
REVIEW of BUSINESS & FINANCE STUDIES

VOLUME 7

NUMBER 2

2016

CONTENTS

Investor's Order Aggressiveness: An Experimental Study of the Impact of Regret	1
Maria Veronica Irine Herdjiono, Maemunah Soeharto, Fitri Ismiyanti & Made Narsa	
A Chinese Kandi Recipe: One Part Sustainability and One Part Entrepreneurial Spirit	11
William E. Bealing, Jr. & Edward Pitingolo	
Foreign Direct Investment, Corporate Social Responsibility and Poverty Alleviation: Evidence from African Countries	21
Efiong Akwaowo & Andree Swanson	
The Role of Finance in Quality Principles	35
Daniel H. Boylan	
Target Security: A Case Study of How Hackers Hit the Jackpot at the Expense of Customers	41
Dorothy A. McMullen, Maria H. Sanchez & Margaret O'Reilly-Allen	
South Stream: European Nation State Building in the Putin and Post-Putin Era	51
Benedict E. DeDominicis	
The Effects of Foreign Bank Entry on Financial Performance of Domestic-Owned Banks in Ghana: A Comment	71
Isaac Boadi	
The Growing Importance of Integrated Reporting for Corporate Social Responsibility	75
Kathleen M. Wilburn & H. Ralph Wilburn	
An Introduction to Linking Theory	91
Janet L. Walsh	
Anti-Counterfeiting Technologies in Albanian Food Industry	101
Kreshnik Vukatana, Kozeta Sevrani & Elira Hoxha	

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This Journal is the result of the collective work of many individuals. The Editors thank the members of the Editorial Board, ad-hoc reviewers and individuals that have submitted their research to the Journal for publication consideration.

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ISSN 2150-3338 (print) and ISSN 2156-8081 (online)



INVESTOR'S ORDER AGGRESSIVENESS: AN EXPERIMENTAL STUDY OF THE IMPACT OF REGRET

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ABSTRACT

This study examines the influence of regret experience and anticipation regret in deciding order aggressiveness when investors buy and sell. This study is an experimental research design with a mix between and within subjects (Experienced Regret-due to act versus Experienced Regret-due to not act) X (Anticipated Regret versus No anticipated regret). This study involved 40 undergraduate students. The results showed that experienced regret and anticipated regret impact order aggressiveness. Investors respond to the experience of regret and anticipation of the same emotions by showing risk averse behavior (low aggressiveness) and risk seeking behavior (high aggressiveness) when selling and buying.

JEL: G110

KEYWORDS: Aggressiveness, Anticipated, Experienced, Order, Regret

INTRODUCTION

Traditional finance assume that agents are rational and stock prices in capital markets reflect fundamental values, consistent with Expected Utility Theory and consistent with the Efficient Market Hypothesis. However, in capital market, investors are not fully rational. Those differences occur because there are behavioral aspects from investors and Expected Utility Theory fails to explain decisions taken by investors (Kahneman and Tversky 1979). The deviation on capital markets which is not explained by Expected Utility Theory and the Efficient Market Hypothesis encourages development of behavioral finance which examines the behavioral aspect of investors in capital markets. In capital markets, investors have to make decision when buying and selling stocks. There are two types of orders that can be submitted to capital markets, limit orders and market orders. A limit order is an order to buy/sell a pre-specified quantity at a pre-specified price that does not improve on the best opposing quote. A market order strategy is an order to buy/sell a pre-specified quantity at the best available price (Verhoeven et al., 2004).

