E C O N O M I C S B U L L E T I N

Buying Winners while Holding on to Losers: an Experimental Study of Investors' Behavior

Anna Dodonova
University of Ottawa

Yuri Khoroshilov
University of Ottawa

Abstract

This paper presents the results of an experimental study aimed to understand how the past stock performance affects investor's desire to buy or sell the stock. It shows that people prefer to buy stocks that performed well in the past. However, when investors must sell one of the stocks they already own, their desire to have their funds invested into the past winner significantly diminishes, which may be due to their reluctance to realize their losses.

This research was supported by University of Ottawa School of Management and Initiation Research and New Development research grants.
Citation: Dodonova, Anna and Yuri Khoroshilov, (2007) "Buying Winners while Holding on to Losers: an Experimental Study of Investors' Behavior." *Economics Bulletin*, Vol. 7, No. 8 pp. 1-8
Submitted: May 18, 2007. **Accepted:** May 22, 2007.
URL: http://economicsbulletin.vanderbilt.edu/2007/volume7/EB-07G10009A.pdf

1. Introduction

This paper presents the results of an experimental study that was designed to test the effect of past realized stock returns on people investment decisions, and, in particular, on decisions involving buying new stock and selling previously owned stock. Currently two theories seek to explain the effect of past stock performance on investment decisions. First, people may believe that stock returns are positively correlated in the short run (which is consistent with empirical studies of Jegadesh and Titman 1993, and Conrad and Kaul 1988 and 1989), and, thus, people want to invest in stocks that performed well in the past ("trend-chasing"). Investors who follow trend-chasing strategies are also known as "momentum investors" or "positive feedback traders". An alternative theory, proposed by Shefrin and Statman (1985) and Schiller (1998), is based on the assumption that investors are loss-averse and as such are reluctant to sell the stock when its price drops below the value at which it was bought. In the case when investors need to reallocate their portfolios or withdraw some funds, such behavior leads to selling stocks that performed well in the past and keeping stocks that performed poorly. As a result, such investors will have more of their funds invested in past losers, i.e., will behave as "contrarian investors".

The empirical evidence of the effect of past stock performance on people's investment decisions is mixed. On one hand, Andreassen and Kraus (1988) report an experimental study where subjects, who were told that stock prices are authentic and were asked to trade at given prices, behaved as trend-chasers. Kumar (2005) looks at the "style-switching" strategies of individual investors. He shows that investors form their demand for a group of assets with similar characteristics (the "style") based on the past performance of those assets and they buy the "styles" that performed well in the past. Ippolito (1992) and Sirri and Tufano (1998) show that mutual fund cash inflows depend positively on the funds' past performance. Schiller (1989) argues that a number of Americans buy stocks for the first time when the market is bullish. Bange (2000), using the survey conducted by the American Association of Individual Investors, shows that individual investors are positive feedback traders and they tend to buy more equity during market run-ups. On the other hand, Shefrin and Statman (1985) and Odean (1998) show that when individual investors decide to sell some of the assets they own, they are reluctant to sell assets that performed poorly and, as a result, they sell assets that performed well.

Although seeming incompatible, these two hypotheses are not. One can notice that, according to the trend-chasing hypothesis, investors expect past winners to continue their favorable performance and, thus, they want to buy more of such stocks. Thus, one can expect trend-chasing behavior to affect the demand for stocks. The loss-aversion hypothesis, on the other hand, affects people's desire to sell, i.e., it affects the supply of stocks.

In this paper we provide experimental evidence that these two theories are not in conflict but rather complement each other. In the experimental study reported in this paper, the same set of subjects were provided with information about historical stock returns and were asked to make selling and buying decisions based on this information. We found that subjects are more willing to invest in stocks that performed well in the past and which they do not own

yet than to keep past winners and sell past losers when investors have to sell some of the stocks they already own.

