria for a gambling disorder (trading addiction) by answering yes to four or more of the DSM-5 diagnostic questions. Another 27 investors (9.5%) can be classified as potential problem gamblers, as they meet precisely three of the nine diagnostic criteria. Overall, 14.4% of the investors show symptoms of excessive gambling in the stock market.

Table 3. Frequency Table of Trading Addiction Symptoms.

Number of Trading Addiction Symptoms	Frequency	Percentage
0	117	41.05
1	66	23.16
2	61	21.40
3	27	9.47
4	10	3.51
5	1	0.35
6	0	0
7	1	0.35
8	1	0.35
9	1	0.35
Total	285	100.00%
	Frequency	Percentage
No symptoms (0)	117	41.05
Some symptoms (1 or 2)	127	44.56
Problem gambling (=3)	27	9.47
Gambling disorder ($\geq$4)	14	4.91
Total	285	100.00%

Notes: the table shows the frequency distribution of the number of affirmative answers the investors gave to the nine DSM-5 diagnostic questions for compulsive gambling, adapted to stock market trading. In other words, the frequency distribution of the number of 'trading addiction symptoms' displayed by the investors in the sample (N = 285). See Table 4 for the nine DSM-5 diagnostic criteria.

In Table 4, we inspect which of the DSM-5 diagnostic criteria tend to be met most frequently in the following four investor groups: potential trading addicts (DSM-5 score $\geq$ 4), problem traders (DSM-5 score = 3), investors with some symptoms (DSM-5 score = 1 or 2), and investors without any symptoms. In the group with some symptoms, about 50% always think of ways to find money to trade stocks and have to trade with increasing amounts of money to maintain their excitement. Among problem traders, about 75% meet these two criteria, and 70% try to win back past losses. In the trading addict group, nearly all have these three symptoms. In addition, 64% have tried to reduce or quit trading but could not, and 57% admit having to borrow money from family or friends to cover losses from trading (93% of trading addicts have one of these two symptoms). Clearly, the gambling disorder symptoms are most severe among potential trading addicts.

Table 4. Proportion of Investors Giving Confirmative Answers to the DSM-5 Diagnostic Criteria.

DSM-5 Diagnostic Criteria for Gambling Disorder, Adapted to Stock Trading	Trading Addiction Score				
	=0	=1 or 2	=3	≥4	0 to 9
	No Symptoms	Some Symptoms	Problem Traders	Trading Addicted	All Investors
1. You trade stocks with larger amounts of money to maintain your excitement.	0%	50%	74%	100%	34%
2. You borrow money from family members or friends to cover losses from stock trading.	0%	4%	11%	57%	6%
3. You always think of ways to find money to trade stocks.	0%	53%	81%	93%	36%
4. You lie to your family or friends about your stock trading.	0%	6%	4%	36%	5%
5. You tried to reduce or quit trading stocks but could not.	0%	7%	15%	64%	8%
6. You trade stocks to escape problems in your life.	0%	2%	7%	21%	2%
7. You return to stock trading because you want to win back money you lost.	0%	23%	70%	71%	20%
8. You have problems in your work or family because of your stock trading.	0%	0%	0%	7%	0%
9. When trying to reduce or to quit stock trading you feel irritated.	0%	5%	37%	43%	8%
Number of investors (N)	117	127	27	14	285
Proportion of sample (%)	41.1%	44.6%	9.5%	4.9%	100%

Notes: the table shows the percentage of 285 Thai investors giving affirmative answers to the nine DSM-5 diagnostic questions about gambling addiction, adapted to stock trading, with the questions listed in the first column. The sample has been split into four different groups in Columns (2)–(5): respondents without symptoms, respondents 1 to 2 symptoms, respondents with exactly 3 symptoms (problem traders) and respondents with 4 or more symptoms (potential trading addicts).

Additional tests showed that excessive gambling in the stock market (DSM-5 score ≥ 3) was more common among young and single investors and less frequent among business owners.[10] Table 5 shows the correlations of the trading addiction score with the socio-demographic variables and control variables in Column (1). Younger age and lower income are positively associated with the trading addiction score, consistent with Hypotheses 1 and 3. We did not find a gender effect (Hypothesis 2). Further, higher risk tolerance, gambling propensity, and overconfidence are positively associated with the trading addiction score. As some of these characteristics overlap[11], such as being young and single, we also estimated a multiple regression model for the trading addiction score, shown in Column (2) of Table 5. We found that trading addiction scores are higher among younger investors, those with higher gambling propensity, risk tolerance, and overconfidence, and investors with lower financial literacy, all else equal.

Our data confirm that some Thai stock market investors display symptoms of gambling disorder and problem gambling based on the DSM-5 diagnostic criteria. Further, confirmative answers to the nine trading addiction questions are much more common than affirmative answers to questions about conventional forms of gambling such as lotteries, casinos, sports, and games betting. In the following sub-sections, we assess the validity of the trading addiction scale by estimating its relation with speculative trading behavior, stress, depression, and substance use.

Table 5. Trading Addiction Score Explained.

	(1)	(2)
	Trading Addiction Score	
	Correlations	**Regression**
Age	−0.240 ***	−0.018 **
		(0.009)
Male (0/1)	−0.017	−0.143
		(0.124)
Single (0/1)	0.187 **	0.135
		(0.148)
Master degree	−0.127 *	−0.146
		(0.136)
Low income	0.172 **	−0.106
		(0.154)
High income	−0.188 **	−0.256
		(0.164)
Gambling propensity	0.264 ***	0.354 ***
		(0.086)
Risk tolerance	0.216 ***	0.102 ***
		(0.032)
Financial literacy	−0.053	−0.061 **
		(0.031)
Overconfidence: miscalibration	0.183 **	0.159 ***
		(0.032)
Pseudo-R^2		0.084
Observations		285

Notes: Column (1) shows Pearson correlations of the trading addiction score with the variables on the left side. Column (2) reports multiple regression results with robust standard errors in parenthesis, estimated with a negative binomial count model. The sample consists of N = 285 investors. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.2. Trading Addiction Scores and Speculative Trading

We now discuss our test of Hypotheses 4 to 8 about the relation between the trading addiction score and speculative trading behavior. Table 6 reports the estimated coefficients of multiple regression models for trading behavior, while controlling for gambling propensity, risk tolerance, overconfidence, financial literacy, and socio-demographic variables.

Overall, a higher trading addiction score is positively related to higher trading frequency, day trading, trading lottery stocks, trading derivatives, and having a margin account. Only the effect on portfolio diversification is not significant, which may be because most investors tend to hold underdiversified individual stock portfolios (Polkovnichenko 2005; Dimmock et al. 2021), making the effect of trading addiction harder to identify.

