
Empirical Research of Disposition Effects in Vietnam's Stock Market

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Abstract

This paper examines some cognitive biases of Vietnamese stock investors by analyzing trading records for 1,201 accounts at a brokerage firm. These investors tend to make poor trading decisions by selling good stocks and buying bad stocks. They demonstrate a significant reference to holding the losing stocks and selling the winning stocks which is known as the disposition effect. It provokes many implications for researchers, market practitioners and policy makers.

Keywords: Disposition effect, extrapolation bias, prospect theory, behavioral finance.

1. Introduction

Among the three psychological foundations of behavioral finance, emotional foundation plays an important role in explaining individual behavior. Emotion is sometimes argued to have a strong relationship with prospect theory (Kahneman and Tversky's). "Fear" and "greed" are two major emotions of individuals found in financial markets. Recall the fact that many people buy lottery tickets, which is contradictory to loss aversion in terms of gains. Those people, at the same time, may buy insurance, which is contradictory to risk-seeking in terms of loss. Buying the lottery is an exhibition of "greed", expecting to get rich quickly while buying insurance shows "fear". So, this example suggests that the nonlinearity of weighting function arises from emotion. In emotion-rich situations, people's weighting function is expected to be more inverse-S shaped. That emotion influences how individual investors make financial decisions, researchers have found two behaviors. The first is the house money effect, the inclination to take on more risk after investment success. The second is the disposition effect, which is the behavior that we will examine in regard to the Vietnamese stock market.

The disposition effect is a direct result of an investor's trading behavior. *It is the tendency of investors to sell winning stocks too early and hold losing stocks too long.* For example, when someone buys a stock at the price of VND 10; this stock, however, declines dramatically. The general trend of people is not to sell until the stock recovers above 10 VND and is a reflection of the disposition effect. The disposition effect is clearly a bias and

hurts the wealth of investor. It could not exist if market participants behaved in compliance with the efficient market hypothesis and the rationality assumption.

The Vietnamese stock market is a new and emerging market in Asia. It started in July 2000, and now comprises three stock exchanges: HOSE, HNX, and Upcom. The dominant feature of the Vietnamese stock market is the fact that investors are inclined toward herd mentality, making the market risky and low-liquidity. Other exhibitions of investor cognitive psychology such as the disposition effect, extrapolation bias... have not been examined yet. Therefore, our study aims to disprove the efficient market in Vietnam under the view of behavioral finance by testing the inclination of investors toward several types of behavior biases. From the academic significance, investigating cognitive psychology gains insight into the drivers of investors' behavior, and helps to construct more accurate models to describe systematic trading patterns than the efficient market hypothesis. For the sake of investor wealth, to understand their own behavior biases makes them aware of what factors influence their choice, providing them with useful equipment to improve trading decisions. In this paper, we also make some recommendations for the government, and policy makers to improve and develop the Vietnamese security market in the future.

2. Literature review

The disposition effect is considered to be the implication of extending the prospect theory of Kahneman and Tversky's (1979) to investment in general and stock trading in par-

ticular. Based on the rationale of prospect theory, Shefrin and Statman first documented the concept of the “disposition effect” in 1985. In this study, the authors propose that people often keep away actions that create regret and pursue actions that bring about pride. This propensity allows investors to be predisposed to realizing winners more readily than losers. They are likely to sell winners too early since they want to be proud of having achieved a gain. They hold losing stocks longer since they are afraid of selling right before an increase in the price. Moreover, the feeling of regret experienced by selling a winner too soon is lower than the regret produced by holding on a loser too long. However, the theory that people avoid disappointment and strive for pride does not provide a perfect explanation for the disposition effect. It is highly likely that regret can also exist in gains. For example, at a certain stock price, if the regret function weights more than the pride function for an investor, he might not want to sell a winning stock. Furthermore, there is an asymmetry between the strength of pride and regret, as regret is stronger. This leads to inaction over action (Kahneman and Tversky, 1979). Such an asymmetry would make investors reluctant to realize both gains and losses. Thus pride and avoiding regret can help understand the disposition effect; but, it can only partially explain the cause of disposition effect.

Other possible causes of the disposition effect that are put forward by Shefrin and Statman are loss aversion, mental accounting, and self control. The first explanation, loss aversion, is a contribution of prospect theory. There exists a reference point around which

investors perform asymmetric risk aversion: above that point, investors sell winners because of risk aversion to gain and hold losers because of risk seeking in losses. On the other hand, with mental accounting, people divide prospects into separate accounts, executing prospect theory independently between accounts as if there were no interaction between them. Shefrin and Statman also apply the theory of self control in economics (Thaler, 1981) to explain the disposition effect. There are two parts in behavior: the rational part, or the planner; and the emotional part, or the doer. That the doer tends to realize pride and keep away regret can conflict with the rationality of the planner. As a result, the lack of self control between the planner and the doer hinders the investor from making reasonable choices. The disposition effect, for example, is a situation in which self control exhibits: the doer has a more powerful impact than the planner. By avoiding regret, the doer holds on to the losing stocks too long.

