

Mitigating Investor Risk-Seeking Behavior in a Down Real Estate Market

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Using an extension of the prospect theory known as false reference points, this study examines the behavior of real estate investors after experiencing a loss. The results confirm our central hypothesis that when investors attempt to avoid the pain of regret by changing the lens through which they view losses, they become more likely to hold onto bad investments. This unwillingness to sell bad investments in the short run causes investors to be more likely to experience heightened levels of unavoidable regret in the long run. The results hold across demographic characteristics but are slightly more pronounced for men and international investors, specifically those from Asia.

Keywords: Behavioral real estate, Mental accounting, Prospect theory, Risk aversion

INTRODUCTION

We are currently in the throws of the worst financial crisis since the Great Depression. Now more than ever, the current economic condition has shed light on the importance of real estate as an asset class. Real estate has been gaining increasing attention from pension funds, insurance companies, private equity, and hedge funds. Whether held directly or indirectly, real estate represents the bulk of the wealth in the world today¹ and should be a major focus of institutional investors.

Traditional models use expected utility maximization assumptions as a guide to understanding and predicting people's actual investment behavior. Given the widespread failure of assuming all investors are perfectly rational at all times, behavioral models have been introduced. Approaches such as the prospect theory have been used to explain why people deviate from rationality when confronted with a portfolio that has decreased in value. For example, the prospect theory holds that people become risk-seeking when holding stocks that have gone down in value². Instead of selling the losers,

investors have been found to hold them far too long to avoid the pain of regret (Odean [1998]).

We propose an extension of the prospect theory in this study by suggesting that people are so averse to regret that in severe down markets they will (to their own detriment) exacerbate their risk-seeking behavior by introducing a false reference point. To clarify, assume an investment has decreased in value. If the expected return on the investment is zero and has positive risk, utility maximization says the investor should sell the asset. In reality, people do not sell. Instead, they continue to hold the asset in the hopes that it will increase in value to a level at or above the original purchase price to avoid regret. This is where the prospect theory stops. We propose that in addition to falling prey to this disposition effect (the unwillingness to sell losers), investors will also try to avoid regret by introducing a false reference point. For example, instead of thinking about the investment's negative return in isolation, investors will make themselves feel better by thinking more globally in terms of how their investments in other assets have done well enough to offset their current losses. While this may sound like a healthy coping mechanism on the surface, we demonstrate empirically that this subconscious comforting effort will make investors even worse off because it will cause them to be more likely to hold onto losing investments. Doing so will further reduce investors' overall wealth position and cause them to

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experience unavoidable and even more painful regret. To our knowledge, no study has ever suggested an extension of the prospect theory in this way, nor has a study ever empirically verified our hypothesized outcome.

Our results confirm that coupling a false reference point with the prospect theory will cause investors (much to their detriment) to be more likely to hold onto a losing investment even though this contradicts expected utility maximization theory. Our finding is important because now that investor cognition is better understood, fund managers are more able to help investors avoid making this bad situation even worse.

LITERATURE REVIEW

Prospect Theory

Prospect Theory was first proposed by Kahneman and Tversky [1979]. Since then, many studies have used prospect theory to explain empirically observed departures from rational expected utility maximization. For example, when explaining why the equity premium is so high, Benartzi and Thaler [1995] suggested that investors are not averse to the variability of returns; rather, they are averse to loss. Because annual stock returns are negative much more frequently than are annual bond returns, loss-averse investors will demand a large equity premium to compensate them for the much higher chance of losing money in a given year. The authors show that over a one-year horizon, the prospect values of stock and bond returns are about the same if stocks return 8% more than bonds, which explains the equity premium.

Shefrin and Statman [1985] explain the disposition effect among investors using prospect theory. Because people feel the pain of incurring losses much more than the pleasure of experiencing gains, and because people are willing to gamble in the domain of losses, investors will hold onto loser stocks far too long and will sell winners far too quickly. Theoretically, the purchase price of a stock should not enter into the decision as to whether or not it should be sold. If the stock is expected to provide a positive abnormal return, it should be held. Otherwise, it should be sold.