Column (1) in Table 6 shows the estimated coefficients of an ordered logit regression explaining investor trading frequency. In the tables, we do not show marginal effects for ordered logit models, as the sign and significance of the marginal effect depend on the outcome category being predicted. For example, a one-point increase in trading addiction score is associated with a 5.5% *increase* in the probability of trading almost every day (the highest outcome category), and a 3.8% *decrease* in the probability of trading less than once a month (the lowest category). Other factors that explain higher trading frequency are higher risk tolerance, overconfidence, and higher trading experience (more than one year).

Table 6. Speculative Trading Behavior and Trading Addiction Symptoms.

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade Frequency	**Day Trading**	**Number of Stocks**	**Trade Lottery Stocks**	**Trade Derivatives**	**Margin Account**
Trading addiction score	0.359 ***	0.071 ***	0.176	0.069 ***	0.042 **	0.028 ***
(0–9)	(0.092)	(0.026)	(0.252)	(0.022)	(0.020)	(0.009)
Gambling propensity scale	0.010	0.051	−0.436	−0.003	0.040	0.028
(1–5)	(0.207)	(0.053)	(0.478)	(0.047)	(0.048)	(0.027)
Risk tolerance scale	0.334 ***	0.024	0.620 ***	0.055 ***	0.056 ***	−0.003
(1–10)	(0.066)	(0.015)	(0.195)	(0.015)	(0.015)	(0.009)
Financial literacy	−0.034	0.005	0.269	0.001	0.013	−0.014 *
(1–9)	(0.067)	(0.013)	(0.180)	(0.012)	(0.013)	(0.008)
Overconfidence:	0.210 ***	0.034 ***	0.566 ***	0.021 **	0.016	0.003
miscalibration	(0.047)	(0.010)	(0.152)	(0.008)	(0.010)	(0.005)
Age	0.010	−0.005	0.069	−0.003	0.002	−0.004 *
	(0.016)	(0.003)	(0.043)	(0.004)	(0.003)	(0.002)
Male	0.359	−0.059	−1.302 **	−0.064	0.014	0.072 **
	(0.258)	(0.056)	(0.648)	(0.055)	(0.055)	(0.030)
Single	0.022	−0.048	−1.186 *	−0.089	0.033	−0.030
	(0.268)	(0.064)	(0.713)	(0.062)	(0.061)	(0.035)
Master's degree	−0.494 *	−0.102 *	0.133	0.023	0.044	0.002
	(0.260)	(0.057)	(0.641)	(0.058)	(0.055)	(0.034)
Income low	0.383	0.064	0.042	0.184 ***	0.182 ***	−0.033
	(0.353)	(0.073)	(0.779)	(0.063)	(0.063)	(0.043)
Income high	−0.357	−0.036	−0.271	0.114 *	−0.122 *	0.073 *
	(0.284)	(0.069)	(0.765)	(0.061)	(0.070)	(0.038)
Assets low	0.251	0.005	−1.373 **	−0.049	−0.185 ***	−0.020
	(0.313)	(0.070)	(0.671)	(0.068)	(0.068)	(0.039)
Assets high	0.053	−0.033	2.974 ***	−0.098	0.028	0.051
	(0.289)	(0.075)	(0.909)	(0.073)	(0.076)	(0.043)
Trading experience <	−0.984 **	−0.114	−2.098 ***	−0.167 *	−0.277 ***	−0.030
1 year	(0.391)	(0.091)	(0.757)	(0.091)	(0.083)	(0.042)
Trading experience >	−0.129	0.028	−0.330	0.022	0.049	0.014
5 year	(0.276)	(0.064)	(0.713)	(0.066)	(0.064)	(0.037)
Type of model	Ordered logit	Logit	Count	Logit	Logit	Logit
Pseudo-R^2	0.139	0.159	0.083	0.200	0.220	0.249
Observations	285	285	259	285	285	285

Notes: The table reports marginal effects for the logit regressions in Column (2)–(6). For the ordered logit model in Column (1) the table shows the coefficient estimates. Robust standard errors are shown in parentheses. The dependent variable "Trade frequency" in Column (1) measures the investor's stock trading frequency in the last 12 months on an ordinal scale: (1) I rarely trade, (2) 1–10 times per year, (3) 1–10 times per month, (4) 3–4 times per week, (5) Almost every day, or every day. Dependent variable "Day trading" in Column (2) is a dummy for having bought and sold the same stock within a day. Dependent variable "Number of stocks" in Column (3) is the number of different individual stocks in the investor's portfolio. Dependent variable "Trade lottery stocks" in Column (4) is a dummy for having traded lottery stocks during the last 12 months. Dependent variable "Trade derivatives" in Column (5) is a dummy for having traded derivatives or listed warrants during the last 12 months. Dependent variable "Margin account" in Column (6) is a dummy for having used a margin account for trading stocks in the last 12 months. The main independent variable "Trading addiction score" is the number of DSM-5 gambling disorder questions (adapted to stock trading) that the investor gave affirmative answers to, on a scale from 0 to 9. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Column (2) shows marginal effects for day trading, i.e., buying and selling the same stock within a day. A one-point increase in trading addiction score is associated with a 7.1% increase in the probability of day trading, all else equal. Another variable that significantly relates to day trading is overconfidence. Column (4) in Table 6 shows the marginal effects for owning lottery-type stocks. A one-point increase in trading addiction score is associated with a 6.9% increase in the probability of owning lottery stocks, all else equal. Higher risk tolerance, overconfidence and low income are also related to lottery stock trading. Finally, Columns (5) and (6) show that the trading addiction score is also significantly related to

derivatives trading and having a margin account, which both facilitate the use of leverage and can be used to speculate in the stock market (see, e.g., Ladley et al. 2020).

In sum, the trading addiction score positively relates to speculative trading styles such as high trading frequency, day trading, trading lottery-type stocks, trading derivatives, and having a margin account. Only portfolio diversification is not significantly related to the trading addiction score. Other factors explaining speculative investor trading behavior are overconfidence, risk tolerance, and trading experience. The conventional gambling propensity scale does not predict speculative trading behavior in the sample of Thai investors, consistent with the results for Dutch investors reported by Cox et al. (2020).

4.3. Trading Addiction Score, Stress and Substance Use

Table 7 shows the effect of trading addiction scores on stress, depression, smoking, and drinking alcohol, as a test of Hypotheses 9 to 12. Columns (1) and (2) in Table 7 show the coefficients for the investor's self-reported levels of stress and depression. A one-point increase in trading addiction score is associated with a 3.1% increase in the probability of being more stressed than usual (the fifth outcome), all else equal. The effect on feeling depressed is not significant. Further, a one-point increase in the trading addiction score is associated with a 4.8% higher probability of drinking alcohol, as shown in Column (4) of Table 7. Trading addiction is not significantly related to smoking, while gambling propensity is. In sum, the trading addiction score relates positively to higher stress levels and alcohol use.

