Compulsive trading among individual investors: A new analysis framework

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Abstract

This study explores whether retail investors trading in stocks might have something in common with compulsive gamblers. A booklet of questionnaires, including the South Oaks Gambling Screen (Lesieur & Blume, 1987) and a version adapted for stock market trading was completed by a sample of active investors, gamblers and a control group in Greece. Results suggest that retail trading in the stock market is addictive, exhibiting persistent levels of pathological addiction across bullish and bearish market periods (2000-2008).

Key Words: stock trading; retail investor; addiction

JEL codes: D190;D100

1. Introduction

John M. Keynes (1955) expressed the relationship between investors and pathological gamblers succinctly as follows: "It is generally agreed that casinos should, in the public interest, be inaccessible and expensive. And perhaps the same is true of the stock exchange". Given that pathological gambling addiction, affecting an estimated 1% to 2% of the United States population (NORC, 1999), apart from its psychosomatic implications, doubles the risk of job losing and quadruples the risk of filing for bankruptcy (Sumitra & Miller, 2005), the estimated, by the National Opinion Research Center, annual cost of $5 billion and lifetime cost of $40 billion to the U.S.A. society is justified (NORC, p.53, 1999). The degree to which Keynes' analogy extends to investors' suffering from an equivalent addiction is the focus of our study.

The fact that investment decisions are not always taken based on economic principles, but rather on other, non-economic, factors is widely appreciated; individual investors have been found to prefer stock-picking and frequent portfolio turnover rather than well diversified index-based investing, despite the widely substantiated lower investment performance (Barber & Odean, 2000). Moreover, Shiller (2000), Statman (2002), Barberis & Huang (2008) and Kumar (2009) established that stock market investors in many cases act as gamblers. Hence, retail trading is often characterized by irrational behavior and more closely resembles gambling (Shiller, 2000; Statman, 2002). In this
respect, the active individual stock investor, apart from an overall tendency to underperform index funds (Barber & Odean, 2000; Kumar, 2009), has been found to share certain common socioeconomic factors with gamblers (Kumar, 2009).

Alternative explanations have been given for such investor behavior, including peer pressure to maintain or increase social status and social acceptability of gambling (Kumar, 2009), investor overconfidence and gender roles (Barber & Odean, 2001), sensation seeking (Grinblatt & Keloharju, 2009) and joy and a feeling of accomplishment (Hoffman & Jager, 2005). Moreover, drawing a clear distinction between stock trading and betting might not be an easy exercise: Jadlow & Mowen (2010) found gamblers and investors to exhibit many common traits including material needs, competitiveness, superstition, low financial conservatism and numeracy, but to differ in terms of present-time orientation, emotional instability and impulsiveness.

Taking the results of earlier studies about the gambling aspect of stock investing a step further, we analyze the possibility that individual equity investors suffer from an equivalent to gambling addiction pathology. Although gambling behavior has been exhibited clearly and identifiably by online investors (Griffiths, 1999), only a few researchers have to date mentioned a compulsive gambling element on the part of retail investors, among them Steinberg & Harris (1994), Steinberg (1998) and Govoni et al. (2004). "Compulsive stock investing" has not been previously analyzed and pinpointed as such.

Govoni et al. (2004) point out that a key element of an addiction is the inability to quit, despite repeated attempts to do so, rendering potentially addicted investors most profitable for retail brokers, irrespective of market conditions. Recent poor stock market performance could lead investors to loss-chase, "doubling-down" in their effort to recoup their losses, in a similar manner to compulsive gamblers (Turner, 1998). By the same token, compulsive investors who suffer from an equivalent to the gambler's delusion that "they can control the game" (Frank & Smith, 1989) would result in a refusal to quit and put an end to the excitement of a winning stock market streak (or indeed a losing one). Likewise, the existence of addiction among individual investors playing the "investment gamble" should be prevalent in both stock market booms and busts, reflecting the need to stay in the game. By examining behavior across the stock market cycle of individual brokerage clients, we ascertain the prevalence of addiction, measured by a high score on the South Oaks Gambling Screen (Lesieur & Blume, 1987), a typical measure internationally (Volberg & Wray, 2007) for gambling addiction, adapted by us for the stock market. A persistent degree of compulsive investment behavior across varying stock market index levels and recent market performance (related to "value" or "momentum" investment strategies) may well suggest that individual stock market investing constitutes an addiction. We find that there is a considerably consistent prevalence of compulsive retail investor behavior at three distinct points in time (2000, 2007 and 2008) which represent

