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Source: *Financial Analysts Journal*, Vol. 60, No. 4 (Jul. - Aug., 2004), pp. 35-43

Published by: Taylor & Francis, Ltd.

Stable URL: <https://www.jstor.org/stable/4480586>

Accessed: 17-10-2019 09:54 UTC

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Are Professional Traders Too Slow to Realize Their Losses?

Ryan Garvey and Anthony Murphy

Data on a U.S. proprietary stock-trading team provide evidence of the tendency of traders to hold on to their losers too long and sell their winners too soon—that is, the “disposition effect.” The group of traders studied earned more than \$1.4 million in intraday trading profits, but they realized their winning trades at a much faster rate than their losing trades. This tendency lowered their profitability. When the traders limited their risk exposure by trading in small share sizes, in low-priced stocks, or during periods of low volatility, the discrepancy between losing and winning holding times rose. An analysis of intraday prices suggests that traders could increase trading profits by holding winners longer and selling losers sooner.

When proprietary stock traders trade on behalf of their firms, they risk firm capital. Proprietary traders are highly influential in the pricing of many U.S. equities because of the volume they trade. Bear, Stearns & Company estimated that proprietary stock traders account for 16 percent of daily NASDAQ/NYSE share volume (Goldberg and Lupercio 2003). Despite their presence in U.S. markets, however, little is known about their behavioral tendencies. The behavioral finance literature focuses on individual investors (liquidity traders), as opposed to professional traders (informed traders), despite the latter group’s frequent effect on market prices.

Our study sought to bridge this gap by testing a unique dataset of 15 professional stock traders for evidence of the disposition effect (Shefrin and Statman 1985). The disposition effect is a behavioral finance theory that predicts individuals will hold their losing investments too long and sell their winning investments too soon to optimize profits. Past research (including Odean 1998; Schlarbaum, Lewellen, and Lease 1978; and Shefrin and Statman) found evidence of this behavior on the part of individuals who invest in U.S. equities. Others have found evidence of the disposition effect in a variety of settings: Coval and Shumway (2001), Heisler (1994), and Locke and Mann (2000) in the futures and commodities markets; Ferris, Haugen,

and Makhija (1988) in stocks (based on changes in volume and price); Weber and Camerer (1998) in an experimental setting; and Shapira and Venezia (2001) in Israel.

Whether the disposition effect holds for all stock market participants (e.g., professional traders as well as individual investors) is of considerable interest, but the question has not been completely answered. The principal characteristic that distinguishes a trader from an investor is mind-set. Many traders hold stocks for minutes or hours, seldom overnight, and close out positions for small profits. Our study is the first to test a sample of professional U.S. stock traders for evidence of the disposition effect. Do consistently profitable traders suffer from the same tendencies that plague individual investors? The extent to which a professional stock trader suffers from the disposition effect has implications for more than individual profitability. Because of their trading frequency and the large blocks they trade, a disposition effect among professional traders would have strong implications for the price discovery process for active stocks.

The Disposition Effect

Kahneman and Tversky’s (1979) groundbreaking work on choice under uncertainty revealed that individual decision makers are concerned with changes in their financial wealth and that they are averse to losses from these changes. This descriptive model of decision making under risk is called “prospect theory,” of which the disposition effect is an extension. Prospect theory was originally intended to explain the numerous violations of the expected utility paradigm. Under prospect theory,

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individuals maximize an S-shaped valuation function that is concave in regard to gains and convex in regard to losses. Also, it is steeper in the domain of gains than in the domain of losses, which is indicative of risk-averse behavior.

In an investment setting, Shefrin and Statman placed prospect theory into a wider theoretical framework and labeled it "the disposition effect." To understand how the disposition effect influences investor decision making, consider an investor who purchases a stock for \$100. After one year, the stock drops 10 percent in value to \$90. The investor can either sell the stock and realize a loss or hold the stock for another period in hopes that it will rise in value. To decide what to do with the stock, the investor evaluates it in terms of gains and losses and the expected-risk-return measure the investor previously used for the stock. Kahneman and Tversky labeled this phase the "editing phase." Critical to the editing phase is a reference point in relation to which gains and losses can be calculated.

In previous testing of the disposition effect, the purchase price typically served as the reference point. The reference point does not need to be a fixed point, however. It can be an expectation or aspiration level by which the investor codes gains and losses (Kahneman and Tversky). If the investor in this example believes that the risk no longer justifies the return, then in accordance with prospect theory, the investor will make a decision based on the S-shaped valuation function. The convex domain of losses will influence the decision, and the investor is likely to hold the stock.

