

# Overconfident Individual Day Traders: Evidence from the Taiwan Futures Market\*

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## Abstract

A specific day-trading policy in Taiwan futures market allows an investigation of the performance of day traders. Since October 2007, investors who characterize themselves as “day traders” by closing their day-trade positions on the same day enjoy a 50% reduction in the initial margin. Because we can identify day traders *ex ante*, we have a laboratory to explore trading behavior without the contamination of potential behavioral biases. Our results show that the 3,470 individual day traders in the sample incur on average a significant loss of 61,500 (26,700) New Taiwan dollars after (before) transaction costs over October 2007-September 2008. This implies that day traders are not only overconfident about the accuracy of their information but also biased in their interpretations of information. We also find that excessive trading is hazardous only to the overconfident losers, but not to the winners. Last, we provide evidence that more experienced individual investors exhibit more aggressive day trading behavior, although they do not learn their types or gain superior trading skills that could mitigate their losses.

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*Keywords:* overconfidence, index futures, day traders, individual investors, learning

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# 1. Introduction

Day traders are both controversial and mysterious. Little research has been devoted to their investment behavior and performance mainly because we have lacked a way to identify them and to track their trading history. Most studies on their behavior are limited by identification *ex post* as completing at least one round-trip trade on the same trading day. Such an *ex post* identification strategy may obscure the traders' motive of profiting solely from the anticipation of short-term price movements. Trading behavior may be the result of other motives, including liquidity needs, portfolio rebalancing, or anticipation of tax law changes.

Ideally, researchers would like to have an *ex ante* way to identify day traders who trade only for profit as this would yield a more accurate documentation of their trading activities. We take advantage of a policy implemented in the Taiwan futures market that provides a clear-cut way to identify day traders *ex ante*, and study their trading behavior.

On October 8, 2007, the Taiwan Futures Exchange (TAIFEX) implemented a new margin requirement policy that allows investors to specify orders as day-trade orders and deposit half of the required margin. When a day-trade order is executed successfully, the position must be closed before the end of the trading day. Essentially, an investor commits to be a "day trader" *ex ante*.<sup>1</sup> Previous studies have relied on executed transactions to identify day traders. In our case, day traders reveal themselves by submitting the specific day-trade orders. Hence, we can focus on traders identified by their day-trade orders rather than investors who merely buy and sell the same security on the same day.<sup>2</sup>

Our contribution is to take advantage of this margin rule on the TAIFEX to examine several questions: Are these day trades profitable? Are the day traders susceptible to the overconfident bias in terms of information precision and biased in interpretation of information? Do they lose

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<sup>1</sup>Suppose that the original initial margin is 100,000 New Taiwan Dollars (TWD). Normally, the maintenance margin is set at 75 per cent of the initial margin, or 75,000 TWD. In other words, a day trader can incur as much as 25,000 TWD before receiving a margin call. The 75 per cent rule does not apply to the halved margin (50,000 TWD) for a day trader. In fact, a day trader is still allowed to lose up to 25,000 TWD before paying the variation margin. Therefore, by committing to day trades, an investor actually doubles its trading leverage.

<sup>2</sup>Henceforth, day trading refers to transactions executed by day-trade orders, and day traders are investors who submit day-trade orders.

more money by trading more contracts? In other words, is trading hazardous to their wealth? Is there any difference in the relation between trading frequency and performance among winning and losing day traders? Finally, do day traders ever learn from their past trading experience and performance?

The first question is related to the research by Harris and Schultz (1998), Jordan and Diltz (2003), Garvey and Murphy (2005), Linnainmaa (2005), and Barber, Lee, Liu, and Odean (2011). Odean (1999) and Barber and Odean (2000) investigate the second and the third questions for regular individual investors, respectively. We believe that it is worth revisiting these questions with our day trader sample. In addition, exploration of the last two questions should give us a more complete picture of the investment behavior of day traders.

Several features motivate us to answer these questions by studying day traders in the Taiwan futures market. First, day traders in the TAIEX have to close their positions before the end of the day, which engenders liquidation risk in addition to the market risk. Intuitively, those who engage in day trading should be either the most informed or the most confident that they are the informed as they are willing to take on extra liquidation risk for a reduced margin. If the former is the case, day trades should deliver a positive average return. This unique institutional setup gives us a better lens to reexamine the issue of investor overconfidence, when day traders believe that they possess valuable information but in fact they do not.

Second, the maximum investment horizon for day trades is just one day. Therefore, the realized end-of-day positions of our day traders are not related to intra-day returns. This is an important feature, as we can observe day traders' positions without the impact of the disposition effect.<sup>3</sup> Nor do we need to calculate average returns of several holding periods to accommodate different investment horizons for investors as in Odean (1999).

Third, our day traders can easily capitalize on negative information by taking short positions, because there are no short-sale constraints in the futures market. Jordan and Diltz (2003) point

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<sup>3</sup>Barber and Odean (2000) use monthly holding positions and calculate monthly returns to avoid such bias. By doing so, they need to assume that trading takes place on the last day of the month and also ignore intra-month trading.

out that the conventional Wall Street wisdom holds that day trading is profitable when the overall market is trending up. One explanation is the high cost of selling stocks short. The cost of shorting futures contracts, however, is the same as going long. We are thus able to study the performance heterogeneity among day traders by examining the difference in profitability of both short and long day trades and of trades from both winning and losing day traders. Most interestingly, we can also investigate the learning process of day traders in the TAIFEX.

Finally, it is apparent that our day traders are not trading for consumption or liquidity needs as they cannot spend the proceeds from selling short. Instead, they have to deposit the margin. Portfolio rebalancing or diversification are unlikely to be behind day trades, because they are doomed to liquidation before the closing of a trading day. Moreover, there is no capital gains tax in Taiwan.

Overallly we can safely conclude that the main purpose of submitting day-trade orders is to leverage up a position to maximize the trading profit from speculating on short-term price movements. The Taiwan futures market provides us with an ideal environment to answer our questions.

Using the complete trading record in the TAIFEX from October 8, 2007 through September 30, 2008, we find that for domestic individual day traders, the average net profit for a round-trip trade is  $-613$  TWD (one US dollar is roughly 32 TWD during our sample period). The 3,470 individual day traders on average incurred a significant aggregate loss of 61,500 TWD after accounting for transaction costs. According to Odean (1999), this result implies that individual day traders are overconfident regarding the precision of their information. Before transaction costs, individual day traders still suffered an average of 26,700 TWD loss. This indicates that day traders are not only overconfident but also have a biased interpretation of the information. For institutional day traders, results are similar but statistically insignificant because of a much smaller sample.

We also find that numbers of short positions and long positions are similar for individual day traders when we differentiate the direction of round-trip trades. Individual day traders are not as reluctant to short as US individual investors. Interestingly, the average profit of short-initiated

round-trip trades is higher than that of long-initiated round-trip trades for individual investors, with a 160 TWD profit for short positions and a 676 TWD loss for long positions. This implies that when individual investors are short selling, they are less overconfident and more careful than when they are taking long positions.

Note that because the above analysis is based on the money profit of a single round-trip day trade, the results might be subject to a scaling issue. In particular, a day trader with a large margin account size in terms of the amount of deposited initial margin is able to trade more futures contracts in a round-trip trade and is thus exposed to a high level of profit and loss. Ideally, we should calculate the genuine realized returns for day traders based on the information about their margin account size. Unfortunately, such information is not available. Having said that, we do calculate two types of return, namely, index return and net return, to address the potential scaling issue.

The index return of a round-trip day trade for a day trader is computed as the aggregate gained or lost index points divided by the average longing or short-selling index point. This return should be able to largely alleviate the scaling concern even though it does not fairly reflect the true realized return for a day trader. In view of this, the net return, which is defined as the net profit from a single round-trip trade divided by the total initial margin required to complete the trade, helps us to gauge the realized return of a trader. For a typical individual trader who always deposits just enough money in his/her margin account for a round-trip day trade, this net return would be identical to his/her realized return. Note that this net return is calculated under the assumption that there is no margin call whatsoever due to the lack of margin account information.

We find that the average index return and net return for individual day traders are  $-0.22$  per cent and  $-3.73$  per cent, respectively. Both of them are significantly negative. The median returns are negative and significant as well. These results suggest that individual day traders in the TAIEX are not only overconfident about the precision of their information, but also biased in interpreting their information. Moreover, we find that the median net return for a short-initiated day trade is  $-1.36$  per cent, much higher than the median net return of  $-2.77$  per cent for a

long-initiated day trade. These results are consistent to those using trading profit in TWD as the performance measure. Given the data limitation that we do not have the detailed margin account information, we still rely on the trading profit in TWD as our main variable of interest as it reflects accurately the investment performance each day trader has.

