Holding On and Letting Go:
Experimental Evidence on Reducing the Disposition Effect through Varying Levels of Information Salience

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Abstract: The disposition effect is the tendency of investors to exhibit behavioral bias in selling their winning shares and in holding on to their losing shares. Previous literature has covered the causes of disposition effect, but only a few are dedicated to decreasing this phenomenon. This study aims to explore the effects of reducing the level of saliency of information on the disposition effect. By measuring the incidence of disposition effect and relating this with the returns across different groups, we find that male investors, risk-seeking investors, and investors exposed to high levels of purchase price saliency and low levels of financial ratio saliency are more susceptible to the disposition effect. These groups exhibited the lowest returns, proving that disposition effect is a financially detrimental behavioral bias common among investors (evidenced by 79.33% of the sample). When experiencing gains, highly salient financial ratio information and the absence of purchase price decreases the risk-aversion of the respondents, thus allowing them to optimally let go of winning shares to increase gains, while for losses, the presence of purchase price and financial ratios decrease the riskiness of investors, thus allowing them to sell their losing stocks optimally and cut capital losses. Using qualitative response models, the results show that investors treat capital gain as a major determinant in their decision to sell, and the level of saliency of purchase price information is more significant than the level of saliency of financial ratio information.

Keywords: disposition effect; behavioral finance; individual investors; experimental economics; financial wealth

1. INTRODUCTION

Behavioral economists have long been documenting widespread biases in investor behavior and evaluating their impact on trading performance. Financial detriment is often cited as an effect of irrational investor behavior, and a prime example of which is the disposition effect – the tendency of investors to let go of their winning investments prematurely and hold on to their losing investments for a longer period (Barber & Odean, 2011; Frazzini, 2006; Kaustia, 2010).

Despite its market stabilizing benefit (Li et al., 2014), the disposition effect is negatively correlated with the individual financial wealth of investors (Chang, 2013). Selling winning stocks prematurely forgoes future capital gains, while holding losing stocks for too long accumulates capital losses (Kaustia, 2010). Moreover, Barber and Odean (2011) classified this behavior as an investment mistake since it is very tax inefficient. Disposition effect is also linked with herding behavior, which leads to extreme and price volatility, an event every investor seeks to avoid (Chang, 2013). Furthermore, the disposition effect can result in low trading performance in the market (Frydman & Rangel, 2014; Odean, 1998; Frazzini, 2006). Being one of the most widely documented biases in behavioral finance, this phenomenon has proven to be known as common investor behavior (Shefrin & Statman, 1985; Ferris et al., 1988; Odean, 1998; Shapira & Venezia, 2001; Grinblatt & Keloharju, 2001; Weber & Camerer, 2003; Dhar & Zhu, 2006).

Saliency of information is one of the causes of disposition effect. Saliency is the ability of information to

attract the audience's attention and to solicit reaction (Huang et al., 2013). Controlling the level of saliency of information can greatly affect the behavior of investors, especially when the manipulation of the presented information is during the time of making investment decisions (Frydman & Rangel, 2014). The salience effect in every market is so strong and widespread that investors tend to react more strongly to highly salient information (Fiske & Taylor, 1991).

Having salient information can magnify the disposition effect, as manipulating the level of saliency of an item during the time of decision affects the weight that it receives in the decision making. One factor that can be considered as salient information is the stock's purchase price. Frydman & Rangel (2014) concluded that the stock's purchase price is an important driver of the disposition effect. They showed that in making the purchase price of stocks more salient, the disposition effect among investors tends to increase.

There is a clear gap in research about the relationship of the varying levels of information saliency on financial ratios and stock purchase price on the selling decisions of disposition investors. The present study aims to address this gap by identifying the reducing effects of varying levels of information saliency on the disposition effect through a laboratory experiment.