What if the stock had increased by 10 percent? Then, the price of the stock is in the concave domain of gains, and according to prospect theory, the investor is likely to sell the stock and realize the gain.

Data and Methodology

Our sample is a highly skilled, proprietary stock-trading team. These 15 traders generated more than \$1.4 million in intraday trading profits during a downward-trending market. The group trades solely equities, and nearly all (more than 94 percent) of the trades are in NASDAQ stocks.

The data for this group of traders are from a U.S. direct-access broker for the period 8 March through 13 June 2000. There were 68 trading days and two market holidays during this time period. Direct-access brokers allow clients to choose their order-routing method via high-speed connections to the financial markets. The U.S. SEC (2000) has identified 133 direct-access brokers in the United States, and the firm of Keefe, Bruyette & Woods (see "Direct Access" 2001) has estimated that system

users number 75,000. Typically, these brokers appeal to day traders rather than investors. The National Association of Securities Dealers (NASD) recently defined a day trader as "an individual who conducts intraday trading in a focused and consistent manner, with the primary goal of earning a living through the profits derived from this trading strategy" (SEC). Day traders aim to profit by executing many intraday trades to take advantage of small price movements (e.g., \$0.10, \$0.05). Their profits per closing trade are often small, but because of frequent trading, their end-of-day profits can be sizable.

The day-trading industry is bifurcated into retail and proprietary (professional) traders. The two groups differ in several ways. First, retail day traders risk their own capital, retain all their profits, and bear all their losses. They do not receive any formal training. In addition, retail day traders pay set commission fees, and they are governed by strict margin laws. Retail day traders are not required to be licensed. Proprietary day traders are hired and fired by a firm on the basis of their performance. They trade firm capital and receive a percentage of their profits and losses. Proprietary traders receive formal training on various trading strategies and techniques that are recommended by the firm. These traders typically pay little or no commission, and they are not governed by the same margin requirements as retail day traders.¹ Proprietary traders are required to pass the NASD Series 7 licensing exam. Most proprietary trading programs are formed as partnerships or limited liability companies, and the traders sign operating agreements governing their membership rights (capital contribution, risk agreements, payouts, benefits, etc.) in the partnership.

The direct-access broker in our study has both a retail client base and a proprietary trading team. We chose to study the firm's proprietary traders because they were highly active and consistently profitable and there were no complications arising from taxes, commissions, and so on.

The traders' proprietary status is the most unique aspect of this study. The firm is a member of the NASD and is one of the largest direct-access brokers in the United States. We obtained the data on-site directly from the brokerage house database, which ensured data completeness and eliminated any possibility of data tampering. The proprietary traders trade in an on-site location in the New York City area.

The data consist of a transaction database. Each trade entry lists the trader's identification, the time the order was filled on the relevant exchange, the order type (limit order, stop limit order, etc.), the

action taken (buy, sell, short, or cover), the volume, the price, the location of the trade, and the counterparties on the trade. We analyzed all 15 traders who traded the firm's capital over this period, but not all of the traders traded for the whole time period.

For an idea of how much more active these traders are than individual investors, consider a previous comprehensive study of the disposition effect by Odean. Odean examined 10,000 accounts at a discount brokerage firm over a six-year period. In total, these accounts conducted 97,483 transactions on stocks listed in the CRSP files. The 15 professional traders we examined conducted 96,323 stock transactions in 68 trading days.

To understand whether the holding time for each roundtrip was justified, we also obtained data from Nastraq (North American Securities Tracking and Quantifying system), which is maintained by the NASD. Nastraq contains trade data, inside quote data, and individual quote data for each market participant during a day. For our analysis, we were concerned only with the inside quote data. Because we had the execution time in seconds for each trade, we could compare the inside quote at the time of execution with the inside quotes before and after the trade. This ability allowed us to determine whether the traders were justified in selling or covering their open positions.

Calculating Trading Profits and Duration.

To determine the trading profit on a roundtrip transaction, we matched the opening trade for each stock in each trader's account with the subsequent trade of the opposite sign each day. Professional traders do not always open and close positions with two trades. A trader may lay off part of an open position or combine a closing transaction with an opening transaction. Regardless of whether trades opened, closed, or simultaneously opened and closed a position, we searched forward in time each day until the opening position was closed out to keep track of accumulated inventory and the corresponding prices paid or received. We matched all but 115 of the 96,323 trades (more than 99.88 percent of trading activity) by using our matching algorithm. These 115 unmatched trades could have been long-term investments, or the traders could have been purchasing stock to hedge against future short-sale constraints. Professional traders rarely hold positions overnight because of the increased price risk, but they typically do hold large blocks of shares in the stocks they trade most to avoid restrictions on short selling.