1 "Doubling down" refers to the strategy of doubling the number of shares initially held, when a stock price drops considerably, in an attempt to recoup losses with the hope of a potential upward repricing.
diametrically opposing points in the Athens Stock Exchange (ASE) stock market cycle, which provides the groundwork of our research.

The remainder of the study comprises the following parts: Part 2 summarizes the theoretical underpinnings of our research and our hypotheses, Part 3 outlines the methodology and the tools we employ, Part 4 presents our results and Part 5 summarizes our conclusions and presents directions for new research.

2. Theory and Hypotheses Development

A considerable amount of household savings is invested each year in the stock market, amounting to 17.9% of household income in the U.S. for 2007 (Bucks et al., 2009). Interestingly enough, 84% of households hold less than 10 stocks in their portfolio (Goetzmann & Kumar, 2008), revealing a severe lack of diversification. As a result of retail portfolio under-diversification, severe underperformance vis a vis passive index investing has been evidenced (Barber & Odean, 2000). Even allowing for individual investor “learning” from recent investment experiences, the fact that risky investments are occasionally rewarded by large wins, increases the total funds allocated to risky assets (or equivalent changes in expected returns), thus perpetuating their portfolio under-diversification (Miller, 2000) and resulting underperformance.

This extensively proven retail investor underperformance might also indicate a gambling element in individual investor choices. Such parallel behavior between stock investors and gamblers has been noted by several researchers in the past, including Miller (2000), Shiller (2000), Statman (2002) and Barberis & Huang (2008). Investing in a concentrated stock portfolio, according to Kumar (2009), satisfies the gambling needs of the psyche, providing strong evidence of similarities between the behavior of state lottery players and investors in risky stocks. Kumar (2009) also found considerable evidence that state lotteries and lottery-type stocks attract similar socioeconomic individuals who act complementarily. Moreover, Miller (2000) draws an analogy between less-informed individual investors and gamblers, stating that they both persistently allocate considerable amounts to risky assets, because they occasionally receive windfall profits. We argue that if lotteries and stock markets share an analogous clientele, they most probably also share equivalent psychological patterns such as compulsive behavior.

Behaviours which have been associated with problem gambling have been described variously as compulsive, addictive and pathological. Pathological gambling was first included as a diagnosable mental disorder in DSM-III in 1980 and was defined as "a chronic and progressive failure to resist impulses to gamble" (Volberg & Steadman, 1988). Diagnostic criteria for pathological gambling (according to DSM-IV, (APA, 1994)) are as follows: a) chronic and progressive inability to resist impulses to gamble, b) gambling compromising,

The full household portfolio including Keogh, 401 Ks, Individual Retirement Accounts and Pension Plans should be factored in for safer conclusions regarding equity portfolio diversification, a fact taken into consideration in the study of Calvet et al., (2009).

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disrupting, or damaging family, personal and vocational pursuits and c) the gambling is not due to an antisocial personality disorder. Therefore, pathological gambling can be considered as a “drugless” impulse disorder (Custer, 1984). The mostly used tool to screen pathological gambling is the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987), which has been employed in numerous gambling addiction studies internationally, in spite of its widespread criticism (Volberg & Wray, 2007). We employ the same SOGS screen to pinpoint addiction prevalence among retail investors, replacing the word “gambling” with “trading” in its questions.