Table 7. Stress, Depression, Substance Use and Trading Addiction Symptoms.

	(1)	(2)	(3)	(4)	(5)
	Stress Scale	Depression Scale	Smoking Dummy	Drinks Alcohol Dummy	Needs Returns for Expenses
Trading addiction score (0–9)	0.485 ***	0.097	0.012	0.048 **	0.030 **
	(0.099)	(0.086)	(0.014)	(0.023)	(0.014)
Gambling propensity scale (1–5)	−0.206	0.134	0.063 **	0.111 **	−0.040
	(0.217)	(0.165)	(0.030)	(0.055)	(0.032)
Risk tolerance scale (1–10)	0.048	−0.003	0.008	0.003	0.007
	(0.063)	(0.069)	(0.012)	(0.017)	(0.011)
Financial literacy (1–9)	0.019	−0.001	−0.000	−0.004	−0.022 **
	(0.068)	(0.064)	(0.011)	(0.014)	(0.009)
Overconfidence: miscalibration	−0.141 ***	−0.009	−0.013 **	−0.001	−0.007
	(0.053)	(0.055)	(0.005)	(0.011)	(0.006)
Age	−0.034 **	0.007	0.003	0.001	−0.001
	(0.014)	(0.016)	(0.003)	(0.004)	(0.003)
Male	0.327	−0.205	0.146 ***	0.190 ***	0.037
	(0.242)	(0.240)	(0.038)	(0.058)	(0.040)
Single	−0.256	−0.060	0.046	0.079	−0.052
	(0.273)	(0.257)	(0.051)	(0.070)	(0.048)
Master degree	0.556 **	0.137	−0.031	−0.005	0.072 *
	(0.260)	(0.243)	(0.041)	(0.061)	(0.041)
Income low	0.216	−0.067	0.001	−0.088	0.046
	(0.295)	(0.274)	(0.050)	(0.072)	(0.054)
Income high	−0.140	−0.377	−0.063	−0.068	−0.102 ***
	(0.284)	(0.281)	(0.046)	(0.071)	(0.037)
Assets low	−0.223	−0.373	−0.028	0.032	0.004
	(0.271)	(0.277)	(0.046)	(0.074)	(0.047)
Assets high	−0.630 **	0.143	−0.006	0.065	0.111
	(0.312)	(0.322)	(0.055)	(0.083)	(0.072)

Table 7. *Cont.*

	(1)	(2)	(3)	(4)	(5)
	Stress Scale	Depression Scale	Smoking Dummy	Drinks Alcohol Dummy	Needs Returns for Expenses
Trading experience < 1 year	−0.167 (0.357)	0.023 (0.295)	0.024 (0.064)	0.017 (0.082)	0.014 (0.056)
Trading experience > 5 year	0.374 (0.262)	−0.002 (0.258)	0.020 (0.045)	−0.043 (0.070)	−0.059 (0.046)
Type of model	Ordered logit	Ordered logit	Logit	Logit	Logit
Pseudo-R^2	0.061	0.008	0.140	0.074	0.142
Observations	285	285	285	285	285

Notes: The table reports marginal effects for the logit regressions in Column (3)–(5). For the ordered logit models in Column (1) and (2), the tables show the coefficient estimates. Robust standard errors are shown in parentheses. The dependent variable "Stress scale" in Column (1) is the respondent's answer to a question about how stressful life has been in the last 12 months, measured on a 7-point ordinal scale: from (1) not at all stressful, (2) just a little stressful, to (6) very stressful, and (7) terribly stressful. Dependent variable "Depression scale" in Column (2) is the respondent's answer to a question about how depressed he/she has been in the last 12 months, measured on a 7-point ordinal scale: from (1) not at all depressed, to (7)terribly depressed. Dependent variable "Smoking dummy" in Column (3) is a dummy for smoking cigarettes or cigars. Dependent variable "Drinks alcohol dummy" in Column (4) is a dummy for the answer "Yes" to the question "Do you drink alcohol?". Dependent variable "Needs returns for expenses" in Column (5) is a dummy for the answer "Need most" to the question "Do you have an investment objective to use the returns to cover regular expenses?". The main independent variable "Trading addiction score" is the number of DSM-5 gambling disorder questions (adapted to stock trading) that the investor gave affirmative answers to, on a scale from 0 to 9. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Gambling disorders can lead to financial problems, and we expect this to hold for excessive gambling in the stock market as well. One question in the investor survey asked the respondents whether they need their investment returns to pay for regular expenses, with the following three possible answers: "no need because I have sufficient income", "need some" and "need most". In our sample, 34 respondents (11.9%) indicate that they need most of their investment returns to cover regular expenses. We use the answer "need most" as a crude proxy for financial problems. Column (5) in Table 7 shows that a one-point increase in the trading addiction score is associated with a 3.0% increase in the probability of needing most returns to cover regular expenses.

4.4. Robustness Check: Investors with a Trading Problem or Addiction

As a robustness check, we repeated the regressions in Tables 6 and 7 with a dummy variable for having a trading problem or addiction (scores ≥ 3) as the main independent variable, see Appendix B, rather than the number of trading addiction symptoms (0–9).[12] In Table A1, the dummy variable for having a gambling problem or addiction is significantly associated with a higher trade frequency and having a margin account at the 5% significance level, and also with trading lottery stocks at the 10% level. The results are less significant than when using the 0–9 scale variable, likely because the dummy variable has much lower variation than the scale, but all coefficient signs are as expected. In Table A2, having a gambling problem or addiction is significantly associated with higher stress, depression, and needing investment returns to cover expenses. Hence, the main results in Table 7 for stress and needing returns for expenses are robust. In addition, investors with a trading problem or addiction also have higher levels of depression in Table A2.

4.5. Discussion of the Results and Limitations

One potential concern is that our results are influenced by social desirability bias and common method variance in the responses. People underreporting stress, substance use, and traditional gambling activities might also refrain from providing truthful answers to the trading addiction and gambling questions. This would create a spurious relationship among trading addiction, gambling propensity, and some dependent variables such as substance use and stress. However, we do not find that conventional gambling propensity

is related to stress while trading addiction is. Further, social desirability bias cannot explain why the trading addiction score is related to high trade frequency and day trading, which are not looked upon negatively in society. Our four gambling propensity questions are arguably most influenced by social desirability bias because most forms of conventional gambling are illegal in Thailand and against Buddhist religious norms. As our regressions include gambling propensity as a control variable, we partially control for social desirability bias and common method variance; however, the trading addiction scale is still significantly related to speculative trading styles, stress, and alcohol use.