Investors can decide on various level of order aggressiveness. Biais et al. (1995) propose a scheme that classifies orders according to their price and position in the order book. An aggressive order is an order which is allowed to "walk up" or "down" the book order. The least aggressive order is a cancellation where a pending limit order is removed from the book. Some researches argue what determines the order strategy is price change (Foucault 1999; Handa and Schwartz, 1996). A temporary change of stock price is the main cause the order selection. High price volatility encourages investors to choose a limit order rather than market order (Foucault 1999; Ahn et al. 2001; Bae et al. 2003). The overall investment decision is a series of decisions, in which experience and anticipation emotion influence the investor in decision making (Lee et al. 2009). One emotion that influence decision making is regret. Regret arises after knowing the result of an unchosen decision is better than the result of the chosen decision (Bell 1982). Regret also arises when

a previous decision is not justified (Connolly and Zeelenberg 2002). Regret Theory states that regret increases because of evaluating performance by counterfactual. It is evaluating results of experience by imagining what might occur now with another unmade decision, and then comparing it with the result gained now (Bell 1982). Someone who reckons regret in decision making will behave in regret reluctance which is behaving in certain way to lessen regret (Zeelenberg *et al.* 1996; Zeelenberg and Beattie 1997). This study is an empirical analysis of the impact of regret on order aggressiveness. To test this, a computer stock-market game was designed. Two round experiments and 16 sessions are used to expand our understanding. Overall, our results suggest that experience and anticipated regret effect order aggressiveness. This conclusion implies the investor who experiences regret due to not acting will anticipate the same emotion with a high aggressiveness order in the next buy and selling decision. Investors who experience regret due to acting will anticipate the same motion with a low level aggressiveness in the next selling decision and a high level aggressiveness in the next buying decision. The rest of the paper is structured as follows. The next section describes the relevant literature on regret and order aggressiveness. Next, we will discuss the data and methodology used in the study. The results are presented in the following section. The paper closes with some concluding comments.

LITERATURE REVIEW

Behavioral Aspects in Order Aggressiveness

The behavioral approach in explaining order aggressiveness was examined by Bian *et al.* (2012); Deuskar (2011) and Tykocinski *et al.* (2004). Investors are more likely to change their trading strategy after experiencing regret (Deuskar *et al.* 2011). The influence of regret in following order decisions is stronger if the prior order was executed rather than unexecuted (action leads to more regret than inaction). The decision influenced by regret produces low return and continues to display poor performance for at least 3 months (Deuskar *et al.* 2011). Various behaviors are displayed by investors in selling and buying stock. Investors show disposition effect behavior, which is selling stocks that give return (Bian *et al.* 2012). Investors being more aggressive tend to sell when the price up and investors tend to be unaggressive when price is down. At a certain point, aggressiveness in selling declines toward shares that give benefits. Aggressiveness that is disposed to decline was explained as house money effect behavior. After investors got some return, the investor is more willing to take risk. Unaggressive orders can also be categorized as a form of decision postponement caused by putting in a lower bid price or higher offer price than the best bid and the best offer. In this case the buy and sale realization will take time. A postponement in decision making is one form of decision avoidance (Anderson 2003).

Regret

Regret is an emotional response to what could have happened had the individual made a different decision as opposed to what actually happened (Shefrin and Statman, 1985). A theory that explains feeling regret is Regret Theory (Loomes and Sungden, 1982; Bell 1982). Someone will feel regret if he compares “what is” and “what might have been and realize that “what might have been” is better than “what is”. This is a thinking mechanism known as counterfactual thinking. Experiencing regret makes someone anticipate the same emotion in the next decision or will anticipated regret. Kahneman and Tversky (1982) compared regret due to acts and nonacts. They find that subjects reported greater regret for acting than for not acting. People anticipated regret if they get full information about the outcome from a decision they take and don't take. In order strategy, experience regret and anticipated regret effect order aggressiveness since investors are not fully rational. Based on our theoretical and empirical review as well as issues presented, the hypotheses in this study are: Based on the counterfactual thinking system, someone will experience regret more deeply when his decisions show poor outcome (Nicolle *et al.* 2011). Deciding to act while continuing to transact intensely on stocks with high volatility is the form of regret anticipation. Investor will act aggressively because the investor feels if on the next decision he does not act aggressively, and the outcome

is poor, the investor will regret more. Investors who anticipate regret will be more aggressive than investors who don't anticipate regret both in buying and selling decisions. The theoretical and empirical results discussed lead us to the following hypothesis:

H1: When transacting on stock with high volatility, some investors experience regret due to acting. On the following decision the investor anticipates regret and will use an order strategy with a high-level aggressiveness in both buying and selling decisions.