The three different time periods during which we collected our data (November 1999 to March 2000, March to November 2007 and February to April 2008) represent a full cycle of the General ASE Index: its level was 4107, 4898 and 5256 respectively, representing a -12.3%, 21% and 83% year-on-year average performance throughout our study periods. ASE investors at the end of 2000 suffered a dramatic -39% annual downturn in index performance (comparing year end levels), whereas other peripheral European markets fared much better (Italy +5%, Spain 0%). The 2007 upswing in global markets gave an opportunity to individuals holding on to their ASE stocks bought during the 1999 frenzy to recoup some of their losses. Unfortunately, those not quick enough to realize this suffered an additional -47% year-on-year correction by the end of 2008. Interestingly, although between 2000 and 2008 there has been a dramatic increase of Greek per capita income, the ASE failed to attract investors to the degree that other peripheral European markets did, in spite of their much lower per capita income growth (Italy: +24% per capita income experienced +47% annual stock market turnover; Spain: +38% per capita income witnessed a +436% annual stock market turnover; Greece: +61% per capita income with only a +21% annual stock market turnover). Hence, the ASE provides us a unique setting to test whether under these conditions of sluggish stock market turnover and subdued performance there still exist addicted investors. The ASE represented at the end of 2008 (the last year of our study) the seventh larger out of twenty, in terms of market capitalization, European stock market ($90.2 bn).

Based on the above, we formulate the hypothesis that active retail investors may suffer from compulsive gambling behavior, in a similar manner to pathological gamblers. By scoring their SOGS gambling addiction screen, we can test whether there is indeed a certain percentage of addicted stock market investors, leading us to draw another parallel dimension with pathological gamblers. Moreover, by testing whether this score is influenced by alternative stock market settings, specifically bull or bear, we can determine whether the proportion of investment-addiction victims is determined endogenously (investor-characteristics driven) or exogenously (stock-market driven). Hence, we formulate our first two hypotheses:

**Hypothesis 1.** Individual investors suffer from addiction problems in an analogous manner to pathological gamblers.

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The ASE remains until now the only European market that has not managed to recover its historical 1999 high at some stage within the last 11 years.
Hypothesis 2. The incidence of retail investor addiction is determined endogenously (by individual investor characteristics), rather than exogenously (by stock-market factors).

It is worth mentioning that, in the U.S.A., there is a gambling prohibition in the majority of states, in order allegedly to forestall the disruptive consequences of compulsive gambling behavior to households. At the same time, taking on considerable risk via leveraged positions in the stock market or related derivative markets, is perfectly legal. However, treating leveraged stock market trading as legal and gambling as illegal has less to do with differences in risk or the probability of financial and/or social ruin, than with traditions and historical social norms (Hurt, 2006). This dichotomy and regulatory doctrine has probably biased U.S. researchers against efforts to understand investment addiction or to develop an analogous to pathological gamblers' (SOGS) addiction screen.

3. Methodology and Tools

3.1 Participants

Our sampling methodology is purposely designed to measure whether, on average, a significant amount of retail investors exhibits compulsive gambling behaviour across alternative market environments; by drawing a new random sample in three different occasions (in 2000, 2007 and 2008) we minimize the overall variance of our estimated population proportion of addicted subjects (Cohran, 1977, pp. 345). Overall, five hundred and eighty two (582) questionnaires were distributed using a snowball technique (Breakwell et al., 1995) to a sample of a) a group of 317 (112 males and 105 females) active retail investors (at least one trade during the previous 12 month period), b) a group of 114 (86 males and 28 females) active gamblers (at least one betting during the previous 12 month period), and c) a control group consisting of 151 "non gambling or actively investing" people (66 males and 85 females). The original "layer" of the sample was obtained through local Greek retail brokerage firms, not offering investors international investment products, and sports gambling outlets. All questionnaires were translated into Greek. The participants were not informed as to the purpose of the study. The age of the participants ranged from 20 to over 70 years old. The majority of the respondents were from the two larger cities in Greece, namely Athens and Thessaloniki.