In addition, we discover a smirk relation between trading frequency and performance of day traders. Estimating a quantile regression of profits on the number of traded contracts by every fifth percentile, we find that, below the 15th percentile in profit, the more the day traders trade, the more loss they incur. For day traders above the 60th percentile, the more they trade, the more profit they make. Collectively, the documented relation between the profit and the number of contracts suggests that trading is hazardous only to the wealth of overconfident losers, but not to that of the informed or skillful winners. This result extends the finding of Barber and Odean (2000) that trading is hazardous to the wealth of individual investors and is also consistent with Barber, Lee, Liu, and Odean (2011), who show cross-sectional differences in the trading skill of day traders in the Taiwan stock market.<sup>4</sup>

Finally, we find that the more experienced individual investors exhibit more aggressive day trading behavior. Furthermore, profits earned in the past are linked only weakly to day trading activity. Higher past profits alone do not contribute to more intensive day trading activity. This result also shows that overconfident day traders do not learn their own ability from their past performance as suggested by Gervais and Odean (2001). Trading experience plays a limited role in guiding individual investors to earn profits by taking advantage of the extra leverage enabled by the new day trading policy.

Our paper is organized as follows. Section 2 provides a discussion of the literature most closely related to our work. Section 3 describes the data on the Taiwan futures market. Section 4 outlines our empirical approach, and presents our main results and confirming tests. Conclusions and a summary of our findings are provided in Section 5.

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<sup>4</sup>Note that the day traders in Barber, Lee, Liu, and Odean (2011) are identified *ex post* as well.

## **2. The literature on day trader behavior and overconfidence bias**

We first provide a brief literature review as context for our study of both day traders and their overconfidence biases.

### **2.1. Day traders**

Harris and Schultz (1998) use Nasdaq's Small Order Execution System to analyze the performance of individual day traders. Their data include around 10,000 round-trip trades over a three-week period. Their individual day traders earn a small average profit, even trading with market makers. Jordan and Diltz (2003) examine the profitability of a sample of 324 US day traders. They show that there are about twice as many day traders who lose money as those who turn a profit. They also document that around 20 per cent of sample day traders are better than marginally profitable. Garvey and Murphy (2005) report consistent intraday trading profits by 15 proprietary stock traders over 96,000 trades in three months in 2000. Garvey and Murphy (2004) use the same data and find that those traders earned more than \$1.4 million in intraday trading profits.

Rathre than studying the behavior of a small number of US day traders, Linnainmaa (2005) and Barber, Lee, Liu, and Odean (2011) examine a large sample of day traders in two international markets. Linnainmaa studies a Finnish data set of 22,529 day traders over January 1995 - November 2002. He shows that individual day traders are reluctant to close losing day trades, which consequently hurts their performance by as much as 6 per cent in the three months after a holdings change. Barber, Lee, Liu, and Odean document great variation in gross and net returns earned by day traders on the Taiwan Stock Exchange from 1992 through 2006. They find that the spread in returns between top-ranked and bottom-ranked day traders exceeds 60 basis points per day.

All these studies focus on day traders in stock markets and provide mixed evidence on profitability. Their results may be contaminated by the disposition effect, however, because these

sample day traders are identified *ex post*. The disposition effect demonstrates that individual investors are inclined to close profitable positions quickly, but hold losing positions as long as they can. Thus these studies of the performance of day traders may be biased upward because of the disposition effect.

We provide new evidence on the performance of day traders in the Taiwan futures market, where investors commit to day trading *ex ante*. Since the positions of *ex ante* day traders will be closed before the closing of the trading day, irrespective of profit or loss, the disposition effect is largely mitigated. Performance evaluation is also free of noises due to other trading needs or behavioral biases. To the best of our knowledge, Holmberg, Lönnbark, and Lundström (2013) is the first study of the profitability of day trading strategies in the futures market. They propose a way to assess the success rate of trades and profitability of a popular day trading strategy called the Open Range Breakout (ORB) strategy. When applying the strategy to US crude oil futures market, they find an impressive success of ORB strategies. In this paper we attempt to explore, with the help of unique data, the behavioral biases of day traders in the futures market. We thus add to the literature by providing a new perspective.

## **2.2. Investor behavioral biases**

There is a plethora of literature on investor behavioral biases. We only briefly discuss the most relevant, namely, papers focusing on investor overconfidence and the disposition effect. Odean (1999) and Barber and Odean (1999) use discount brokerage accounts to demonstrate that overall trading volume in equity markets is excessive. They show that investors are not only overconfident about the precision of their information but also biased in their interpretation of that information. Barber and Odean (2000) show that individual investors who hold common stocks directly pay a tremendous performance penalty for active trading. Those who trade the most earn an annual return of 11.4 per cent compared to a market return of 17.9 per cent during 1991 - 1996. They attribute their findings to investor overconfidence.



Barber and Odean (2001) further explore overconfidence by men versus women, and find that men trade 45 per cent more than women. Their results show that trading reduces men's net returns by 2.65 per cent a year, compared with 1.72 per cent for women. Barber, Lee, Liu, and Odean (2009) analyze the complete trading history of all stock investors in Taiwan over 1995 - 1999 and find that individual investor trading results in systematic and economically large losses. They argue that investor overconfidence is one of the major reasons.

In addition to the overconfidence bias, individual investors are shown to exhibit the disposition effect. Heisler (1994) documents that small speculators in the Treasury bond futures market exhibit loss aversion. They tend to hold trades that incur an initial loss significantly longer than those that show an initial profit. Jordan and Diltz (2004) show that approximately 62 per cent of sample day traders hold losing transactions longer than profitable ones and conclude that their sample day traders exhibit the disposition effect. Using data on a US proprietary trading team, Garvey and Murphy (2004) find that even professional traders sell their winners too soon and hold on to their losers too long. Overall, the disposition effect is detrimental to the trading performance of individual investors. Locke and Mann (2005) document that the ability to close open positions promptly is an important success factor for a professional futures trader. Holding on to both losing positions and winning positions too long will have negative effects on trading performance.

Our day traders have to close their positions before the end of the day in exchange for a halved margin deposit. Their commitment *ex ante* to liquidation intuitively makes them ideal candidates for studying overconfidence because they have the strongest belief that they are informed or have trading skills.

### **3. Data description**

Futures contracts on the TAIEX are traded by an electronic trading system (ETS) from 8:45 AM to 1:45 PM. After the opening call auction at 8:45 AM, the TAIEX operates as an electronic

continuous auction market before the closing auction at 1:45 PM. During regular trading hours in the continuous auction market, all submitted orders are matched on a real-time basis according to price and time priority without the intermediation of designated market makers.

Investors are allowed to submit both market orders and limit orders to the ETS. Market orders to buy or sell more contracts than the amount currently outstanding at the best price levels would have to "walk up or down the book." Orders on the TAIFEX are valid only for the current trading day and would not be included in the limit order book on future trading days even if they are not successfully executed. Order and transaction information for futures contracts is disseminated to the public on a "real-time" basis using an electronic screen, with information on the last traded price, transaction volume, the best five bid and ask prices, and the trading volumes desired by investors to trade at these prices.

The four major contracts traded on the TAIFEX are the Taiwan Stock Exchange Index Futures (hereafter TXF), which is based on all listed stocks on the Taiwan Stock Exchange; the mini-Taiwan Stock Exchange Index Futures (hereafter MXF), whose payoff is only one-quarter of the TXF; the Electronic Sector Futures (hereafter EXF), which is based on the Taiwan Stock Exchange Electronic Sector Index; and the Finance Sector Futures (hereafter FXF), which is based on the Taiwan Stock Exchange Financial Sector Index.

Our data include all trades from October 8, 2007 through September 30, 2008. In each transaction, we observe the investor's account number, investor type (individual or institutional), contract type, and other relevant information. Table 1 shows descriptive statistics of all the transactions in the sample period. The first observation worth emphasizing is that futures market trading is dominated by individual investors. Individual investors are responsible for 71 per cent of total transactions, higher than the percentage in the Taiwan stock market (63 per cent in 2008 and 72 per cent in 2009). The majority of the transactions take place on the Taiwan Stock Exchange Index, with 54 per cent on the TXF and 33 per cent on the MXF. The Electronic and Financial Sector Index Futures account for 5.6 per cent and 5.4 per cent, respectively, while all other futures account for less than 1.3 per cent.

On October 8, 2007, the TAIFEX implemented a new margin requirement policy to boost the trading volume of the index futures. For the major four index futures ( the TXF, MXF, EXF, and FXF), the initial margin requirement is reduced by 50 per cent if an investor indicates an order as a day-trade order. When a day-trade order is successfully executed, the position has to be closed by the investor before 1:30 PM, 15 minutes before the market close. Otherwise, the position will be forced to close by the TAIFEX through either a market order or a limit order that is five ticks within the latest trade. In other words, the maximum duration of an index futures position that is initiated by a day-trade order is less than five hours.