Investors compare which regret they feel deeper about to determine whether he sells immediately. But in reality, the price is still increasing, or he does not sell immediately. By positioning the price, which is getting further from the best offer, to anticipate regret, the investor shows an increase of commitment. Someone steps up his commitment if withdrawal decisions lead to regret later rather than a decision of persistence (Wong and Kwong, 2007). The decision to be aggressive in a buying decision points out that the investor wants to be more intense in his decisions. A poor outcome can result from not acting which results in regret. This results in him changing his decision to be more intensive in making transactions on stocks traded. The decision to change his strategy falls under regret regulation theory. This theory states that in managing regret, someone will look at options which are different from the previous decision (Pieters and Zeelenberg 2007). Based on previous theoretical and empirical results we examine the hypothesis:

H2: When transacting on stocks with high volatility, investors who experience regret due to not acting, and on the following decision anticipates regret, will use an order strategy with low-level aggressiveness in selling decisions and high-level aggressiveness in buying decisions.

DATA AND METHODOLOGY

Experiment Design

This research uses a 2x2 experimental design. Manipulation is done toward two factors with two levels. These factors are regret experience factor (act and nonact) and regret anticipation factor (anticipate regret and not anticipate regret). The experiment was conducted by using a computer based stock market game. In this research, the within variable treatment is regret anticipation. The decision to act and not to act is the participants' between variable. Table 1 shows the 2x2 experiment design. Regret experience is divided into two components: regret experience due to acting and regret experience due to not acting. Regret anticipation is divided into two components: anticipates regret and does not anticipate regret. This experiment design is post test only control group. In this design subjects are randomly selected and assigned to two groups. Experimental study is using within subject and between subject designs. Between subject design compares the influence of the same treatment on different participants. Within subject design compares the influences of the different treatment to the same participants. To analyze this hypothesis we computed independent t-tests between Object 1 (O_1) for hypothesis 1 and Object 3 (O_3) for hypothesis 1 and independent t-test Object 2 (O_2) and Object 4 (O_4) for hypothesis 2.

Treatment

Treatment used for regret experience is shaped by conditioning the presence and absence of opportunity to enter a price when doing purchase and selling transaction. In this scenario, regret experience due to not acting arises when participants don't have the opportunity to fill at a bid/ask price. Regret experience due to acting arises when participants have the opportunity to fill at a bid/ask price. The treatment used for regret anticipation is through the treatment of full feedback or partial feedback. In this scenario, the participant anticipates regret if they get information about stock performance for stocks they sell/buy or they don't sell/buy (full feedback). They will not anticipate regret if they only get information about stocks that they sell/buy. This treatment refers to the research done by Raeva and Van dijk (2009).

Table 1: Research Experiment Design

Annotation		Regret Experience	High Volatility
Regret Anticipation	Anticipate Regret	Due to act (Commission)	O ₁
		Due to Nonact (Omission)	O ₂
	Do Not Anticipate Regret	Due to act (Commission)	O ₃
		Due to Nonact (Omission)	O ₄

Table 1 shows the 2x2 design on the research. Regret experience is divided two classes, regret experience due to acting and regret experience due to not acting. Regret anticipation is divided two classes, anticipate regret and do not anticipate regret.

Participant

Participants in the trading game are undergraduate students who were recruited from a finance management class. They were randomly assigned to one of two conditions of experience regret (omission and commission).