We calculated durations in a manner similar to the calculation of trading profits. Each trade in our database had a time stamp indicating when it

occurred. We calculated the duration between the opening transaction and the subsequent roundtrip trade. If a roundtrip trade closed out more than one opening transaction, we used a weighted average of the various opening positions. For instance, suppose the trader opened up a 1,000-share position of Dell at 9:30:00 a.m. and then purchased another 2,000 shares of Dell at 9:30:10 a.m. If the next trade was a sell of 3,000 shares of Dell at 9:30:20 a.m., the duration on the roundtrip trade was 13.33 seconds $[(1/3 \times 20 \text{ seconds}) + (2/3 \times 10 \text{ seconds})]$.

To test for evidence of the disposition effect, we examined the mean and median differences in holding times for roundtrip trades on both winning and losing roundtrips. The null hypothesis is that the difference in holding times for losing and winning roundtrips is equal to zero. Because we analyzed a truncated distribution of the total roundtrips, longer-duration trades were lost in the estimation procedure, but because nearly all trades were closed out within a day, these trades had a minimal impact on our overall results.

Eliminating Testing Biases. By testing the disposition effect on professional traders rather than individual investors, our study eliminates some of the biases plaguing previous research. For instance, analyzing professional traders eliminates complications resulting from taxes. Taxation influences selling decisions; therefore, a decision by an individual investor to sell might be motivated by a tax effect, the disposition effect, or a combination of the two. Badrinath and Lewellen (1991), Odean, and Shefrin and Statman found evidence that investors sell more losing investments at the end of the year, although Constantinides (1984) showed that investors should gradually realize their capital losses over the year for tax purposes. Researchers have attempted to separate the tax and disposition effects, but discovering an investor's true intent is difficult, if not impossible. In contrast to the behavior of individual investors, professional traders are usually looking for short-term trading profits rather than long-term capital gains and repeatedly buy and sell securities throughout the day. The average holding time for the professional trader is only 197 seconds per roundtrip, and 99.88 percent of all trades are closed out within a day. Taxes are clearly not an issue with the traders we observed.

Another advantage to testing the disposition effect on professional traders rather than individual investors is that professional traders are not motivated to trade by diversification needs or capital constraints. Lakonishok and Smidt (1986) suggested that investors might realize winners at a faster rate than losers in an attempt to rebalance

their portfolios. The traders we observed, however, generally specialized in one or two stocks during the day, so for them, diversification was not an issue. In addition, professional traders trade the capital of a firm, so they are not motivated to trade by capital constraints or consumption needs. Moreover, the trades of professional traders are usually exempt from transaction costs, or the traders pay little in transaction costs, whereas Harris (1988) suggested that individual investors are averse to realizing a loss because of the higher trading costs on losing transactions.

Finally, our study provides a robust testing of the disposition effect because of the way we calculated gains and losses. Usually the purchase price (status quo) is taken as the reference point when researchers attempt to measure the speed of realizing losses and gains. For investors with long holding periods, however, the true reference point is difficult to establish. For instance, consider an investor who has just purchased a stock for \$50 that soon thereafter rises in value to \$60. An investor who sells the stock in the near future for \$55 may feel that she or he lost out on the run-up instead of "breaking even." Thus, a run-up in the stock price is likely to influence an individual's decision, which causes confusion as to the true reference point. Professional traders seek to earn pennies off of roundtrip transactions. They have such a short horizon that the previous intraday purchase price is almost certainly the true reference point. Furthermore, each trader we analyzed has a box in the corner of his or her trading terminal that calculates trading profit in real time from the previous intraday purchase price, which further strengthens our assumption regarding the reference price.²

Empirical Results

Summary statistics pertaining to the proprietary trading group are in **Table 1**. As a group, the traders earned about \$1.4 million in intraday trading profits over the 68-day trading period, and they traded about 0.1 percent of total NASDAQ share volume. Despite the high trading profits, the profit per roundtrip trade is relatively small. The average and median roundtrip profits are statistically different from zero.