In the US, “pattern day traders” are defined as investors who trade the same stock four or more times in five business days. In this study, index futures investors are defined as day traders if their positions are established through day-trade orders. Our definition is thus different from that in the US as we have a clear way to classify day traders ex ante.<sup>5</sup>

#### **4. Performance of day traders in the Taiwan futures market**

Our main research questions include: Are day trades profitable? Are day traders susceptible to overconfidence biases with regard to the precision and interpretation of their information? Do they lose more money by trading more contracts? Is there any difference in the relation between trading frequency and performance between winning and losing day traders? Finally, do day traders’ past trading experience and performance affect their trading behavior?

We provide evidence on these questions in turn. Our results shed light on the possible behavioral biases for the most aggressive individual traders in the market.

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<sup>5</sup>Under the rules of the New York Stock Exchange and the Financial Industry Regulatory Authority (FINRA), investors who are deemed pattern day traders must have at least \$25,000 in their accounts. See <http://www.sec.gov/answers/daytrading.htm> for more details.

## 4.1. Definition of day traders and round-trip trades

To analyze the performance of day traders, we first have to identify day trades. We thus exclude transactions not initiated by day-trade orders. Second, we need to convert raw transactions into completed round-trip trades. Essentially, a round-trip trade occurs when an initiated position, long or short, is covered. The profit of a round-trip trade can be calculated when an investor's net position for an index futures is back to zero again. We calculate the payoff of a round-trip trade following Jordan and Diltz (2003) and Feng and Seasholes (2005). Finally, we include in the analysis only investors who conduct more than five day trades during the sample period.

Summary statistics of raw transactions by day traders are shown in Table 2. Transactions are reported separately for domestic individual and institutional day traders. There are 1.42 million contracts traded by individual day traders and only 44,000 contracts traded by institutional day traders. The average trade size of domestic individual day traders is about 1.5 contracts compared to 1.7 contracts for institutional day traders.<sup>6</sup> Except for the first month, we see more than 1,000 individual day traders each month.<sup>7</sup> The number stabilizes at around 1,500 per month in the later half of the sample period.

Only a few institutional investors conduct day trading, averaging at 14 per month. Although institutional day traders account for only 3 per cent of the day-trade contracts, it is worth spending some time in studying whether their performance differs from the performance of individual day traders.

## 4.2. Performance of aggregate round-trip day trades

Before we calculate performance at a day trader level, looking at how average round-trip trades perform offers us a general picture. The results in Table 3 suggest that both individual and institutional day trades generally perform poorly after taking transaction costs into account. Interestingly, there exists asymmetry between the long-initiated and short-initiated trades by both types

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<sup>6</sup>There is barely any foreign individual day trading on the TAIEX.

<sup>7</sup>The identity of day traders could be different each month. In total, we have 3,470 individual day traders.

of day traders.

Panel A reports the profit of all the round-trip trades by individual and institutional day traders. There are 348,000 round-trip day trades by individual investors. On average, one round-trip day trade loses 266 TWD; after commission fee and transaction tax, the loss drops to 613 TWD. Both figures are statistically significant.<sup>8</sup> While the average profit of a round-trip trade for institutional day traders is also negative, it is not significant at conventional significance levels. The significantly positive median profits of round-trip trades by individual and institutional day traders suggest a skewed distribution in the round-trip trade profit, implying performance heterogeneity among day traders on the TAIFEX.

Panels B and C report profits for long-initiated and short-initiated round-trip trades by both types of day traders. Numbers of long and short positions are similar for the individual day traders. Unlike the stock day traders in the literature, our sample individual day traders are not as reluctant to short as we anticipated.

Several reasons might explain this result. First, the cost of initiating a long or short position is symmetric in the index futures market. Second, the daily downside risk is capped at 7 per cent because of price limits in the Taiwan stock market. Third, the margin call, which is normally about 25 per cent of the initial margin, also limits the exposure of day traders to downside risk.

Turning to performance, we discover an intriguing asymmetric pattern in the long and short positions for different types of day traders. While individual long day trades perform most poorly with gross and net profits of  $-676$  and  $-1,014$  TWD, short positions yield an average positive gross payoff of 160 TWD and an average loss of 196 TWD after transaction costs. This result suggests that when they are shorting, individual day traders are more cautious and less overconfident than when they are taking long positions.

In the case of institutional day traders, however, the average payoff for long-initiated round-

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<sup>8</sup>The transaction tax of Taiwan futures market is 0.8 basis point for initiating or closing one contract. The commission fee varies for different types of investors and across different brokerage firms. Although comprehensive commission fee data are not available, the average commission fee for initiating or closing a contract is around 37.5 TWD according to a press release from the Ministry of Finance on October 4, 2008. We thus apply this fee to all the transactions we analyze.

trip trades is much higher than that for the short-initiated ones, with a difference of 12,274 (12,339) TWD including (excluding) transaction costs. Given the larger trade size of each round-trip trade as shown in Table 2, gains and losses are much greater for institutional day traders.

The crucial insights here are the generally poor performance of day trades and the performance heterogeneity in both types of trades and types of traders.

### **4.3. Overconfident day traders**

Odean (1999) argues that individual investors may be overconfident in two ways. First, individual investors believe that they have relevant information, but actually they have none, and they are overconfident about how to interpret their information. In other words, they have biased interpretations of information. Second, individual investors may overestimate the precision of their information signals, if they are indeed informed.

Odean develops tests for the null hypotheses of biased interpretation of information and of overconfidence in the precision of information. If individual investors are overconfident about their ability to interpret information correctly, average gross trading profits should be very close to zero or negative. If individual investors are overconfident in the precision of their information, however, average net trading profits after transaction costs should be about zero or negative. We apply Odean's tests to determine whether our sample individual day traders are overconfident or not.

With the payoff of every round-trip day trade, we can aggregate trades at investor level over our sample period to gauge profitability. Following Jordan and Diltz (2003), Table 4 reports the distribution of the gross and net profits for day traders with 50,000 TWD in each bin. We also show performance separately for long-initiated and short-initiated day trades. In total, we have 3,470 individual day traders who submit day-trade orders on at least five trading days during our sample period. The fact that the numbers of day traders taking long and short positions are similar implies that most of the day traders trade in both directions.

If day traders are rational, they should be the most informed or have the best information

processing technology, as they are willing to bear the risk of forced liquidation before the end of the trading day. They must believe that the benefit of extra leverage, with a 50 per cent reduction in initial margin allowed for day-trade orders, outweighs the risk of premature liquidation. Alternatively, individual day traders may simply overestimate the precision of their information. Therefore, following Odean (1999), our first null hypothesis is that the net profit of individual day traders should be greater than or equal to zero.

The results in Table 4 clearly reject the null hypothesis. An average individual day trader incurs a significant loss of 61,500 TWD after transaction costs during the whole sample period. While the sample average might be driven by outliers, the significantly negative median alleviates that concern. Besides, not even 20 per cent of the individual day traders make positive net profits. With no other reasons to trade such as tax filing or liquidity demand, our evidence strongly corroborates a conclusion that individual day traders are overconfident as to the precision of their information signals.

The second question is whether day traders are systematically misinterpreting information available to them. If their trading decisions are consistently wrong, then individual day traders must have biased interpretations. Hence, the second null hypothesis is that on average day traders should have gross profits no less than zero.

Again, the first column in Table 4 shows rejection of the second hypothesis. The day traders suffer an average loss of 26,700 TWD before transaction costs. Median losses are not as great but still significant. Only around 29 per cent of day traders make positive gross profits. Overall, the evidence indicates that individual day traders have a biased interpretation of information, resulting in negative gross profits. As before, we find that long-initiated trades perform more poorly than short-initiated trades at an investor level. This result suggests that individual day traders are more overconfident when initiating long positions.

The above analysis of overconfident behavior of individual day traders is based on the performance of their round-trip trades. According to the definition of round-trip trade, a day trader may accumulate many futures contracts before completing a round-trip trade by bringing his or her

open interests back to zero. In other words, day traders may have different margin account sizes in terms of the amount of deposited initial margin for their round-trip trades. Such heterogeneity of account size may result in the performance heterogeneity of day traders as shown in Table 4 and distort our inference. To mitigate the potential dependence of profit from day trades on the account size, we also calculate the index return and the net return of each round-trip day trade for individual day traders.<sup>9</sup>

The index return of a round-trip day trade for a day trader is defined as the aggregate gained or lost index points divided by the average longing or short-selling index point. This return should be able to largely alleviate the scaling concern even though it does not fairly reflect the true realized return for a day trader. In view of this, we also calculate the net return, which is defined as the net profit from a single round-trip trade divided by the total initial margin required to complete the trade, to gauge the realized return of a trader. For a typical individual trader who always deposits just enough money in his/her margin account for round-trip day trades, this net return would be identical to his/her realized return. Note that this net return is calculated under the assumption that there is no margin call whatsoever due to the lack of margin account information.