One year later (1986), the research of Lakonishok and Smidt was an emerging one documenting the disposition effect which took into consideration the impact of tax. It is obvious that in most markets, short-term capital is taxed at a higher rate than long-term. Consequently, investors incline to sell losing stocks in the short term in order to get more tax refunds. Likewise, they will postpone realizing gains, waiting for the long term to take advantage of lower income taxes incurred. If investors behave for the sake of minimizing taxes, trading would be predictable. According to Lakonishok and Smidt, nevertheless, disposition effect predicts an inconsis-

tent image with tax predictions. They found the positive relationship between stock prices and trading volumes: winning stocks have higher abnormal volume than losers. Then, they proposed two reasons for the disposition effect. The first reason is portfolio rebalancing. A portfolio of assets will change over time because some investments will increase in value and others will decrease. The investments that have increased in value will begin to have a larger weight in the portfolio while the losing ones will take up less. In order to maintain the original investment mix and risk class, the portfolio needs to be rebalanced regularly. Thus, an investor will regularly sell winning investments and hold on losing investments in order to avoid his portfolio changing its weight of asset classes. Lakonishok and Smidt suggested another cause for the disposition effect, and it is about investors who buy stocks based on positive information. They sell the stock when the price goes up, thinking that such increase has reflected their initial information. They will keep holding the stock if the price goes down believing that the stock has not yet reflected their information.

Ferris et al. (1998) contributed another reason to explain the disposition effect: the trading costs. In this study, the author compared two models of trading in equities: tax loss selling and the disposition effect. This is analogous to Lakonishok and Smidt's comparing tax predictions and the disposition effect. Ferris et al. produced the opposite result with tax loss selling effects and a consistent result with disposition selling effect when trading volumes and returns are positively correlated.

The disposition effect was first evidenced in market data by Odean (1998). He investigated 10,000 discount brokerage accounts, finding that individual investors demonstrated a significant preference for selling winners and holding losers, except in December when tax motivated selling prevailed. The reason for their behavior is neither to rebalance portfolio, nor to avoid the higher trading costs of low priced stocks. He also analyzed the subsequent portfolio performance to find that it is not justified to exhibit the disposition effect. For taxable investments, it is subnormal and leads to lower after-tax returns. More specifically, the extent to which this behavior affects price movements depends on the trading activities of major market participants such as professional and institutional investors. Like the findings of Lakonishok and Smidt (1986) and Ferris et al. (1998), in the case the disposition effect exhibits in aggregate, it may create the positive relationship between price change and trading volume.

The method of Odean to find the disposition effect in market data has limitations because we cannot take into consideration investor expectations and individual decisions. The results found in aggregate market data may stem from the statistical factors but not the behavioral ones. Weber and Camerer (1998) fixed this shortcoming by using experimental evidence: they examined individual trading decisions in controlled experiments, detecting the disposition effect directly. The result revealed that people use purchase prices to be the reference point: they sell more often the winning stock (the price above purchase price) than the losing stock (the price below

purchase price). It is suggested by the author that people misperceive future price changes because of the influence of mean reversion. Weber and Camerer used prospect theory as the second reason for the disposition effect: people are reluctant to record losses because they are risk seeking in loss and risk averse in gain of the S-shaped value function.

In the second experiment, Weber and Camerer let subjects sell all shares in their account automatically at the end of the investment period. However, participants could purchase those stocks back in the next period without any transaction costs. The result was that participants exhibited less of a disposition effect. In other words, they chose not to buy back the losing stocks. When participants have to decide for themselves while still owning the shares if they continued to hold the stock or not, they are subject to gambler's fallacy, as they blindly believe in mean reversion. This experiment proposed self control as the reason for the disposition effect.

A lot of research applies the previous study to detect the disposition effect in other markets up to now. Zur Shapira and Itzhak Venezia (2000) researched the disposition effect in Israel's stock market. Their results demonstrate that the disposition effect exists not only at individual but also at the institutional level. However, the professionals exhibit less disposition effect compared to individuals as they have better education and better experience. Also, they suggest that market microstructure models assume the presence of irrational and rational traders and could be enhanced by incorporating investors with varying degrees of biases or information.

In Finland's stock market, Grinblatt and Keloharju (2001) discovered the exhibition of the disposition effect for both individual and institutional investors. Also, past price patterns do affect the trading volume in this stock market. Disposition effect was also found in American residential real estate market by Genesove and Mayer (2001). The study of Dhar and Zhu (2002) on individual investors also found the same result. Such investor characteristics such as education, account levels, and trading experiences are found to play critical roles in the level of the disposition effect. It reveals that more educated, wealthier, and more frequent investors are less exposed to the disposition effect. Analyzing the disposition effect at the individual level, can identify more factors which contribute to the disposition effect, assisting investors with better decisions.