Trading Game

We conducted a 2 round and 16 session experimental study. We displayed 10 data price movements of 20 companies. Every session needed 2 minutes. The scenario for round 1 (experience regret due to act) was as follows:

Session 1 (Buy): You should buy 10 of 20 stocks by filling in a bidding price. At the end of this session you will get information about stock performance of firms that you buy. You realize a loss if the recent price is below your buying rate, and you realize a gain if the recent price is over your buying rate.

Session 2 (Buy): You should buy 20 stocks by filling in your bidding price.

Session 3 (Buy): You should buy 10 of 20 stocks by pushing a bidding price. At the end of this session you will get information about the performance of stocks that you buy and you do not buy. You realize a loss if the recent price is below your buying rate, and you realize a gain if the recent price is over your buying rate. For stock you don't buy, you realize a loss if the recent price goes down and you realize a gain if the recent price goes up.

Session 4 (Buy): You should sell buy 20 stocks by fill in your bidding price.

Session 5 (Sell): You have 20 stocks and now you should sell 10 of 20 by filling in an asking price. You can decide at what level of price you want to sell. At the end of the session you will get information about the recent price of stocks that you sell. You realize a loss if the recent price is over your selling rate, and you realize a gain if the recent price is below your selling rate.

Session 6 (Sell): You should sell 20 stocks you have by filling in your asking price.

Session 7 (Sell): You have 20 stocks and now you should sell 10 of 20 by filling in the asking price. You can decide at what level of price you want to sell. At the end of the session you will get information about the recent price of stocks that you sell and stocks that you don't sell. You realize a loss if the recent price is over your selling rate, and you realize a gain if the recent price is below your selling rate. For stocks that you don't sell, you realize a loss if the price of a stock that you have goes down and realize a gain if the price gos up.

Session 8 (Sell): You should sell 20 stocks you have by filling in your asking price.

The scenario for round 2 (experience regret due to not acting):

Session 1 (Buy): You should buy 10 of 20 stocks by pushing the “buy” button. At the end of this session you will get information about the performance of stocks that you buy. You realize a loss if the recent price is below your buying rate, and you realize a gain if the recent price is over your buying rate.

Session 2 (Buy): You should buy 20 stocks by filling in your bidding price.

Session 3 (Buy): You should buy 10 of 20 stocks by pushing the “buy” button. At the end of this session you will get information about the performance of stocks that you buy and you do not buy. You realize a loss if the recent price is below your buying rate, and you realize a gain if the recent price is over your buying rate. For stocks you don’t buy, you realize a loss if the recent price goes down and you realize a gain if the recent price goes up.

Session 4 (Buy): You should buy 20 stocks by filling in your asking price.

Session 5 (Sell): You have 20 stocks. Now you should sell 10 of 20 by pushing the “sell” button. You can decide at what price level you want to sell. At the end of the session you will get information about the recent price of stocks that you sell. You realize a loss if the recent price is over your selling rate, and you realize a gain if the recent price is below the selling rate.

Session 6 (Sell): You should sell 20 stocks you have by filling in your asking price.

Session 7 (Sell): You have 20 stocks and now you should sell 10 of 20 by push the “sell” button. You can decide the price level at which you want to sell. At the end the session you will get information about the recent price of stocks you sell and stocks you don’t sell. You realize a loss if the recent price is over your selling rate. You realize a gain if the recent price is below your selling rate. For stocks that you don’t sell, you realize a loss if the price of stock that you have goes down and realize a gain if price goes up.

Session 8 (Sell): You should sell 20 stocks you have by filling in your asking price.