Table 5 presents the distributions of index return and net return for individual day traders. The information from Table 5 is generally in line with that contained in Table 4. An individual day trader on average incurs a significant loss of -3.73% after transaction costs. This result combined with the also significant median loss of -2.32% strongly corroborates a conclusion that individual day traders are overconfident about the precision of their information signals. Like the results shown in Table 4, both index return and net return from long-initiated trades are significantly lower than those from short-initiated trades at per investor level. It implies that individual day traders are indeed more overconfident when initiating long positions. These results indicate that our findings on the overconfident behavior of individual day traders in the TAIEX are not sensitive to the account sizes of round-trip trades.

In summary, the day traders in our sample voluntarily restrict liquidation timing to enjoy the

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<sup>9</sup>We thank the referee for bringing this issue to our attention.



extra leverage provided by the halved initial margin. The information story cannot explain the *ex ante* nature of day trading and the poor average performance we document *ex post*. The conclusion we draw from Table 4 is that individual day traders are both overconfident in the precision of information and biased in interpretation of their information. The results are consistent with the findings in Odean (1999) and Barber, Lee, Liu, and Odean (2009) for regular individual equity traders.

#### **4.4. Overconfident institutional day traders**

Table 6 shows that the overall performance for the 42 institutional traders is also poor. The average net profit is  $-89,100$  TWD and the average gross profit is  $4,200$  TWD. The wider difference between the gross profit and the net profit, compared with individual day traders, is because institutional investors trade more. With the small number of observations, however, neither average gross profit nor average net profit is statistically significant.

When we look at the direction of trades separately, institutional day traders perform better when taking long positions than when taking short positions. The performance however varies widely and the average is seriously affected by a few outliers. The wide variation of payoff also contributes to the low statistical power. According to the medians that are more robust to the outlier problem, we find contradictory evidence that both gross profit and net profit for long-initiated day trades ( $-5500$  TWD and  $-7937$  TWD) are lower than those for their counterparts ( $-850$  TWD and  $-4481$  TWD) although so not significantly. Overall, such contradictory and insignificant results make us hesitate to conclude that institutional day traders, like individual day traders, are overconfident about not only the precision of their information, but also their interpretation of the information.

We also investigate the influence of account size for a single round-trip day trade on the results as shown in Table 6. Comparing the results in Table 6 and Table 7, we find that the pattern of median returns is quite similar to the pattern of median profits, while the pattern of average returns is different from that of average profits. Apparently, this result is due to the susceptibility of mean

statistics to outliers. Take the long-initiated day trades for example, the significant negative mean net return may be resulted from few institutional day traders who usually have large positions for round-trip day trades and trade actively. Despite this difference, we find that account size does not change our main conclusions about the behavior of institutional day traders drawn from their aggregate profit of round-trip trades.

Taking these results at face value, although the institutional day traders in the TAIEX may be overconfident in the precision of their information, their interpretation of information is unbiased. Besides, according to the median profits and median returns, they are less overconfident when initiating short positions than when initiating long positions. Nevertheless, these conclusions are drawn from a sample that is too small to produce high enough statistical significance.

#### **4.5. Trading is hazardous only to overconfident day traders**

Given that individual day traders are overconfident, we now ask whether they lose more if they trade more frequently, as Barber and Odean (2000) document for US equity stock traders. We are essentially interested in whether day traders suffer more losses by trading more futures contracts.<sup>10</sup>

Table 8, Panel A, is analogous to Figure 1 in Barber and Odean (2000). We sort total contracts traded by individual investors into quintiles and report averages within each quintile for total gross profit, profit per contract, net profit, net profit per contract, and number of round-trip trades. The losses increase with the number of contracts traded for the first four quintiles, from 16,400 TWD to 62,600 TWD. For the most frequent trading-quintile, those day traders manage to make a total gross profit of 31,200 TWD on average, but the gain for the most aggressive day traders is all consumed by the transaction costs. The negative net profits increase monotonically from 18,300 TWD to 108,200 TWD. The conclusion here is similar to Barber and Odean's (2000) that trading is hazardous to day traders' wealth.

The relation between the number of contracts traded and the performance is, however, quite

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<sup>10</sup>Because of the small numbers of institutional day traders, we deal henceforth only with individual day traders.

different when we look at the profit per contract.<sup>11</sup> The extent of negative profit per contract, both before or after transaction costs, drops as the number of contracts traded increases.

Overall, two core lessons can be learned here. First, day traders suffer from less loss per contract when they trade more. Second, day traders in the most frequent trading-quintile could make even more money by trading more. This result is consistent with the finding of Linnainmaa (2005) that the most active day traders come close to being profitable.

To further explore this relation, we sort day traders into quintiles by total profit or average profit instead of contract numbers. Panels B and C of Table 8 report the results.

Panel B shows that only the fifth-quintile day traders earn a significant amount of profit. The average gross profit within that quintile is 267,000 TWD, compared with an abysmal –324,900 TWD for the first quintile. After transaction costs, the fifth-quintile day traders still make a 188,500 TWD profit. This is consistent with the results in Barber, Lee, Liu, and Odean (2011), who find some day traders in the Taiwan equity market have superior trading skills. Coval, Hirshleifer, and Shumway (2005) also find that certain skillful individual investors can exploit market inefficiencies to earn abnormal profits.

Transaction costs, however, consume roughly 30 per cent of the gross profit. Profit per contract increases monotonically from a negative 504 TWD to 308 TWD while net profit per contract increases from a negative 593 TWD to 218 TWD. Performance heterogeneity across the sample day traders is evident. A similar pattern is seen in Panel C as well.

One particularly intriguing finding is the pattern of contract numbers in Panels B and C. Figure 1 and Figure 2 convey the most essential point. Sorted by total profit, contract numbers take a smirk pattern. In other words, the top-quintile winners and the bottom-quintile losers both trade quite actively. This implies that trading is hazardous only to the wealth of the losers, not to the wealth of the winners. Although investors need to trade more to earn large gains or incur significant losses, the smirk is not due to this simple mechanism. When we sort day traders by average profit per contract, we continue to see a smirk pattern in Figure 2.

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<sup>11</sup>If we assume that the margin deposited for each trade remains at the same level for all time, the profit per contract serves as a reasonable proxy for the return.

To formally test the relation between profits and number of contracts traded among winners and losers, we use quantile regressions. The advantages are twofold. First, such a test is less affected by outliers. Second, any quantile can be estimated with higher statistical power over least square regression within subgroups. We run 19 different quantile regressions of total gross profit or total net profit on a constant term and contract numbers traded, from the 5th percentile to the 95th percentile.<sup>12</sup>

For the sake of space, we show only the coefficients of interest and the confidence intervals in Figure 3 for the total gross profit and Figure 4 for the total net profit. Both figures agree with the smirk patterns we see in Figures 1 and 2. In the case of day traders below the 15th percentile in gross or net profit, the more they trade, the more losses they suffer. Yet, for day traders above the 60th percentile, the more they trade, the more profit they can make.

For instance, day traders in the 95th percentile (the most-winning day traders) make an extra 400 TWD gross profit by trading one more contact. Day traders in the 5th percentile (the most-losing day traders), however, incur an extra 800 TWD gross loss if they take one more position. Collectively, the documented relation between profits and contract numbers does not fully corroborate that trading is hazardous to investors' wealth. Trading is hazardous only to overconfident losers' wealth, but not to informed or skillful winners.

#### **4.6. Excessive day trading is related to past trading volume but not profit**

Can we tell whether day trading activity and profits are related to investors' past trading record? In other words, we would like to know whether overconfident day trading is due to learning as shown in Gervais and Odean (2001).

We first identify 2,641 day traders of the 3,470 with trading records from January 2000 through September 2007. These day traders have the opportunity to learn about their trading skills from past trading experience. Panel A of Table 9 reports the performance of individual day traders in this subsample.

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<sup>12</sup>Koenker (2005) provides a detailed description of quantile regression.

Interestingly, the day traders with trading records perform more poorly than those without trading records. The average gross (net) profit is  $-38,400$  ( $-73,400$ ) TWD, both more negative than the profits reported in Table 4. These experienced investors seem to gain no superior skills from their past trading. This result seems inconsistent with the argument of Linnainmaa (2011) that investors may trade to learn about their abilities as active traders, even if they expect to lose from their active investing.