In an examination of racetrack betting, McGlothlin [1956] and Ali [1977] empirically documented an anomaly which points to the central role of reference points. These studies found that bettors tend to shift their bets toward long-shots and away from favorites later in the racing day. Because the track takes a percentage of each dollar bet, the average bettor is behind by the last race of the day. These bettors now strongly prefer higher risk, lower expected return long-shot bets because a long-shot bet can generate a payoff large enough to cover their earlier losses. The end-of-the-day effect is consistent with using zero daily profit as a reference point and becoming risk-seeking once in the domain of losses in the hopes of at least breaking even. This betting behavior cannot be explained by rational expected utility theory because

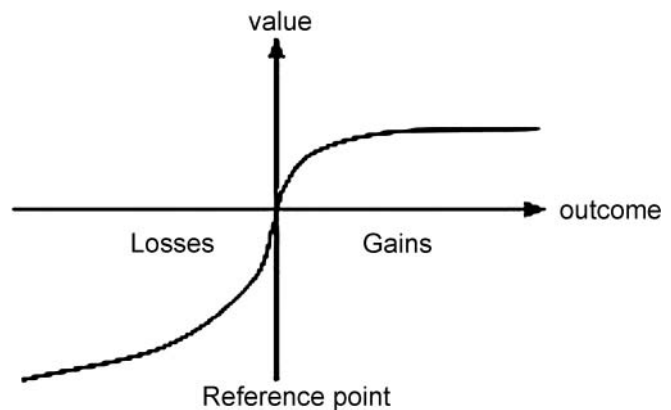


FIGURE 1 Value function based on the prospect theory.

the last race of the day is not fundamentally different from the first race of the day. In sum, prospect theory has been used to explain actual investment (betting) behavior where traditional utility maximization theory has fallen short.

Kahneman and Tversky [1979] proposed the prospect theory as a descriptive model of decision making. It deviated from other prescriptive theories—specifically expected utility theory—which could not explain human behavior under certain circumstances such as financial decisions. The following three points summarize the main ideas of prospect theory:

1. An individual views monetary consequences in terms of changes from a reference point.
2. The resulting value function is steeper for losses than for gains, as shown in Figure 1. An equal-magnitude gain and loss do not have symmetric impacts on decision making. Instead, losses hurt more than gains satisfy; most empirical estimates conclude that losses are about twice as painful as gains are pleasurable.
3. The value curve is concave for gains and convex for losses, implying that decision makers will be risk averse when choosing between gains and risk-seeking when choosing between losses.

False Reference Points

To define a gain or loss in prospect theory, an investor must first identify a starting, or reference point. Genesove and Mayer (2001) examined residential real estate selling behavior in the Boston market after real estate prices had fallen precipitously. They document that people who buy homes at a price of \$400,000, for example, latch onto this reference point and are incredibly resistant to sell at any price lower, no matter how far down the market has gone since the purchase. Homeowners do this because of regret aversion. As long as the loss is only on paper, it does not hurt as badly as a realized loss. Based on the expected utility theory, price is not a function of what was paid for the asset.

To determine current value, all that matters is an expectation about future price and risk movements. Alternatively stated, a potential homebuyer is not willing to pay above market value for a home just because the seller bought at the peak. To the new buyer, the original purchase price is not relevant. Genesove and Mayer [2001] find that because sellers cling to the higher false reference point, they set unrealistically high asking prices and experience greater time on the market with no associated increase in final transaction price.

Those unfamiliar with behavioral issues might assume that the reference point investors use is always their purchase price, but this is often not the case. For stocks, Potoshman and Serbin [2003] show that investors tend to select a stock's 52-week high as the appropriate reference point. In real estate,

Seiler et al. [2008] demonstrate that any opportunity to sell previously at a higher price can represent a new reference point. Importantly, these new, higher reference points work against the investor because they will result in regret if the asset is sold. So instead of selling and locking into the regret, the investor tries to avoid experiencing regret by holding the (losing) asset longer. Worse yet, as previously explained, prospect theory maintains that the investor will likely depart from risk averse behavior and gravitate toward dangerous risk-seeking behavior. Becoming a risk seeker often results in even greater losses and, therefore, more regret in the long run. In sum, we postulate that outcomes predicted by the prospect theory can be made significantly worse if investors try to avoid facing up to their losses by redefining their reference point.

