Gambling in the Stock Market: The Motivations behind Excessive and Speculative Trading[1]

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Abstract

Active stock trading by individual investors is hard to explain, as investors who trade more actively tend to perform worse. Using a unique survey dataset, we investigate to what extent gambling motives can explain excessive and speculative trading. We use five different proxies for gambling motives, ranging from fairly innocent, such as aspiring a small chance to become rich, to quite severe, namely a standard psychiatric test for compulsive gambling. We find that especially compulsive gambling can explain frequent trading by individual investors well, in addition to indicators for participating in conventional gambling activities (e.g., casinos). In addition, investors driven by gambling motives tend to be in a significantly worse financial situation compared to other investors with a similar socio-demographic profile.

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1. Introduction

What makes individual investors trade? This longstanding question has received extensive attention in the financial literature. Although classical models posit that rational investors should only trade as a result of new information becoming available or to rebalance their portfolio occasionally, many individual investors trade excessively and thereby lower their performance (Barber *et al.,* 2009). Several explanations for these puzzling trading strategies have been put forward. Barber and Odean (2001; 2000) argue that investors are overconfident, over-estimating the precision of their private information about stocks. Another prominent explanation is that investors derive utility directly from their trading activities. For example, they can be learning by trading (Seru, Shumway and Stoffman, 2010), or effectively using stock market trading as a form of entertainment or gambling (Dorn and Sengmueller, 2009).

Trading as a form of gambling has received strong empirical support in the literature recently, as the trading volume of individual investors tends to drop significantly on days with drawings of large lottery jackpots, such as the U.S. Powerball lottery (Dorn *et al.,* 2014). Similarly, stock market trading in Taiwan (Gao and Lin, 2015) is sensitive to lottery jackpots, and seems partially driven by individual investors' desire to gamble. Apart from this indirect evidence, it is also important to measure the gambling motives of investors at the individual level and to establish a direct link with excessive trading behavior. Our paper aims to fill this gap in the literature, using a unique survey dataset of individual investors in the Netherlands.

In this paper we run a horse race between five different proxies for gambling motives, to see which one can best explain excessive trading behavior. The proxies for gambling motives range from fairly innocent, such as aspiring a small chance to become rich or trading for entertainment, to quite severe, namely a standard test for compulsive gambling from the psychiatric profession.

The first well-known gambling motive is sensation seeking, taking risks just for the sake of the experience and the thrill of it (Zuckerman, 1994). Grinblatt and Keloharju (2008) and Dorn and Sengmuller (2009) show that active stock market trading can be driven by sensation seeking in the financial domain. To capture the sensation seeking gambling motive, we use an indicator variable for investing for the fun or the challenge of it (see Dorn and Sengmuller, 2009). A second established gambling motive is the aspiration to become rich (Conlisk 1993), to quickly achieve a wealth level far beyond the current value ("to become a millionaire"). Statman (2002) argues that not only lottery players, but also stock traders can be driven by the aspiration to become rich. As proxy for the wealth aspiration gambling motive we use an indicator for investing with the aim to have a small chance to become rich.

As third gambling motive for active stock trading, some investors could use trading as a direct substitute for traditional forms of gambling such as casinos and sports betting. Speculating in the financial market can offer large payoffs and direct feedback about gains and losses, similar to conventional forms of gambling, but arguably with better odds of winning and lower costs. Kumar (2009) documents that individual investors who prefer speculative stocks tend to have the same socio-demographic characteristics as gamblers. As a proxy for trading as a substitute for gambling, we ask the investors if they have gambled in the last 12 months, such as in casinos, sports betting, and on slot machines. In addition, we also measure the DOSPERT gambling risk-taking scale (Weber et al., 2002), a proxy for gambling propensity. Markiewicz and Weber (2013) find that DOSPERT scale explains the trading volume of investors in an experimental market.

Finally, as a fourth motive, we consider compulsive gambling, defined as a persistent counter-productive gambling behavior. Compulsive gamblers have difficulty to resist their urge to gamble, regardless of the negative consequences. As a proxy we use the DSM-5 screen for compulsive gambling from the American Psychiatric Association (2013). It is well established

in the psychiatric literature that for a small group of people gambling activities can become excessive and problematic; this may also apply to speculative stock trading if people use it as a substitute for gambling. Youn *et al.* (2016) and Kamolsareeratana and Kouwenberg (2017) indeed provide initial evidence that a small but significant number of individual investors in Korea and Thailand display symptoms of compulsive gambling behavior in the stock market. In addition, in recent years highly speculative derivatives and leveraged products have been directly marketed and sold to individual investors, such as contracts for differences and binary options. These financial products facilitate gambling on short-term price movements (see Figure 1), with horizons as short as a couple of seconds.

[Insert Figure 1 here]

Using a unique dataset collected in a representative sample of Dutch investors we show that excessive trading, namely trading several times a week and day trading, can be directly linked to the gambling motives of individual investors. Especially acuter forms of gambling motivation, namely the DOSPERT gambling risk-taking scale and the DSM-5 excessive gambling screen, have strong explanatory power, after controlling for alternative explanations such as overconfidence, trading experience and high risk tolerance. A horse race among the five gambling proxies identifies the DSM-5 screen for compulsive gambling as having the strongest link with excessive stock trading. In addition, the DSM-5 screen also predicts investing in derivatives and leveraged products, which allow investors to chase highly skewed all-or-nothing payoffs. More benign gambling motives, such as investing for a small chance to become rich, are not significantly related to excessive trading.

Further, we address whether gambling motives are associated with potential negative financial consequences for individual investors, using a measure for the number of financial

problems experienced in the last 12 months and two survey questions about the investor's financial situation. We find that investors who are gamblers (indicated by conventional gambling in the last 12 months, the DOSPERT scale, or DSM-5 excessive gambling) are in a significantly worse financial situation, compared with investors who have similar a socio-demographic profile in terms of age, education, income and wealth. Just having the aspiration to become rich or investing for fun, two other gambling motives, are not associated with worse financial situations for investors.

Our results make several contributions to the literature. First, we show that investors can have a wide range of gambling motives for trading and speculating in financial markets, ranging from just aspiring a small chance to get rich, to trading as a substitute for conventional gambling, to compulsive forms of trading as gambling. The extant empirical literature does not distinguish between different gambling motives for trading, while arguably one motive is not as important or worrisome as the other. We find that especially trading as a substitute for gambling and compulsive gambling motives can explain the active stock trading of individual investors. Second, we show that investors with gambling motives, especially those with more serious indications, are in a worse financial condition compared to investors with an otherwise similar profile.