It is noticeable that the disposition effect described above has been mainly in Western cultures. However, there may be psychological differences between Asian cultures such as those of Korea, China, Singapore, and Vietnam. According to Hofstede (1980), cultural differences are frequently expressed in cognitive studies as an individualism-collectivism continuum. The collectiveness of Asian society vs. the individuality of Western society leads to the difference in perception of risk in the two cultures. A loss incurred by an individual in Asian countries can be shared by family members while it is not often the case in Western ones. Moreover, the fact that the Asian education system encourages students to follow but not criticize makes their investors more overconfident. It is highly like-

ly that cultural differences have an impact on behavioral finances in general and disposition effects in particular.

Recently, G. Chen et al. (2007) used brokerage account data from China to study investment decisions in an emerging Asian market. They find that Chinese investors make trading mistakes when they are reluctant to realize their losses, they tend to be overconfident, and they exhibit a representative biases. Both Chinese individual and institutional investors suffer from these behavioral biases, but the former seems to exhibit more biases than the latter. G. Chen et al. found the disposition effect following Odean's methodology: aggregate proportions of gains and losses realized regression of those proportions on investor characteristics, duration of buy/sell round trips, and the hazard ratio test.

3. Methodology

3.1. Variables

In this study, we constructed a set of three investor characteristics: trading frequency, account value, and diversifying levels. Three characteristics are three important explanatory variables to compare the degrees of the disposition effect. We establish formulas for these variables based on the meaning of each so that they are justifiable representatives for individual frequency, wealth, and diversification levels.

Trading frequency

Trading frequency is defined as the average number of days in which investors have an order, given that the investor is holding stocks in his/her account. It is calculated by taking the total orders an investor made in a consid-

ering periods divided by the number of working days observed from the first transaction occurred to the last transaction occurred.

$$Frequency = \frac{NWD - Dx}{\sum_{D_0}^{D_1} Or}$$

In which:

- *NWD*: is the Net workdays between the first day and the last day observed transactions (excluding weekends and holidays)

- *Dx*: number of days investor does not holding stocks in portfolio

- $\sum_{D_0}^{D_1} Or$: Total numbers of transactions in the period.

Diversification level

The diversification level is the average number of different stocks holding in investor's portfolio over time. We cannot simply count the number of different stocks an investor had bought throughout his/her investment period. For example, we observed that in one year, an investor invested in 12 different stocks. It is wrong to say that the investor diversified his/her investment in 12 different stocks because he/she may not hold all 12 stocks simultaneously. That investor only holds one stock at one particular moment and turns it over after every month. Therefore, we suggested a way to calculate the diversification level by taking the average numbers of stock holdings.

First, we need to calculate the number of stocks holding in investor's account after each purchased/sold order. If the order was purchased, we added the stocks into the account, vice versa. We made a quantity dummy variable

such that we assigned 1 for stocks if the balance was positive, meaning: an investor is holding that stock in his/her portfolio and 0 when the balance was zero, not holding the stock.

We determine the length of time that an investor held a particular stock by multiplying this quantity dummy variable with the length of time which the investor held the stock. Then we added the length of time an investor held each stock together. After that we divided the sum to the number of working days observed between the first and the last transaction occurred.

$$\text{diversification level} = \frac{\sum_1^n D_i \times T_i}{NWD - Dx}$$

In which:

- D_i : is the dummy variable for stock i . The variable is 1 if stock is positive, meaning investor was holding stock i at that time. Zero (0) means that investor was not holding the stock i at that time

- N : is the total number of different stock has been hold in investor's account.

- $\sum_1^n D_i \times T_i$ is the sum of length of time that investor held each different kind of stock in the period.

- NWD : is the net workdays (adjusted for weekend and holidays) between the first and the last day observed in the investor's transactions

- Dx : is the number of days investors did not hold any kind of stock.

So, diversification level can be understood as the average number of different stocks an investor was holding in one particular day. Certainly, the minimum value of diversification level is 1 when an investor invested in only one stock at the time.

Account value

Wealthier investors may behave differently than other individual investors. In Vissing-Jørgensen (2003) studies (as cited in G. Chen et al (2007)), wealthier investors may somewhat dismiss some psychological bias (representative bias). Therefore, we want to address this variable in our study.

3.2. Methodology to test disposition effects

The methodology for investigating the disposition effect is to look at the frequency with which investors sell winners and losers relative to their opportunities to sell each (Odean, 1998a). The opportunities to sell here are any day that a sale takes place in a portfolio. When an investor buys a stock and has not sold it yet, that stock is considered to be a "paper gain" if the price declines, and a "paper loss" if the price increases. At the moment of selling out, that stock becomes a "realized gain" or "realized loss" depending on the selling vs. buying price. The *total gains (losses) that can be realized* are the total of realized gains (losses) and paper gains (losses). When the stock is sold for a capital gain, the proportion of gains realized to the total gains that can be realized as the formula:

$$\text{Proportion of gain realized (PGR)} = \frac{\text{realized gains}}{\text{realized gains} + \text{paper gains}}$$

For stock sold at a capital loss, proportion of losses realized is computed analogously:

$$\text{Proportion of gain losses (PGL)} = \frac{\text{realized losses}}{\text{realized losses} + \text{paper losses}}$$

A large difference in PGR and PLR indicates that people sell gains more readily than losses.