TABLE 1
Variables Examined Independently From Each Other For All Six Scenarios.

Variable	N	50/50 Iso	50/50 Port	50/50 Diff	30/70 Iso	30/70 Port	30/70 Diff	10/90 Iso	10/90 Port	10/90 Diff
Overall	345	4.06	3.79	0.27*	6.06	5.78	0.28**	7.03	6.98	0.05
Men	196	4.00	3.63	0.37*	6.11	5.80	0.31*	7.09	6.98	0.11
Women	148	4.13	3.99	0.14	6.00	5.76	0.24	6.96	6.99	-0.03
North America	102	3.77*	3.61	0.16	5.84**	5.49	0.35*	6.93	6.78**	0.15
South America	6	5.33	5.17*	0.16	7.33	7.00	0.33	8.50	8.17	0.33
Asia	115	4.39*	3.97	0.42*	6.22**	5.96	0.26	7.02	7.09**	-0.07
Europe	61	4.08	3.87	0.21	6.15**	6.08	0.07	7.21	7.31	-0.10
Africa	4	4.75	2.25*	2.50	8.25**	6.75	1.50	7.75	8.00**	-0.25
Australia	1	1.00	5.00	-4.00	8.00	7.00	1.00	9.00	9.00	0.00
U.S.	96	3.79	3.63	0.16	5.84	5.51	0.33*	6.96	6.84	0.12
International	193	4.28	3.93	0.35*	6.27	6.03	0.24	7.13	7.18	-0.05
Married	57	3.51*	3.14**	0.37	5.58	5.16*	0.42	6.47	6.53	-0.06
Single	287	4.16*	3.92**	0.24*	6.16	5.91*	0.25*	7.14	7.07	0.07
Beginning	292	4.12	3.84	0.28*	6.14	5.86	0.28**	7.09	7.08	0.01
End	52	3.67	3.50	0.17	5.62	5.35	0.27	6.73	6.42	0.31
Day	150	4.35*	3.99	0.36*	6.31	5.89	0.42**	7.21	7.19	0.02
Night	194	3.83*	3.63	0.20	5.87	5.70	0.17	6.90	6.82	0.08
Bull	135	3.83	3.61	0.22	5.96	5.69	0.27	6.92	6.89	0.03
Bear	209	4.20	3.90	0.30*	6.12	5.84	0.28*	7.11	7.04	0.07
Under 30	265	4.12	3.86	0.26*	6.09	5.79	0.30**	7.08	7.01	0.07
30+	79	3.84	3.53	0.31	5.96	5.75	0.21	6.86	6.89	-0.03

NOTE1: Paired-Samples T-Tests were used in the three "Diff" columns.

NOTE2: Independent Samples T-Tests were used for the dummy variables in the "Iso" and "Port" columns.

NOTE3: ANOVA and Post Hoc tests were used for the six continents in the "Iso" and "Port" columns.

*Indicates statistical significance at 95%.

**Indicates statistical significance at 99%.

NOTE4: Before Independent Samples T-Tests and Post Hoc Tests were performed, a Levene test for equal variance is conducted. The results are based on the outcome of this test.

NOTE5: Numbers in **bold** indicate statistical significance beyond the 95% level when the scores are compared to their median value of (5).

Data

To empirically test our theoretical framework, we need to construct a carefully crafted experiment that bores down deep into the specific delineations between these various behavioral issues. While it would be nice to observe and collect data on actual trading behavior, no such data can be collected that perfectly isolates the prospect theory and false reference points. Instead, like virtually all other seminal work in the field, our data source will be gathered from experiments.

In our experiment, we present six different scenarios to subjects. In the first three scenarios, real estate is the only asset under consideration, and in the last three scenarios real estate is considered within a portfolio context (with other assets such as stocks and bonds). In all the scenarios, real estate has been bought one year ago as an investment. Since then, it has gone down in value 20%. In the first scenario, there is a 50% chance of the investment property returning to its purchase price and a 50% chance it will go down another 20%. In the second scenario, there is a 30% chance of the investment property returning to its purchase price and a 70% chance it will go down in value another 20%. In the third scenario, there is a 10% chance the property will return to its purchase price and a 90% chance it will go down another 20%. The fourth through sixth scenarios are the same as the first three except they are presented in a portfolio context where currently the loss of 20% in the value of the real estate investment is exactly offset by a gain in the value of other asset classes (stocks and bonds). Subjects are asked how likely they are to sell the real estate investment in all scenarios on a scale from 1 to 9.