Next, we regress the number of round-trip day trades or total net profits of day traders on the number of contracts traded, number of trading days, and gross profits earned during January 2000 through September 2007. Numbers of contracts traded and number of trading days serve as proxies for the trading experience, while the gross profits help investors to know their “type” in the context of Gervais and Odean (2001). Independent variables are standardized for the convenience of interpretation, and standard errors are adjusted for heteroscedasticity following Davidson and MacKinnon (1993).

Table 10 shows that both past numbers of contracts traded and number of trading days are strongly correlated with day-trade activity. A one-standard deviation increase in the number of contracts traded over January 2000 - September 2007 leads to 61 more round-trip day trades. Similarly, a one-standard deviation increase in the of number of trading days leads to 25 more round-trip day trades. The more experienced individual investors exhibit more aggressive day trading behavior, but day trading activity is only weakly related to profits earned in the past. The higher past profit alone does not contribute to more intensive day trading activity.

Finally, day trading profit is correlated with the number of contracts traded. A one-standard deviation increase in the past number of contracts traded would lead to a 270,000 TWD higher day-trade profit. The day-trade profit is unrelated to past trading profits. The overconfident day traders do not learn their types from their past performance. Another interpretation is that they do not gain trading skills or better information processing technology.

The evidence suggests overall that trading experience plays a limited role in helping individual investors earn profits by taking advantage of the extra leverage produced by the new day trading

policy. It also gives support to the hypothesis of Gervais and Odean (2001) that biases in the learning process of investors may lead them to become overconfident.

#### **4.7. Comparison of complete day-trader sample and subsample**

Our general analysis requires at least five executed day trades in order for investors to be included in the sample. We relax this ad hoc threshold to examine whether our results are robust to other choices of threshold, and recast the analysis in Table 4 but report only the main statistics for brevity.

Panel B of Table 9 indicates that the performance of all individual day traders who conduct at least one day trade is as poor as that shown in Table 4. On average, they incur significant losses of 48,800 TWD after transaction costs. Before transaction costs, they lose 26,700 TWD on average.

Panel C reports the results when we increase the threshold to ten day trades. The sample size is reduced, but we see similar results. The pattern of day traders losing more in long positions than in short positions also persists.

To sum up, the documented overconfidence of individual futures day traders in Taiwan appears to be structurally stable and not an artifact of the sample.

### **5. Concluding remarks**

We have taken advantage of a relatively recent day-trading policy in the Taiwan futures market to study the performance of day traders. The policy gives us a clear-cut way to identify day traders *ex ante*. Essentially, investors commit to be day traders by flagging their orders as day-trade orders, or positions that need to be closed on the same trading day. We thus have an ideal laboratory to address our questions. Are day trades profitable? Are day traders overconfident as to the precision of their information? Do they have a biased interpretation of information? Do they lose more money by trading more contracts? In other words, is trading hazardous to their wealth? Are there any differences in the relation between trading frequency and performance for

winning and losing day traders? Finally, do day traders' past trading experience and performance affect their trading behavior?

Several elements related to the Taiwanese market policy motivate us. First, investors like these day traders who voluntarily assume liquidation risk are supposed to be either the most informed or the most confident that they are informed. Second, the maximum investment horizon for the investors must be one day by default. The day traders' positions can be observed without the potential bias of the disposition effect. Third, futures day traders can easily capitalize on their negative information by taking short position. Finally, these traders are unlikely to trade for consumption, liquidity, portfolio rebalancing, diversification, hedging, and or tax motives.

The results show that the 3,470 individual day traders suffer substantially negative gross and net profits. This implies that individual day traders are not only overconfident as to the precision of information but also biased in their interpretation of information. The result for institutional day traders is similar but statistically insignificant because of the much smaller number of observations.

We also find that numbers of short positions and long positions are similar for individual day traders. To our surprise, the short-initiated round-trip trades perform better than the long-initiated round-trip trades for individual investors. Our results do not fully support that investors lose more by trading more. Trading is hazardous only to the overconfident losers, but not to the winners.

Finally, we find that more experienced day traders exhibit more aggressive day trading behavior, while overconfident day traders do not learn their types from their past performance. Trading experience thus plays a limited role in helping individual investors earn profits by taking advantage of the extra leverage enabled by the market's day trading policy.

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**Table 1 All Index Futures Descriptive Statistics**

	Total Transactions	Investor Type		Product Type				
		Individual	Institutional	TXF	MXF	EXF	FXF	Others
2007/10	1,870,994	1,381,276	489,718	1,078,166	506,157	129,863	141,018	15790
2007/11	2,470,271	1,779,260	691,011	1,454,938	711,988	139,628	139,699	24018
2007/12	2,716,747	1,804,619	912,128	1,525,523	936,893	123,451	113,037	17843
2008/01	4,176,970	2,544,218	1,632,752	2,235,007	1,361,298	298,008	225,626	57031
2008/02	1,791,517	1,270,273	521,244	925,136	548,780	129,299	110,563	77739
2008/03	3,403,473	2,515,959	887,514	1,839,396	1,131,589	197,695	201,394	33399
2008/04	2,886,335	2,174,869	711,466	1,510,854	955,650	175,457	205,264	39110
2008/05	2,864,748	2,095,692	769,056	1,522,378	934,713	168,154	189,498	50005
2008/06	2,970,428	2,125,787	844,641	1,607,198	1,027,271	146,669	154,925	34365
2008/07	3,272,217	2,374,412	897,805	1,785,649	1,158,925	137,089	151,129	39425
2008/08	3,349,750	2,552,303	797,447	1,798,758	1,203,782	174,041	132,168	41001
2008/09	3,640,049	2,628,370	1,011,679	1,978,549	1,302,017	168,387	147,844	43252
Total	35,413,499	25,247,038	10,166,461	19,261,552	11,779,063	1,987,741	1,912,165	472,978
Average	2,951,125	2,103,920	847,205	1,605,129	981,589	165,645	159,347	39,415
Ratio	100.000%	71.292%	28.708%	54.390%	33.262%	5.613%	5.400%	1.336%

*Notes.* Table 1 reports the summary statistics of all trades in the Taiwan futures market from October 8th, 2007 to September 30th, 2008. The number of total transaction, the number of transactions by domestic individual and institutional day traders, and the number of transactions in the Taiwan Stock Exchange Index Futures (TXF), the mini-Taiwan Stock Exchange Index Futures (MXF), the Electronic Sector Futures (EXF), the Finance Sector Futures (FXF), and the other types of futures are reported respectively. The number of transactions are reported on each month while the total and average over the months are also presented.

**Table 2 Day-trade Index Futures Descriptive Statistics**

Date	Number of Contracts		Number of Transactions		Investor/Day		Investor	
	Individual	Institutional	Individual	Institutional	Individual	Institutional	Individual	Institutional
2007/10	38,454	1,180	26,356	618	2,907	40	742	7
2007/11	115,502	5,182	76,243	3,094	7,339	85	1255	11
2007/12	99,043	3,602	69,780	2,516	7,715	74	1368	12
2008/01	149,068	678	95,680	514	8,129	54	1485	13
2008/02	67,692	491	49,675	327	5,703	58	1292	18
2008/03	140,022	1,623	96,775	1,038	9,218	134	1609	17
2008/04	117,438	1,102	82,383	807	9,485	115	1585	15
2008/05	114,628	6,378	80,227	3,222	9,028	105	1573	15
2008/06	127,341	4,026	89,410	2,355	9,120	65	1571	11
2008/07	142,063	1,610	98,211	1,258	8,527	64	1640	18
2008/08	150,233	13,286	110,233	7,304	10,605	134	1671	16
2008/09	160,646	4,812	110,746	3,733	9,868	108	1683	17
Total	1,422,130	43,970	985,719	26,786	97,644	1,036	17,474	170
Average	118,511	3,664	82,143	2,232	8,137	86	1,456	14
Max	160,646	13,286	110,746	7,304	10,605	134	1,683	18
Min	38,454	491	26,356	327	2,907	40	742	7

*Notes.* Table 2 reports the summary statistics of the day trades for four Taiwan index futures, including TFX, MFX, EFX, and FXF, from October 8, 2007 to September 30, 2008. The number of contracts, number of transactions, number of investor/day, and the number of investors per month for domestic individual and institutional day traders are reported separately. The identify of day traders in each month could be largely overlapped over months. In total, we have 3,470 distinct individual day traders and 42 institutional day traders.