3.3. Data

The data for this study was provided by a nationwide brokerage firm. 2,340 accounts were randomly selected from all accounts from 23 April, 2007 to 15 March, 2011 (969 workdays). However, not all accounts and transactions are useful. We initially eliminated un-matched orders which left 64,332 transaction records. Furthermore, we deleted 923 accounts which only sold orders and 87 accounts which only purchased orders. After that, we deleted accounts with negative balances, which can be explained that investors had purchased stocks before the considering periods. The elimination was necessary because we did not know the purchased price; hence, we cannot calculate the return for those accounts. Finally, we had the final sample of 1,201 accounts with 57,282 successful transactions.

In the test for trading performance, we had to reduce our data set in order to get the stock price for four months after trade transactions. Due to the fact that our data set includes the most recent transactions, up to 15 March, 2011, we had to reduce our data set in order to get the stock price for four months after trade transactions. Hence, in testing subsequent returns of transactions after trades, we used transactions records from 23 April, 2007 to 1 December, 2010. The stock price used was collected up to 1 April, 2011. Therefore, there were 1,133 accounts used in this test. The rest of our study still used the whole 1,201 accounts. We believed that this is not a source of bias.

The data set is similar to a previous study conducted by G. Chen et al. (2007) on the Chinese stock market. In that study, the authors examined 46,969 Chinese individual accounts in a period of four years, from May 1998 to September 2002. Vietnamese and Chinese are new and emerging markets. The Chinese investors are similar to Vietnamese investors in culture and in the legal framework (e.g. each investor can only open one account in one brokerage firm). Therefore, this study will draw comparisons between Vietnamese and Chinese investors in the context of exposing cognitive and psychological errors.

4. Findings

Disposition Effect

We compute the PGR and PLR for our sample commencing with identifying realized gains and losses. From the data set, we filter out the days that sales happen; then, compare the selling price with average purchase prices to label the sale as either “realized gain” or “realized loss”. There are 12,053 sales for capital gains and 10,873 sales for capital losses in the total of 22,926 transactions in our entire sample. The rate of return is also estimated for each realized gain and loss. Table 1 summarizes the average value of such returns.

In Odean (1998a) 43 percent of all sales were for a loss. In my database for the Vietnamese stock market, 47.43 percent of such sales are for a loss. We add an additional test to investigate whether the return of realized loss (in absolute value) is greater than that realized gain. The test used is t-test for two independent groups (realized gains and realized losses), assuming equal variance. The

Table 1: Realized gains and realized losses

	realized gains	realized losses
mean return	0.171	-0.192
std. dev.	0.219	0.175
n	12,053	10,873

Table 2: Testing the equality of realized gains and losses

T-test for means of realized gains and realized losses	
pooled variance *	0.040
pooled standard deviation	0.200
t statistic	-7.896
df	22924
p-value	0.000
F-test for equality of variances	
variance: realized gains	0.048
variance: realized losses	0.031
F	1.560
p-value	0.000

statistics are presented in table 2.

F-test was used to test the assumption of variance equality. As can be seen, the hypothesis that variance of realized gains and realized losses are equal is rejected with the F-statistic of 1.56. It suggested that two independent groups, realized gains and realized losses have equal variance. Hence, the assumption for the test is that two independent groups have equal variance is reasonable.

In term of returns, it suggests that investors are more ready to sell the winner than the loser. Specifically, they realize the gains at a return of 17% while waiting until the return for loss position is -19%. T-statistic for the test

is -7.896, and p-value is approximately zero, indicating that we can reject null hypothesis at 1 percent significant level.

The identification of paper gain or loss for a stock is only made on days of sales. On days without a sale, no paper gains or paper losses are counted. In the test for disposition effect, we have to determine the reference point, from which to determine the gain/loss. Some possible reference points are the highest purchase price, first purchase price, the latest purchase price. In this paper, we use the average purchase price weighted by volume purchased. Like the previous part, the price also needs to be adjusted for stock splits,

Table 3: Paper gains and losses

	Paper gains	Paper losses
Mean return	0.183	-0.206
std. dev.	0.262	0.179
N	8,821	19,142

stock dividends and stock mergers; then, we compare the reference point to the stock price high/low during the trading date to determine if the stock is a paper gain or loss. The stocks are categorized into three groups: it is counted as a paper gain when its daily low price is greater than its average purchase price; if its daily high price is smaller than its average price, we label the stock a paper loss; if its average purchase price lies between the high and the low, it is not classified as neither a gain nor a loss.