We continue the paper by explaining our measures for gambling motives in the next section. The third section describes the Dutch survey data while the fourth section presents the results for trading behavior, followed by the financial consequences in the fifth section. Lastly, the conclusions are presented in the sixth section.

2. Gambling Motives and Measures

Individual investors who trade individual stocks actively tend to achieve significantly lower portfolio returns (Odean, 1999; Barber and Odean, 2000), as do investors who invest in options (Bauer et al., 2009; Hoffmann and Shefrin, 2014) and leveraged products (Entrop et al., 2014). It is a major puzzle in the literature why investors pursue these counterproductive speculative investment strategies, if they can achieve significantly better returns by simply buying and holding the market (a low cost ETF, for example). In this paper we test to what extent gambling motives for trading can provide an explanation for this puzzle. In this section we first introduce the different type of gambling motives people can have for speculative trading in the financial markets, and we define our measures for these gambling motives.

2.1 Sensation seeking motive

The first gambling motive is sensation seeking, a personality trait that involves taking risks just for the fun and the thrill of the experience (Zuckerman, 1994). Active and speculative trading by individual investors in the financial markets could be explained by such a non-economic motive, if investor derive utility directly from their risk-taking activities (Conlisk, 1993). Horvath and Zuckerman (1993) document that sensation seeking is positively related to risky behavior in many domains, including gambling and financial risk taking. Further, Grinblatt and Keloharju (2009) find that sensation seeking can explain the active trading activity of Finnish investors, using the number of speeding tickets as a proxy for the trait. Dorn and Sengmueller (2009) test the related entertainment motive for investing using a survey administered among clients of a German discount broker. They find that those who enjoy trading tend to have a portfolio turnover rate that is twice as high compared to other investors.

We measure the *Sensation seeking* motive by an indicator variable that equals one if the investor mentions "the fun or the challenge of it" as one of his investment goals. Our survey

included one question where investors were asked to indicate their investment objectives, with the following seven possible answers: 1. "Saving for retirement, or to generate additional income", 2. "Saving for a special expense (e.g., a new car, or vacation)", 3. "Saving for a specific purpose, such as mortgage prepayment, or the kids' education", 4. "Preserving my wealth. The money is not needed for any specific goal or expense, and it should just maintain its value", 5. "The fun or challenge of investing", 6. "Investing gives me a small chance to get rich, and I am willing to take risk for this purpose", 7. "Another purpose" (with open response). Respondents could select more than one possible investment objective from the list.

2.2 Aspiration to become rich motive

A second gambling motive is to pursue a small chance to become rich, to quickly achieve a wealth level far beyond the initial value ("to become a millionaire"). Statman (2002) explains that lottery players and stock traders often share the same dream of becoming rich quickly, hoping to gain a large payoff to achieve their aspirational wealth level, or to be relieved from their financial burdens. Kumar (2009) documents that especially low-income investors tend to trade lottery stocks that offer a small chance of an extreme positive return. In addition, Kumar (2009) shows that the trading volume of lottery stocks also tend to rise during economic downturns. We measure the *Wealth aspiration* gambling motive by an indicator variable that equals one if investors agree that their investment objective is "to give me a small chance to get rich, and I am willing to take risk for this purpose".

2.3 Trading as a substitute for conventional gambling

The third gambling motive for stock market trading is when investors use trading as a substitute for conventional gambling activities, such as lotteries, casinos and sports betting. Similar to conventional forms of gambling, speculating in the financial markets can offer large

payoffs and direct feedback about gains and losses, but arguably with better odds of winning and lower costs. Kumar (2009) shows that investors in speculative lottery stocks tend have the same socio-demographic profile as conventional gamblers, namely relatively low income, low education, young, single men. Gao and Lin (2015) and Dorn, Dorn and Sengmueller (2014) both show that stock market trading by individual investors decreases markedly on days when large and hence salient lottery jackpots are at stake. Gao and Lin document that trading volume can drop as much as 7% on jackpot days among stocks that are likely to attract individual traders.

As a first proxy for stock market trading as a substitute for gambling we ask investors if they participated in the following gambling activities in the last 12 months: playing slot machines, gambling in casinos, online gambling, sports betting or real money poker games. One drawback of the simple "gambled in the last 12 months" proxy is that it does not consider the amount of risk people are willing to take when gambling, nor whether they have any plans to gamble again in the future. To alleviate these concerns we also measure the DOSPERT gambling risk-taking scale of Weber et al. (2002), consisting of the following four questions:

How likely is it that you will participate in the following activities?

1. *Betting with 100 euro or more on a slot machine.*

2. *Betting with 100 euro or more in a poker game, or in an online casino game.*

3. *Betting with 100 euro or more on the result of sports game, or in a sports betting pool.*

4. *Betting with 500 euro or more in a casino.*

with the following response scale for each question: 1. "Very unlikely", 2. "Unlikely", 3. "Neither likely nor unlikely", 4. "Likely", 5. "Very likely".

Markiewicz and Weber (2013) report that the DOSPERT gambling scale explains the trading volume of investors in an experimental market. Our second proxy for trading as a

substitute for gambling equals one when investors answer "Very likely", "Likely", or "Neither likely nor unlikely" to at least one of the four DOSPERT gambling questions above.

2.4 Compulsive gambling motive

Finally, as a fourth gambling motive for stock market trading, we consider compulsive or excessive gambling tendencies. Compulsive gambling is defined as a 'persistent and recurrent counter-productive gambling behaviour' characterized by the inability to control the urge to gamble, often leading to harmful consequences, such as financial and familial problems (Blaszczynski and Nower, 2002). The latest version of the Diagnostic and Statistical Manual of Mental Disorders, DSM-5 (2013) of the American Psychiatric Association's (APA) checks the following nine criteria to diagnose compulsive gambling:

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.*

An individual meeting at least four out of nine criteria within a 12-month period is classified as a compulsive gambler. We adopt the DSM-5 screening questions above to assess if individual investors in our sample display symptoms of excessive gambling behavior in the financial markets, by replacing the word 'gambling' with 'trading financial products' (see the

Appendix). The response scale for each question is "Never", "Sometimes" or "All the time". We count the answers "Sometimes" and "All the time" as 1, and "Never" as 0, and use a score of four or more symptoms as our measure for excessive gambling in the financial markets.

Our motivation for applying this screen is that it is well established in the psychiatric literature that for a small group of people gambling activities can become excessive and problematic; this may also apply to speculative trading of stocks (and other financial products) if people use it as a substitute for gambling. Further, from a policy perspective, it is also important to develop measures that can distinguish relatively harmless forms of gambling in the financial markets, from more excessive forms of gambling that can have negative side-effects for investors and society. Youn *et al.* (2016) and Kamolsareeratana and Kouwenberg (2017) provide initial evidence that a small but significant number of individual investors in Korea and Thailand display symptoms of compulsive gambling behavior in the stock market.