**Table 3 Profit and Net Profit for Round-trip Trades**

Panel A: All round-trip trades				
(thousands TWD)	Individual		Institutional	
	Profit	Net Profit	Profit	Net Profit
Mean	***-0.266	***-0.613	0.043	-0.905
p-value	(0.000)	(0.000)	(0.994)	(0.869)
Median	***0.300	***0.189	***0.400	***0.284
p-value	(0.000)	(0.000)	(0.000)	(0.000)
Max	2,298	2,065	12,160	12,086
Min	-5,180	-5,235	-10,464	-10,653
number of obs	348,063	348,063	4,134	4,134

Panel B: Long-initiated round-trip trades				
(thousands TWD)	Individual		Institutional	
	Profit	Net Profit	Profit	Net Profit
Mean	***-0.676	***-1.014	6.824	5.841
p-value	(0.000)	(0.000)	(0.374)	(0.444)
Median	***0.300	0.148	***0.450	*0.294
p-value	(0.000)	(0.392)	(0.000)	(0.051)
Max	1,908	1,799	12,160	12,086
Min	-5,180	-5,235	-2,769	-2,833
number of obs	177,415	177,415	1,862	1,862

Panel C: Short-initiated round-trip trades				
(thousands TWD)	Individual		Institutional	
	Profit	Net Profit	Profit	Net Profit
Mean	***0.160	***-0.196	-5.515	-6.433
p-value	(0.005)	(0.001)	(0.475)	(0.409)
Median	***0.350	***0.193	***0.400	***0.248
p-value	(0.000)	(0.000)	(0.000)	(0.000)
Max	2,298	2,065	10,385	10,314
Min	-2,596	-2,689	-10,464	-10,653
number of obs	170,648	170,648	2,272	2,272

*Notes.* Table 3 reports the profit and net profit of all, long-initiated, and short-initiated round-trip trades. Net profit is the gross profit minus the transaction fee and tax. The profit and net profit for domestic individual day traders and institutional day traders are reported separately. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.

**Table 4 Distribution of Profit and Net Profit for Domestic Individual Investors**

	All Trades		Long-initiated		Short-initiated	
	Profit	Net Profit	Profit	Net Profit	Profit	Net Profit
(thousands TWD)						
below -500	78	105	44	54	24	28
-500 to -450	16	20	7	13	4	4
-450 to -400	25	17	13	15	4	7
-400 to -350	26	30	21	27	6	10
-350 to -300	29	36	29	33	11	13
-300 to -250	48	59	37	34	9	14
-250 to -200	71	92	48	61	27	31
-200 to -150	107	154	90	96	42	56
-150 to -100	228	269	186	207	94	115
-100 to -50	485	540	381	444	239	288
-50 to 0	1361	1473	1,623	1,722	1,479	1,688
0 to 50	697	473	792	608	1,093	872
50 to 100	133	80	70	56	140	92
100 to 150	33	27	28	17	51	32
150 to 200	27	23	17	12	19	13
200 to 250	19	10	12	12	19	11
250 to 300	12	6	6	5	8	9
300 to 350	7	7	6	5	5	6
350 to 400	9	5	8	1	8	3
400 to 450	6	5	1	1	4	5
450 to 500	5	2	2	1	5	3
above 500	48	37	22	19	35	26
Mean	*-26.654	***-61.470	***-34.813	***-52.253	8.229	*-10.040
p-value	(0.071)	(0.000)	(0.000)	(0.000)	(0.281)	(0.095)
Median	***-18.675	***-29.996	***-13.000	***-19.219	***-2.950	***-6.709
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Max	29,171	23,121	14,547	11,580	14,623	11,541
Min	-20,991	-23,384	-19,201	-20,982	-2,993	-3,351
Observations	3,470	3,470	3,443	3,443	3,326	3,326

*Notes.* Table 4 reports the total profit and net profit of all, long-initiated, and short-initiated trades of domestic individual investors. The profit and net profit are reported in the bin of 50 thousand TWD. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.

**Table 5 Distribution of Index Return and Net Return for Domestic Individual Investors**

	All Trades		Long-initiated		Short-initiated	
	Index Return	Net Return	Index Return	Net Return	Index Return	Net Return
below -10%	12	406	15	581	8	331
-10% to -9%	1	76	6	79	4	58
-9% to -8%	3	114	7	97	2	80
-8% to -7%	2	103	3	128	2	91
-7% to -6%	8	134	9	137	2	115
-6% to -5%	8	171	8	179	5	117
-5% to -4%	14	218	16	204	10	171
-4% to -3%	13	303	20	254	12	182
-3% to -2%	36	338	37	296	27	306
-2% to -1%	93	408	105	325	55	337
-1% to 0%	2248	438	2174	379	1813	404
0% to 1%	972	308	969	259	1302	331
1% to 2%	32	149	43	168	38	224
2% to 3%	11	108	14	96	17	146
3% to 4%	7	57	4	68	10	92
4% to 5%	4	30	4	36	4	68
5% to 6%	1	35	0	28	5	62
6% to 7%	4	9	1	22	1	43
7% to 8%	0	15	1	17	5	31
8% to 9%	0	11	3	13	1	25
9% to 10%	0	5	1	12	1	20
above 10%	1	38	3	65	2	92
Mean	***-0.216%	***-3.727%	***-0.266%	***-4.652%	***-0.113%	***-2.345%
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)
Median	***-0.029%	***-2.316%	***-0.036%	***-2.766%	***-0.012%	***-1.358%
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Max	10.376%	29.432%	20.271%	52.429%	43.723%	54.344%
Min	-51.735%	-66.132%	-51.735%	-81.054%	-110.449%	-86.180%
Observations	3470	3470	3443	3443	3326	3326

*Notes.* Table 5 reports the index return and net return of all, long-initiated, and short-initiated trades of domestic individual investors. The rates of return are reported in the bin of one per cent. The index return is calculated by dividing index points gained or lost by corresponding average long and short selling index points. The net return is calculated by dividing the net profit in Table 4 by the total margin, which is equal to the havled initial margin for one contract multiplied by the total number of contracts for a single round-trip trade. During the whole sample period, the initial margins for the TXF, MTX, EXF, and FXF futures contracts remain as 78,000 TWD, 20,000 TWD, 64,000 TWD, and 64,000 TWD, respectively. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.

**Table 6 Distribution of Profit and Net Profit for Institutional Day Traders**

	All Trades		Long-initiated		Short-initiated	
	Profit	Net Profit	Profit	Net Profit	Profit	Net Profit
(thousands TWD)						
below -500	1	1	0	0	1	1
-500 to -450	0	0	0	0	0	0
-450 to -400	0	0	0	0	0	0
-400 to -350	1	1	0	0	0	0
-350 to -300	0	0	0	0	0	0
-300 to -250	0	1	0	0	0	0
-250 to -200	0	0	0	1	0	0
-200 to -150	1	3	3	2	1	1
-150 to -100	0	1	0	2	0	1
-100 to -50	5	5	4	2	3	3
-50 to 0	20	18	20	21	17	19
0 to 50	7	6	8	9	12	11
50 to 100	1	1	2	0	3	1
100 to 150	1	0	0	0	0	0
150 to 200	0	1	0	1	0	0
200 to 250	1	0	0	1	1	2
250 to 300	0	0	0	0	0	0
300 to 350	0	0	2	0	0	1
350 to 400	0	0	0	0	1	0
400 to 450	0	1	0	0	1	0
450 to 500	0	0	0	0	0	0
above 500	4	3	2	2	2	2
Mean	4.218	-89.058	309.921	265.272	-298.324	-348.015
p-value	(0.988)	(0.785)	(0.234)	(0.265)	(0.557)	(0.513)
Median	-11.875	** -15.264	-5.500	* -7.937	-0.850	-4.481
p-value	(0.100)	(0.041)	(0.223)	(0.054)	(0.703)	(0.504)
Max	5,240	5,069	10,460	9,569	5,156	5,072
Min	-9,962	-11,956	-187	-204	-20,422	-21,525
Observations	42	42	41	41	42	42

*Notes.* Table 6 reports the total profit and net profit of all, long-initiated, and short-initiated trades of institutional day traders. The profit and net profit are reported in the bin of 50 thousand TWD. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.