The trading profits occurred during a down market; the NASDAQ Composite Index was down 22 percent and the NASDAQ 100 Index was down 14 percent over the 68 trading days. The trades in the period were heavily concentrated in highly transparent NASDAQ stocks. Did the downward trend of the market bias our findings? We believe our results are robust to an upward or a downward

Table 1. Summary Statistics on Trading, 8 March–13 June 2000

| Measure | Amount |
|---------------------------------------|---------------|
| <i>Trading profits (\$)</i> | |
| Total trading profits | 1,431,626.46 |
| Average profit per day | 21,053.33 |
| Average profit per roundtrip | 24.33* |
| Median profit per roundtrip | 18.75* |
| <i>Volume</i> | |
| Average volume per trade | 1,235 |
| Total volume | 118,967,894 |
| Percent of total NASDAQ share volume | 0.11 |
| <i>Dollar volume</i> | |
| Average dollar volume per trade | 51,373.51 |
| Total dollar volume | 4,948,450,604 |
| Percent of total NASDAQ dollar volume | 0.09 |
| <i>Trades</i> | |
| Total trades (number) | 96,323 |
| Trades filled (number) | 195,473 |
| Percent of total NASDAQ trades | 0.11 |

Notes: Trading profits were calculated exclusive of execution costs. NASDAQ share volume, dollar volume, and total trades came from www.marketdata.nasdaq.com.

*Significantly different from zero at the 1 percent level.

market trend because of the way these traders trade. Professional traders seek to profit from volatility rather than trends in the market. Of the 58,835 roundtrips, 25,601 were on intraday short positions. In addition to profiting in either direction the market moves, these traders are looking for only incremental price changes because they do not intend to hold a stock for the day or a prolonged period. Thus, the overall trend of the market has little relevance for them. The highest average trading profit for the group (\$30.54) occurred when the trades were held for less than a minute. Trading profits steadily declined with each minute, to a low of \$12.31 for trades held for four minutes or more. Holding a trade so long was, however, quite unusual; only 16 percent of roundtrips occurred at or beyond four minutes. Because time is critical to these and other professional traders, any reluctance on the trader's part to realize a loss can have severe implications for that trader's profitability.

Evidence of the Disposition Effect. The proprietary trading team has been without a doubt highly active and consistently profitable. Therefore, a reasonable assumption is that the traders are exempt from any costly behavioral tendency, such as the disposition effect. Our results show, however, that despite their financial sophistication, they hold

losers much longer than winners, indicating that they are reluctant to realize a loss. **Table 2** highlights the mean and median duration times for winners and losers among the 58,835 roundtrips. The difference between the means of 102 seconds, with a *t*-statistic greater than 13, is highly significant.

Table 2. Durations of Roundtrips

| Roundtrip | Mean Duration (seconds) | Median Duration (seconds) | Number of Roundtrips |
|------------------------------|-------------------------|---------------------------|----------------------|
| Losing roundtrip | 268 | 102 | 16,610 |
| Winning roundtrip | <u>166</u> | <u>64</u> | 36,290 |
| Difference | 102 | 38 | |
| <i>t</i> -Statistic/Wilcoxon | 13.28 | 42.87 | |

Notes: A losing roundtrip had a trading profit below zero, and a winning roundtrip had a trading profit above zero. The 5,935 roundtrips that resulted in neither a gain nor a loss were omitted. The *t*-statistic tests the null hypothesis that the difference in means is zero. The Wilcoxon rank-sum test tests the equality of the medians.

To test the robustness of our results, we segregated roundtrip trades by when they occurred during the day. The trading day was divided into three equal time periods—an opening/morning period (9:30 a.m. to 11:40 a.m.), a midday period (11:40 a.m. to 1:50 p.m.), and a closing/afternoon period (1:50 p.m. to 4:00 p.m.).³ **Table 3** shows that mean (and median) durations differed by period. The differences in the durations of losing and winning trades for each time period, however, are highly

Table 3. Duration by Time of Day

| Time Period | Mean Duration (seconds) | Median Duration (seconds) | Number of Roundtrips |
|------------------------------|-------------------------|---------------------------|----------------------|
| <i>9:30 a.m.–11:40 a.m.</i> | | | |
| Losing roundtrips | 182 | 92 | 7,002 |
| Winning roundtrips | <u>126</u> | <u>59</u> | 15,751 |
| Difference | 56 | 33 | |
| <i>t</i> -Statistic/Wilcoxon | 11.89 | 28.04 | |
| <i>11:40 a.m.–1:50 p.m.</i> | | | |
| Losing roundtrips | 361 | 124 | 3,726 |
| Winning roundtrips | <u>218</u> | <u>75</u> | 8,303 |
| Difference | 143 | 49 | |
| <i>t</i> -Statistic/Wilcoxon | 7.97 | 20.41 | |
| <i>1:50 p.m.–4:00 p.m.</i> | | | |
| Losing roundtrips | 309 | 102 | 5,854 |
| Winning roundtrips | <u>179</u> | <u>64</u> | 12,173 |
| Difference | 130 | 38 | |
| <i>t</i> -Statistic/Wilcoxon | 7.38 | 25.33 | |

Note: See notes to previous tables.

significant. One reason for the differences among the intraday holding times could be market activity. That is, the midday period traditionally has less volume and price volatility than the opening and closing periods. Thus, a trader can hold a trade longer in the midday period without risking substantial price fluctuations. The opening period traditionally has more volume and price volatility, so a trader is often forced to close out a trade quickly to limit risk exposure.