3. Dutch Investor Survey Data

In this section we describe the data collection process and summarize the socio-economic characteristics of our sample, as well as the main variables.

3.1 Data collection

We collected our data by fielding a survey in 2017 in two different panels containing Dutch individual investors that make their own trading decisions. The first panel is the AFM panel operated by the Dutch Authority for Financial Markets regulator (AFM), and the second is the Dutch National Bank Household Survey (DHS) conducted by CentERdata, a research institute specialized in socio-economic research.

The DHS is representative for the Dutch population, and often used in other studies of investor behavior (see, e.g., Gaudecker, 2015). DHS members receive a small compensation

for each survey that they complete. Our DHS data were collected in October 2017, specifically targeting all panel members who indicated to invest in financial markets, as well as a comparison group of non-investors. In total 620 completed responses were collected, consisting of 275 investors (investing in stocks, bonds, mutual funds, leveraged products, derivatives, or other financial products) and 345 non-investors. Out of the 275 investors, only 106 respondents indicated to make their own investment decisions and during the last 12 months traded stocks, ETF's, derivatives or leveraged products. As we study individual investor trading behavior, all results reported onwards are based on this investor subsample of 106 direct investors.

A strong advantage of the DHS panel is that it is representative for the Dutch population, consisting of approximately different 2,300 households. Our survey results indicate that only 5% (106/2,300) of Dutch households directly trade in the financial markets, in particular individual stocks, ETF's, derivatives and leveraged products.[2] This demonstrates that direct ownership of stocks and other risky financial products such as derivatives is still relatively rare in the Dutch population. An unintended consequence is that the sample for our study of trading behavior, with 106 direct investors, is rather small.

To collect more investor data, we also fielded our survey in a panel conducted by the Dutch Authority for Financial Markets (AFM). The AFM is the Dutch equivalent of the United States Securities and Exchange Commission (SEC) and supervises the conduct of financial institutions in savings, investments, insurance and loan markets. The AFM regularly conducts surveys using its own panel of 1,733 respondents. The panel composition is as follows: (i) about 40% consists of people who in the past contacted AFM directly with questions or complaints, and who agreed to participate in surveys, (ii) 10% of the members were voluntary enrolled through AFM's website, and (iii) 50% of the members were recruited from the general Dutch population by a market research company (GfK). The AFM panel is not representative for the

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[2] Due to our focus on active and speculative trading, we exclude investors who only invest in bonds and/or in traditional mutual funds (not traded on the financial market).

Dutch population, because it overweighs financial consumers and individual investors who previously contacted AFM. Our survey was distributed to all AFM panel members in March 2017 and we received 866 responses within one week, corresponding to a 50% response rate.[3] Among the 866 respondents, only 259 directly invest in stocks, ETF's, derivatives or leveraged products.

The use survey data for our study, instead of stock market trading records, has some disadvantages: our measures of trading behavior are self-reported and they lack detail. However, brokerage datasets also have several drawbacks that our investor survey data do not suffer from. Investors can have multiple brokerage accounts, and data from one particular broker could represent only a small fraction of an investor's total portfolio and wealth. For example, an investor investing $10,000 in a lottery stock may not be taking much risk overall if he also has $500,000 in bond mutual funds elsewhere. Our survey data from the DHS and AFM panel represent the investor's overall portfolio and financial situation.

3.2 Demographics of the investor samples

Descriptive statistics for the two investor samples are reported in Table 1. Panel A shows the demographic composition of the samples, comparing the AFM to the DHS. Significant differences in means or proportions between the AFM and DHS investors are indicated by stars in the AFM column. A striking overall profile emerges: the typical Dutch investor in financial markets is a 60-year old man.[4] Female investors are almost absent: only 9% of the DHS investors and 6% of the AFM are female. Further, the large majority of investors have more than five years of experience investing in stocks (about 90%), and one out five investors (20%) have access to a financial advisor. On these key aspects the two investor samples are very

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[3] Panel members recruited by GfK receive compensation for participating in surveys, while the voluntary enrolled AFM panel members participate in a semi-annual lottery to win a lunch with AFM's CEO.
[4] Less than 10% of the investors are younger than 35 years in the DHS panel, and less than 10% are younger than 45 years in the AFM panel.

similar (no significant differences). There are also some significant differences between the two groups. In general, the investors in the AFM panel are somewhat wealthier, have higher income and are more likely to be a business owner.

For the main results of the paper we combine the two investor groups, given the similar investor profile (age, gender, trading experience, and access to financial advice), and to increase the overall sample size for the study. In all regression models we also include a dummy for AFM respondents, to control for any sample selection effects.

[Insert Table 1 here]

3.3 Summary statistics of the main variables

Panel B of Table 1 reports descriptive statistics of the proxies for gambling motives. About 45% in both samples mention "investing for the fun or the challenge of it" as one of their investment goals, indicating that the sensation seeking (or entertainment) motive is very common among individual investors. Only 10% (DHS) to 15% (AFM) of the investors are wealth aspirers, willing to take risk for a small chance to get rich. Further, 9% (AFM) to 14% (DHS) of the investors have gambled conventionally in the last 12 months. About 9% of both investor samples can be classified as risk-taking gamblers based on the DOSPERT scale, indicating that they may gamble with at least 100 euro of real money at stake in casinos, on slot machines or on sport/card games. Finally, about 5% of the investors in both samples can be classified as excessive gamblers in the financial markets, because they display four or more DSM-5 symptoms of compulsive gambling. There are no significant differences in the gambling motives of the investors in the AFM and DHS samples, which supports our approach of combining the two groups to increase the sample size for the main analyses in Section 4.

Panel B of Table 1 also shows descriptive statistics for the DOSPERT gambling risk-taking scale that ranges from 1 to 5, and for the number of DSM-5 compulsive gambling symptoms, ranging from 0 to 9. The mean of the DOSPERT scale is close to 1 (="Very Unlikely"), indicating that overall the propensity to gamble among Dutch investors is low. Similarly, the typical investor has displays almost no symptoms of compulsive gambling in the stock market. In sum, gambling motives are relatively rare among Dutch investors, except for the sensation seeking motive of trading for the fun or challenge of it.