**Table 7 Distribution of Index Return and Net Return for Institutional Day Traders**

	All Trades		Long-initiated		Short-initiated	
	Index Return	Net Return	Index Return	Net Return	Index Return	Net Return
below -10%	1	3	2	6	1	3
-10% to -9%	0	1	0	0	0	1
-9% to -8%	0	1	0	2	1	1
-8% to -7%	0	1	0	2	0	1
-7% to -6%	1	2	0	1	0	3
-6% to -5%	0	3	0	1	0	2
-5% to -4%	0	1	0	3	0	3
-4% to -3%	0	3	1	3	0	0
-3% to -2%	0	5	0	4	0	3
-2% to -1%	1	6	2	3	0	5
-1% to 0%	25	4	24	4	19	5
0% to 1%	11	3	10	3	18	3
1% to 2%	1	2	1	1	2	4
2% to 3%	1	2	1	4	0	2
3% to 4%	0	3	0	3	0	1
4% to 5%	0	0	0	0	0	1
5% to 6%	0	0	0	1	0	0
6% to 7%	0	1	0	0	0	0
7% to 8%	0	0	0	0	0	1
8% to 9%	0	0	0	0	0	1
9% to 10%	0	0	0	0	0	0
above 10%	1	1	0	0	1	2
Mean	-0.96%	***-2.34%	-3.83%	***-4.60%	1.21%	-1.37%
p-value	(0.583)	(0.002)	(0.220)	(0.003)	(0.804)	(0.155)
Median	-0.02%	***-1.75%	** -0.03%	***-2.16%	0.00%	** -1.29%
p-value	(0.0352)	(0.004)	(0.022)	(0.002)	(0.925)	(0.049)
Max	29.19%	10.12%	2.54%	5.99%	167.63%	19.30%
Min	-66.24%	-14.21%	-125.54%	-51.23%	-111.74%	-13.01%
Observations	42	42	41	41	42	42

*Notes.* Table 7 reports the index return and net return of all, long-initiated, and short-initiated trades of domestic individual investors. The rates of return are reported in the bin of one per cent. The index return is calculated by dividing index points gained or lost by corresponding average long and short selling index points. The net return is calculated by dividing the net profit in Table 6 by the total margin, which is equal to the havled initial margin for one contract multiplied by the total number of contracts for a single round-trip trade. During the whole sample period, the initial margins for the TXF, MTX, EXF, and FXF futures contracts remain as 78,000 TWD, 20,000 TWD, 64,000 TWD, and 64,000 TWD, respectively. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.



**Table 8 Quintile of Contract Number, Profit, Net Profit, Profit per Contract, Net Profit per Contract, and Round-trip Trade Number**

Panel A: Sorted by number of contract					
	1st Q	2nd Q	3rd Q	4th Q	5th Q
Number of Contract	24.14	59.40	120.02	251.22	1613.61
Profit (thousands TWD)	-16.43	-33.90	-51.54	-62.58	31.17
Profit per Contract (TWD)	-680.71	-570.63	-429.38	-249.10	19.32
Net Profit (thousands TWD)	-18.26	-38.45	-60.63	-81.78	-108.23
Net Profit per Contract (TWD)	-756.20	-647.35	-505.16	-325.54	-67.07
Round-trip Trade Number	10.83	24.25	47.70	94.89	323.87

Panel B: Sorted by total net profit					
	1st Q	2nd Q	3rd Q	4th Q	5th Q
Number of Contract	644.82	236.01	210.05	110.96	866.56
Profit (thousands TWD)	-324.90	-57.35	-16.56	-1.46	267.01
Profit per Contract (TWD)	-503.86	-243.02	-78.85	-13.19	308.12
Net Profit (thousands TWD)	-382.11	-74.81	-30.50	-8.43	188.51
Net Profit per Contract (TWD)	-592.59	-316.98	-145.21	-75.98	217.54
Avg Round-trip Trade Number	148.47	90.36	72.02	47.22	143.46

Panel C: Sorted by net profit per contract					
	1st Q	2nd Q	3rd Q	4th Q	5th Q
Number of Contract	312.22	206.57	261.64	409.50	878.47
Profit (thousands TWD)	-277.40	-86.84	-37.02	0.35	267.64
Profit per Contract (TWD)	-888.48	-420.36	-141.49	0.84	304.66
Net Profit (thousands TWD)	-307.39	-104.40	-57.62	-26.40	188.47
Net Profit per Contract (TWD)	-984.54	-505.38	-220.24	-64.47	214.54
Avg Round-trip Trade Number	43.33	67.42	90.65	151.26	148.87

*Notes.* Table 8 reports the average values of the total profit, total net profit, profit per contract, net profit per contract, and total round-trip trades in each quintile groups for domestic individual investors. Panel A reports the results sorted by the number of total contracts traded by individual day traders during the sample period. Panel B shows the results sorted by the total profit. The Panel C shows the results sorted by the profit per contract.

**Table 9 Robustness Check: the Distribution of Profit and Net Profit for Domestic Individual Investors**

Panel A: With Trading Record						
	All Trades		Long-initiated		Short-initiated	
	Profit	Net Profit	Profit	Net Profit	Profit	Net Profit
Mean	**-.38.394	***-.73.364	***-.43.558	***-.61.200	5.078	**-.13.194
p-value	(0.012)	(0.000)	(0.000)	(0.000)	(0.509)	(0.028)
Median	***-.20.750	***-.32.639	***-.14.875	***-.20.724	***-.3.200	***-.6.998
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Max	23,718	15,028	11,114	7,229	12,605	8,984
Min	-20,991	-23,384	-19,201	-20,982	-2,634	-3,182
Obs	2,641	2,641	2,622	2,622	2,523	2,523

Panel B: Threshold Zero						
	All Trades		Long-initiated		Short-initiated	
	Profit	Net Profit	Profit	Net Profit	Profit	Net Profit
Mean	**-.23.462	***-.48.786	***-.29.032	***-.42.413	4.450	**-.10.107
p-value	(0.026)	(0.000)	(0.000)	(0.000)	(0.457)	(0.032)
Median	***-.10.150	***-.16.674	***-.7.600	***-.11.419	***-.2.450	***-.5.050
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Max	29,171	23,121	14,547	11,580	14,623	11,541
Min	-20,991	-23,384	-19,201	-20,982	-2,993	-3,351
Obs	4,867	4,867	4,585	4,585	4,252	4,252

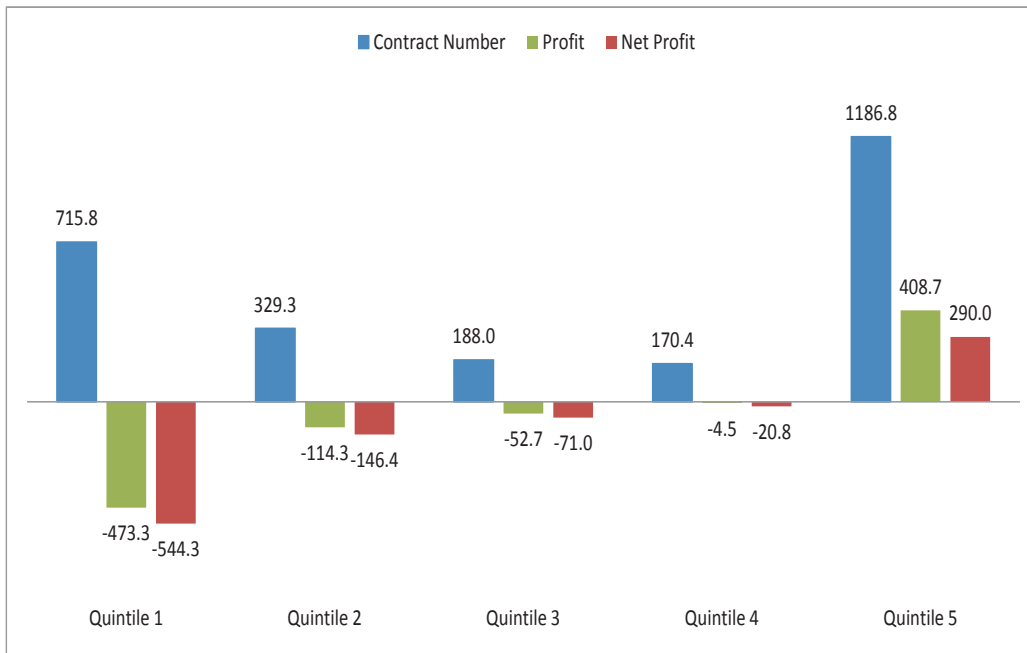
Panel C: Threshold Ten						
	All Trades		Long-initiated		Short-initiated	
	Profit	Net Profit	Profit	Net Profit	Profit	Net Profit
Mean	-28.192	***-.71.849	***-.39.332	***-.61.025	11.227	-11.251
p-value	(0.143)	(0.000)	(0.001)	(0.000)	(0.247)	(0.140)
Median	***-.24.950	***-.39.899	***-.18.175	***-.25.857	***-.3.550	***-.9.293
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Max	29,171	23,121	14,547	11,580	14,623	11,541
Min	-20,991	-23,384	-19,201	-20,982	-2,993	-3,351
Obs	2,653	2,653	2,644	2,644	2,601	2,601

*Notes.* Table 9 reports the total profit and net profit of all, long-initiated, and short-initiated trades of domestic individual investors. Panel A reports the results of all individual day traders with trading record from 2000/01/01 to 2007/10/07. Panel B reports the results of individual day traders with at least one day trade. Panel C reports the results of individual day traders with at least ten day trades. \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.