Data

Data were collected from the trading game described above. Order aggressiveness refers to research done by Ranaldo (2004), Hall and Hautsch (2006) who determine the high bid price for purchase and low ask price for sale. Order aggressiveness is counted using this formula:

$$\text{Bid Aggresiveness Order} = \text{Log price best bid} - \text{log price incoming bid order} \quad (1)$$

$$\text{Offer Aggresiveness Order} = \text{Log price best ask} - \text{Log price incoming ask order} \quad (2)$$

In this case log price best bid/ask is a computer simulated price and price incoming bid/ask order is the price that participants fill in as part of the trading game. To test Hypothesis 1 we compare data that were collected in round 1 session 2 and 4 for bid aggressiveness orders. We compare data in round 1 session 6 and 8 for offer aggressiveness orders. To test Hypothesis 2 we compare data collected in round 2 session 2 and 4 for bid aggressiveness orders. We compare data in round 1 session 6 and 8 for offer aggressiveness orders. We have 400 data points for each session (20 bid/offer price of stock for 20 participants). Table 2 and 3 show the average order aggressiveness for each participant.

Table 2: Order Aggressiveness of Investors Who Experience Regret Due to Acting

Investor	Buy		Sell	
	(1)	(2)	(3)	(4)
	No Anticipate (Round 1 Session 2)	Anticipate (Round 1 Session 4)	No Anticipate (Round 1 Session 6)	Anticipate (Round 1 Session 8)
1	-0.004271	-0.007539	0.001143	0.002221
2	-0.005188	-0.007566	0.003443	0.003975
3	-0.003061	-0.005549	0.001660	0.007030
4	-0.005012	-0.006656	0.004558	0.005181
5	-0.005251	-0.007764	0.002741	0.006839
6	-0.006477	-0.011795	0.001829	0.007893
7	-0.005252	-0.010034	0.002385	0.008904
8	-0.002895	-0.008286	0.004539	0.003392
9	-0.005476	-0.008402	0.005878	0.002439
10	-0.004051	-0.009158	0.002348	0.004951
11	-0.006313	-0.008067	0.002059	0.004458
12	-0.005247	-0.010651	0.003979	0.005238
13	-0.001687	-0.009939	0.001961	0.005366
14	-0.003021	-0.007997	0.002163	0.004462
15	-0.004283	-0.007979	0.001944	0.006976
16	-0.005156	-0.008052	0.002960	0.004316
17	-0.007536	-0.009324	0.004759	0.004267
18	-0.008445	-0.010232	0.003351	0.007129
19	-0.005280	-0.008237	0.001471	0.006936
20	-0.006542	-0.010254	0.001619	0.008067
Average	-0.005022	-0.008674	0.002840	0.000550

The table shows average bid and offer order aggressiveness of 20 investors who experience regret due to acting. The data was taken from transactions at round 1 session 2, 4, 6 and 8. Column 1 shows the investor's number, column 2 shows bid order aggressiveness of investors who do not anticipate regret, column 3 shows bid order aggressiveness of investors who anticipate regret, column 4 shows offer order aggressiveness of investors who do not anticipate regret, column 5 shows offer order aggressiveness of investors who anticipate regret.

Table 3: Order Aggressiveness of Investors Who Experience Regret Due to Not Acting

Investor	Buy		Sell	
	(1)	(2)	(3)	(4)
	No Anticipate (Round 2 Session 2)	Anticipate (Round 2 Session 4)	No Anticipate (Round 2 Session 6)	Anticipate (Round 2 Session 8)
1	-0.002625	-0.007766	0.006049	0.004562
2	-0.004036	-0.007532	0.007546	0.005202
3	-0.005166	-0.00851	0.007451	0.002871
4	-0.010472	-0.005497	0.006356	0.002003
5	-0.007041	-0.010792	0.008952	0.005062
6	-0.005161	-0.009623	0.009626	0.002871
7	-0.009316	-0.005352	0.006392	0.003921
8	-0.007233	-0.007433	0.006489	0.001649
9	-0.006022	-0.005645	0.006449	0.002643
10	-0.003664	-0.010650	0.006347	0.002637
11	-0.007227	-0.009656	0.005286	0.003943
12	-0.005969	-0.008384	0.006637	0.003663
13	-0.004989	-0.008412	0.006923	0.001909
14	-0.007092	-0.008351	0.005268	0.002834
15	-0.006999	-0.009455	0.008425	0.002734
16	-0.004991	-0.010760	0.005343	0.003727
17	-0.008115	-0.007461	0.006854	0.005031
18	-0.005744	-0.008668	0.008499	0.003045
19	-0.007101	-0.009486	0.008636	0.003276
20	-0.003909	-0.006393	0.010256	0.00288
Average	-0.006144	-0.008291	0.007189	0.003323