Our survey also included important control variables for active trading behavior from the literature, namely risk tolerance, overconfidence and financial literacy. Risk tolerance is assessed on a 10-point scale ranging from 1 indicating "Not willing to take risks" to 10 being "Very willing", using the general risk question of Dohmen at al. (2011). Financial literacy is measured by nine questions from Van Rooij et al. (2011) in the DHS panel, and by seven questions in the AFM panel. The financial literacy measures in both sample are rescaled to range from 0 (0% correct) to 1 (100% correct) to make them comparable. We asked respondents how many of the financial literacy questions they think they answered correctly The miscalibration form of overconfidence is measured as the difference between the estimated and the actual percentage of correct answers. Respondents were also asked to compare themselves with the average investor on a 5-point response scale ranging from 1 being "No, much worse" to 5 "Yes, much better". We create a 0/1 indicator for the better-than-average-effect, which is equal to 1 if the response is "Yes, somewhat better" or "Yes, much better", and 0 otherwise.

Finally, our survey includes questions on trading behavior. We use five variables to capture excessive and speculative trading behavior. *Trading frequency* measures the frequency at which the investor trades individual stocks on a 5-point response scale: 1 = "I barely trade", 2 = "1-10 times/year", 3 = "1-10 times/month", 4 = "3-4 times/week", 5 = "almost every day".

We construct a dummy for *High trading frequency* that equals one if the investor trades more than three times a week, or every day. Respondents are also asked to indicate if they bought or sold the same stock within a single day (during the last 12 months), which we recode into an indicator variable for *Day trading*. We also ask respondents how many different individual stocks they hold in their portfolio, as a measure of *Diversification*. Finally, investors are asked if they traded or invested in *Derivatives* and *Leveraged products* during the last 12 months.

Summary statistic of the trading variables are shown in Panel C of Table 1. Investors in both samples trade stocks quite infrequently, with the typical answer being "1-10 times/year". Only 9% of the investors in the AFM panel trade stocks 3-4 times a week, or almost every day, versus only 2% of the DHS investors. The prevalence of day trading is around 20% in both samples. Hence, only a minority of direct investors in the Dutch population trade stocks frequently. AFM investors tend to trade more actively, and have on average more stocks in their portfolio, compared to the representative DHS sample. The median number of different individual stocks owned is five (four in the DHS, six in the AFM). In the DHS sample trading in derivatives and leveraged products is rare (11% and 4%, respectively), but it is more common in the AFM sample (28% and 12%).

In sum, active and speculative trading is relatively rare in the population of Dutch investors, affecting only a small sub-group. Investors in the AFM panel do tend to trade more actively than in the DHS, and the AFM investors are also more likely to own derivatives and leveraged products. In our main regression analyses, where we combine both investor groups, we will control for these differences in trading behavior by including a dummy for the AFM panel as one of the explanatory variables.

4. Explaining Excessive and Speculative Trading Behavior by Dutch Investors

In this section we conduct a 'horse race' analysis to examine which measure of gambling motives is most predictive of active and speculative individual investor trading behavior.

4.1 Excessive market stock trading

It is a major puzzle why some individual investors trade stocks frequently, as most research indicates that they would be better off if they traded less actively (Odean 1999, Barber and Odean, 2000). We now test to what extent different gambling motives for stock market trading can provide an explanation. As our main proxy for excessive stock trading we use the *High trading frequency* dummy, equal to one for investors who trade at least 3-4 for times a week, or every day. As a second proxy for excessive trading we use the *Day trading* dummy, equal to one for investors who bought and sold the same stock within one day. Barber et al. (2014) find that day trading accounts for more than 20% of the total trading volume in Taiwan, but the vast majority of day traders lose money (about 80%).

Table 2 presents descriptive statistics of trading behavior across different screens for gambling motives, combing the 365 investors in the AFM and DHS samples. The baseline investor group in the first column of Table 2 consists of respondents who do not display any gambling motives. On average, investors in the baseline group trade stocks just 1-10 times per years, only 6% have a high trading frequency, and 13% day-trade stocks. Among *Sensation seekers* and *Wealth aspirers*, investors who trade for the fun/challenge or to have a small chance to become rich, the stock trading frequency is slightly higher based on the 5-point trading frequency scale. But there is no significant difference in the percentage of investors with high trading frequency and day-trading, compared to the baseline group.

We now examine the two proxies for trading as a substitute for conventional gambling: *Past gamblers,* investors who gambled conventionally in the last 12 months, and *Risk-taking*

gamblers, investors exhibiting some gambling propensity on the DOSPERT scale. Table 2 shows that *Past gamblers* are about three times more likely to day-trade stocks. Further, the proportion of investors with high stock trading frequency is double in this group, at 11% compared to 6% for the baseline (but not significantly different). Among *Risk-taking gamblers*, about 50% day-trade stocks and 14% have a high stock trading frequency.

Finally, among the *Excessive stock market gamblers*, who pass the DSM-5 compulsive gambling screen, the day-trading rate is 63% and one out of five (19%) have a high stock trading frequency. Overall, the pattern of results in Table 2 suggests that excessive trading is more common among investors with stronger gambling motives.

[Insert Table 2 here]

Since trading behavior is also driven by other factors such as overconfidence (Barber and Odean, 2001), risk tolerance and financial literacy, we now estimate multiple regression models to analyze how well gambling motives can explain excessive stock trading, after accounting for these other factors. The models include two measures for overconfidence, miscalibration and better-than-average, alongside indicators for risk tolerance and financial literacy (Van Rooij *et al.,* 2011). Further, we include demographic controls for age, gender, marital status, education level, income, wealth and stock trading experience. As noted before, we also include a dummy variable to account for any structural differences in trading behavior between the AFM and DHS sample.

[Insert Table 3 here]

The main results of the regression analysis in Table 3 are in line with the descriptive statistics. The DSM-5 *Excessive stock market gamblers* screen is highly significant in explaining high trade frequency in Panel A and day-trading in Panel B. This group of investors is approximately two times more likely to trade excessively in the stock market and to day-trade. *Risk-taking gamblers*, based on the DOSPERT gambling propensity scale, also have significantly higher stock trading frequency and tend to day-trade more often. *Past gamblers*, *Wealth aspirers* and *Sensation seekers* do not trade more actively than other investors, after controlling for other variables, with nearly all coefficients insignificant. Finally, when we run a horse race among all gambling motives in Column (7) of Table 3, it is the *Excessive stock market gamblers* screen that best explains excessive trading behavior.