One limitation of the findings is that the main independent variable, the trading addiction score, probably has measurement error, as people could try to hide or understate their problems. Bias due to errors in the independent variable can be reduced by using an instrumental variable technique. However, we do not have good instruments for trading addiction in the survey that are also independent of the dependent variables. The impact of measurement error is usually to shrink the beta coefficient of that variable to zero, due to attenuation bias. Therefore, all the effects of trading addiction reported in Tables 6 and 7 are likely conservative and would be larger if we could eliminate or reduce measurement error.

A related limitation of our study is that we did not have access to the investors' trading records and financial information, so we could not measure their actual losses and potential financial problems associated with trading addiction. Walters and Fernbach (2021) recently introduced a new method that incentivizes respondents to report their portfolio returns more accurately, which is a promising direction for further research. Future research combining a longitudinal survey with actual trading records (e.g., from brokers or tax records) could also shed more light on the long-term financial and personal consequences of trading addiction and investigate the effectiveness of preventative measures.

5. Conclusions

We adopted the DSM-5 diagnostic checklist of the American Psychiatric Association to assess whether some individual investors gamble compulsively in the stock market. We found that 41 out of 285 (14.4%) Thai investors in our sample showed symptoms of excessive gambling in the stock market, and 4.9% were potentially addicted to trading. Potential gambling addicts typically admitted that they tried to reduce or quit trading but could not, or they had to borrow money from friends and family to cover their losses from stock trading, or they lied about their trading activities. The rate of trading addiction in Thailand is comparable to the 4.4% rate reported for a large sample of Dutch investors by Cox et al. (2020), and substantially lower than the 21.5% prevalence rate found among Korean investors by Youn et al. (2016). However, the prevalence of less severe 'problem gambling' symptoms is relatively high in Thailand at 9.5%, compared to only 3.6% among Dutch investors (Cox et al. 2020).

Our results validate the trading addiction scale by showing that it is related to a range of speculative trading behaviors commonly associated with poor outcomes for individual investors, such as high trade frequency, day trading, derivatives trading, and buying so-called "lottery stocks". Our analyses controlled for potential confounding factors, including risk tolerance, overconfidence, financial literacy, and conventional gambling propensity. We further validated the trading addiction scale by testing whether it is associated with other gambling-related problems such as stress, feeling depressed, and substance use. Our results confirm that this is the case. Potential trading addicts tend to be younger, lower educated, and have lower incomes, similar to the socio-demographic profile of gambling addicts in the literature (Welte et al. 2015; Allami et al. 2021). Other variables significantly associated with higher trading addiction scores are higher risk tolerance, gambling propensity and overconfidence, and lower financial literacy.

Overall, our results suggest that there are investors in the stock market who display the symptoms of a gambling addiction to trading. Our results are in line with studies in clinics that report about patients who sought treatment for gambling addictions related to stock trading and other forms of investment (Granero et al. 2012; Shin et al. 2015; Grall-Bronnec

et al. 2017), and survey evidence from Korea (Youn et al. 2016) and the Netherlands (Cox et al. 2020). It is also in line with indirect evidence showing that individual investors in the U.S., Germany, and Taiwan tend to trade less actively in the stock market during weeks with large lottery jackpots (Dorn et al. 2014; Gao and Lin 2014). Further, our results confirm the relationship between trading addiction and more active and speculative trading styles reported by Cox et al. (2020).

Our results raise awareness about retail investors whose objectives in the financial market are more related to gambling than making long-term investments and the problems that such gambling behavior can cause when it becomes compulsive. The individual and societal costs of gambling addictions are estimated to be several billion annually in the U.S. alone (National Gambling Impact & Policy Commission (US) (1999)).

Our work implies that health policymakers and consumer protection agencies should be aware that problematic gambling behavior is not limited to casinos but also occurs in financial markets through speculative trading. Further, trading addiction problems are likely more widespread in countries that ban or restrict conventional forms of gambling, such as Thailand. Financial institutions and brokers could use survey questions for trading addiction based on DSM 5 diagnostic criteria to proactively screen for gambling problems among their customers. With this information, they could try to help or intervene before these customers face financial difficulties and stop trading altogether. Consumer protection regulation should also focus on "gamblified" investment products that target people's desire to gamble but lead to losses for most investors.

Author Contributions: A.K. and R.K. together conceptualized the study. A.K. gathered the survey data. A.K. and R.K. analyzed the data. R.K. supervised the project. A.K. prepared the original draft. R.K. revised the paper. All authors have read and agreed to the published version of the manuscript.

Appendix A. Investor Survey

Appendix A.1. Socio-Demographic Questions

1. Gender
   - ☐ Male
   - ☐ Female
2. Age: _____ years
3. Marital status
   - ☐ Single
   - ☐ Married
   - ☐ Divorced
   - ☐ Widowed
4. Children
   - ☐ Yes, _____ (no. of children)
   - ☐ No
5. Average monthly income　　　　　Thai Baht

6. Occupation
   ☐ Employee ☐ State enterprise officer
   ☐ Government officer ☐ Doctor/Nurse
   ☐ Lecturer/Professor ☐ Policeman/Soldier
   ☐ Student ☐ Lawyer/Prosecutor/Judge
   ☐ Housewife/-man ☐ Self-employed/Entrepreneur
   ☐ Retired ☐ Other: _____
7. Education
   ☐ Lower than Bachelor's degree
   ☐ Bachelor's degree
   ☐ Master degree or higher
   ☐ Other: _____

Appendix A.2. General Trading Questions

The following questions ask about your trading activities during the past 12 months. Please recall and give an answer based on your actual trading activities.

1. How often do you trade?
   ☐ Almost every day, or every day
   ☐ 3–4 times per week
   ☐ 1–10 times per month
   ☐ 1–10 times per year
   ☐ Rarely trade
2. How many stocks do you hold in your portfolio on average? (e.g., if your portfolio consists of 100 shares of Stock A and 200 shares of Stock B, then you have 2 stocks in your portfolio which is Stock A and B)
   _____ stocks
3. Have you performed net settlement trades? (That is to buy and sell the same stock within a day)
   ☐ Yes   ☐ No
4. Have you used a margin trading account to trade?
   ☐ Yes   ☐ No
5. Do you trade warrant(s) and/or derivatives?
   ☐ Yes   ☐ No
6. Lottery-stocks are speculative stocks that give investors a small chance of making a very large profit. Do you trade lottery-stocks?
   ☐ Yes   ☐ No
7. Please list the names of lottery-stocks that you know.