3.2 Procedure

Participants throughout our surveys (2000, 2007 and 2008) were provided with the South Oaks Gambling Screen (SOGS) for gamblers and our stock market-adapted version (TSOGS) for investors, aimed to measure the degree of addiction. A questionnaire incorporating basic demographics was distributed

* The notable exception of Connecticut Council on Gambling Addiction and related research in the U.S. from Steinberg & Harris (1994) and Steinberg (1998) cannot substantiate the adequacy of efforts in this context, especially if contrasted with the abundance of studies focusing on gambling addiction.
throughout our three surveys. The order of the questionnaires was randomised. All respondents participated on a voluntary basis. Complete anonymity was guaranteed and preserved.

3.2.1 The South Oaks Gambling Screen (SOGS and TSOGS)

The American Psychiatric Association includes pathological gambling as an impulse control disorder in its Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). The South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987) has been developed to measure gambling-related difficulties and has been used in population research in over 45 jurisdictions in Asia, Canada, Europe, Oceania and the United States (Volberg & Wray, 2007). The group of gamblers and investors in our study completed the SOGS screen, determining their total degree of addiction score by adding up the number of questions which showed an "at risk" response. A total score higher than 5 (out of 20) was the cutoff criterion for the categorization of "probable pathological gambling". A total score of 1 to 4 indicated some gambling problem, whereas, a score of 0 indicated no problem.

We modified the original SOGS questionnaire by replacing the word "gambling" with "trading" in its questions. The resulting reliability tests for our modification via its Cronbach alpha and factor analysis justify our approach (more on this in the following "Results" section). Administration and scoring were the same as for the original questionnaire. In our Trading-adapted SOGS screen (henceforth TSOGS), symptoms characterizing a pathological gambler in stock market trading include some of the following: (i) frequent preoccupation (ii) hiding trading profits or losses from family, (iii) lying about big profits, where in fact there were losses, (iv) money arguments with partners, (v) guilt feelings about trading, (vi) trading larger amounts over a longer period than intended, (vii) chasing losses, (viii) repeated unsuccessful efforts to cut down or stop trading, (ix) criticisms from others on trading habits, (x) loss of work-time in order to pursue trading, (xi) default on debts or other financial responsibilities, (xii) borrowing money from household nest-egg, loan sharks, banks, friends, spouse, credit card or overdrafts to continue trading or to pay off margin debts and (xiii) liquidating personal and family property to continue trading.

4. Results

Our stock trading adapted TSOGS questionnaire was tested for internal reliability and found to be satisfactory (Cronbach alpha of 0.742>0.705 at 95% confidence, one sided test). Moreover, by performing a principal component analysis we find a single factor with an eigenvalue of 3.57 (more than 83% of

Most questions were counted apart from questions 1, 2, 3, 15c and 15f, as in the original SOGS screen. The only question not counted in our stock trading context is number 16 of SOGS, which refers to "cashing in stocks, bonds or other securities to gamble or pay gambling debts".
the second larger 1.95) accounting for 18.8% of total variance. All factor loadings for the first factor are positive. The Kaiser-Meyer-Oklin criterion for sampling adequacy has been found "middling" (0.722) and the Bartlett's test of sphericity rejects the null hypothesis for lack of variables' intercorrelation (chi2 =945.84, |p|=0.000). Finally, based on a confirmatory factor analysis via maximum likelihood we find that all single factor loadings are significant at 99% level (Table 1). We summarize our addiction incidence findings from TSOGS questionnaires completed from active retail investors throughout our study in Table 3; we scored a total of 317 questionnaires of which we identified 95 subjects with a pathological gambling condition (TSOGS score higher than 5).

