Chapter 4

Empirical Results

4.1 House Money Effect

The house money effect is manifested in a greater tendency to take more risk once a gain or profit has been experienced. Evidence that there is a psychological explanation for this behavior is predicted on the feeling that they are playing with the house's money, not their own money.

We begin the analysis by estimating regression of the historical price change of stocks on the investment gain during the previous sale period (*t*-1). For each investor on each sale, we calculate the trading profit by using the method of FIFO. Then the house money effect would require that the coefficient significantly differs from zero, whether positive or negative.

The coefficient from the regressions and associated *t*-statistic are reported in Table 13. Consistent with the argument of Thaler and Johnson (1990), the results in Table 13 reveal a strong house money effect and show that individual investors increase their risk taking when they have prior investment gains. The coefficient that is associated with the prior gains differs significantly from zero at the 1% level. Because there is a single independent variable, the coefficients in the regressions of individual risk taking on prior investment gain have a straightforward interpretation—the coefficients are the correlations. The house money effect would

require that the coefficient significantly differs from zero, whether positive or negative. The empirical results show a significant positively correlated which support the house money effect and investors are more likely to be a positive feedback trader—they prone to buy stocks with abnormally good performance. Our results are also consistent with the prediction in law of small number theory (Tversky and Kahneman (1974)). People misconception of chance and believe in local representativeness (gambler's fallacy). Take a coin tosses for heads or tails for example, people regard the sequence H-H-H-H-T-T to be more likely than the sequence of H-H-H-H-H-H, which in fact they have the same probability to occur. Thus, after observing a long run of price increase, most people erroneously believe that price is more likely to fall in the future. If he is willing to buy such stocks, it means that he takes more risk and is likely to accept gambles that would normally be unacceptable to him.

Insert Table 12 here

If an investor receives a big gain result from selling stocks that recently have experienced abnormally high returns and then he reinvests in same stocks, the house money effect measure would be overestimate. To analyze this reinvestment in same stocks problem, we divide our sample into two sub-samples, reinvestment and non-reinvestment sample, according to the ratio of the value of stocks that have been bought back to the total purchase value. Reinvestment group contains observations that the ratio is higher than 0.25, and the non-reinvestment group

contains the rest ones. We then begin to run regressions separately to estimate house money effect measures.

The coefficients from the regressions and associated *t*-statistic are reported in Table 13. The results reveal strong evidence of the house money effect for both two sub-samples. The house money effect measures are all positive and statistical significantly differs from zero in Table 13. Consistent with our prediction, the house money effect measure indeed overestimate in the sample of reinvestment. The differences between sample of reinvestment and non-reinvestment are all positive and significantly differ from zero for horizons that longer than 7-days. However, if we compare the original to non-reinvestment samples, the differences, in general, are insignificant. Excludes the effect of stocks reinvestment, empirical results still reveal strong house money effect and there is no statistical difference between our main sample and non-reinvestment sample.

Insert Table 13 here

4.2 The Size of a Prior Gain should be Large Enough to be Perceived as the House's Money

Our previous findings demonstrate a strong house money effect and show that investors tend to buy up trend stocks once they have experienced a prior gain. However, the question is whether the above behavior holds when investors face little prior gain, or should the gain be substantial enough to be perceived as playing

with the house's money. Now we attempt to examine whether or not the house money effect is associated with the size of prior gain.

The results of Arkes and Blumer (1985) showed those who had paid more would have a greater sunk cost, thus resulting in a stronger sunk cost effect. Arkes, Joyner, and Pezzo (1994) considered the effect of gains rather than costs. They proposed that the house money effect holds when prior gains are unanticipated as a windfall. Therefore we infer that investment gains should be large enough to be unanticipated and perceived as the house's money. Furthermore, the larger the size of the prior gain, the stronger the house money effect will be.

To test the above argument, we partition our sample into quintiles on the basis of gain size. Gains are categorized into four groups, G1 to G4 contain gains in descending size. We then calculate the house money effect measure in each group. The third to sixth columns of Table 12 present the house money effect measures of the four groups that gained in size. Consistent with our expectation and earlier work, we find the house money effect measure in general is positive for every size quintile over different horizons of risk taking. Individual investors, as a group, are affected by the house money effect. In addition, the results reveal the strongest house money effect by individual investors in group G1 (largest size of prior gain), the *t*-statistic associated with the prior gains is highest and significantly over 7-day to 60-day price change. Consistent with Arkes, Joyner, and Pezzo (1994), we find the house money effect is associated with the size of prior gain and this gain should be substantial enough to be perceived as an unanticipated windfall and as playing

with the house's money.

Insert Table 12 here

Further, we analyze the reason why some measures are negative but insignificant in group G1. We run the regressions by taking the absolute price change as the dependent variable. The results are presented in Table 14 and show measures all become positive and statistical significantly. The differences between group G1 and group G4 are all positive and significantly differ from zero. The results imply that for the shorter horizon, investors also exhibit the house money effect that some people are positive correlated and the others are negative correlated. For the long term, investors are positive correlated and are prone to be positive feedback traders.