To test whether purchase price and financial ratio information salience, relative expected value and capital gains, have a significant effect on the investors' susceptibility to the disposition effect and the investors' probability to sell or hold their shares of stock, the following hypotheses are given:

Hypothesis 1: Investors are susceptible to the disposition effect in the absence of any information.
Hypothesis 2: Investors do not increase capital gains in the absence of purchase price
Hypothesis 3: Investors do not decrease capital losses in the presence of purchase price
Hypothesis 4: Relative expected value (REV), capital gains (CG), and financial ratios (FR) has no significant effect on investors' susceptibility to the disposition effect and the investors' probability to sell or hold their shares of stock

2. METHODOLOGY

2.1 Data

The present research employs the use of primary data to estimate the behavior of investors under several experimental interventions. Further, primary data is preferred because of its proximity to the true behavior of investors. Also, primary data is free from interpretations and interventions from third parties; all results captured

in the primary data is from the experimental interventions of the present study.

The 150 target participants of this study are undergraduate students, postgraduate students, and working professionals whose ages range from 18 to 29 years old and have beginning experience in trading stocks or are nonprofessional investors. The qualities of the respondents are chosen to resemble that of the general population of beginning investors, a growing demographic in the Philippines (PSE, 2015). Respondents were randomized through purposive sampling.

2.3 Experimental Groups

The experiment consists of two control groups and four experimental groups with 25 respondents in each group. Table 1 summarizes the information present in the six groups.

Table 1. Comparison between control and experimental groups

	Purchase Price	Financial Ratios	Level of Saliency of Financial Ratios
Control Group A	✓	✗	N/A
Experimental Group B	✓	✓	Low
Experimental Group C	✓	✓	High
Control Group D	✗	✗	N/A
Experimental Group E	✗	✓	Low
Experimental Group F	✗	✓	High

2.4 Empirical Model

Disposition Effect

As operationalized by Odean (1998) the existence of the disposition effect in each participant is determined by the variables shown in Table 2. Data on these variables can be obtained from the participants' actual decision making in the experiment.

The obtained values of the variables shown in Table 2 are then used to compute the Proportion of Gains Realized and the Proportion of Losses Realized as follows:

$$PGR = \frac{RG}{RG + PG} \qquad \text{(Eq. 1)}$$

where:
PGR = proportion of gains realized

RG = number of realized gains
PG = number of paper gains

Table 2. Variables involved in determining the presence of the disposition effect

Variables	Criteria
Realized Gain (RG)	The market price is higher than the purchase price and the investor decides to sell the stock.
Realized Loss (RL)	The market price is lower than the purchase price and the investor decides to sell the stock.
Paper Gain (PG)	The market price is higher than the purchase price and the investor decides not to sell the stock
Paper Loss (PL)	The market price is lower than the purchase price and the investor decides not to sell the stock

$$PLR = \frac{RL}{RL+PL} \qquad \text{(Eq. 2)}$$

where:
PLR = proportion of losses realized
RL = number of realized losses
PL = number of paper losses

A participant's level of the disposition effect is computed by obtaining the difference between PGR and PLR. If $PGR - PLR = 0$ (or $PGR = PLR$), there is no disposition effect. If $PGR - PLR > 0$ ($PGR > PLR$), the disposition effect exists since the participant realized more gains than losses, and if $PGR - PLR < 0$ (or $PGR < PLR$), the reverse of the disposition effect exists for the participant given that he realized more losses than gains.

Probability to Sell
This study focuses on selling or holding decisions, as the disposition effect is primarily a behavioral bias that deals with selling winning shares prematurely and holding on to losing shares for too long (Frydman and Rangel, 2014). There are three variables to be computed and used as independent variables that can affect probability of selling or holding for each participant.

This study will utilize the logit and probit regression models. An estimated model is computed for each participant. The model used in this study is as follows:

$$Pr(Sell_t) = \beta_1 + \beta_2 REV_t + \beta_3 CG_t + \beta_4 FR_t + v_t \quad \text{(Eq. 3)}$$

where:
$Pr(Sell_t)$ = investor's probability to sell at trial (t),

where $Pr(Sell_t)$ = 0, 1.
0 = hold
1 = sell

$$REV = P_{i,t} + F_{i,t+1} \qquad \text{(Eq. 4)}$$
$$CG = P_{i,t} - C_{i,t} \qquad \text{(Eq. 5)}$$

$F_{i,t+1}$ = expected future price of stock (i) at trial (t)
$P_{i,t}$ = current price of stock (i) at trial (t)
$C_{i,t}$ = cost of stock (i) at trial (t)
FR_t = financial ratio qualitative variable at trial (t), where FR = 0, 1, 2.
0 = no financial ratios
1 = unfiltered financial ratios
2 = filtered financial ratios

3. RESULTS AND DISCUSSION

This section presents the key findings of the experimental interventions on the participants' susceptibility to the disposition effect and the probability of their holding or selling the stock.