The table shows average bid and offer order aggressiveness of 20 investors who experience regret due to not acting that anticipate and do not anticipate regret in the next decision. The data was taken from transactions at round 2 session 2, 4, 6 and 8. Column 1 shows the investor's number, column 2 shows bid order aggressiveness of investors who do not anticipate regret, column 3 shows bid order aggressiveness of investors who anticipate regret, column 4 shows offer order aggressiveness of investors who do not anticipate regret, column 5 shows offer order aggressiveness of investors who anticipate regret.

RESULTS AND DISCUSSION

Independent t-tests were used to test Hypothesis 1 and 2. Table 4 displays the investor’s average order aggressiveness in buying and selling transactions who experience regret due to acting and not acting. Table 4 also displays the results of independent t-tests of Hypothesis 1 and 2. In selling decisions, for investors who experience regret due to acting and in the next decision does not anticipate regret the average order aggressiveness is 0.00284. For investors who anticipate the same emotion, the average order aggressiveness is 0.00550. In buying decisions, for investors who experience regret due to acting and in the next decision do not anticipate regret, the average order aggressiveness is -0.00502. For investors who anticipate the same emotion, the average order aggressiveness is -0.00867. In selling decisions, investor who experience regret due to not acting, and in the next decision do not anticipate regret, the average order aggressiveness is 0.00719. For investors who anticipate the same emotion, the average order aggressiveness is 0.00332. In buying decisions, investors who experience regret due to acting, and in the next decision do not anticipate regret, the average order aggressiveness is -0.00614. For investors who anticipate the same emotion, average order aggressiveness is -0.00829.

Table 4: Independent T-Test of Investor’s Order Aggressiveness Who Experience Regret Due to Acting and Not Acting

Transaction	No Anticipate Regret	Anticipate Regret	T-Statistic
Panel A: Order Aggressiveness Who Experience Regret Due to Act			
Sell	0.00284	0.00550	-5.194***
Buy	-0.00502	-0.00867	7.317***
Panel B: Order aggressiveness Who Experience Regret Due to Non-act			
Sell	0.00719	0.00332	-9.701***
Buy	-0.00614	-0.00829	-3.064***

*This table shows average order aggressiveness of investors who experience regret due to acting (Panel A) and not acting (Panel B) in selling and buying decisions. The fourth column reports t-statistic. *** indicate significance at the 1 percents.*

Table 4 Panel A shows independent t-test outcomes of sale transactions. Aggressiveness level implies that an investor who anticipates regret has a higher aggressiveness level with a significant difference compared to an investor who does not anticipate regret ($t = -5.194$; $sig. = 0.000$). The independent t-test outcome of purchase transaction’s aggressiveness level implies that an investor who anticipates regret has a significantly higher aggressiveness level than the investor who does not anticipate regret ($t = 7.317$; $sig. = 0.000$). The result of the first hypothesis test implies that investors who transact on stocks with high volatility, after previously experiencing regret due to acting and on the following opportunity anticipate regret, will use an order strategy with high aggressiveness in selling and purchasing decisions.