Appendix A.3. Investor Profile Questions from the Stock Exchange of Thailand

1. Value of savings and investment in securities   (Securities means mutual funds, debentures, shares, government bonds, or derivatives)
   (1) Lower than Baht 1 Million
   (2) More than Baht 1 Million but not exceed Baht 3 Million
   (3) More than Baht 3 Million
2. Your investing experience in securities
   (1) None
   (2) Less than 1 year
   (3) 1–5 years
   (4) More than 5 years
3. Period of time that you expect not to need the money allocated for investment
   (1) Less than 1 year
   (2) 1–3 years
   (3) 3–7 years
   (4) More than 7 years

4. Do you have an investment objective to use the investment returns as regular expenses?
   (1) Need most
   (2) Need some
   (3) No need because I have a regular income
5. Proportion of money used for investment as a share of your entire assets
   (1) More than 60 percent
   (2) 30–60 percent
   (3) 10–30 percent
   (4) Less than 10 percent

Appendix A.4. Investor Risk Tolerance Assessment Questions from the Stock Exchange of Thailand

1. Investing in the securities which is highly volatile such as shares and derivatives, often generates high return in the long term; however, there is a risk of incurring huge losses. Which level of investment risk could you take?

   (1) I cannot take any risks and would like to focus on investment that generates a regular income and provides the most safety in investment, even though the interest will be at the lowest level.
   (2) I can take a moderate risk. I can take risks from the losses in investment to some extents in order to increase more opportunities to gain more returns in a long term.
   (3) I can take a high risk. I can take risks to acceptable extents in order to receive opportunities to gain more interests in a long term.
   (4) I can take a substantially high risk. I can take the highest risks in order to receive opportunities to gain more interests in a long term.

2. How many losses in investment would you be able to accept?

   (1) I cannot take any losses
   (2) less than 10 percent of the money used for investment
   (3) 10–30 percent of the money used for investment
   (4) More than 30 percent of the money used for investment

Appendix A.5. DSM-5 Trading Addiction Questions

1. You trade stocks in larger amounts of money to maintain your excitement.
   ☐ Yes   ☐ No
2. You have to borrow money from your family members or friends to cover losses from stock trading.
   ☐ Yes   ☐ No
3. You always think of ways to find money to trade stocks.
   ☐ Yes   ☐ No
4. You have to lie to your family or friends about your trading.
   ☐ Yes   ☐ No
5. You tried to reduce or quit trading stocks but could not.
   ☐ Yes   ☐ No
6. You trade stocks to escape problems in your life.
   ☐ Yes   ☐ No
7. You return to trading because you want to win back your lost money.
   ☐ Yes   ☐ No
8. You have problems in your work, family or got divorced because of stock trading.
   ☐ Yes   ☐ No
9. When trying to reduce or quit trading you feel irritated.
   ☐ Yes   ☐ No

Appendix A.6. Gambling Propensity Questions (DOSPERT Gambling Sub-Scale)

    For the following 4 questions, please indicate how likely it is that you will participate in these activities.

1.   Betting a day's income on lottery tickets.
        ☐ Unlikely   ☐ Rarely   ☐ Sometimes   ☐ Likely   ☐ Very Likely
2.   Betting a day's income at a card game.
        ☐ Unlikely   ☐ Rarely   ☐ Sometimes   ☐ Likely   ☐ Very Likely
3.   Betting a day's income on the outcome of a sporting event (e.g., soccer, golf, horse racing).
        ☐ Unlikely   ☐ Rarely   ☐ Sometimes   ☐ Likely   ☐ Very Likely
4.   Gambling a week's income at a casino if you visit one (e.g., Macau, Las Vegas in the U.S., Marina Bays Sand in Singapore, Poipet Casino at the border of Thailand-Cambodia, etc.)
        ☐ Unlikely   ☐ Rarely   ☐ Sometimes   ☐ Likely   ☐ Very Likely

Appendix A.7. Mental Health Questions

1.   How stressful your life has been during last year?
        ☐ Not at all stressful
        ☐ Just a little stressful
        ☐ Less stressful than usual
        ☐ About normally stressful
        ☐ More stressful than usual
        ☐ Very stressful
        ☐ Terribly stressful
2.   During last year how depressed have you been?

1	2	3	4	5	6	7
Not at all depressed						Terribly depressed

Appendix A.8. Substance Use Questions

1.   Do you drink alcohol?
        ☐ Yes   ☐ No
2.   How many times in the past 12 months did you get drunk (even a little bit)?
        ☐ Never ☐ 1–10 times ☐ More than 10 times ☐ Almost every day ☐ Every day
3.   Do you smoke?
        ☐ Yes   ☐ No
4.   Has there been a period in the past 12 months when you smoked cigarettes every day for at least 30 days?
        ☐ Yes   ☐ No

Appendix A.9. Overconfidence Questions

1.   In the following two questions, you will be asked to give two estimates of the value of the SET index one month from now. The current value of the SET index is [CURRENT INDEX VALUE].
    Estimate a lower bound for the SET index value, such that SET index value one month from now will only fall below this lower bound 5% of the time (with a 5% chance).
    Lower bound: _____
    Estimate an upper bound for the SET index value, such that SET index value one month from now will only rise above this upper bound 5% of the time (with a 5% chance).
    Upper bound: _____

2. Do you think that you are a better investor than the average investor with a brokerage account at the same broker?

☐ Yes   ☐ No

3. What percentage of customers of with a brokerage account at the same broker have better skills than you at identifying stocks with above average performance in the future?

(Please give a number between 0% and 100%)

_____ %

Appendix A.10. Financial Literacy Questions

1. Suppose you had 1,000,000 Baht in a savings account and the interest rate was 2% 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 1,000,000 Baht
☐ Exactly 1,000,000 Baht
☐ Less than 1,000,000 Baht
☐ Do not know
☐ Refuse to answer

2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy _____ today with the money in this account?

☐ More than
☐ Exactly the same as
☐ Less than
☐ Do not know
☐ Refuse to answer

3. 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."

☐ Yes
☐ No
☐ Do not know
☐ Refuse to answer

4. Which of the following statements describes the main function of the stock market?

☐ The stock market helps to predict stock earnings
☐ The stock market results in an increase in the price of stocks
☐ The stock market brings people who want to buy stocks together with those who want to sell stocks
☐ None of the above
☐ Do not know
☐ Refuse to answer

5. Which of the following statements is correct? If somebody buys the stock of firm B in the *stock market*:

☐ He owns a part of firm B
☐ He has lent money to firm B
☐ He is liable for firm B's debts
☐ None of the above
☐ Do not know
☐ Refuse to answer

6. Which of the following statements is correct?

☐ Once one invests in a mutual fund, one cannot withdraw the money in the first year
☐ Mutual funds can invest in several assets, for example invest in both stocks and bonds
☐ Mutual funds pay a guaranteed rate of return which depends on their past

performance

    ☐ None of the above

    ☐ Do not know

    ☐ Refuse to answer

7.   Normally, which asset displays the highest fluctuations over time?

    ☐ Savings accounts

    ☐ Bonds

    ☐ Stocks

    ☐ Do not know

    ☐ Refuse to answer

8.   When an investor spreads his money among different assets, does the risk of losing money:

    ☐ Increase

    ☐ Decrease

    ☐ Stay the same

    ☐ Do not know

    ☐ Refuse to answer

9.   Stocks are normally riskier than bonds. True or false?

    ☐ Yes

    ☐ No

    ☐ Do not know

    ☐ Refuse to answer

Appendix B. Robustness Checks

Table A1. Speculative Trading Behavior and Trading Problem or Addiction Dummy.