The regression results for all the independent variables are consistent with our a priori expectations. The amount of capital gains and relative expected value has a positive effect on the decision of the investor to sell the stock, while the additional financial ratio information presented to investors have a negative impact on their selling decisions. This implies that as REV increases or as the decrease in the stock price on the next period increases, the probability to sell of an investor increases. Also, as capital gains increase or as the difference in the current selling price and last purchase price of the stock becomes more positive, the probability to sell a stock increases. Likewise, as more information about the financial ratio of the company are given to the investors, the probability to sell a stock also increases.

The results show that reducing the saliency of the purchase price can greatly decrease the probability that the investor will sell the stock. This also implies that making the purchase price less salient for investors will make it more difficult for them to know the possible capital gains they can harvest once they sell the stock. Comparing the coefficients of capital gains (CG) in Tables 11 and 12, it can be noted that once the purchase price is made less salient, capital gains will have a lower impact on the selling decision of an investor, or the selling decisions of an investor becomes less responsive to the CG and REV variables. To illustrate, in group A, the odds that the investor will sell the given stock will increase by 5.30% ($e^{\beta} - 1$) for every unit increase in the capital gains, while in group D where purchase price shown, the odds of selling a stock will only increase by 3.46% for every unit increase in the capital gains. By making the purchase price less salient and not offering any other additional information, the impact of capital gains in the odds of selling a stock

decreased by almost 2%. For the other groups, all else equal, a unit increase in the capital gains will increase the probability to sell by 5.8% for group B, 3.2% for group C, 3.22% for group E, and 2.13% for group F. The significant difference in the responsiveness of the selling behavior to a change in *CG* is shown in Figure 1.
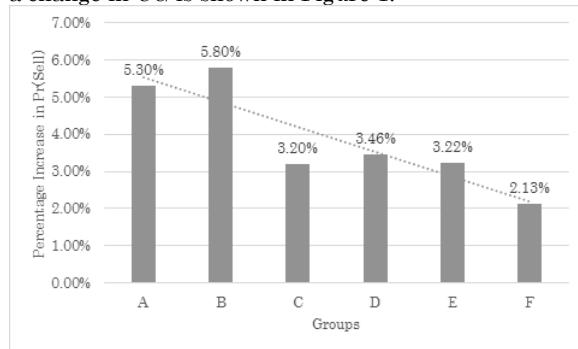

Fig. 1. Comparison per group of the responsiveness to a change in capital gains

The results also show that only the *CG* variable is statistically significant, and both *REV* and *FR* are insignificant, with the exception of *FR* of group E. Being statistically significant for all groups shows that capital gain is an important factor that affects the selling behavior of an investor. Moreover, *REV* is insignificant, and this is consistent with the literature supporting that maximizing *REV* is not of concern to investors in making their selling or holding decisions. Although statistically insignificant, the degree of impact of *REV* on the selling behavior of the investor increases as the purchase price is made less salient and as more information is given to the investor. These decreases in the responsiveness of the dependent variable to the *CG* variable as well as the increase in the responsiveness to the *REV* variable are shown through the changes in the odds of selling a stock.

The pure negative effect of level of *FR* to the probability of selling a stock is also notable. Intuitively, it can be inferred that investors must use financial ratios to better analyze a stock. Specifically, *FR* should only decrease (increase) the probability of selling a stock if the stock winning (losing). However, based on the results, the effect of the use of financial ratios on the probability of selling is always negative, regardless of the performance of the stock's returns. This may imply that the additional information given to investors might have led to more confusion, ultimately leading to investors not acting rationally. Alternatively, due to the low information asymmetry as evidenced by presenting additional information, investors were able to make better decisions on when to sell the stock, thereby reducing trading volume from a decrease in the probability to sell.