Comparing mean addiction scores between different groups we find that on average retail investors and gamblers in our sample suffer from some degree of addiction problem, their scores being significantly higher than zero (3.23 and 3.47 respectively), as can be seen at Table 2. In terms of pathological addiction, a high degree of retail investors revealing pathological gambling behavior (TSOGS score higher than 5) was found throughout our study: an average of 29.97% of retail investors evinces a severe stock market investment addiction, whereas 58.67% of our sample has at least some degree of addictive behavior (Table 4). Table 4 shows the estimated proportion of addicted investors in our study with standard errors and confidence intervals obtained via Monte Carlo bootstrap resampling, signifying their distinctive magnitudes between alternative degrees of addiction. They indicate there is a considerable degree of pathological addiction, with only a minor percentage of investors portraying no addiction problem at all: retail investor percentage with no addiction problem at 95% confidence interval ranges from 11.24% to 11.69%. The majority of investors have some addiction problem (58.67%) and the balance comprises pathologically addicted investors (29.97%). In any case, the percentage of retail investors with some pathological gambling problems (TSOGS score greater than 0) is significantly different than zero, confirming our 1st Hypothesis, namely that active retail investors tend to suffer from investment addiction. Moreover, we may be 95% confident that a minority of 11.24 to 11.69 percent of our sample has no addiction problems at all.

In order to test our 2nd Hypothesis on the independence between addiction and the level and/or last year’s performance of the stock exchange, we perform a quantile regression: we regress the total addiction score of retail investors (SOS score) on the ASE General index’s past year’s performance for the same period of our study and on the mean value of the same index throughout the period of questionnaire distribution. We run two separate quantile regressions, accounting on the one hand for momentum investing, which relates to recent index performance, and on the other hand, value investing, which relates to the

6 In a population versus pathological gamblers study undertaken in the U.S.A., a principal components analysis for SOGS scores in the general population indicated a primary factor with eigenvalue of 3.8, accounting for 21% of the variance and a cronbach alpha of 0.69 (Stinchfield, 2002), broadly in line with our results for TSOGS. The scale thresholds used for retail investors (TSOGS), above 1 indicating some addiction problem and above 5 pathological addiction, correspond to SOGS questionnaire.
current index level (Hong & Stein, 1999). In addition, we use several demographic covariates that have previously been found to influence household investment decisions, such as education (Calvet et al., 2009), age (Wang & Hanna, 1997) and sex (Barber & Odean, 2001). By estimating the effects via a quantile regression, we can subdue inconsistency due to outliers and non-normality of data (Greene, 2008). Furthermore, we run a bootstrap of 10,000 Monte Carlo resamplings to estimate the least absolute deviation estimator standard errors of quantile regression. The results are summarized on Table 5.

Based on the results of our two quantile regressions, we cannot reject the joint hypothesis that all coefficients for both Index level and Index past year performance are different than zero \( F(5, 315)=1.49, \) Prob.\( >F=19.37\% \) for ASE YOY performance and \( F(5, 315)=1.40, \) Prob.\( >F=22.34\% \) for ASE Index level. Hence, we accept our 2nd Hypothesis that neither plays a role in determining the degree of retail investor addiction. Moreover, the independence of the stock index level and recent performance extends to the full range of addicted subjects, as indicated by the coefficient insignificance in various quantiles of the SOS scores, which represent the full range from pathologically addicted to non-addicted investors. Finally, there is no varied dependence of the degree of investor addiction on alternative phases of stock market cycle, as our data include both bull, bear and intermediate market environments. Interestingly, demographic characteristics also play a minor role in determining the degree of addiction amongst the higher echelon of SOS score quantiles, which represent addicted individuals. We found that lower education increases the SOS scores of individual investors, albeit not to an extent that might render them compulsive gamblers, as it only pertains to the lower quantile (10%) of SOS scores. In addition, being male plays an influential role for low total SOS scores (25% quantile), at a marginal threshold between non- to some degree of investment addiction.

5. Conclusions

The objectives of this present study were to explore whether trading in the stock market is potentially a compulsive form of behavior, exhibiting similarities to gambling addiction. Furthermore, it was hypothesized that individuals becoming addicted to trading in the stock market are not influenced by erratic stock indexes and the resulting losses or profits, but rather by other individual-specific reasons. The results of this study offer strong support for both hypotheses.