The theoretical framework underpinning the disposition effect could help explain why a professional trader would suffer from the tendency to hold losers too long and sell winners too quickly. In Shefrin and Statman's analysis of the human tendency to seek pride and avoid regret, if a trader exhibits asymmetry between pride and regret (with regret being stronger), then the trader is more apt to postpone regret by riding losers. Conversely, a strong emotional tendency to realize the feeling of pride leads a trader to sell winners too soon. Professional traders often trade together (such as the proprietary trading team we analyzed), which can promote a sense of competition. This rivalry could enhance a trader's tendency to seek pride and avoid regret at the expense of the group's overall profitability.

A second reason a professional trader might be reluctant to realize a loss could stem from a self-control measure. Traders often use stop-loss orders or have in their minds a predetermined loss they are not willing to go beyond (\$0.10, \$0.25). A common strategy we observed was to place a limit order on the Island ECN (electronic communications network) immediately after opening a position in order to limit downside risk. If the trade was profitable, the limit order would be canceled. Most professional traders are clearly aware of the dangers of not adhering to some self-control measure. The extent to which a professional trader deviates from this measure can have severe effects on trading profitability. Thus, large losses or even large gains are rare. In our sample, the largest loss realized on an intraday roundtrip was $-\$2,870.21$, but only 8 percent of our sample's roundtrips were higher than \$150.00, and 5 percent were under $-\$150.00$.

We do not know whether the firm or the traders were aware that they were suffering from the disposition effect. The firm did, however, have self-control measures in place to limit risk (and possibly the disposition effect). The traders were overseen by a trading manager, who told us that each of the 96,323 trades was closely monitored. The manager made sure the traders were risking the appropriate capital on each trade.⁴ In addition, the trading manager monitored the trading strategy and techniques used. The decision a trader made about when to

enter and exit a position was often discussed between the trader and the manager at the end of the day. Because the traders were highly profitable, the impact of the disposition effect on trader profitability may have been overlooked at the firm. In addition, testing for the disposition effect can be difficult because intraday price data subsequent to each transaction must be analyzed.

If the professional traders held losers longer than winners, why were they nevertheless consistently profitable? After all, a reasonable assumption is that their reluctance to realize a loss would eventually lead them to lose profits. To explore this question, we segregated roundtrip duration times on the basis of position size. We found that a majority of trades involved 1,000–2,000 shares. We then segregated roundtrip holding times for winning and losing trades by position size below 1,000 shares, position size of 1,000–1,999 shares, and position size of 2,000 shares or more.

Table 4 indicates that, consistent with previous results, the differences between losing and winning trades in all three size categories are statistically significant. Trades conducted for fewer than 1,000 shares, however, had an average difference (average losing holding time minus average winning holding time) more than five times greater than trades with a position size of 2,000 shares or more.⁵ Apparently, when these professional traders were trading with the smaller share sizes, they were more willing to take risks than when trading a larger volume because any large price movement has less

of an impact on trading profitability when a small volume is involved. Therefore, the traders were more susceptible to holding losers for prolonged periods while waiting for them to turn around.

Impact on Trading Profits. An obvious indication that the disposition effect is affecting a professional trader is the trader's overall profitability. To examine this issue, we calculated the average absolute price change and average absolute trading profit for all winning and losing roundtrips. If a roundtrip closed out more than one opening transaction, we used a weighted average of the various opening positions (which is similar to our duration calculation).⁶ Table 5 displays the results of this calculation. On average, the traders lost \$0.10 on a losing roundtrip and gained \$0.09 on a winning

Table 5. Performance

| Measure | Mean | Median | Number of Roundtrips |
|--------------------------------|--------------|--------------|----------------------|
| <i>Absolute price change</i> | | | |
| Losing roundtrips | \$ 0.10 | \$ 0.06 | 16,610 |
| Winning roundtrips | <u>0.09</u> | <u>0.06</u> | 36,290 |
| Difference | \$ 0.01 | \$ 0.00 | |
| <i>t</i> -Statistic/Wilcoxon | 6.14 | -1.76 | |
| <i>Absolute trading profit</i> | | | |
| Losing roundtrips | \$100.46 | \$62.50 | 16,610 |
| Winning roundtrips | <u>85.43</u> | <u>54.68</u> | 36,290 |
| Difference | \$ 15.03 | \$ 7.82 | |
| <i>t</i> -Statistic/Wilcoxon | 11.67 | 10.71 | |

Note: See notes to previous tables.