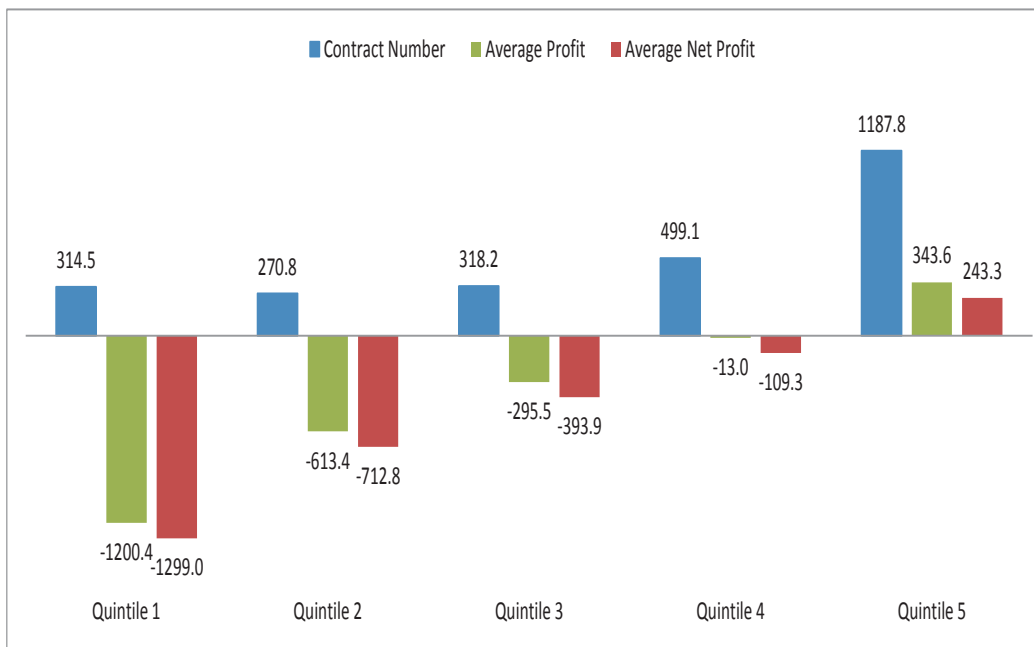
**Table 10 Overconfident Day Trading is Related to Past Trading Activity but not Profits**

	Number of round-trip trades					Total net profits				
Number of contracts	***61.0 (0.000)			***60.8 (0.000)		*270339.1 (0.093)			*270355.6 (0.093)	
Number of trading days	***25.3 (0.004)			***24.9 (0.004)		10722.2 (0.561)			9646.7 (0.611)	
Past Profits			7.4 (0.683)	**2.9 (0.011)	6.0 (0.671)			19742.5 (0.886)	-224.2 (0.997)	19202.2 (0.889)
Number of observations	2,641	2,641	2,641	2,641	2,641	2,641	2,641	2,641	2,641	2,641
Adj-R-Squared	4.93%	0.85%	0.07%	4.94%	0.89%	15.36%	0.02%	0.08%	15.36%	0.10%

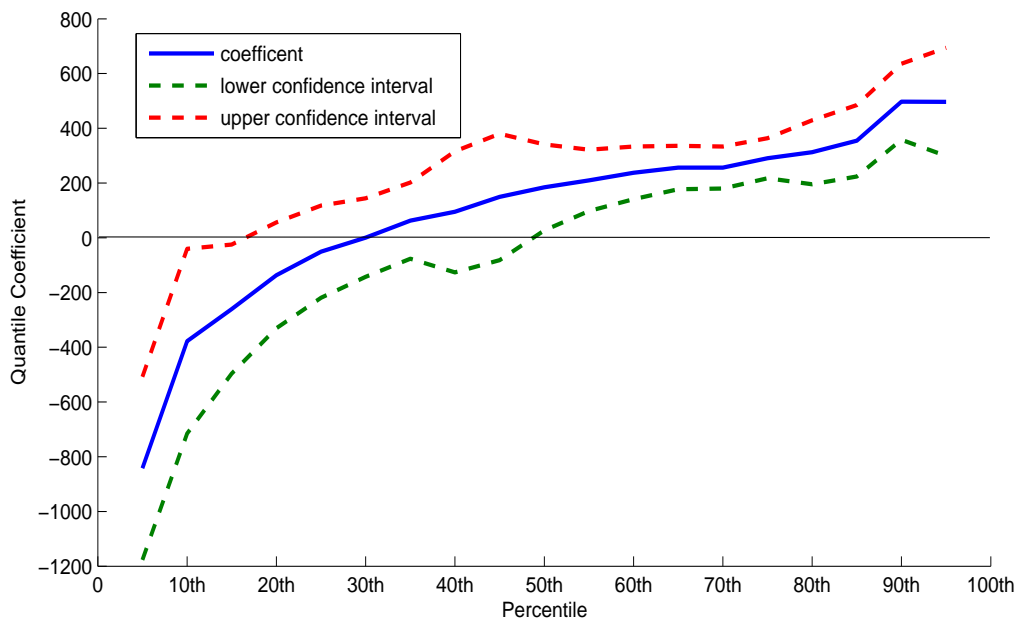
*Notes.* Table 10 reports the regression results with number of round-trip day trades or total net day-trade profits as the dependent variable. The independent variables includes number of contracts traded, number of trading, and days total gross profits from 2000/01/01 to 2007/10/07. The independent variables are standardized. The observations contains 2,641 individual day traders who have trading record from 2000/01/01 to 2007/10/07. The standard error is adjusted for heteroscedasticity by Davidson and MacKinnon (1993). \*: significant at 10% level, \*\*: significant at 5% level, \*\*\*: significant at 1% level.



**Figure 1 The Average Total Contract Number, Total Profit, and Total Net Profit within each Quintile sorted by the Total Profit**

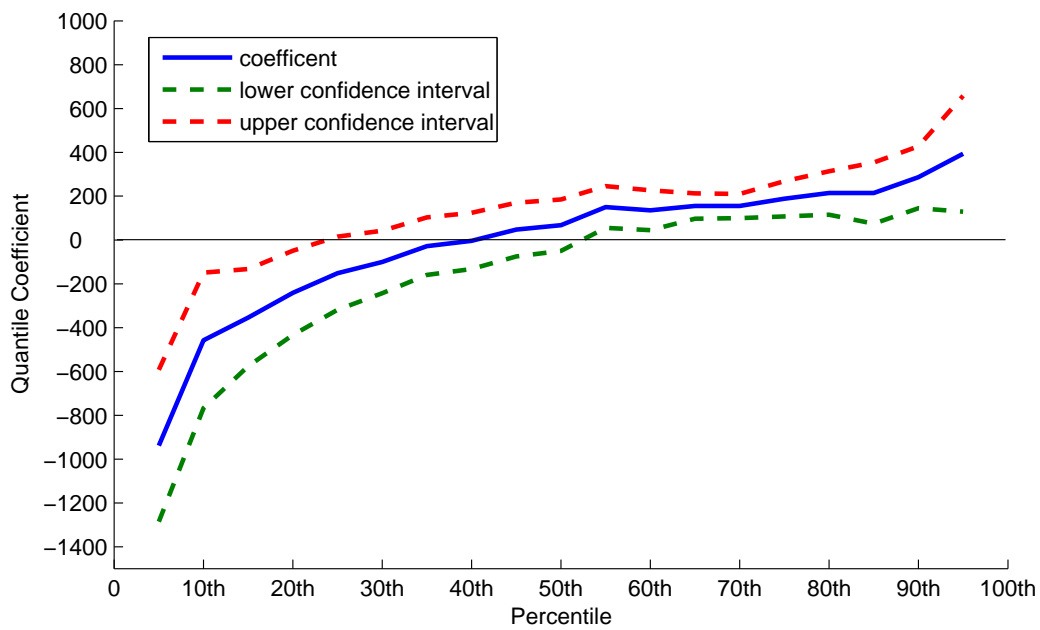


**Figure 2 The Average Total Contract Number, Total Profit, and Total Net Profit within each Quintile sorted by the Average Profit per Contract**



Note:

**Figure 3 The Coefficients of Quantile Regression of the Profit on Number of Contracts traded and the 95% Confidence Intervals**



**Figure 4 The Coefficients of Quantile Regression of the Net Profit on Number of Contracts traded and the 95% Confidence Intervals**