We believe that our findings open new research avenues for exploring addiction amongst investors, possibly also affecting investment professionals, which is a direction to be explored in the future. More importantly, we provide sufficient grounds for international investment regulators to appreciate the degree of congruence between gamblers and retail investors, who have been found to portray addictive behavior, which in turn further prejudices the accuracy of their evaluation of investment risks. Active stock investors suffer from pathological gambling behavior and governments should take adequate preventive measures, much in line with those designed to curb pathological...
gambling. Moreover, fiduciary financial-institution obligations should entail psychometric analysis to test the degree to which their "best" retail clients (those with the highest trading frequency) suffer from investment addiction. Our research shows that retail investors exhibiting compulsive gambling behavior underestimate the risks involved, so that an investment advisor's objective and factual analysis of potential economic volatility does not suffice to protect them from false perceptions of investment risk. The dichotomy between gamblers and investors is evidently not as great as one might have thought.
Table 1. Confirmatory single factor analysis for addiction SOGS-based questionnaire delivered (TSOGS)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z</th>
<th>P&gt;z</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>sogs4</td>
<td>0.0858</td>
<td>0.0309</td>
<td>2.77</td>
<td>0.006</td>
<td>0.0252 0.1461</td>
</tr>
<tr>
<td>sogs5</td>
<td>0.0955</td>
<td>0.0205</td>
<td>4.64</td>
<td>0.000</td>
<td>0.0551 0.1358</td>
</tr>
<tr>
<td>sogs6</td>
<td>0.0748</td>
<td>0.0281</td>
<td>2.65</td>
<td>0.008</td>
<td>0.0195 0.1300</td>
</tr>
<tr>
<td>sogs7</td>
<td>0.1025</td>
<td>0.0330</td>
<td>3.10</td>
<td>0.002</td>
<td>0.0377 0.1672</td>
</tr>
<tr>
<td>sogs8</td>
<td>0.1104</td>
<td>0.0311</td>
<td>3.54</td>
<td>0.000</td>
<td>0.0493 0.1715</td>
</tr>
<tr>
<td>sogs9</td>
<td>0.1235</td>
<td>0.0294</td>
<td>4.19</td>
<td>0.000</td>
<td>0.0657 0.1813</td>
</tr>
<tr>
<td>sogs10</td>
<td>0.0709</td>
<td>0.0265</td>
<td>2.68</td>
<td>0.007</td>
<td>0.0189 0.1229</td>
</tr>
<tr>
<td>sogs11</td>
<td>0.1274</td>
<td>0.0283</td>
<td>4.50</td>
<td>0.000</td>
<td>0.0718 0.1829</td>
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<tr>
<td>sogs12</td>
<td>0.1857</td>
<td>0.0209</td>
<td>8.86</td>
<td>0.000</td>
<td>0.1446 0.2268</td>
</tr>
<tr>
<td>sogs13</td>
<td>0.1454</td>
<td>0.0131</td>
<td>11.03</td>
<td>0.000</td>
<td>0.1196 0.1713</td>
</tr>
<tr>
<td>sogs14</td>
<td>0.1389</td>
<td>0.0298</td>
<td>4.66</td>
<td>0.000</td>
<td>0.0805 0.1974</td>
</tr>
<tr>
<td>sogs15a</td>
<td>0.1257</td>
<td>0.0174</td>
<td>7.19</td>
<td>0.000</td>
<td>0.0915 0.1600</td>
</tr>
<tr>
<td>sogs15b</td>
<td>0.1199</td>
<td>0.0190</td>
<td>6.31</td>
<td>0.000</td>
<td>0.0827 0.1572</td>
</tr>
<tr>
<td>sogs15d</td>
<td>0.1148</td>
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<td>8.46</td>
<td>0.000</td>
<td>0.0882 0.1414</td>
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<td>0.1199 0.1976</td>
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<td>sogs15g</td>
<td>0.0098</td>
<td>0.0038</td>
<td>2.57</td>
<td>0.010</td>
<td>0.0023 0.0173</td>
</tr>
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<td>8.57</td>
<td>0.000</td>
<td>0.1138 0.1814</td>
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<tr>
<td>sogs15i</td>
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<td>0.0073</td>
<td>7.75</td>
<td>0.000</td>
<td>0.0425 0.0714</td>
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<tr>
<td>sogs17</td>
<td>0.0547</td>
<td>0.0138</td>
<td>3.95</td>
<td>0.000</td>
<td>0.0275 0.0818</td>
</tr>
</tbody>
</table>