Table 4. Duration by Trade Size

| Trade Size | Mean Duration (seconds) | Median Duration (seconds) | Number of Roundtrips |
|--------------------------------------|-------------------------|---------------------------|----------------------|
| <i>Trade size < 1,000</i> | | | |
| Losing roundtrips | 364 | 108 | 6,374 |
| Winning roundtrips | <u>186</u> | <u>61</u> | 16,640 |
| Difference | 178 | 47 | |
| <i>t</i> -Statistic/Wilcoxon | 10.62 | 32.33 | |
| <i>1,000 ≤ Trade size < 2,000</i> | | | |
| Losing roundtrips | 216 | 99 | 7,499 |
| Winning roundtrips | <u>148</u> | <u>64</u> | 15,197 |
| Difference | 68 | 35 | |
| <i>t</i> -Statistic/Wilcoxon | 8.45 | 27.54 | |
| <i>Trade size ≥ 2,000</i> | | | |
| Losing roundtrips | 188 | 98 | 2,737 |
| Winning roundtrips | <u>153</u> | <u>77</u> | 4,453 |
| Difference | 35 | 21 | |
| <i>t</i> -Statistic/Wilcoxon | 3.12 | 8.84 | |

Note: See notes to previous tables.

roundtrip. The null hypothesis that the \$0.01 difference in means is equal to zero can be rejected at the 1 percent level with a *t*-statistic greater than 6. In terms of absolute trading profits, the difference between the average loss on a losing roundtrip and the average gain on a winning roundtrip of \$15.03 is significant at the 1 percent level with a *t*-statistic greater than 11. Because losers were held longer than winners, losing trades experienced greater price fluctuation, thereby leading to a statistically significant difference in absolute trading profits. But because winning trades outnumbered losing trades, the traders were still profitable.

Suppose a group of traders is indifferent between holding winning and losing trades. Both winners and losers are held for an average absolute price change of \$0.09. In this case, the group saves \$182,378.60 ($\$0.01 \times 18,237,860$ losing closing shares). Alternatively, suppose winning trades are, on average, sold too soon. Then, if both winning

and losing trades occur at \$0.10, the traders save, on average, \$353,377.48 ($\$0.01 \times 35,337,748$ winning closing shares). If the traders cut their losses at \$0.09 and hold the gains for \$0.10, the total profit is \$535,756.08 ($\$182,378.60 + \$353,377.48$) higher.

Are Holding Times Justified?

It is indeed difficult to calculate the true impact of the disposition effect on profitability. The holding periods of some trades may be justified, whereas the holding periods for others are not. One way to estimate whether the holding times for winners and losers are justified is to look at the price and/or trend of the market before and after each roundtrip was executed. To do so, we examined those roundtrips that occurred on the 20 most heavily traded stocks from 9:30 a.m. to 4:00 p.m. These stocks accounted for more than 90 percent of the proprietary trading team's share volume for our sample period.⁷ Using the inside quote file in Nasdaq for the 20 stocks, for each second during the trading day from 8 March through 13 June 2000, we created a file with the existing inside spread. The inside spread is not calculated on Nasdaq for each second during the day; it is updated when a change occurs in either the bid, ask, bid depth, or ask depth. So, for each second that was not accounted for, we filled in the corresponding spread. We then compared the time on each of the 50,358 roundtrip trades (in the 20 most heavily traded stocks) with the corresponding time on the Nasdaq file.

We were not concerned with matching prices between the two datasets (because the traders could be executing on either side of the spread, within the spread, or outside the spread). Our main objective was to determine whether a holding time was justified for winning and losing roundtrips. Therefore, we measured the price on Nasdaq at

time t seconds against the price on Nasdaq before and after the time (at time $t + 15$ seconds, $t - 15$ seconds, $t + 30$ seconds, $t - 30$ seconds, $t + 45$ seconds and $t - 45$ seconds) on each of the 50,358 roundtrips. This process captured the trend of the market before and after each roundtrip. We used the midpoint price $[(\text{Bid} + \text{Ask})/2]$ on Nasdaq at time t and at each of the six time periods to eliminate any complications with the bid-ask spread. Finally, we took the midpoint price at time t and subtracted from it the midpoint price at each time. We calculated results of the price change depending on whether the trader was in a long or short position; the results for winning and losing trades are given in Table 6.