The experiments were conducted over a three-year period at a university in the western United States. Subjects participating in the study were MBA students in a masters' level required finance course. All 345 students who took this course completed the experiment that was conducted in class. In addition to responses to the six scenarios already described, four additional questions were asked to gather demographic information to see if results vary by age, gender, marital status, or country of origin.

Given the tremendous demographic diversity of the university, the experiment was conducted in a rich environment that allowed a rare opportunity to examine these various demographic characteristics in a controlled setting. The respondents come from 24 different countries. North America represents 30% of the sample, Asia 33%, and Europe 18%. Respondent ages range from 20–57 with an average of 30.24 years. Men compose 57% of the sample. Finally, 17% of the respondents are married. In addition to socio-demographic information, variables added to the dataset after completion of the experiment include whether the experiment was conducted at the beginning versus the end of the term, whether the class was held during the day or at night, and whether the real estate market was in a bear versus bull state at the time. The purpose of collecting these additional variables

is to control for any external influences that might affect the responses. We have no theoretical reason to suspect these additional control variables will have any impact on the results.

RESEARCH HYPOTHESIS

It is well documented that investors behave in the manner described by the prospect theory after experiencing a loss. While it is not the purpose of the current investigation to directly test this theory again, the experiment does allow us to informally observe the prospect theory at work. Specifically, the prospect theory would suggest that in all six scenarios, respondents would choose a number on the scale leaning toward the lower end of the spectrum. That is, investors will be more likely to hold onto the real estate investment even though utility maximization theory would suggest they should sell it. Again, the reason is that the real estate investment has an expected return of zero with positive risk. Alternatively, an investment in a T-Bill, which has a

TABLE 2
Pairwise Comparisons for all Real Estate Isolation
Decisions and Real Estate within a Portfolio Decision.

Variable	N	30/70 10/90 Iso	50/50 30/70 Iso	50/50 10/90 Iso	30/70 10/90 Port	50/50 30/70 Port	50/50 10/90 Port
Overall	345	0.97**	2.01**	2.98**	1.20**	1.99**	3.19**
Men	196	0.97**	2.12**	3.09**	1.18**	2.16**	3.35**
Women	148	0.96**	1.87**	2.83**	1.22**	1.77**	2.99**
North America	102	1.09**	2.07**	3.16**	1.29**	1.88**	3.18**
South America	6	1.17*	2.00**	3.17**	1.17*	1.83*	3.00*
Asia	115	0.80**	1.83**	2.63**	1.13**	1.98**	3.11**
Europe	61	1.05**	2.10**	3.15**	1.23**	2.21**	3.44**
Africa	4	−0.50	3.50	3.00	1.25	4.50**	5.75**
Australia	1	1.00	7.00	8.00	2.00	2.00	4.00
U.S.	96	1.11**	2.05**	3.17**	1.33**	1.89**	3.22**
International	193	0.86**	1.99**	2.86**	1.16**	2.10**	3.25**
Married	57	0.89**	2.07**	2.96**	1.37**	2.02**	3.39**
Single	287	0.98**	2.00**	2.98**	1.17**	1.99**	3.16**
Beginning	292	0.94**	2.02**	2.97**	1.22**	2.02**	3.24**
End	52	1.12**	1.94**	3.06**	1.08**	1.85**	2.92**
Day	150	0.89**	1.97**	2.87**	1.29**	1.90**	3.19**
Night	194	1.03**	2.04**	3.07**	1.13**	2.07**	3.20**
Bull	135	0.96**	2.13**	3.09**	1.20**	2.08**	3.28**
Bear	209	0.98**	1.93**	2.91**	1.20**	1.94**	3.14**
Under 30	265	0.99**	1.98**	2.97**	1.22**	1.93**	3.15**
30+	79	0.90**	2.13**	3.03**	1.14**	2.22**	3.35**

Note: Paired-Samples T-Tests were used throughout.