Log-likelihood -894.712  Number of obs - 295

| Goodness of fit test: | LR = | 488.777 | Prob[chi2(152)> LR] = 0.0000 |
| Test vs independence: | LR = | 484.028 | Prob[chi2(19)> LR] = 0.0000 |

Table shows results from confirmatory factor analysis for questionnaires delivered measuring stock market addiction, based on South Oaks Gambling Screen (SOGS) questionnaire adapted for stock market trading (TSOGS), in which we have changed the word “gambling” into “trading”. Sogs4-17 represent individual questions (variables) and coefficients their single-factor loadings. Data represent questionnaires collected from retail investors throughout our study. The Test vs. independence assumes under the null that the covariance matrix is diagonal.

Table 2. Confidence interval for mean of addiction score (SOGS and TSOGS) between groups of investors, gamblers and control group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
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<tr>
<td>Control group</td>
<td>151</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

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Addiction scores obtained from SOGS questionnaire for gamblers and control group and TSOGS questionnaire for investors. Mean scores and respective standard errors with 95% Wald confidence intervals are reported. A SOGS or TSOGS score greater than zero represents some addiction problem, whereas scores greater than five indicate pathological gambling addition. SOGS question #16 has been omitted for investors.

Table 3. Summary of Addiction Problems for Retail Investors (2000-2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>No Problem</th>
<th>Some Problem</th>
<th>Addicted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>20</td>
<td>99</td>
<td>59</td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>(11.24%)</td>
<td>(55.62%)</td>
<td>(33.15%)</td>
<td>(100.00%)</td>
</tr>
<tr>
<td>2007</td>
<td>9</td>
<td>48</td>
<td>20</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>(11.69%)</td>
<td>(62.34%)</td>
<td>(25.97%)</td>
<td>(100.00%)</td>
</tr>
<tr>
<td>2008</td>
<td>7</td>
<td>39</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>(11.29%)</td>
<td>(62.90%)</td>
<td>(25.81%)</td>
<td>(100.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>186</td>
<td>95</td>
<td>317</td>
</tr>
<tr>
<td></td>
<td>(11.36%)</td>
<td>(58.68%)</td>
<td>(29.97%)</td>
<td>(100.00%)</td>
</tr>
</tbody>
</table>

Summary of results from the three studies performed for retail investors according to their TSOGS questionnaire, scoring, a measure of the degree of their pathological addiction, scaled from 0 to 20. "No Problem" indicates subjects with no addiction problem (TSOGS questionnaire scores equal to zero), "Some Problem" indicates subjects exhibiting a degree of addiction (TSOGS score between 1 and 5) and "Addicted" pertains to subjects with a total TSOGS score higher than 5, indicating they are pathological gamblers. Parentheses indicate row percentages.

Table 4. Incidence of Pathological Gambling Addiction in Retail Investors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Proportion (%)</th>
<th>Bootstrap Std. Error (%)</th>
<th>Binomial [95% Conf.]</th>
<th>-Bias corrected Interval</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Problem</td>
<td>11.36</td>
<td>0.117</td>
<td>11.24</td>
<td>11.69</td>
<td>36</td>
</tr>
<tr>
<td>Some Problem</td>
<td>58.67</td>
<td>2.297</td>
<td>56.70</td>
<td>62.90</td>
<td>186</td>
</tr>
<tr>
<td>Pathological Addiction</td>
<td>29.97</td>
<td>2.385</td>
<td>25.87</td>
<td>33.15</td>
<td>95</td>
</tr>
</tbody>
</table>
TSOGS total score higher than 5, indicating that they are pathological gamblers. N indicates the number of subjects in each category of addiction. 95% confidence intervals are obtained after 10,000 bootstrap resamplings, correcting for clustering in years and bootstrapping bias.

References