When the traders realized a positive profit on a short trade, on average, the midpoint price continued to decrease (the difference was \$0.0055 at 15 seconds later, \$0.0076 at 30 seconds later, and \$0.0096 at 45 seconds later). Thus, holding the position would have been more advantageous than realizing the profit. Table 6 also shows that, on average, closing out the short position earlier would not have been advantageous. When the traders realized a losing trade on a short position, the price, on average, continued to increase after they covered the position. For example, the midpoint price was \$0.0102 higher 15 seconds later. Traders could have reduced their losses, on average, however, if they had covered their short positions earlier. The pattern is similar for long positions. All price changes are statistically different from zero.

These results are consistent with the disposition effect. The traders are highly profitable, but trading profits could have been even higher if winners had been held longer and losers had been realized sooner.

Table 6. Price Changes before and after Roundtrips
(time in seconds)

| Type of Trade | Roundtrips | Time in Relation to Time t | | | | | |
|-----------------------|------------|------------------------------|------------|------------|------------|------------|------------|
| | | $t - 45$ | $t - 30$ | $t - 15$ | $t + 15$ | $t + 30$ | $t + 45$ |
| <i>Long position</i> | | | | | | | |
| Winning trades | 17,321 | \$0.0424* | \$0.0315* | \$0.0168* | -\$0.0097* | -\$0.0174* | -\$0.0200* |
| Losing trades | 10,218 | -0.0175* | -0.0160* | -0.0091* | 0.0083* | 0.0149* | 0.0189* |
| <i>Short position</i> | | | | | | | |
| Winning trades | 13,925 | -\$0.0255* | -\$0.0189* | -\$0.0104* | \$0.0055* | \$0.0076* | \$0.0096* |
| Losing trades | 8,894 | 0.0261* | 0.0200* | 0.0100* | -0.0102* | -0.0176* | -0.0223* |

*Significantly different from zero at the 1 percent level.

Conclusion

We examined data from a highly profitable proprietary stock-trading team for evidence of the disposition effect—the tendency to realize gains too soon and hold losses too long. Although past research demonstrated this tendency for individual investors, we used a unique dataset to test whether professional traders are susceptible to the same behavioral tendency.

These professional traders held their losing trades much longer than their winning trades. Nevertheless, because they carried out more winning than losing trades overall, the traders were still profitable—earning more than \$1.4 million in intraday trading profits over a 68-day trading period in a downward-trending market. The traders minimized their loss exposure by trading few shares, trading low-priced stocks, or trading during times of low market activity. Yet, they exhibited risky behavior by holding their losing trades too long even under these conditions. Our analysis suggests that the traders sold winners too soon and held losers too long: When traders realized a profitable roundtrip, the price continued to increase for a long position and decrease for a short position. When traders realized an unprofitable roundtrip, they could have lessened the loss if they had sold their long positions and covered their short positions sooner.

These findings have implications not only for proprietary traders but also for other practitioners.

For instance, portfolio managers who suffer from the disposition effect reduce investor returns. As is the case with proprietary traders, portfolio managers are generally considered to have a high level of financial sophistication, they trade the capital of others, and their actions are monitored by their employers. Our findings imply that a fund manager might outperform a standardized benchmark and receive a performance bonus but still produce returns that are lower than they would have been in the absence of the costly disposition effect. Moreover, long-term investors may suffer from the disposition effect as much as the highly skilled traders we studied.

In addition, because active traders affect market prices, those who suffer from the disposition effect are affecting all market participants. For instance, these professional traders accounted for nearly 2 percent of the share volume of Dell and WorldCom during our sample period. The tendency of these traders to refrain from selling losers could have slowed the rate at which negative news about these two companies was translated into prices. The sluggish response of other traders trading on the same signals could have slowed this rate even more.

We would like to thank the CEO and other executives of the U.S. direct-access broker that provided the data for this study. We are also grateful for copyediting services provided by Angelique Johnston and research assistance provided by Giovanni Tosti.