Focusing on the control variables in the model, the better-than-average overconfidence proxy helps to explains high stock trading frequency in Panel A, in line with previous studies by Barber and Odean (2000, 2001). High risk tolerance and low financial literacy predicts day-trading in Panel B, which is plausible. Surprisingly, miscalibration appears to be negatively related to day trading, but this effect is only marginally significant

4.2 Trading derivative and leveraged products

Financial innovation has made available many securities other than stocks that are attractive for investors with gambling motives, such as derivatives and leveraged products. These products allow investors to achieve highly skewed and levered payoffs. However, because of their complex nature and often low liquidity, these products typically entail relatively high risks, fees and costs. Bauer et al. (2009) show that Dutch investors suffer substantially larger losses on their option investments than on their stock investments. Entrop et al. (2016) document that retail investors also typically realize negative abnormal returns when

investing in structured financial products. Similar to active stock trading, it is puzzling why investors choose to invest in these products when they tend to achieve poor returns.

Bauer et al. (2009) find that gambling and entertainment appear to be the main motivations behind the option trading of Dutch retail investors. Filippou et al. (2017) document that there is a substitution effect between options and stocks with lottery-like features for retail investors, with out-of-the-money options displacing lottery stocks when they are available. All of the above suggests that when individual investors trade options and leveraged products, gambling motives likely play a role. Table 2 indeed shows that investors with gambling motives typically are twice as likely to invest in derivatives, with the proportion ranging from 27% to 38%, compared to the baseline rate of 16% for investors without gambling motives. Focusing on leveraged products, Table 2 shows that *Past gamblers* and *Risk-taking gamblers* are about three times more likely to invest in these products at 23%, compared to only 7% in the baseline group.

[Insert Table 4 here]

In Table 4 we estimate a multiple logistic regression model to explain investing in derivatives or leveraged products: the dependent variable equals one if the investor invested either in derivatives or in leveraged product during the last 12 months. In line with the previous results for stock market trading, Table 4 show a strong positive relationship between the DSM-5 compulsive gambling screen and trading of derivatives or leveraged products. *Excessive gamblers in the stock market* are more likely to invest in these products, while other gambling motives show a weaker positive relation, with only the *Past gamblers* proxy marginally significant at the 10% level. Other factors that predict investment in derivatives and leveraged products are high risk tolerance, high financial literacy, and the better-than-average form of

overconfidence. These results are plausible, as investors need to be willing to take on high risk, have some knowledge of these relatively complex products, and need to be confident in their financial skills to trade them. Among the control variables, financial literacy has the most significant effect on trading of derivatives and leveraged products.

In additional results available on request, we have also estimated two separate regressions, one for investing in derivatives, and one for investing in leveraged products. The results show that investing in derivatives is best explained by the *Excessive gambling in the stock market* motive (DSM-5). On the other hand, investing in leveraged products is best explained by the *Past gamblers* proxy, suggesting that leveraged products are frequently used as a substitute by conventional gamblers who also go to casinos and play on slot machines. The descriptive statistics by group in Table 4 also reveal this pattern.

4.3 Discussion

We find that gambling motives are powerful in explaining excessive stock market trading by individual investors, beyond other factors such as overconfidence, risk tolerance, and financial literacy. Further, gambling motives explain investing in derivatives and leveraged products, which allow investors to create highly skewed payoffs. Especially the compulsive gambling motive, proxied by DSM-5 *Excessive gamblers in the stock market* screen, and the trading as a substitute for conventional gambling motive, proxied by the DOSPERT *Risk-taking gamblers* screen, explain excessive stock trading behavior well. Other more innocuous gambling motives, such as aspiring to become rich, or trading for the fun and excitement of it, do not explain the trading behavior of individual investors well. The fact that especially the compulsive gambling screen explains active and speculative trading behavior, raises concerns about the potentially negative consequences on the investors' wealth and well-being. In the next

section we analyze how our screens for gambling motives relate to the financial situation of the household.

5. Gambling Motives and Financial Situation

We now investigate whether investors with gambling motives are in a relatively worse financial situation, and which gambling motives in particular are associated with more financial problems for investors. If gambling motives stimulate excessive stock trading and investment in derivatives and leveraged products, we expect these investors to be in relatively worse financial situations than others, given the well-documented poor performance of these speculative trading strategies (see, for example, Barber and Odean, 2000, Bauer et al., 2009, and Entrop et al., 2016)

5.1 Financial situation

We devise three indicators for the financial situation of the investor. The first question asks if the investors are able to *Make ends meet* financially, with a 5-point response scale: 1. "Very easy", 2. "Easy", 3. "Neither easy nor difficult", 4. "Difficult", and 5. "Very Difficult". The second question for *Financial situation* asks "What is your current financial situation?", with possible responses ranging from 1. "I have a lot of money leftover", 2. "I have some money leftover", 3. "I make ends meet exactly", 4. "I am slightly dipping into my savings", to 5 "I am running into debt". The third set of questions asks whether eight common financial problems occurred within the past 12 months, such as receiving letters from a debt collection agency and being overdue on rent or mortgage payments. We use the total number of affirmative answers, ranging from 0 to 8, as a proxy for financial problems. Finally, we construct two more dummy indicators for a having poor financial situation using these previous variables: one for *Making*

debt or using savings, and one for having *At least one financial problem* (excluding late bill payment).

[Insert Table 5 here]

Table 5 shows descriptive statistics of the investors' financial situation across the five gambling motive groups, as well as the baseline group. *Excessive stock market gamblers* tend have significantly worse scores on all indicators of financial situation, compared to the baseline investor group without any gambling motives. These excessive gamblers are three times more likely to make debt or dip into their savings, and they are more than twice as likely to have experienced at least one financial problem in the last 12 months. A similar picture emerges for investors with conventional gambling motives, although less extreme. *Past gamblers* and *Risk-taking gamblers* are about twice as likely to make debt or use their savings. Finally, investors with more benign gambling motives like *Sensation seekers* and *Wealth aspirers* do not have a significantly worse financial situation than the baseline group.

The multiple regression results in Table 6 confirm that *Excessive gamblers in the stock market* tend to be in significantly worse financial situation and have more financial problems, compared to other investors with a similar socio-demographic profile. *Risk-taking gamblers* have also more difficulty making ends meet, while *Past gamblers* report a worse financial situation and have higher number of financial problems. In line with the previous results, we find that the two milder forms of gambling motives, investing for the fun/challenge and investing for a small chance to get rich, are not associated with a worse financial situation.

[Insert Table 6 here]

5.2 Discussion

Although it is difficult to establish the direction of causality, one way to read the results is that investors who gamble excessively in the stock market, or who trade as a substitute for conventional gambling, tend to end up in a relatively worse financial situation due to the costs and losses of their speculative trading strategies. However, it is also possible that being in a relatively poor financial situation is a trigger for people to gamble in the financial markets in an attempt to catch up and gain a large amount of wealth quickly. Regardless of what the direction of causality is, either scenario is worrisome, and could warrant upfront screening for symptoms of excessive investor gambling by brokers, using for example the DSM-5 screen.