Based on the regression results, the effect of the independent variables on the probability to sell is consistent for the two regression models. Gujarati & Porter (2009) stated that in using binary regressand models such as the logit and probit models, it is more important to compare the expected signs of the beta coefficients and their statistical significance in contrast to comparing only the value of the beta coefficients from the regression results. Likewise, they noted that the goodness of fit of the model only has a second importance. In checking for the goodness of fit, it is more applicable to use the McFadden R^2 and the count R^2. With this, we find that the regression models have a low McFadden R^2 but a high count R^2, which can imply that the models can be considered reliable. In addition, since all the LR statistics of all the groups are statistically significant at the 5% level, it can be assumed that the variables are collectively significant even though they are not individually significant.

For further analysis, the groups were further subdivided into two more subgroups - those participants ending with a gain and those ending with a loss. The participants are included in the gain group if his ending cash balance (including the liquidation price of remaining stocks) is above the starting cash balance of 350 EC otherwise, he is part of the loss group. For this part, we can compare how those participants experiencing a gain and those experiencing a loss value *REV*, *CG* and *FR* in making their selling decisions. Simply, the effects of the independent variables to the probability to sell a stock may differ for the gain groups and loss groups. Table 14 shows the logit and probit regression results for the gain and loss participants per group.

Generally, for the gain group, the effect of REV to the probability to sell is positive, while the effect of CG and FR is negative. If REV increases or the amount of decrease in the expected stock price in the next period increases, those investors experiencing a gain will have the more tendency to sell the stock which is contrary to the disposition effect. As CG increases, the probability to sell of those experiencing a gain decreases. This is also true for FR variable that as the FR information become more filtered, the probability to sell decreases for those experiencing a gain. This finding for the gain group is consistent with the descriptive statistics that as the variables lower the disposition effect, the investor will be able to experience higher gains. Moreover, as the purchase price are made less salient, the impact of REV to the probability to sell increases (more selling of possible losing stock) while the impact of CG to the selling behavior decreases (less selling of winning stocks). This is the reason why there is lower disposition effect for those groups with less salient purchase price. In addition, as the information about the financial ratio is made more salient, the effect of REV to the selling probability decreases for the groups with purchases price while it increases for the

groups without purchase price. It can also be noted that the change in the impact of REV is higher for low FR saliency condition than in the high FR saliency condition. And, as FR information is made more salient, the effect of CG to the probability to sell decreases (except for group B that has resulted to an increased effect of CG to the selling probability). Lastly, as saliency of FR info increases, the effect of FR variable to the selling probability decreases. Taking into consideration the significance of the variables, the CG variable is the only significant for those groups with purchase price while the REV variable is significant for those groups without purchase price. FR information is also made significant in group E where there is no purchase price and low saliency of FR. This can signify that for those participants who experienced a gain, making the purchase price less salient can shift their focus of decision-making from looking at capital gains to looking at relative expected value. Likewise, financial ratio can have a significant effect on the decision of an investor to sell the stock if it is less salient. For all groups, both the logit and probit regression resulted into similar signs for the coefficients of the variables.

For the loss group, the effect of REV to the probability to sell is negative while it is positive for CG. For the FR variable, its effect on the probability to sell is both negative and positive, depending on the presence of purchase price. So, as REV increases, the probability to sell (a possible losing stock) decreases. And as CG increases, the probability to sell (a winning stock) increases. As the purchase price are made more salient, the effect of REV, CG and FR to the probability of selling a stock changes.

For REV, its negative impact in the probability to sell decreases as the purchase price is made more salient in cases where there is no saliency about FR information. However, in cases where the FR information is made salient, the impact of REV to the probability of selling is reversed in such a way that its negative impact in the high purchase price saliency condition is turned to having a positive impact in the low purchase price saliency condition. This implies that if FR information is salient and purchase price is made less salient, an increase in REV can increase the probability to sell (a possible losing stock) which means that an investor is exhibiting lower presence of the disposition effect. In the case of CG, there is only little changes in the impact of CG in the probability to sell and its impact to the selling probability is still positive even if the purchase price is made less salient. This also implies that making the purchase price less salient cannot change the focus of decision-making of those investors who experienced a loss and still put same weight in the CG even though the purchase price is less salient. Another notable result is that for those participants who experienced a loss, the effect of making the purchase price less salient is that it of selling a stock