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade Frequency	Day Trading	Number of Stocks	Trade Lottery Stocks	Trade Derivatives	Margin Account
Trading problem or addiction	0.823 **	0.100	−0.583	0.136 *	0.099	0.083 **
	(0.364)	(0.086)	(0.901)	(0.082)	(0.074)	(0.037)
Gambling propensity scale (1–5)	0.165	0.082	−0.254	0.028	0.056	0.042 *
	(0.201)	(0.052)	(0.474)	(0.046)	(0.047)	(0.026)
Risk tolerance scale (1–10)	0.355 ***	0.031 **	0.666 ***	0.060 ***	0.059 ***	−0.000
	(0.066)	(0.016)	(0.204)	(0.015)	(0.015)	(0.009)
Financial literacy (1–9)	−0.054	0.002	0.262	−0.002	0.011	−0.017 **
	(0.068)	(0.013)	(0.177)	(0.012)	(0.013)	(0.008)
Overconfidence: miscalibration	0.225 ***	0.039 ***	0.580 ***	0.026 ***	0.019 *	0.005
	(0.046)	(0.009)	(0.150)	(0.008)	(0.010)	(0.005)
Age	0.011	−0.006	0.067	−0.003	0.002	−0.004 *
	(0.017)	(0.003)	(0.043)	(0.004)	(0.003)	(0.002)
Male	0.337	−0.068	−1.316 **	−0.072	0.013	0.077 ***
	(0.257)	(0.057)	(0.643)	(0.056)	(0.055)	(0.029)
Single	0.057	−0.043	−1.198 *	−0.081	0.037	−0.026
	(0.266)	(0.065)	(0.715)	(0.063)	(0.061)	(0.035)
Master degree	−0.526 **	−0.107 *	0.109	0.014	0.038	−0.009
	(0.260)	(0.058)	(0.642)	(0.059)	(0.056)	(0.035)
Income low	0.348	0.061	0.077	0.181 ***	0.179 ***	−0.039
	(0.348)	(0.074)	(0.779)	(0.063)	(0.064)	(0.042)
Income high	−0.437	−0.047	−0.291	0.104 *	−0.130 *	0.069 *
	(0.283)	(0.071)	(0.759)	(0.063)	(0.071)	(0.037)
Assets low	0.255	0.012	−1.318 *	−0.044	−0.182 ***	−0.015
	(0.307)	(0.072)	(0.675)	(0.069)	(0.069)	(0.040)
Assets high	−0.019	−0.044	2.966 ***	−0.107	0.023	0.042
	(0.290)	(0.077)	(0.906)	(0.075)	(0.076)	(0.045)

Table A1. *Cont.*

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade Frequency	Day Trading	Number of Stocks	Trade Lottery Stocks	Trade Derivatives	Margin Account
Trading experience < 1 year	−0.986 **	−0.122	−2.166 ***	−0.168 *	−0.274 ***	−0.035
	(0.393)	(0.091)	(0.751)	(0.090)	(0.083)	(0.039)
Trading experience > 5 year	−0.164	0.014	−0.384	0.012	0.043	0.015
	(0.276)	(0.065)	(0.704)	(0.067)	(0.065)	(0.037)
Type of model	Ordered logit	Logit	Count	Logit	Logit	Logit
Pseudo-R^2	0.130	0.140	0.083	0.180	0.215	0.224
Observations	285	285	259	285	285	285

Notes: robust standard errors in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table A2. Stress, Depression, Substance Use and Trading Problem or Addiction Dummy.

	(1)	(2)	(3)	(4)	(5)
	Stress Scale	Depression Scale	Smoking Dummy	Drinks Alcohol Dummy	Needs Returns for Expenses
Trading problem or addiction	1.190 ***	0.527 **	0.003	0.066	0.119 ***
	(0.310)	(0.267)	(0.054)	(0.082)	(0.046)
Gambling propensity scale (1–5)	−0.050	0.150	0.069 **	0.130 **	−0.030
	(0.216)	(0.149)	(0.029)	(0.053)	(0.029)
Risk tolerance scale (1–10)	0.090	−0.003	0.009	0.008	0.009
	(0.061)	(0.068)	(0.012)	(0.016)	(0.011)
Financial literacy (1–9)	−0.015	−0.006	−0.002	−0.008	−0.024 ***
	(0.067)	(0.061)	(0.011)	(0.014)	(0.009)
Overconfidence: miscalibration	−0.110 **	−0.006	−0.012 **	0.002	−0.005
	(0.051)	(0.054)	(0.005)	(0.011)	(0.006)
Age	−0.035 **	0.008	0.003	0.001	−0.000
	(0.014)	(0.016)	(0.003)	(0.004)	(0.003)
Male	0.298	−0.190	0.145 ***	0.185 ***	0.038
	(0.240)	(0.241)	(0.038)	(0.059)	(0.040)
Single	−0.215	−0.063	0.050	0.084	−0.049
	(0.275)	(0.255)	(0.051)	(0.069)	(0.049)
Master degree	0.494 *	0.144	−0.033	−0.008	0.069 *
	(0.261)	(0.248)	(0.041)	(0.062)	(0.041)
Income low	0.184	−0.056	0.001	−0.089	0.050
	(0.299)	(0.274)	(0.050)	(0.071)	(0.052)
Income high	−0.220	−0.391	−0.066	−0.077	−0.106 ***
	(0.276)	(0.282)	(0.046)	(0.071)	(0.037)
Assets low	−0.233	−0.388	−0.027	0.034	−0.005
	(0.271)	(0.275)	(0.048)	(0.075)	(0.047)
Assets high	−0.665 **	0.129	−0.008	0.055	0.092
	(0.306)	(0.320)	(0.055)	(0.082)	(0.068)
Trading experience < 1 year	−0.182	0.036	0.018	0.010	0.015
	(0.348)	(0.294)	(0.063)	(0.083)	(0.056)
Trading experience > 5 year	0.308	−0.005	0.016	−0.054	−0.064
	(0.263)	(0.259)	(0.045)	(0.070)	(0.045)
Type of model	Ordered logit	Ordered logit	Logit	Logit	Logit
Pseudo-R^2	0.047	0.009	0.137	0.065	0.148
Observations	285	285	285	285	285

Notes: The table reports regression results with robust standard errors in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Notes

1   This behavior is in line with the model of Gervais and Odean (2001), where investors take too much credit for initial gains from trading and subsequentially become overconfident. Overconfidence in turn leads to excessive trading and speculation. In addition, self-attribution bias can also prevent investors from learning from their mistakes, because losses are blamed on factors beyond their own control (Hoffmann and Post 2014).