6. Conclusions

Individual investors who follow active and speculative trading strategies, such as frequent stock trading, day-trading and investing in derivatives, mostly hurt their own returns. Existing research has examined overconfidence, learning by trading, trading for fun and gambling as possible explanations for this puzzling unprofitable investor behavior. We contribute to this literature by testing four different gambling motives for active and speculative trading by retail investors: sensation seeking, wealth aspiration, trading as a substitute for gambling, and compulsive trading as gambling. We measure these gambling motives at the individual level in two investor samples from the Dutch population, and then link the gambling motives to investor trading behavior. To the best of our knowledge, only Dorn and Sengmueller (2009) have tested this link before, while most evidence about trading as a form gambling is indirect from the impact of lottery jackpots on stock trading volume. From a policy and consumer-protection perspective, however, it is also important to develop good direct measures of gambling in the financial markets, especially to help detect excessive gambling behavior that can have potential negative side-effects on investors.

We find that gambling motives can explain a substantial part of individual investors' excessive and speculative trading behavior, beyond what known factors like overconfidence, risk tolerance, trading experience and financial literacy can explain. Among the different gambling motives, trading as a substitute for gambling and compulsive trading as gambling, best explain which investors have a high trade frequency, tend to day-trade and invest in derivatives and leveraged products. In a horse race between the different gambling proxies, the screen for compulsive gambling in the stock market best explains excessive and speculative trading. In addition, individual investors who pass the screen for compulsive gambling also tend to be in a significantly worse financial situation compared to investors who have a similar socio-demographic profile in terms of wealth, income and education. By contrast, more innocuous gambling motives, such as investing for fun or for a small chance to become rich, are not associated with active trading behavior and a worse financial situation.

On the positive side, our data show that only a small fraction of the Dutch population directly trade in individual stocks, derivatives or leveraged products, about 5%. Further, the large majority of these direct investors trade stocks less than 10 times a year, and do not invest in derivatives or leveraged products. Only a small group of investors follow more active and speculative trading strategies, with day-trading stocks and investing in derivatives being most common, pursued by about one in five direct investors (or 1% of the Dutch population). Our screen for compulsive gambling in the stock market can be helpful in identifying those active investors who might be more at risk than others of harming their own finances with their trading behavior. Compulsive gambling is a known risk that can have serious consequences for people's personal life, including their wealth, health and family relations, but compulsive trading as gambling in financial markets has so far received limited attention. We hope that our research will stimulate further studies into the causes and consequences of compulsive gambling in the stock market. Future research could also examine in more detail how trading motives change

with trading experience, and to what extent trading as gambling is influenced by the past gains and losses occurred by investors.

References

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

Bali, T. G., Cakici, N., & Whitelaw, R. F. (2011). Maxing out: Stocks as lotteries and the cross-section of expected returns. *Journal of Financial Economics*, *99*(2), 427-446.

Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance*, 55(2), 773-806.

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, *116*(1), 261-292.

Barber, B. M., Lee, Y. T., Liu, Y. J., & Odean, T. (2004). Do individual day traders make money? Evidence from Taiwan. *University of California, Berkeley, working paper*.

Barber, B. M., Lee, Y. T., Liu, Y. J., & Odean, T. (2008). Just how much do individual investors lose by trading?. *The Review of Financial Studies*, *22*(2), 609-632.

Barber, B. M., Lee, Y. T., Liu, Y. J., & Odean, T. (2014). The cross-section of speculator skill: Evidence from day trading. *Journal of Financial Markets*, 18, 1-24.

Bauer, R., Cosemans, M., & Eichholtz, P. (2009). Option trading and individual investor performance. *Journal of banking & finance*, *33*(4), 731-746.

Boyer, B. H., & Vorkink, K. (2014). Stock options as lotteries. *The Journal of Finance*, *69*(4), 1485-1527.

Dorn, D., & Sengmeuller, P. (2009). Trading as Entertainment?. *Management Science*, 55(4), 591-603.

Dorn, A. J., Dorn, D., & Sengmueller, P. (2014). Trading as gambling. *Management Science*, *61*(10), 2376-2393.

Engelberg, J., & Parsons, C. A. (2016) Worrying about the stock market: Evidence from hospital admissions. *Journal of Finance*, 71(3), 1227-1250.

Entrop, O., McKenzie, M., Wilkens, M., & Winkler, C. (2016). The performance of individual investors in structured financial products. *Review of Quantitative Finance and Accounting*, *46*(3), 569-604.

Filippou, I., Garcia-Ares, P. A., & Zapatero, F. (2017). Demand for Lotteries: the Choice Between Stocks and Options, Working paper.

Gao, X., & Lin, T. C. (2015). Do individual investors treat trading as a fun and exciting gambling activity? Evidence from repeated natural experiments. *Review of Financial Studies*, 28(7), 2128-2166.

Gaudecker, H. (2015) How Does Household Portfolio Diversification Vary with Financial Sophistication and Advice. *Journal of Finance,* 70(2), 489-507.

Gervais, S., & Odean, T. (2001) Learning to Be Overconfident. *Review of Financial Studies*, 14(1), 1-27.

Grall-Bronnec, M., Sauvaget, A., Boutin, C., Bulteau, S., Jiménez-Murcia, S., Fernández-Aranda, F., & Caillon, J. (2017). Excessive trading, a gambling disorder in its own right? A case study on a French disordered gamblers cohort. *Addictive Behaviors*, *64*, 340-348.

Granero, R., Tárrega, S., Fernández-Aranda, F., Aymamí, N., Gómez-Peña, M., Moragas, L., & Jiménez-Murcia, S. (2012). Gambling on the stock market: an unexplored issue. *Comprehensive Psychiatry*, *53*(6), 666-673.

Grinblatt, M., & Keloharju, M. (2009). Sensation seeking, overconfidence, and trading activity. *Journal of Finance*, *64*(2), 549-578.

Henderson, B. J., & Pearson, N. D. (2011). The dark side of financial innovation: A case study of the pricing of a retail financial product. *Journal of Financial Economics*, *100*(2), 227-247.

Hoffmann, A. O., & Shefrin, H. (2014). Technical analysis and individual investors. *Journal of Economic Behavior & Organization*, *107*, 487-511.

Horvath, P., & Zuckerman, M. (1993). Sensation seeking, risk appraisal, and risky behavior. *Personality and Individual Differences*, *14*(1), 41-52.