The number of gains and losses, realized and paper, are aggregated across 1,201 investors to compute PGR and PLR for the overall market. In order to aggregate, we assume that each sale, each paper gain, and each paper loss are independent observations. This assumption, however, cannot be taken without skepticism. There is no doubt that the decisions to sell or hold on one date are likely be reliant on the decisions on another date. Though, the dependence between these variables is not a source of bias.

Table 3 summarizes the aggregate paper gains and losses across 1,201 accounts. The average return of paper losses is 20.6% while that of paper gains is only 18.3, suggesting that investors tend to realize gains more readily than they realize losses.

We test the hypotheses that “investors tend

to sell their winners more than their losers”.

$H_0: PGR \leq PLR$ (investors are more willing to sell losers than winners)

$H_1: PGR > PLR$ (investors are more willing to sell winners than losers)

The standard error for the difference in the proportions PGR and PLR is:

$$se = \sqrt{\frac{PGR(1-PGR)}{RG+PG} + \frac{PLR(1-PLR)}{RL+PL}}$$

in which: RG, PG, RL, PL: number of realized gains, paper gains, realized losses, paper losses.

There are two approaches for calculating the PGR and PLR: using trade base and share bases. When PLR and PGR are calculated in term of trades and potential trades, this is the trade base approach. If we aggregate the number of shares holding across all paper gains and losses, we are applying the share base approach. We use both in this section; nevertheless, we PGR and PLR used afterward are calculated based on trades and potential trades.

As can be seen, with both the trade base and share base, the difference in proportions is statistically significant at the one percent level. For the trade base approach, the null hypothesis can be rejected with a t-statistic greater than 48. This result is consistent with the pre-

Table 4: Testing for the difference between PGR and PLR

Particulars	Trade base	Share base
PGR	0.577	0.418
PLR	0.362	0.244
difference in proportions	-0.215	-0.173
s.e	0.004	0.000078
t-statistic	-48.868	-2191.405

vious study. Odean (1998a) recorded a t-statistic of 35 in the same testing. The null hypothesis is rejected with a higher degree of statistical significance if using the share base to compute PGR and PLR. Therefore, we can conclude that Vietnamese investors sell their winners more readily than their losses.

The method of aggregating PGR and PLR that we have applied above assumes the independence between each sale and each holding of any investor. An alternative approach is to assume the independence between different investors: gains and losses realized in an account which has no dependence on the others'. Holding this assumption, we estimate PGR and PLR for each account. We eliminate the accounts that have zero denominators for PGR or PLR. The figures are reported on Table 5.

From table 5, we can see the average account PGR of 0.64 which is greater than the average account PLR of 0.382. We conduct the following hypothesis testing:

H_0 : Average account PGR \leq Average account PLR (investors are more willing to sell losers than winners)

H_1 : Average account PGR $>$ Average account PLR (investors are more willing to sell winners than losers)

We test our hypothesis by t-test for two independent groups assuming unequal variances. As shown in Table 6, the average account PGR is 0.2608 larger than the average account PLR. The null hypothesis is rejected with a t-statistics of 21.7. These results lead to the conclusion that Vietnamese investors are inclined toward a disposition effect. G. Chen et al (2007), in the study about the Chinese stock market, rejected the null hypothesis of no disposition effect with a t-statistic of 82.6 and the difference between mean of PGR and PLR across accounts was about 0.2092, which is quite consistent with our finding.

It is realizable that the method of average account PLR and PGR treats every account indifferently. In other words, with this method

Table 5: Average account PGR and PLR

	PGR	PLR
average account	0.643	0.382
s.e.	0.284	0.286
n	1124	1124

Table 6: T-test on difference in average account PGR and PLR

df	2245
difference (PGR - PLR)	0.2608
s.e. of difference	0.01201
t-statistic	21.70
p-value	0.000

we do not take in to consideration the frequency level of each account, ignoring the fact that investors who are more active in trading will provide more accurate evidence for the actual PGR and PLR. This is the inferiority of the average account method compared to the aggregation method.

In some situations, investors are afraid of having a loss, and they may buy additional shares increasing their losing position. The rationale of the behavior is to avoid high transaction costs of selling losing stock. Also investors hope that a small increase in stock prices, but in large volumes, can offset the previous loss. For example, an investor is holding 100 stocks AAA whose current price is VND 9. The original purchase price is supposed to be VND10; thus, he is incurring VND100 losses in the position. If the investor buys an additional 100 shares at price VND 9 instead of selling them, in total the investor is holding 200 shares. Suppose, the stock price increases from VND 9 to VND 9.5, the total

new portfolio value is $200 * 9.5 = 1900(\text{VND})$. The total purchased value was $100 * 10 + 100 * 9 = 1900(\text{VND})$. Therefore, by buying additional 100 shares to a losing position, just a small increase in price, from 9 to 9.5, the investor can recoup the loss when the stock price drops from 10 to 9. It seems to be more reasonable to buy more instead of selling the losing position. This is another form of the disposition effect when investors are more prone to hold losers in the portfolio. We will detect the disposition effect in this form by examining the proportion of stock loss purchase again and the proportion of stock gain purchase again on the day which has purchase order.