Insert Table 14 here

In sum, the results reveal evidence of the house money effect in every size quintile. In addition, the results reveal that individual investors are more likely to take a risk after a larger gain. Most important, the house money effect is most acute in the largest gain group consistent with the hypothesis that the gain should be large enough to be perceived as the house's money.

4.3 The Hedonic Depreciation of the House Money (Prior Gains)

Earlier we showed that individuals routinely consider prior gains when making investment decisions about the future. Moreover, the gain should be large enough to be perceived as house money, and should affect the following risk taking behavior. Here we examine whether the timing of the house money is also an important factor in decision making.

Arkes and Blumer (1985) and Gourville and Soman (1998) argued that the sunk cost effect should weaken over time. In a sequence of experiments, Gourville and Soman (1998) found that a consumer would gradually accept the prepayment cost over time, thus decreasing the sunk cost effect on later consumption behavior. They called this phenomenon “payment depreciation”. In the other respect, individuals were known to incorporate both positive and negative events into their status quo with passing time (Kahneman and Tversky (1979), Kahneman and Varey (1991), and Thaler (1985)). Studies showed that although a newly obtained asset might initially be viewed as a gain, it would gradually be incorporated into a person’s wealth and became a part of the status quo, as evidenced by the “endowment effect” (Kahneman, Knetsch, and Thaler (1990) and Thaler (1980)).

In the case of an investor selling stocks with gains, we believe that the same type of adjustment occurs. We propose that an investor feels a great pleasure from getting a big gain on stock investments yet gradually adapts to that gain over time and thus manifests in a weaker house money effect. We refer to this as the house

money depreciation, the gradual decreasing pleasure impact of house money over time. To explore this issue, we examine the relation between the house money effect and the timing of stock investment. If the house money depreciation holds, the house money effect ought to be weaker with the longer time during the stocks purchase period.

We begin our analysis by identifying the different lengths of time on stock buying processes, such as 3, 4, 5, and 10 days. Then we calculate the house money effect measure of our sample. Table 15 to 18 and Figure 2 present the house money effect measures of four different time lengths and demonstrate that the house money effect is attenuated with time, resulting in a greater willingness to ignore a prior gain and a lesser willingness to increase risk seeking on the later investment decision. For example, the coefficient reported in Table 15 decreases as it moves from 10.51 in the second column to 1.96 in the fifth column, for the 10-day magnitude of price change. Therefore, we identified the extent of this house money effect, showing that individuals continuously adapt to a prior gain, which results in the gradual weakening of the house money effect over time.

Insert Table 15 to 18 and Figure 2 here

The patterns of the findings in the above studies reflect the role of size and timing in the effect of the prior positive outcome affect on risk preference in financial investment. Only when a significant gain is being considered, does an individual become more inclined to take a risk. When the influence of a significant

gain gradually depreciates over time, the greater tendency to take risk also diminishes.

4.4 Underdiversification and Familiarity bias

Recent work (e.g., French and Poterba (1991), Later, Baxter and Jermann (1997), Heath and Tversky (1991), Coval and Moskowitz (1999), Huberman (2001), Grinblatt and Keloharju (2001), and Benartzi (2001)) documented that people diversified their portfolio holdings much less than was suggested by normative models of portfolio choice. Investors believe familiar stocks will deliver higher returns and have less risk than unfamiliar stocks. The brain often uses the familiarity shortcut to evaluate investments. This can cause people to invest too much money in the stocks that are most familiar to them. Ultimately, this leads to underdiversification. Investors allocated too much money to domestic stocks, locals companies, and their employers' stocks.

It is common for people to invest their additional money in their portfolio's stocks. They like investing in the stock they already have or they have ever traded because it is familiar and they tend to opt for what they knew. Therefore the more familiar companies you pick, the more comfortable investment will be. Assuming familiarity affects investment choice, investors who have more serious familiarity bias should be less influenced from the house money effect.

We begin the analysis of the role of familiarity bias in investment risk taking

by dividing the sample into three type investors (large-stock, small-stock, and mixed-stock investors) and then comparing the house money effect measures for the entire sample of investors as well as for sub-samples of investors. We identify investors with two steps. First, the specifications of holding stocks for each trading day are established. On each day, we sum the value of large stocks and small stocks[1] held by an individual. The large-stock ratio is calculated as the ratio of the value of large stocks to total portfolio value. Likewise, the small-stock ratio is calculated as the ratio of small stocks' value to total portfolio holdings. Then we are able to identify a large-stock (small-stock) day when the large-stock (small-stock) ratio is higher or equal to 0.7. For the entire sample period, an investor is defined as a large-stock (small-stock) trader if the ratio of number of large-stock (small-stock) days to total days is higher or equal to 0.7. Finally, the remaining investors are classified as mixed-stock investors.