2   Related, in a survey of Finnish adults, Oksanen et al. (2022) found that cryptocurrency trading was associated with higher psychological distress and perceived stress, whereas stock investment was not.

3   The institutional review board of the Institute for Population and Social Research at Mahidol University reviewed and approved the survey (reference no. IPSR-IRB 2558-72).

4   Based on DSM-IV criteria for gambling addiction, with the additional criteria of having gambled at least 10 times in their lifetime and having a single-year gambling loss exceeding USD 365.

5   The alternative screening questions for gambling problems were the South Oaks Gambling Screen (SOGS) and the Problem Gambling Severity Index (PGSI). There is a high overlap between the alternative screening questions, as they were all influenced by the diagnostic criteria for behavioural (non-drug) addictions in earlier versions of the DSM (DSM IV and DSM III). We prefer to use the DSM-5 screen, to stay close to the latest clinical definition of a gambling disorder.

6   If the annualized volatility of the SET is 15% and the monthly returns are normally distributed, the length of a 90% confidence interval is approximately 200 index points. We calculated our proxy for overconfidence as follows: $(200 -$ stated interval$)/100$.

7   In the general Thai population the average monthly income was 13,100 Thai Baht in 2016 (source: National Statistical Office). The average age of the general Thai population is 35 years old, 49% is male, 31% is single and only 17% has a bachelor's degree or higher.

8   The most frequently traded derivatives in the Thai market are futures on the stock index (SET50), gold futures and warrants. Warrants are call options issued by listed firms that allow investors to buy new shares in the company at a pre-determined price, for a given period of time (e.g., 10 years).

9   For example, according to Statman (1987), a well-diversified portfolio should contain at least 30 stocks.

10   Further analysis shows that business owners tend to have lower risk tolerance to financial losses than other respondents (regular employees) and they are less overconfident about the stock market (i.e., they report wider intervals). After controlling for risk tolerance and overconfidence the effect of occupation is insignificant. We therefore drop occupation in further analyses to simplify the models.

11   There are no multi-collinearity problems in this set of variables, as the highest VIF is 1.65. Age and being single have the strongest correlation, at $r = -0.54$.

12   We do not use a pure trading addiction dummy (score ≥ 4) as the independent variable, as the number of addicts is small (14) and this sometimes causes the problem of "complete separation" in the logistic regression models. Therefore, as an alternative we have created a dummy variable for a trading addiction score of 3 or higher, covering both problem gamblers and addicts, a group of 41 investors.

References

Allami, Youssef, David C. Hodgins, Matthew Young, Natacha Brunelle, Shawn Currie, Magali Dufour, Marie-Claire Flores-Pajot, and Louise Nadeau. 2021. A meta-analysis of problem gambling risk factors in the general adult population. *Addiction* 116: 2968–77. [CrossRef] [PubMed]

American Psychiatric Association. 2013. *Diagnostic and Statistical Manual of Mental Disorders (DSM-5®).* Washington, DC: American Psychiatric Association Publishing.

Arthur, Jennifer N., Robert J. Williams, and Paul H. Delfabbro. 2016. The conceptual and empirical relationship between gambling, investing, and speculation. *Journal of Behavioral Addictions* 5: 580–91. [CrossRef]

Assanangkornchai, Sawitri, Edward B. McNeil, Nopporn Tantirangsee, Phunnapa Kittirattanapaiboon, and Thai National Mental Health Survey Team. 2016. Gambling disorders, gambling type preferences, and psychiatric comorbidity among the Thai general population: Results of the 2013 National Mental Health Survey. *Journal of Behavioral Addictions* 5: 410–18. [CrossRef]

Bali, Turan G., David Hirshleifer, Lin Peng, and Yi Tang. 2021. *Attention, Social Interaction, and Investor Attraction to Lottery Stocks.* Working Paper, No. w29543. Cambridge: National Bureau of Economic Research.

Bali, Turan G., Nusret Cakici, and Robert F. Whitelaw. 2011. Maxing out: Stocks as lotteries and the cross-section of expected returns. *Journal of Financial Economics* 99: 427–46. [CrossRef]

Barber, Brad M., and Terrance Odean. 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance* 55: 773–806. [CrossRef]

Barber, Brad M., and Terrance Odean. 2001. Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* 116: 261–92. [CrossRef]

Barber, Brad M., and Terrance Odean. 2013. The behavior of individual investors. In *Handbook of the Economics of Finance.* Amsterdam: Elsevier, vol. 2, pp. 1533–70.

Barberis, Nicholas, and Ming Huang. 2008. Stocks as lotteries: The implications of probability weighting for security prices. *American Economic Review* 98: 2066–100. [CrossRef]

Blaszczynski, Alex, and Lia Nower. 2002. A pathways model of problem and pathological gambling. *Addiction* 97: 487–99. [CrossRef]

Cox, Ruben, Atcha Kamolsareeratana, and Roy Kouwenberg. 2020. Compulsive gambling in the financial markets: Evidence from two investor surveys. *Journal of Banking & Finance* 111: 105709.

Cunningham-Williams, Renee M., Linda B. Cottler, W. M. Compton 3rd, and Edward L. Spitznagel. 1998. Taking chances: Problem gamblers and mental health disorders—Results from the St. Louis Epidemiologic Catchment Area Study. *American Journal of Public Health* 88: 1093–1096. [CrossRef]

Dimmock, Stephen G., Roy Kouwenberg, Olivia S. Mitchell, and Kim Peijnenburg. 2021. Household portfolio underdiversification and probability weighting: Evidence from the field. *Review of Financial Studies* 34: 4524–63. [CrossRef]

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2009. *Triumph of the Optimists*. Princeton: Princeton University Press.