In the same token with PGR and PLR method, we will calculate the ratio called, proportion of gains purchased again (PGPA) and proportion losses purchased again (PLPA). The method to calculate PGPA and PLPA is very much similar to PGR and PLR.

$$\frac{\text{Gains Purchased Again}}{\text{Gains Purchased Again} + \text{Gains Potentially Purchased Again}} = \text{Proportion of Gains Purchased Again (PGPA)}$$

$$\frac{\text{Losses Purchased Again}}{\text{Losses Purchased Again} + \text{Losses Potentially Purchased Again}} = \text{Proportion of Losses Purchased Again (PLPA)}$$

Table 7: Testing for the difference between PGPA and PLPA

PGPA	0.109965
PLPA	0.123234
difference	0.013268
S.E	0.002280
t stat	5.817814
p-value	0

If PGPA is smaller than PLPA, investor exposes to disposition effect.

The table 7 illustrates the results of PGPA and PLPA ratios. The table shows that the rate of repurchase for the losing stock is about 12% meanwhile the rate of repurchasing the winning stock is 10.9%. The null hypothesis that the difference between ratios is equal to a significantly rejected rate at 5% significant level. It means that we have some evidence that investors are exposed to disposition effects.

Disposition effect and investor characteristics

We go further to the disposition effect presented by Vietnamese investors by examining the relationship between investor characteristics and the disposition effect; in other words, we research on how different investors exhibit different levels of the disposition effect. Investor features include trading frequency, diversification levels, and account values – three variables that we have just constructed in the first section of this paper. We regress these characteristics onto the difference between PGR and PLR (PGR – PLR) and the sign of (PGR – PLR) (whether it is negative or positive).

The regression equations are:

$$PGR - PLR = \alpha + \beta_1 (\text{Trading frequency}) + \beta_2 (\text{Diversification level}) + \beta_3 (\text{Account value}) \quad (1)$$

$$\text{Logit}(Y_N) = \alpha + \beta_1 (\text{Trading frequency}) + \beta_2 (\text{Diversification level}) + \beta_3 (\text{Account value}) \quad (2)$$

PGR and PLR are computed for each account in the data set except for the accounts with zero denominators for two proportions. Y_N is a dummy variable, taking the value of 1 for the account having PGR greater than PLR (positive (PGR – PLR)) and taking the value of 0 for the account having PGR smaller than PLR (negative (PGR – PLR)). In other words, the value of 1 indicates accounts that present a disposition effect, and otherwise. We look up from the database in section 1 to get the trading frequency, diversification levels, and account value corresponding to each account.

We use the ordinary least squares method (OLS) to estimate the model (1). In the study about Chinese investors (G. Chen et al, 2007), the adjusted R² for the same model was approximately 1.17%. Our model exhibits an adjusted R² of 1.93%. But, we care more

Table 8: Regression (PGR-PLR) on frequency, diversification level

Variable	coefficient	s.e.	t-statistic	Prob
α	0.271	0.027	9.955	0
Freq	-0.002	0.000	-3.438	0.001
Div_lev	0.012	0.007	1.787	0.074
Acc_val	-1.04e-11	0.000	-3.251	0.001
F-stat				8.34
Prob(F-test)				0.0000
R-squared adjusted				0.019

about its overall significance. The F-statistic for testing overall significance of the model is 8.349, corresponding to a p-value of 0.000017. Therefore, we can conclude that the model is statistically significant. Table 8 presents coefficients for each independent variable.

There are only two variables (trading frequency and account value) statistically significant at 1 percent level. The negative sign of frequency shows the negative relationship between “freq” variable of investor and exhibition of disposition effect: the greater “freq” value is, the less disposition effect is shown. However, the interpretation of “freq” variable, as developed in the first section, is that the investor who trades more actively is assigned a lower “freq” value. Consequently, we see the positive relationship between investors’ activeness and tendency for the disposition effect: more frequent activity is, more prone to the disposition effect. This is inconsistent with the result of the Chinese investors (G. Chen et al, 2007). The positive signs of diversification levels, on the other hand, suggests an investor who diversifies his investment in

more stocks suffers more from a disposition effect. This explained variable, however, is not significant at the five percent level. It suggests that Vietnamese investors may not diversify their investment in order to reduce risk, but they are exposing themselves to the disposition effect. Because of a fear of loss, investors by more stocks ; consequently, it increases the number of stocks in the portfolio. Account value has a negative relationship with disposition effect: high account value is more inclined to realize loss than low account value. It can be interpreted as people with larger accounts pay more attention to their trading decision, making better choices in realizing gains and losses.