Notes

1. Proprietary traders are not governed by retail margin rules because they are “members,” not customers, of a firm (SEC). In the SEC study, some proprietary traders had leverage positions as high as 10 to 1 during the day. Proprietary trading programs typically engage in a “joint back office” agreement with the clearing broker. Section 17 C.F.R. 240.15c3-1 of the *NASD Manual* (www.cchwallstreet.com/NASD) provides further information on margin rules.
2. We interviewed traders, observed them trading, and collected data at the direct-access brokerage firm.
3. The 91 roundtrips that occurred before the open or after the close were omitted.
4. We were told that each trader could trade/risk anywhere from \$50,000 to \$400,000 during the day. The more skilled traders were allowed the most flexibility in the size of capital traded.
5. We found similar results when we disaggregated trades based on price per share. For instance, on average, losers were held longer than winners by 246 seconds on stocks priced under \$40, 51 seconds on stocks priced between \$40 and \$50, and 44 seconds on stocks priced \$50 and above. All differences are highly significant.
6. For instance, suppose the trader opened up a 1,000-share position in Dell at 9:30:00 a.m. for \$50 and then purchased another 2,000 shares of Dell at 9:35:00 a.m. for \$49. If the next trade was a sell of 3,000 shares of Dell at 9:40:00 a.m. for \$51, the average absolute price change on the roundtrip trade was calculated as \$1.65 [that is, $(1/3 \times \$1.00) + (2/3 \times \$2.00)$].
7. The top 20 stocks are listed on NASDAQ, and 16 of the 20 stocks were in the NASDAQ 100 at the time of the study.

References

- Badrinath, S., and Wilbur Lewellen. 1991. "Evidence on Tax-Motivated Securities Trading Behavior." *Journal of Finance*, vol. 46, no. 1 (March):369–382.
- Constantinides, George. 1984. "Optimal Stock Trading with Personal Taxes: Implications for Prices and the Abnormal January Returns." *Journal of Financial Economics*, vol. 13, no. 1 (March):65–69.
- Coval, Joshua, and Tyler Shumway. 2001. "Do Behavioral Biases Affect Prices?" Working paper, University of Michigan.
- "Direct Access: The Evolution and Growth Continues." 2001. Company report, Keefe, Bruyette & Woods, vol. 39.
- Ferris, Stephen, Robert Haugen, and Anil Makhija. 1988. "Predicting Contemporary Volume with Historic Volume at Differential Price Levels: Evidence Supporting the Disposition Effect." *Journal of Finance*, vol. 43, no. 3 (July):677–697.
- Goldberg, Daniel, and Angel Lupercio. 2003. "Down, but Not Out: Semi-Pro Traders Endure a Third Straight Down Year." Company report, Bear, Stearns & Company (March): www.rushtrade.com/Press/030303.pdf.
- Harris, Lawrence. 1988. "Predicting Contemporary Volume with Historic Volume at Differential Price Levels: Evidence Supporting the Disposition Effect: Discussion." *Journal of Finance*, vol. 43, no. 3 (July):698–699.
- Heisler, Jeffrey. 1994. "Loss Aversion in a Futures Market: An Empirical Test." *Review of Futures Markets*, vol. 13, no. 3:793–822.
- Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decisions under Risk." *Econometrica*, vol. 47, no. 2 (March):263–292.
- Lakonishok, Josef, and Seymour Smidt. 1986. "Volume for Winners and Losers: Taxation and Other Motives for Stock Trading." *Journal of Finance*, vol. 41, no. 4 (September):951–974.
- Locke, Peter, and Steven Mann. 2000. "Do Professional Traders Exhibit Loss Realization Aversion?" Working paper, Texas Christian University.
- Odean, Terrance. 1998. "Are Investors Reluctant to Realize Their Losses?" *Journal of Finance*, vol. 53, no. 5 (October):1775–98.
- Schlarbaum, Gary, Wilbur Lewellen, and Ronald Lease. 1978. "Realized Returns on Common Stock Investments: The Experience of Individual Investors." *Journal of Business*, vol. 51, no. 2 (April):299–325.
- SEC. 2000. "Report of Examinations of Day-Trading Broker-Dealers." Washington, DC: Securities and Exchange Commission.
- Shapira, Zur, and Itzhak Venezia. 2001. "Patterns of Behavior of Professionally Managed and Independent Investors." *Journal of Banking and Finance*, vol. 25, no. 8 (August):1573–87.
- Shefrin, Hershey, and Meir Statman. 1985. "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence." *Journal of Finance*, vol. 40, no. 3 (July):777–790.
- Weber, Martin, and Colin Camerer. 1998. "The Disposition Effect in Securities Trading: An Experimental Analysis." *Journal of Economic Behavior and Organization*, vol. 33, no. 2 (January):167–184.