Kamolsareeratana, A., & Kouwenberg, R. (2017). Gambling Addiction in the Stock Market, Working paper.

Kumar, A. (2009). Who gambles in the stock market?. *Journal of Finance*, *64*(4), 1889-1933.

National Gambling Impact Study Commission (1999) Final report, available from http://govinfo.library.unt.edu/ngisc/reports/fullrpt.html.

Odean, T. (1999). Do investors trade too much?. *American Economic Review*, *89*(5), 1279-1298.

Statman, M. (2002). Lottery players/stock traders. *Financial Analysts Journal,* 58(1), 14-21.

Volberg, R. A. (2001). *When the Chips Are Down: Problem Gambling in America*. Twentieth Century Fund.

Weber, E. U., Blais, A. R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, *15*(4), 263-290.

Welte, J. W., Barnes, G. M., Tidwell, M. C. O., Hoffman, J. H., & Wieczorek, W. F. (2015). Gambling and problem gambling in the United States: Changes between 1999 and 2013. *Journal of Gambling Studies*, 31(3), 695-715.

Youn, H., Choi, J. S., Kim, D. J., & Choi, S. W. (2016). Development and validation of a stock addiction inventory (SAI). *Annals of General Psychiatry*, *15*(1), 16.

Zuckerman, M. (1994). *Behavioral Expressions and Biosocial Bases of Sensation Seeking*. Cambridge University Press.

Figure 1: Example of a Binary Option

Source: Olymp Trade, Binary Options Broker. https://olymptrade.com/lands/LPL09-03-01en/

Table 1 Summary statistics of the main variables

Panel A: Demographics

	AFM			DHS		
	Mean	Min	Max	Mean	Min	Max
Age in years	61.52	30	92	59.01	21	92
Male	0.94	0	1	0.91	0	1
Single	0.19*	0	1	0.27	0	1
Low education	0.04**	0	1	0.11	0	1
High school education	0.19	0	1	0.25	0	1
Bachelor education	0.45	0	1	0.36	0	1
Master education	0.31	0	1	0.28	0	1
Low income (< 39k euro)	0.18*	0	1	0.25	0	1
Medium income (39k to 78k euro)	0.34***	0	1	0.55	0	1
High income (> 78k euro)	0.36***	0	1	0.20	0	1
Low wealth (< 50k euro)	0.18***	0	1	0.35	0	1
Medium wealth (50k to 150k euro)	0.20**	0	1	0.31	0	1
High wealth (> 150k euro)	0.48**	0	1	0.33	0	1
Low stocks trading experience (< 1 year)	0.03	0	1	0.01	0	1
Medium stock trading exp. (1-5 years)	0.06**	0	1	0.14	0	1
High stock trading experience (> 5 years)	0.91	0	1	0.85	0	1
Regular employment	0.35**	0	1	0.46	0	1
Business owner	0.17**	0	1	0.08	0	1
Retired	0.42	0	1	0.40	0	1
Unemployed/disabled/other dummy	0.06	0	1	0.06	0	1
Has access to financial advisor	0.24	0	1	0.18	0	1
Observations	259			106		

***, ** and * denote significant differences in the mean or proportion between the AFM and DHS samples, at the 1%, 5% and 10% level

Panel B: Gambling motives and control variables

	AFM			DHS		
	Mean	Min	Max	Mean	Min	Max
Sensation seeking motive	0.43	0	1	0.48	0	1
("invest for fun or the challenge")						
Wealth aspiration motive	0.15	0	1	0.10	0	1
("invest for a small chance to get rich")						
Conventional gamblers	0.09	0	1	0.14	0	1
(Gambled conventially in the last 12 months)						
Risk-taking conventional gamblers	0.08	0	1	0.09	0	1
(Gambling propensity based on DOSPERT)						
Excessive gamblers in the financial market	0.04	0	1	0.06	0	1
(4 or more DSM-5 symptoms)						
DOSPERT gambling risk-taking scale (1 to 5)	1.13	1.0	3.5	1.17	1.0	3.5
DSM-5 excessive gambling symptoms (0 to 9)	0.96[*]	0	9	0.71	0	7
Risk tolerance scale from 1 to 10	6.08[**]	1	10	5.53	1	10
Financial literacy score (0 to 100% correct)	0.76[***]	0.29	1	0.95	0.33	1
Overcondifence miscalibration	0.04[***]	-0.86	0.71	-0.03	-0.38	0.13
Overconfidence better-than-average	0.20	0	1	0.13	0	1
Observations	259			106		

***, ** and * denote significant differences in the mean or proportion between the AFM and DHS samples, at the 1%, 5% and 10% level

Panel C: Dependent variables

	AFM			DHS		
	Mean	Min	Max	Mean	Min	Max
Stocks trading frequency scale 1-5	2.46***	1	5	1.88	1	4
(1= I barely trade, ..., 5 = almost every day)						
Frequent stock trading indicator	0.09**	0	1	0.02	0	1
Day trading stocks	0.22	0	1	0.19	0	1
Number of stocks	10.03***	1	45	5.08	1	25
Investing in derivatives	0.28***	0	1	0.11	0	1
Investing in leveraged products	0.12**	0	1	0.04	0	1
Making ends meet scale 1-5	1.72***	1	4	1.98	1	4
(1= very easy, ..., 5 = very difficult)						
Financial situation scale 1-5	1.88	1	5	2.01	1	4
(1= money leftover, ..., 5 = debt increasing)						
Financial situation deteriorating dummy	0.09	0	1	0.11	0	1
Number of financial problems (0 to 8)	0.32	0	4	0.26	0	3
Has at least 1 serious financial problem	0.15	0	1	0.15	0	1
Observations	259			106		

Trading frequency stocks scale: 1= I barely trade, 2 = 1-10 times/year, 3 = 1-10 times/month, 4 = 3-4 times/week, 5 = almost every day.