2. The Design of the Experiment

Our experimental study consisted of 3 rounds: Preliminary Round, Round 1, and Round 2. The entire study was conducted using e-mail. The subjects of our study were undergraduate students whose compensation for participation in the study was set as a function of the relative performance of their investment portfolio, where the average payment was set to $20 per student. The design of the experiment was as follows:

Preliminary Round:
On the first day of experiment (Saturday) each subject was assigned two randomly chosen stocks from fifteen out of the thirty stocks included into the Dow Jones Industrial Average (DJIA) index[1]. Each subject was assumed to invest 500ED (Experimental Dollars) into each stock. Subjects were given stock names and were told that they could conduct any research they wish. They were also given the complete details about future rounds and their compensation formula (as described below)[2].

Round 1:
Two weeks later (on Saturday morning), each subject was given the relative returns on the two stocks he/she owned (relative to the average return on portfolios of all students participating in the experiment) and was asked to sell one of the stocks. They were required to submit their decision by the end of the weekend. The money generated by this sale was kept in the subject's accounts as cash until the next round

Round 2:
Two weeks later (on Saturday morning), each subject was presented with a pair of randomly chosen stocks from the remaining fifteen stocks from the DJIA index[3] that were not used in Round 1. Subjects were asked to invest all the cash they have in their accounts into one of the two stocks they were presented with. They were required to submit their decision by the end of the weekend. Two weeks later all subjects' portfolios were closed.

Compensation formula:
The total reward for all subjects was set to TC=$20×N, where N is the number of subjects participating in the experiment. The value of each subject's portfolio at the end of the experiment was transferred into "Payment units" (PU) according to the following formula: PU = ED – min(ED), where ED is the value of the subject's portfolio in ED at the end of the

[1] The complete list of these stocks is as follows: 3M Co., Altria Group Inc., American International Group Inc., Boeing Co., Citigroup Inc., E.I. DuPont de Nemours & Co., General Electric Co., Hewlett-Packard Co., Honeywell International Inc., International Business Machines Corp., JPMorgan Chase & Co., Merck & Co. Inc.. Pfizer Inc., United Technologies Corp., Wal-Mart Stores Inc.
[2] See Appendix for the exact instructions given to the subject.
[3] These stocks are: Alcoa Inc., American Express Co., AT&T Inc., Caterpillar Inc., Coca-Cola Co., Exxon Mobil Corp., General Motors Corp., Home Depot Inc., Intel Corp., Johnson & Johnson, McDonald's Corp., Microsoft Corp., Procter & Gamble Co., Verizon Communications Inc., Walt Disney Co.

experiment, and min(ED) is the minimum portfolio value of all subjects participating in the experiment. Based on the value of his/her portfolio, each subject *i* was paid $PU_i \times TC \Big/ \sum_{j=1}^{N} PU_j$ dollars.

In total, 81 subjects participated in Round 1, and 72 of them participated in Round 2. The remaining 9 subjects did not submit their investment decisions for Round 2 in time.

3. Results

Out of 81 subjects who participate in the first round of experiment, 42 subjects (or 52%) decided to sell past losers and to keep the stock with better realized return. Out of 72 subjects who participated in the second round, 52 subjects (or 72%) decided to buy past winners. The difference of 20% is statistically significant at the 1% significance level (using two-sample test for the difference in proportions). This result also holds for a refined sample where the 9 subjects who dropped from the experiment after the first round are excluded from the sample. (In the refined sample 38 out of 72 subjects, or 53%, decided to sell past losers and to keep the stock with better realized return. This figure is significantly lower that the proportion of subjects who bought past winners in the second round at the 2% significance level.)

Table 1

	α	β_1	β_2
Logit model for the entire dataset	-0.035 (0.838)	5.607 (0.297)	16.454 (0.060)
Logit model for the refined dataset	-0.010 (0.953)	4.908 (0.391)	17.098 (0.057)
Probit model for the entire dataset	-0.026 (0.802)	3.516 (0.296)	9.419 (0.064)
Probit model for the refined dataset	-0.012 (0.912)	3.058 (0.393)	9.827 (0.061)

To test the robustness of our results, we have estimated the logit and probit models of the form

$$p_1 = F_{\log it\,/\,probit}\left(\alpha + \beta_1 \times (r_1 - r_2) + \beta_2 \times ind \times (r_1 - r_2)\right), \qquad (1)$$

where p_1 is the probability to keep (in Round 1) or to invest in (in Round 2) the first stock in any given pair, r_1 and r_2 are past realized returns on the first and the second stocks in the corresponding pair, and *ind* is an indicator function which is equal to 0 for the first round and is equal to 1 for the second round. Table 1 presents the estimation results (with p-value given in parenthesis) for both: the entire and refined datasets. As it can be seen from the table, all

estimates of β_2 are positive and significant at the 10% significance level, which indicates that the desire to have funds invested in stocks with higher past performance is higher in situations when investors make buying decisions than when they make selling decisions.