from positive effect in the high purchase price saliency condition to negative effect in the low purchase price saliency condition. Also, alongside with the change in the impact of FR in the probability to sell, its degree of effect to the regressand increases as the purchase price is made less salient. By making the FR information more salient, the probability to sell are made more reversed the effect of FR to the probability responsive to the changes in REV and CG (except for group B), as well as to changes in the FR variable.

For all the groups, the only variable that can significantly affect the selling decision of an investor is the capital gains. This is consistent with the fact that the impact of CG to the probability of selling a stock doesn't change much even though the purchase price of the stock is made less salient. Table 14. Summary of results of logit and probit regressions for all groups according to capital gains and losses

4. CONCLUSIONS

Generally, capital gains and relative expected value have a positive effect on investors' selling decisions, while the use of financial ratios creates a negative effect on their selling decision. Reducing the saliency of purchase price can decrease the selling probability of a stock by almost 2% for normal cases, 2.6% for low financial ratio saliency, and 1.1% for high financial ratio saliency. Moreover, capital gains is statistically significant, while relative expected value, as consistent with previous literature, and financial ratios (except for group E) are statistically insignificant to selling decisions. Maximizing relative expected value was cited as a non-statistically significant motive in selling or holding financial assets. The variable was still included in the random utility model to capture the motive based on purely maximizing investor wealth and to determine whether the variable would be statistically significant under different interventions. The results show evidence supporting prior literature. For the financial ratio variable, its general effect to the probability to sell is insignificant. But if the trading environment or screen is adjusted such that there is no purchase price shown and financial ratios ar at least present, although not very salient, the financial ratio variable will be statistically significant.

For those who experienced a gain, the effect of relative expected value to the probability to sell is positive, while the effect of capital gains and financial ratios is negative. They also showed that as the disposition effect decreases, the investor experiences higher gains. Lowering the saliency of purchase price can increase the impact of relative expected value while decreasing the impact of capital gains to the probability of selling. This is the reason why there is lower disposition effect for those groups with less salient purchase price. Moreover, as the saliency of financial ratio information increases, the

impact of the relative expected value variable decreases for the groups with purchase price, while it increases for the groups without purchase price. Also, the effect of capital gains and financial ratios to the selling decision decreases as the saliency of financial ratio information increases. the capital gain is the only significant variable for those groups with purchase price, while the relative expected value variable is significant for those groups without purchase price. This implies that when facing gains, making the purchase price less salient can shift investors' focus of decision-making from capital gains to relative expected value.

When experiencing losses, the effect of relative expected value to the probability to sell is negative, while it is positive for capital gains. For the financial ratio variable, its effect on the probability to sell is both negative and positive, depending on the presence of purchase price. As the purchase price is made more salient, the effect of relative expected value, capital gains and financial ratios to the probability of selling a stock changes, depending on the degree of saliency of financial ratio information and purchase price. By making the financial ratio information more salient, the probability to sell are made more responsive to the changes in relative expected value and capital gains, as well as to changes in the financial ratio variable. For all groups, the only variable that was able to significantly affect the selling decision of an investor is the capital gains. This implies that making the purchase price less salient cannot change the focus of decision-making of those focus on financial information rather than realizable capital gains, as the filtered information provides better firm performance measures that can lead to higher returns. Thus, focusing on the information brought about by financial ratios reduces risk aversion in gains and pride-seeking behavior that is associated with foregoing further gains. On the other hand, when experiencing losses, investors should focus on purchase price and financial information. In doing so, more information is gathered, and investors are able to avoid the illusion of knowledge that leads to overconfidence. Thus, financial ratios and purchase price salience reduce risk-seeking in losses and regret-avoiding behavior that is associated with sustaining further losses. By seeking and understanding key pieces of information such as purchase price and financial information (market valuation ratios, profitability ratios, and expert analyses) to aid in decision making, investors can experience higher gains and curb further losses.

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