In Odean (1998a), infrequent traders reported a difference in PGR and PLR of 0.156 while frequent traders exhibited a difference of only 0.04. In other words, in Odean’s findings, infrequent traders were more reluctant to realize loss than frequent ones. Likewise, G. Chen et al (2007) reported a negative relationship between frequency and the disposition effect in the same regression model. This study also made a conclusion

Table 9: Binary logistic regression of (PGR-PLR) on frequency, diversification level, account value

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.973	0.180	5.418	0.000
Freq	-0.011	0.002	-4.381	0.000
Div-lev	0.296	0.061	4.816	0.000
Acc_val	-4.55e-11	0.000	-2.849	0.004
LR statistic (3 df)			107.019	
Probability(LR stat)			0.000	
McFadden R-squared			0.091	

about the negative sign of account value variables: investors who have larger accounts suffer less from a disposition effect.

The model (2) is estimated by the binary logistic regression. The model is significant at 5 percent with the p-value for LR statistic much smaller than 0.05. As can be seen on Table 9, our model produces a low McFadden R² of 9.07 percent.

The result arrived from this model is consistent with that of the linear regression. Negative signs in frequency levels can be interpreted that the odd in favor for an investor exhibits disposition effect increases as he or she trades more actively. This variable is statistically significant at 1 percent level with a z-statistic of -4.381. The second explained variable, diversification level, produces a z-statistic of 4.816, also being significant at 1 percent level. The estimated coefficient of is 0.296, suggesting the positive relationship between diversification levels and disposition effects: as investors spread their portfolios into more different stocks, they demonstrate a stronger preference for realizing winners than losers. Account values,

on the other hand, move negatively with the odd in favor of the disposition effect: the greater the account value, the smaller the odd in favor of unwillingness to realize losses. This independent variable's z -statistic is - 2.849, corresponding with a p-value of 0.004 (smaller than 0.05). Therefore, an account value is significant.

Duration between winning and losing roundtrip

In addition to Odean's method, also known as PGR&PLR method, we can examine the disposition effect by comparing the average length of time it takes for an individual to sell stock for gain versus the average of time to sell stock for loss. If there is a shorter average holding period for stocks sold for gain compared to that of stocks sold for loss, we would have evidence for the disposition effect. To conduct the test, we follow Shapira&Venezia's (2001) approach, which is also known as the "duration method". In the test, the authors calculate and compare the duration of each winning and losing roundtrip. Accordingly, a roundtrip begins when investor first buys the stock and ends when investor

stops having that stock in the portfolio. A simple roundtrip consists of only one purchase of a stock and followed by a sale of all stock in the portfolio. A complex roundtrip consists of multiple purchases and/or sales. A complex roundtrip is certainly more complicated when dealing with many combinations of buy and sell orders. For example, an investor buys 100 shares, after that the investor sells 50 shares on two different days. In this paper, we report both simple and complex roundtrips. Duration is defined as the weighted average of time from the first buy to the final sale, second buy to the sale and so on. The weights used are the value (number of shares bought multiply with the purchasing price) of each buy.

$$W_i = \frac{\# \text{ share bought at time } x \text{ purchasing price}}{\text{Total value of stock bought in a roundtrip}}$$

$$\text{Duration} = W_i \times L_t$$

Where: L_t is the length of time from the purchase date t to the date of final sale in a roundtrip

To determine whether the roundtrip is winning or losing, we compare the total value of stock bought and total value of stock sold. If the total value bought were less than to total value sold, the roundtrip were winning roundtrip or otherwise.

Table 10 reports the duration for winning and losing roundtrips. On average, neglecting simple or complex roundtrips, the losing roundtrip is about 41 days longer than the winning roundtrip. T-stat for the difference is 27.15, which produces very small p-values; therefore, the difference is significant at 5%. Apparently, duration for a simple roundtrip

must be shorter than the for a complex roundtrip because the complex roundtrip constitutes multiple buy and sell orders. The difference between a losing roundtrip and a winning roundtrip for both simple and complex is almost the same, around 39 days. We can also notice that the average time for a Vietnamese individual investor to hold a losing stock is almost more than double the time that the investor holds a winning stock, 72 days versus 31 days for the losing roundtrip and winning roundtrip respectively. From the above evidence, we can conclude that Vietnamese individual investors hold losing stocks and are more ready to sell the winning stocks. Therefore, the test once again reconfirms the existence of the disposition effect for Vietnamese individual investors.

The difference in duration between winning and losing s give us a yardstick to measure the disposition effect. In comparison with previous studies Sharpia & Venezia (2001), the average duration of winning roundtrips of Israeli investors is about 20.24 days meanwhile that of losing roundtrips is about 63.27 days. It appears that Israeli investors are more prompt to realize winning and losing stocks than Vietnamese investors. However, the difference between the duration of winning roundtrips and losing roundtrips of Israeli investors is 43 days, which is greater than Vietnamese individual investors. Accordingly, we can conclude that Israeli individual investors may somewhat exhibit more disposition effects than Vietnamese individual investors. From that point we can have a view of the effect of culture on investors' behavior and the tendency to exhibit disposition effects.