To test further the robustness of our results, we looked at investors who cannot be identified as trend-chasers or contrarian investors, i.e., at those who (i) kept past winners in Round 1 and bought past loser in Round 2, or (ii) kept past losers in Round 1 and bought past winners in Round 2. In total, there are 34 such investors. Consistent with our main result, 71% of such investors (24 out of 34) kept past losers in Round 1 and bought past winners in Round 2. This percentage is significantly different from 50% at the 3% significance level (using one-sample proportion test).

4. Conclusion

The experimental study presented in this paper document the effect that the past stock performance has on investor's desire to buy or sell the stock. It shows that people are more willing to buy the stock that performed well in the past. In addition, their desire to have funds invested into the past winner is significantly lower if they already own the stock and must sell some other stocks in order to keep the past winner. This result is consistent with both "trend-chasing" and "holding on to losers" hypotheses.

5. Appendix

Initial e-mail

The following e-mail was sent to all students who replied to campus postings and expressed their interest in the experiment:

Thank you for your interest in our experimental study of investment behavior. Below you will find the timeline and basic procedures of our experiment.

Timeline:
The experiment will be conducted in 3 steps. All communication will be done by e-mail

1) *On Saturday, (specific date is stated), each of you will be given a portfolio of two stocks with ED500 (500 Experimental Dollars) invested in each of them. The choice of stocks may be different for different students and will be assigned randomly.*
2) *On Saturday (specific date is stated, two weeks from the date stated in step 1 above), you will be asked to sell one of the stocks. You must submit your selling decision by 11:59pm on Sunday. The cash generated from this sale will be kept on your account until the next step.*
3) *On Saturday (specific date is stated, two weeks from the date stated in step 2 above), you will be asked to invest cash from you account into one of the stocks from the list of stocks offered at that time. You must submit your selling decision by 11:59pm on Sunday.*

4) *On Saturday (specific date is stated, two weeks from the date stated in step 3 above) your account will be closed and both stocks (one kept from Step 1 and the other bought in Step 3) will be sold at the current market price. The value of your portfolio (in ED) will determine you final payoff according to the following formula:*

Formula for your payoff:

The average payoff will be $20 per student; however, your exact payoff may be lower or higher depending on your portfolio performance. In general, you should expect to receive somewhere between $5 and $35. If you will not submit your investment decision on-time, we will assume that you want to withdraw from the experiment, in which case you will not receive any compensation.

The total reward for all students in this experiment will be TC=$20×N, where N is the number of students participating in the experiment The value of your portfolio will be transferred into "Payment units" (PU) according to the following formula: PU = ED – min(ED), where ED is the value of your portfolio in ED at the end of experiment, and min(ED) is the minimum portfolio value of all students participating in the experiment. You compensation will be equal to $PU \times \frac{TC}{\sum_{j=1}^{N} PU_j}$ *dollars.*

Note that your compensation depends on how well you did relative to the other students, not on the absolute value of your portfolio.

Preliminary round

Thank you very much for participating in my experimental research in investor's behavior. This is the first round of the experiment. For this round, each of you will be given 2 randomly chosen stocks from a set of 15 socks that are included into the Dow Jones Industrial Average (DJIA) index and you are obligated to invest 500 experimental dollars (ED) into each of these two stocks. The attach Excel file specifies wich pair of stocks is allocated foe each participant.(the data is sorted based on your e-mail address).

You are encouraged (but not required) to gather information about these stocks. For example, you may find historical performance and basic financial data at www.yahoo.com (click on Yahoo finance or just go to http://biz.yahoo.com/r/), www.etrade.com, or www.ameritrade.com. For your convenience, the ticker (or "stock symbol") for each stock is also provided.