The summary statistics for three types of investors are reported in Table 19. Panels A, B, and C report descriptive information on the trading activity and portfolio holdings for our small-stock, large-stock, and mixed-stock investor samples, respectively. Our sample size is largest in the group of mixed-stock, followed by large-stock and small-stock investors, in that order. Overall, they hold relatively few stocks. They focus on a small number of stocks with which they are familiar. Both the mean and median in our sample of individuals are below 8

[1] We classify stocks into four groups based on their size in ascending order. We then regard stocks in the group of the largest size as the large stocks. Likewise, small stock is defined as in the group of the smallest size

different stocks. And the mode is 1 or 2 different stocks. Comparing stock holdings among the three types of investors, small-stock investors hold the fewest stocks, followed by large-stock and mixed-stock investors, in that order. The average number of stocks held by small-stock, large-stock, and mixed-stock investors is 1.54, 3.61, and 7.05, respectively.

In addition, we present the trading activity for three types of investors. Small-stock investors trade least frequent, followed by large-stock and mixed-stock investors. On average, small-stock, large-stock, and mixed-stock investors trade 5.44, 9.71, and 20.31 times during one year period. Mixed-stock investors have the largest annual trading lots and volumes. The size of stocks held by small-stock investors is much smaller than by large-stock investors, though annual trading lots are larger in small-stock than in large-stock investors. As a result, annual trading volumes are still higher in large-stock than in small-stock investors.

Insert Table 19 here

The house money effect measures and associated *t*-statistics are reported in Table 20. In addition, we repeat the analysis for the investors who are also classified in the group of largest prior gain (G1) and present the results in Table 21. Consistent with what we expect, familiarity affects investment choice of individual investors. We find investors who have more serious familiarity bias should be less influenced from the house money effect. Specifically, large-stock investors have more serious familiarity bias than all individuals as a group, thus large-stock

investors have less influenced from the house money effect than average individuals. The mixed-stock investors who are the least influenced by familiarity bias have the strongest house money effect.

Insert Table 20 here

Repeating the analysis for the investors who are also classified in the group of largest prior gain (G1) yields similar results. In sum, individual investor's investment choice is indeed driven by familiarity bias. Investors invest too much money in the similar size of stocks that are most familiar to them. Such a factor may dominant the risk representation and diminishes the strength of the house money effect.

Insert Table 21 here

4.5 Reference Point

So far we have collected evidence that individual investors' prior outcomes affect decision-making strategy and risk taking in financial markets. People are willing to take more risk following earlier gains. Moreover, only when a significant gain is being considered, does an individual become more inclined to take a risk. When the influence of a significant gain gradually depreciates over time, the greater tendency to take risk also diminishes. In this section we would like to evaluate variations in the house money effect over different reference points in an

attempt to shed light on the important issue in behavior finance on reference points.

The concept of reference point was introduced in prospect theory (Kahneman and Tversky (1979), Tversky and Kahneman (1991), and Tversky and Kahneman (1992)). The value function is defined over gains and losses relative to a reference point, not over the wealth level suggested by normative economic models. Although prospect theory specifies the shape of the value function around the reference point, it does not specify where people set their reference point. Recent studies (e.g., Shefrin and Statman (1985), Odean (1998), Heisler (1994), Weber and Camerer (1998), Gneezy (1998), Heach, Huddart, and Lang (1999), Huddart and Lang (2003), Core and Guay (2001), Poteshman and Serbin (2003)) suggested and found evidence that people tend to consider the average purchase price and the prior maximum price as their reference point in financial investments.

To evaluate the role of reference points associated with the house money effect, we repeat the analysis by using the LIFO method, average purchase price, and the previous period's price as reference points when we compute gains in stock investments. The house money effect measures and associated *t*-statistic for all positive profits are reported in Table 22 and Table 23. The second to fifth columns present the results by using the first purchase price, the most recent purchase price, average purchase price, and the prior high price as reference points, respectively.

The results reveal strong evidence of the house money effect in stock investments of individual investors for all four reference points. The house money

effect measures are all positive and statistic significantly differs from zero in Table 22. No matter what type of reference point we use, we demonstrate the strong house money effect. Evaluation across different reference points reveals that people are more likely to use prior maximum stock price as reference point and compare the selling price for each stock sold to its prior maximum price to determine whether that stock is sold for a gain or a loss. The results are consistent with the findings of Weber and Camerer (1998) and Gneezy (1998) and the evidence on stock options (Heach, Huddart, and Lang (1999), Huddart and Lang (2003), Core and Guay (2001), and Poteshman and Serbin (2003)), that the maximum stock price is a more effective reference point than the purchase price. Investors' reference points adapt over time and the currently-salient reference point is the highest stock price attained some time ago. People focus on extreme events when making investment decisions. The feeling of happiness to bring from the profit over prior high is stronger and the effect of such feeling on risk taking behavior is also strongest.

Insert Table 22 and Table 23 here