Table 10: Duration of losing roundtrip and winning roundtrip.

Complex	Losing roundtrip	Winning roundtrip	Difference	t-stat	p_value
mean	83.68	45.53	38.16	15.1	1.94E-50
stdv	106.75	62.69			
count #	2424	2335			
simple	Losing roundtrip	Winning roundtrip	Difference	t-stat	p_value
mean	64.04	25.57	38.47	20.26	1.63E-87
stdv	106.74	45.32			
count #	3499	5900			
All roundtrip traded	Losing roundtrip	Winning roundtrip	Difference	t-stat	p_value
mean	72.08	31.23	40.85	27.15	1.3E-155
stdv	107.17	51.64			
count #	5923	8235			

Disposition effect: Rational or Irrational

The reason that investors sell winning stocks and hold losing stocks might be that they expect the losing to outperform the winning ones in the future. For example an investor buys a stock with the hope that the price will go up when the market appreciates that favorable information. If the stock goes up, she sells it; on the other hand, if the stock goes down, she continues to hold it, believing that the information is not reflected in the price yet.

We follow Odean (1998a) to conduct a test of whether such beliefs are reasonable or not. In other words, we test whether the stocks that are sold for profit (realized gains) are more profitable than stocks that could be, but are not, sold for a loss (paper losses). The methodology is to calculate the returns after 10 days, one month, and four months after a sale of a winning stock or an occurrence of a paper loss.

The hypothesis is as following:

$H_0: R_{\text{realized gains}} \geq R_{\text{paper losses}}$ (realized gains outperform paper losses)

$H_1: R_{\text{realized gains}} < R_{\text{paper losses}}$ (paper losses outperform realized gains)

The test used is t-test for two independent groups (realized gains and paper losses), assuming equal variance.

Table 11 reports the results of the test. As can be seen, the rate of return on paper losses is smaller than the rate of return on realized gains about 1.3%; 2.4%; and 1.7% respectively for 10 days, 1 month and 4 months periods after the date the gains were realized and the paper losses were recorded. The test produces p-value which is very close to 1. It indicates that we failed to reject null-hypothesis. It means that the expectation of investors that the paper losses will outperform the realized gains in near future is not justified. Consequently, investors who are exposed to disposition effects will be penalized.

Table 11: T-test on ex post returns of paper losses and realized gains

	10 days	1 month	4 months
R(rg)-R(pl)	0.013	0.024	0.017
t-statistic	5.976	7.777	3.239
p-value	1	1	0.999

5. Implications

This paper examines the investor's psychology in making trading decisions and finds that Vietnamese individual investors exhibit disposition effects. It provokes many implications for researchers, market practitioners and policy makers .

Disposition effects can affect the supply side of the stock, consequently, directly affecting the stock price. If the disposition effect holds in aggregate, it can cause the positive relations between stock prices and volume (Lakonishok and Smidt (1986) and by Ferris et al. (1988) cited in Odean (1998). Moreover, disposition effects can act as a stock price stabilizer that can inhibit the possibility of stock increases and decreases. For instance, if many investors buy stocks at a particular price, that price would become a reference point for investors. If stock prices decrease below an investor's reference point, the disposition effect makes investors more reluctant to sell the losing stocks; consequently, it reduces the stock supply and slows down the process of price decreases. On the other hand, if stock prices increase, the effect makes investors more ready to sell the winner; accordingly, stock supplies increase and it slows down the process of stock increases. Therefore, if we observe abnormal market trading volumes, we can expect that the market or a particular

stock price will have some resistance to increases or decreases some days after. Hence, the disposition effect can explain the correlation between stock changes and volume of exchange.

Disposition effects means that stock prices cannot quickly adjust to information; consequently, it causes a systematic mispricing. For instance, disposition effects can cause investor who had negative information, to reluctantly sell the stock below his/her reference price. By not selling the stock with negative information, the investor fails to signal bad information to the market. Subsequently, market prices cannot quickly incorporate the new bad information, and new information will have a time delay to reflect into stock prices.

In the view of investors, the disposition effect severely affects investors' wealth. Holding the loser too long in the hope that the stock will recover is just frivolous. Investors will lose others investment opportunities. Similarly, selling the winner too soon, investors will have to reinvest the money and also incur the opportunity of cost by the return of the stock sold.

Apparently, investors should avoid falling into the "disposition effect". However, it is very difficult for investors to correct and even

be fully informed about the consequences. Once again, we recommend investors to “Cut losses and let the profits run”. We suggest that investors set a maximum loss and set an investment horizon for investing. If the loss reaches the threshold, investors should not hesitate to sell the unprofitable stocks. Furthermore, investors should sell stocks after a predetermined investment horizon regardless for gain or loss. We hope that with this strategy, investors will improve their trading performances.

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