NO ACTION IS REQUIRED AT THIS TIME. In two weeks from now you will be asked to sell one of your stocks and you will keep the remaining stock for four more weeks.

Round 1

Thank you very much for participating in my experimental research in investor's behavior. This is the second round of the experiment. Two weeks ago each of you were provided with two stocks (assigned at random from 15 of 30 stocks that are included into the DJIA index). It is assumed that you invested 500 ED (experimental dollars) into each of the two stocks. Since your final payoff depends on the relative performance of your portfolio relative to the portfolios of other participants, the realized relative performance of each of the stocks is given in the attached Excel file. An increase in the relative stock value (positive relative return) means that you have made money on that stock; a decrease in the relative stock value (negative return) means that you have lost money on that stock. Now you need to sell one of the stocks that you own and the proceeding from that sale will be kept on your account (in cash) till the next round.

You are encouraged (but not required) to gather information about these stocks. For example, you may find historical performance and basic financial data at www.yahoo.com (click on Yahoo finance or just go to http://biz.yahoo.com/r/), www.etrade.com, or www.ameritrade.com. For your convenience, the ticker (or "stock symbol") for each stock is also provided.

You must submit your selling decision by e-mail no later than 11:59pm on Sunday (tomorrow). Please, put "round 2" into the subject of your e-mail and put your name, investor number, and stock name and number of the stock you want to sell.

Round 2

Thank you very much for participating in my experimental research in investor's behavior. This is the last round of the experiment. So far each of you holds shares of one company and cash form the sale that you made two weeks ago. Now, you need to invest your cash into a new company. Each of you is given a choice between two companies (assigned at random from other 15 of 30 stocks that are included into the DJIA index). The name of those stocks and their relative performance over the last two weeks is given in the attached file. You do not own neither of those stocks yet, but you need to decide which one you would like to buy.

You are encouraged (but not required) to gather information about these stocks. For example, you may find historical performance and basic financial data at www.yahoo.com (click on Yahoo finance or just go to http://biz.yahoo.com/r/), www.etrade.com, or www.ameritrade.com. For your convenience, the ticker (or "stock symbol") for each stock is also provided.

You must submit your selling decision by e-mail no later than 11:59pm on Sunday, (tomorrow). Please, put "round 3" into the subject of your e-mail and put your name, investor number, and the name of the stock that you want to ***buy****.*

You final payment will be calculated based on the value of your portfolio two weeks from today.

References

1. Andreassen, P. and S. Kraus (1988) "Judgmental Extrapolation and the Silence of Change" *Journal of Forecasting*, 9, 347-372.
2. Bange, M. (2000) "Do the Portfolios of Small Investors Reflect Positive Feedback Trading" *The Journal of Financial and Quantitative Analysis*, 35, 239-255.
3. Conrad, C., and G. Kaul (1988) "Time-Variation in Expected Returns: *Journal of Business*, 61, 409-425.
4. Conrad, C., and G. Kaul (1989) "Mean-Reversion in Short-Horizon Expected Returns" *Review of Financial Studies*, 2, 225-240.
5. Ippolito, R. (1992) "Consumer Reactions to Measures of Poor Quality: Evidence from the Mutual Fund Industry" *Journal of Law and Economics*, 35, 45-70.
6. Kumar, A. (2005) "Style Switching and Stock Returns". Working Paper, University of Notre Dame.
7. Odean, T., (1998) "Are Investors Reluctant to Realize Their Losses?" *Journal of Finance*, 53, 1775-1798.
8. Schiller, R. (1998) "Portfolio Insurance and Other Investors Fashions as Factors in the 1987 Stock Market Crash" *NBER Macroeconomic Annual*, 287-298.
9. Schiller, R. (1989) "Human Behavior and the Efficiency of the Financial System" NBER working paper 6375.
10. Shefrin, H. and M. Statman (1985) "The Disposition to Sell Winners too Early and Ride Losers Too Long: Theory and Evidence" *Journal of Finance*, 40, 777-792.
11. Sirri, E. and P. Tufano (1998) "Costly Search and Mutual Fund Flows", *Journal of Finance*, 53, 1589-1622.