The behavior of an investor who sells his stock immediately after a price rise and fall, based on Regret Theory, is when doing transaction, the investor faces two choices that realize the expected utility from return received and expected utility from regret (Qin, 2012). A decision to leave the market will produce smaller regret than the decision to continue transactions. As a result, when facing confusion, the investor will prefer to sell his stocks and not do transactions. Therefore, to anticipate regret, investors will prefer to sell stock using an aggressive order. The aggressiveness behavior while purchasing can be explained by two arguments: regret anticipation due to postponement of risk and feedback expectation. In purchasing decisions, aggressive order strategy will reduce postponement risk. Thus, to anticipate regret of postponement risk, investors use an aggressive order strategy. Feedback from unmade decisions can carry expectations which leads someone to behave as a risk seeker (Zeelenberg 1999). Expectations can be a trigger of counterfactual thinking when the outcome gained is not what was expected (Sanna and Turley, 1996). Someone who cannot get what he expected is encouraged to think upward counterfactual, looking at the others better decision’s outcome, so someone will feel regret.

Emotion can also emerge when looking at the chance to realize a return. Therefore, order aggressiveness while purchasing is inseparable from the presence of investor expectations toward stocks with high volatility that could give a high return in a short time. Table 4 panel B shows independent t-test outcomes of sale transaction's aggressiveness level. The results imply that an investor who anticipates regret has a significantly higher aggressive level than the investor who does not anticipate regret ($t = -9.701$; sig. = 0.000). Independent t-test outcomes of purchase transaction's aggressiveness level implies that an investor who anticipates regret has a significantly higher aggressiveness level than the investor who does not anticipate regret ($t = -3.064$; sig. = 0.004). The result of second hypothesis test implies that investors who transacts on stocks with high volatility, after previously experiencing regret due to not acting, and on the following opportunity of anticipating regret, will use an order strategy with low aggressiveness in selling decisions and an order strategy with high aggressiveness in purchasing decisions.

More aggressive behavior during purchasing can be explained. The poor outcome gained because of a small effort makes someone regret more (Van Dijk *et al.* 1999). Regret is closely related to the sense of responsibility toward decision made. The greater sense of responsibility for the decision made, the greater the regret will be. Not acting shows that an investor does not make a big effort in doing transactions. If the outcome gained from that small effort leads to a poor outcome, the investor will regret it. The loss of opportunity to receive stock with high volatility will encourage investors to propose a higher price. In selling decisions, investor behavior shows low aggressiveness in selling. This implies the investor tends to hold stock himself. The decision to be unaggressive in setting the high price while selling can be explained after experiencing regret due to lack of intensity in decision making. Investors will increase commitment toward something owned. Stocks with high volatility are expected to give high returns. So by holding, the investor expects to realize a return from price increases and declines. Someone will step up his commitment if withdrawal decisions produce regret in the future, Wong and Kwong (2007). Increased commitment in selling decisions based on Regret Theory is related to the decision to increase commitment. Investor will compare which regret felt larger, being aggressive or being unaggressive.

CONCLUDING COMMENTS

Traditional finance paradigm use models in which agent are rational. Trading behavior of investors are not easily understood based on this model. Behavioral finance tries to explain financial phenomena in which some agents are not fully rational. Decisions by investors in trading is decided based on the level of aggressiveness in bid or ask applied to the transaction. This paper investigates the effect of experience regret and anticipated regret on order aggressiveness. To test the effects we perform an experiment study with a computer trading simulation. Participant are undergraduates student. Through a 2 rounds and 16 sessions experiment study we report strong evidence that type of experience, regret and anticipated regret, have effect on order aggressiveness. An investor who has experience of regret due to acting, and on the following decision anticipates regret, will use an order strategy with high-level aggressiveness in both buying and selling decisions. When doing transactions on stocks with high volatility, investors who experience regret due to not acting, and on the following decision anticipates regret, will use an order strategy with a low-level of aggressiveness in selling decisions and a high-level aggressiveness in buying decision. Overall, investors consider regret in deciding. We believe that our research is useful to investors, policy makers and fund managers. Further research might consider positive emotion such pride in order aggressiveness.

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