***, ** and * denote significant differences in the mean or proportion between the AFM and DHS samples, at the 1%, 5% and 10% level

Table 2: Trading behavior statistics by gambling motives groups

	Baseline investor group	APA-DSM excessive gambling	DOSPERT gambling propensity	Gambled in the last 12 months	Invest for a chance to become rich	Invest for fun or the challenge
Stock trading frequency (1-5)	2.11	2.88**	2.64**	2.53*	2.51*	2.41**
High trading frequency	0.06	0.19*	0.14	0.11	0.07	0.07
Day trading stocks	0.13	0.63***	0.46***	0.33*	0.32*	0.24
Invests in derivatives	0.16	0.38	0.27	0.33	0.29	0.30***
Invests in leveraged products	0.07	0.19	0.23***	0.23***	0.10	0.12
Number of stocks: mean	8.10	8.38	7.50	7.56	7.69	9.44*
Number of stocks: median	5	6	5	5	5	6**
Observations (N)	145	16	28	36	41	153

***, ** and * denote significant differences in the mean or proportion compared to the baseline group, at the 1%, 5% and 10% level

Table 3: Panel A. High trading frequency dummy and gambling motives

	(1)	(2)	(4)	(3)	(5)	(6)	(7)
APA-DSM excessive gambling		2.17***					1.92***
DOSPERT gambling propensity			1.59**				1.25
Gambled last 12 months				0.89			0.37
Investing for a chance to become rich					0.01		-0.08
Investing for fun or the challenge						-0.11	-0.22
Risk tolerance	0.22	0.18	0.18	0.19	0.22	0.22	0.14
Financial literacy	-0.16	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16
Overconfidence miscalibration	-0.11	-0.08	-0.09	-0.08	-0.11	-0.11	-0.05
Overconfidence better than average	1.36**	1.51***	1.45**	1.36**	1.36**	1.38**	1.56***
Pseudo-R2	0.139	0.174	0.167	0.149	0.139	0.139	0.196
Observations	328	328	328	328	328	328	328

Notes: The table reports ordered logit coefficients. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 3: Panel B. Day trading and gambling motives

	(1)	(2)	(4)	(3)	(5)	(6)	(7)
APA-DSM excessive gambling		1.98***					1.81**
DOSPERT gambling propensity			1.21***				0.97*
Gambled last 12 months				0.60			-0.00
Investing for a chance to become rich					0.81*		0.79
Investing for fun or the challenge						0.27	0.20
Risk tolerance	0.44***	0.42***	0.41***	0.43***	0.42***	0.42***	0.37***
Financial literacy	-0.25**	-0.26**	-0.26**	-0.24**	-0.26**	-0.26**	-0.29**
Overconfidence miscalibration	-0.20*	-0.18*	-0.18*	-0.18*	-0.20**	-0.19*	-0.18*
Overconfidence better than average	0.00	0.11	0.02	-0.03	-0.01	-0.05	0.07
Pseudo-R2	0.101	0.135	0.121	0.107	0.112	0.104	0.159
Observations	328	328	328	328	328	328	328

Notes: The table reports ordered logit coefficients. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 4: Investing in derivatives or leveraged products and gambling motives

	(1)	(2)	(4)	(3)	(5)	(6)	(7)
APA-DSM excessive gambling		1.58**					1.45**
DOSPERT gambling propensity			0.58				0.23
Gambled last 12 months				0.72*			0.46
Investing for a chance to become rich					0.06		-0.08
Investing for fun or the challenge						0.43	0.37
Risk tolerance	0.18**	0.16*	0.16*	0.16*	0.18**	0.16*	0.14
Financial literacy	0.32***	0.32***	0.32***	0.33***	0.32***	0.30**	0.31**
Overconfidence miscalibration	-0.04	-0.03	-0.03	-0.02	-0.04	-0.04	-0.01
Overconfidence better than average	0.71*	0.78**	0.72*	0.68*	0.71*	0.62*	0.69*
Pseudo-R2	0.135	0.152	0.139	0.142	0.135	0.140	0.162
Observations	328	328	328	328	328	328	328

Notes: The table reports ordered logit coefficients. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5: Financial situation and gambling motives groups

	Baseline investor group	APA-DSM excessive gambling	DOSPERT gambling propensity	Gambled in the last 12 months	Invest for a chance to become rich	Invest for fun or the challenge
Making ends meet scale (1-5)	1.79	2.47***	2.23***	1.95	1.73	1.75
Financial situation scale (1-5)	1.94	2.80***	2.41**	2.34**	1.80	1.84
Making debt or using savings (0/1)	0.11	0.33***	0.21**	0.21**	0.06	0.08
Number of financial problems (1-8)	0.24	0.94*	0.69	0.79**	0.33	0.30
At least one financial problem (0/1)	0.14	0.31*	0.24	0.34***	0.12	0.14
Observations (N)	147	15	29	38	49	158

***, ** and * denote significant differences in the mean or proportion compared to the baseline group, at the 1%, 5% and 10% level

Table 6: Financial situation and gambling motives regressions

	(1) Making ends meet scale (1-5)	(2) Financial situation scale (1-5)	(3) Number of financial problems
APA-DSM excessive gambling	1.22***	1.37***	1.06***
DOSPERT gambling propensity	1.02**	0.38	0.46
Gambled last 12 months	0.17	1.27***	0.69**
Investing for a chance to become rich	-0.07	-0.26	-0.05
Investing for fun or the challenge	-0.25	-0.43*	-0.24
Risk tolerance	-0.03	0.01	0.02
Financial literacy	-0.11	0.01	-0.10
Overconfidence miscalibration	-0.03	-0.11	0.08
Overconfidence better than average	-0.21	-0.91***	0.35
High trading experience	-0.22	0.74*	0.48
Age in years	0.01	0.03***	-0.02
Male	0.07	-0.23	-0.11
Single	0.12	0.01	-0.22
Master degree	0.17	0.03	0.26
Low income	0.68*	0.51	-0.24
High income	-0.67**	-0.67**	-0.02
Low wealth	0.53	0.52	0.35
High wealth	-0.70**	-0.40	-0.29
DHS panel data	0.60**	-0.05	-0.31
Gfk panel data	0.09	-0.08	-0.24
Pseudo-R2	0.130	0.116	0.108
Observations	322	309	327

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

Appendix. DSM-5 Gambling Disorder Diagnostic Criteria Adapted to Trading

DSM-5 Trading Addiction Questions in the Investor Surveys

The following questions are about your of trading financial products, such as individual company stocks, ETF's (indextrackers), derivative and leveraged products (such as turbo's, speeders, binary options and CFD's). While answering these questions please consider your actual trading activities during the last 12 months.

1. You trade financial products with larger amounts of money to maintain the excitement.

2. You have to borrow money from family members or friends to cover the losses from trading in financial products.

3. You always think of ways to get money to trade financial products.

4. You lie to your family or friends about your trading in financial products.

5. You tried to reduce trading financial products, or to quit altogether, but you could not.

6. You trade financial products to escape the problems in your life.

7. You trade more in order to win back your previous losses.

8. You have problems in your work, with family members or with your partner as a consequence of your trading in financial products.

9. You become irritated when trying to reduce or quit trading financial products.

Reponse scale shown for each of the above nine DSM-5 questions:

  I.   Never
 II.   Sometimes
III.   Often
IV.   All the time