Dorn, Anne Jones, Daniel Dorn, and Paul Sengmueller. 2014. Trading as gambling. *Management Science* 61: 2376–93. [CrossRef]

Dorn, Daniel, and Paul Sengmueller. 2009. Trading as entertainment? *Management Science* 55: 591–603. [CrossRef]

Eraker, Bjørn, and Mark Ready. 2015. Do investors overpay for stocks with lottery-like payoffs? An examination of the returns of OTC stocks. *Journal of Financial Economics* 115: 486–504. [CrossRef]

Gao, Xiaohui, and Tse-Chun Lin. 2014. Do individual investors treat trading as a fun and exciting gambling activity? Evidence from repeated natural experiments. *Review of Financial Studies* 28: 2128–66. [CrossRef]

Gervais, Simon, and Terrance Odean. 2001. Learning to be overconfident. *Review of Financial Studies* 14: 1–27. [CrossRef]

Grall-Bronnec, Marie, Anne Sauvaget, Claude Boutin, Samuel Bulteau, Susana Jiménez-Murcia, Fernando Fernández-Aranda, Gaëlle Challet-Bouju, and Julie Caillon. 2017. Excessive trading, a gambling disorder in its own right? A case study on a French disordered gamblers cohort. *Addictive Behaviors* 64: 340–48. [CrossRef]

Granero, Roser, Salomé Tárrega, Fernando Fernández-Aranda, Neus Aymamí, Mónica Gómez-Peña, Laura Moragas, Nuria Custal, Lisa Orekhova, Lamprini G. Savvidou, José M. Menchón, and et al. 2012. Gambling on the stock market: An unexplored issue. *Comprehensive Psychiatry* 53: 666–73. [CrossRef]

Hoffmann, Arvid O. I. 2007. Individual investors' needs and the investment professional: Lessons from marketing. *Journal of Investment Consulting* 8: 80–91.

Hoffmann, Arvid O. I., and Hersh Shefrin. 2014. Technical analysis and individual investors. *Journal of Economic Behavior & Organization* 107: 487–511.

Hoffmann, Arvid O. I., and Thomas Post. 2014. Self-attribution bias in consumer financial decision-making: How investment returns affect individuals' belief in skill. *Journal of Behavioral and Experimental Economics* 52: 23–28. [CrossRef]

Huberfeld, Ronen, and Pinhas N. Dannon. 2014. Pathological gambling: Who gains from others' losses? In *The Psychological Science of Money*. New York: Springer, pp. 163–85.

Kumar, Alok. 2009. Who gambles in the stock market? *Journal of Finance* 64: 1889–933. [CrossRef]

Kumar, Alok, Huong Nguyen, and Tālis J. Putniņš. 2021. Only Gamble in Town: Stock Market Gambling around the World and Market Efficiency. Working Paper, SSRN 3686393. Available online: https://ssrn.com/abstract=3686393 (accessed on 23 November 2022).

Kumar, Alok, Jeremy K. Page, and Oliver G. Spalt. 2011. Religious beliefs, gambling attitudes, and financial market outcomes. *Journal of Financial Economics* 102: 671–708. [CrossRef]

Ladley, Daniel, Guanqing Liu, and James Rockey. 2020. Losing money on the margin. *Journal of Economic Behavior & Organization* 172: 107–136.

Latvala, Tiina, Tomi Lintonen, and Anne Konu. 2018. Public health effects of gambling–debate on a conceptual model. *BMC Public Health* 19: 1–16. [CrossRef] [PubMed]

Markiewicz, Łukasz, and Elke U. Weber. 2013. DOSPERT's gambling risk-taking propensity scale predicts excessive stock trading. *Journal of Behavioral Finance* 14: 65–78. [CrossRef]

Mitton, Todd, and Keith Vorkink. 2007. Equilibrium underdiversification and the preference for skewness. *Review of Financial Studies* 20: 1255–88. [CrossRef]

Mosenhauer, Moritz, Philip W. S. Newall, and Lukasz Walasek. 2021. The stock market as a casino: Associations between stock market trading frequency and problem gambling. *Journal of Behavioral Addictions* 10: 683–89. [CrossRef]

National Gambling Impact & Policy Commission (US). 1999. *National Gambling Impact Study Commission Final Report*. Washington, DC: National Gambling Impact & Policy Commission (US).

Newall, Philip W. S., and Leonardo Weiss-Cohen. 2022. The gamblification of investing: How a new generation of investors is being born to lose. *International Journal of Environmental Research and Public Health* 19: 5391. [CrossRef]

Oksanen, Atte, Eerik Mantere, Ilkka Vuorinen, and Iina Savolainen. 2022. Gambling and online trading: Emerging risks of real-time stock and cryptocurrency trading platforms. *Public Health* 205: 72–78. [CrossRef]

Polkovnichenko, Valery. 2005. Household portfolio diversification: A case for rank-dependent preferences. *Review of Financial Studies* 18: 1467–502. [CrossRef]

Seru, Amit, Tyler Shumway, and Noah Stoffman. 2009. Learning by trading. *Review of Financial Studies* 23: 705–39. [CrossRef]

Shin, Young-Chul, Sam-Wook Choi, Juwon Ha, Jung-Seok Choi, and Dai-Jin Kim. 2015. Gambling disorder in financial markets: Clinical and treatment-related features. *Journal of Behavioral Addictions* 4: 244–49. [CrossRef]

Statman, Meir. 1987. How many stocks make a diversified portfolio? *Journal of Financial and Quantitative Analysis* 22: 353–63. [CrossRef]

Statman, Meir. 2002. Lottery players/stock traders. *Financial Analysts Journal* 58: 14–21. [CrossRef]

Stucki, Stephanie, and Margret Rihs-Middel. 2007. Prevalence of adult problem and pathological gambling between 2000 and 2005: An update. *Journal of Gambling Studies* 23: 245–57. [CrossRef]

Van Rooij, Maarten, Annamaria Lusardi, and Rob Alessie. 2011. Financial literacy and stock market participation. *Journal of Financial Economics* 101: 449–72. [CrossRef]

Volberg, Rachel A. 2001. *When the Chips Are Down. Problem Gambling in America. A Century Foundation Report.* New York: The Century Foundation Press.

Walters, Daniel J., and Philip M. Fernbach. 2021. Investor memory of past performance is positively biased and predicts overconfidence. *Proceedings of the National Academy of Sciences* 118: e2026680118. [CrossRef] [PubMed]

Weber, Elke U., Ann-Renee Blais, and Nancy E. Betz. 2002. A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making* 15: 263–90. [CrossRef]

Welte, John W., Grace M. Barnes, Marie-Cecile O. Tidwell, Joseph H. Hoffman, and William F. Wieczorek. 2015. Gambling and problem gambling in the United States: Changes between 1999 and 2013. *Journal of Gambling Studies* 31: 695–715. [CrossRef]

Youn, HyunChul, Jung-Seok Choi, Dai-Jin Kim, and Sam-Wook Choi. 2016. Development and validation of a stock addiction inventory (SAI). *Annals of General Psychiatry* 15: 16. [CrossRef] [PubMed]