*Indicates statistical significance at 95%.

**Indicates statistical significance at 99%.

TABLE 3
Initial Regression Estimates Including All Variables for All Six Scenarios.

Overall Model Statistics	50/50 Iso	50/50 Port	50/50 Diff	30/70 Iso	30/70 Port	30/70 Diff	10/90 Iso	10/90 Port	10/90 Diff
R-Square	0.052	0.044	0.017	0.054	0.065	0.020	0.036	0.038	0.017
F-statistic	1.911 (0.058)	1.630 (0.116)	0.588 (0.787)	1.986 (0.048)	2.423 (0.015)	0.720 (0.673)	1.303 (0.242)	1.376 (0.207)	0.595 (0.782)
Independent Variables									
Gender	-0.200 (0.842)	0.883 (0.378)	-1.063 (0.289)	-1.188 (0.236)	-0.795 (0.427)	-0.616 (0.538)	-0.917 (0.360)	-0.646 (0.519)	-0.513 (0.609)
Marital Status Dummy	-1.376 (0.170)	-2.427 (0.016)	0.916 (0.360)	-2.110 (0.036)	-3.243 (0.001)	1.039 (0.300)	-2.260 (0.025)	-2.112 (0.036)	-0.579 (0.563)
Day/Night	-2.406 (0.017)	-1.288 (0.199)	-1.266 (0.207)	-1.563 (0.119)	-0.541 (0.589)	-1.440 (0.151)	-0.792 (0.429)	-1.187 (0.236)	0.562 (0.574)
Bull/Bear	-0.873 (0.383)	-1.086 (0.278)	0.147 (0.883)	0.021 (0.983)	-0.098 (0.922)	0.208 (0.835)	-0.455 (0.649)	0.221 (0.825)	-1.089 (0.277)
Age	-0.007 (0.994)	0.469 (0.639)	-0.458 (0.648)	1.781 (0.076)	2.413 (0.016)	-0.426 (0.670)	1.855 (0.065)	1.285 (0.200)	1.211 (0.227)
North America Dummy	-1.411 (0.159)	-0.932 (0.352)	-0.581 (0.562)	-2.285 (0.023)	-1.989 (0.048)	-0.761 (0.448)	-1.455 (0.147)	-1.712 (0.088)	0.179 (0.858)
Asia Dummy	-0.534 (0.594)	-0.439 (0.661)	-0.136 (0.892)	-1.832 (0.068)	-1.386 (0.167)	-0.869 (0.385)	-1.416 (0.158)	-1.370 (0.172)	-0.290 (0.772)
Europe Dummy	-1.083 (0.280)	-0.625 (0.532)	-0.543 (0.587)	-1.942 (0.053)	-1.237 (0.217)	-1.274 (0.204)	-1.187 (0.236)	-1.154 (0.249)	-0.279 (0.780)

NOTE 1: t-statistics are given within the table.

NOTE 2: p-values are given in parentheses.

NOTE3: Bold numbers are significant beyond the 90% level.

positive expected return and close to zero risk would strictly stochastically dominate the real estate investment.

What this experiment is designed to directly test is whether or not the introduction of a false reference point would change the likelihood of the investor's willingness to sell the real estate asset. From a utility wealth maximization standpoint, the investments in scenarios 1 and 4, 2 and 5, and 3 and 6 are identical. So, if investors behave rationally, their willingness to sell should remain the same within each pair of scenarios. We hypothesize against rationality and in favor of the false reference point argument to suggest that when investors think in terms of their overall portfolio—which in our experiment has increased in value to a level that exactly offsets their real estate loss—they will be more willing to hold onto the loser real estate asset going forward. This will be to their detriment because the mounting losses will result in long-term extended regret aversion and further mental anguish. More formally, the traditional utility maximizing hypothesis can be represented as:

$$H_0 : R_1 = R_4, \quad R_2 = R_5 \text{ and } R_3 = R_6$$

$$H_1 : R_1 \neq R_4, \quad R_2 \neq R_5 \text{ and } R_3 \neq R_6$$

whereas our false reference point behavioral hypothesis can be represented as:

$$H_0 : R_1 > R_4, \quad R_2 > R_5 \text{ and } R_3 > R_6$$

$$H_1 : R_1 < R_4, \quad R_2 < R_5 \text{ and } R_3 < R_6$$

RESULTS

Table 1 presents the results from an examination of our central hypothesis that the introduction of a false reference point will cause investor willingness to hold a losing investment to

increase even though the expected return and risk associated with the investment is identical. The table also allows a casual observation of the prospect theory at work. Specifically, the column labeled "50/50 Iso" defines the investor's starting point in terms of their willingness to sell the proposed losing investment. For the overall sample, the starting point is 4.06. As supported by the prospect theory, we expected to see a mean on the lower end of this 9-point scale, which signifies a greater willingness to hold a loser even though going forward its expected return-risk profile is not favorable. The column labeled "50/50 Port" reports a mean value of 3.79, a number that is statistically significantly lower than 4.06. This statistically significant difference of 0.27 is a direct test of our central hypothesis and confirms that investor behavior can be altered by introducing a false reference point.

Reading down the column, informally, the prospect theory appears to be alive and well for almost all subsamples. Concerning the false reference point introduction, the results are the strongest for those who are married, males, and internationals (specifically those from Asia). In this table, the paired scenarios of 2 and 3 and 3 and 6 are also reported. Results for the false reference point bias continue to hold even when the probabilities associated with the real estate investment are made less favorable. That is, while investors are understandably more willing to sell the investment as its expected return becomes less favorable, they are still more likely to hold it when the false reference point is introduced. It should be noted that in the 90/10 scenario, the differences between the Iso and Port columns remains positive but becomes statistically nonsignificant. This is quite expected as the increased certainty in the drop of value makes people far more likely to sell the property regardless of whether it is viewed in isolation or in a portfolio context.

Table 2 gives the results of a paired-sample t-test to check the difference in the mean responses within a group/case (either in the isolated or portfolio case) as the probability

TABLE 4
Final Regression Estimates Including All Variables for All Six Scenarios.

Overall Model Statistics	50/50 Iso	50/50 Port	50/50 Diff	30/70 Iso	30/70 Port	30/70 Diff	10/90 Iso	10/90 Port	10/90 Diff
R-Square	0.035	0.020		0.041	0.054		0.009		
F-statistic	5.258 (0.006)	7.134 (0.008)		2.416 (0.036)	5.435 (0.001)		3.134 (0.078)		
Independent Variables									
Gender									
Marital Status Dummy		-2.671 (0.008)		-2.147 (0.033)	-3.226 (0.001)		-1.770 (0.078)		
Day/Night	-2.496 (0.013)								
Bull/Bear									
Age				1.869 (0.063)	2.566 (0.011)				
North America Dummy	-2.075 (0.039)			-2.461 (0.014)	-1.941 (0.053)				
Asia Dummy				-2.033 (0.043)					
Europe Dummy				-1.980 (0.049)					

NOTE 1: t-statistics are given within the table.

NOTE 2: p-values are given in parentheses.

NOTE 3: Bold numbers are significant beyond the 90% level.

of price decline increases. As the probability increases, it is expected that people are more likely to sell the investment now. The difference should gradually increase as the probability of the investment going down varies from 50–90%. The results confirm our expectations. All the differences are significant and increasing as the probability of decline in value increases. The largest difference is, of course, between the 50% probability scenario and the 90% probability scenario for both the isolated case and the portfolio case.

It was suggested that the control variables introduced might have an effect on the investor's propensity to suffer from the prospect theory and false reference point biases. A direct test of these considerations is presented in Table 3. As a confirmation check to examine the effect of age, gender, marital status, country of origin, time of class taken, and state of the market, we estimate a regression with all these variables as dummies and the likelihood of selling as the dependent variable. Table 3 shows the result of the initial regression estimates and Table 4 reveals the results of the final regression estimates.

As seen in both tables, the results are not very sensitive to the demographic characteristics of the respondents. That is, the prospect theory and the false reference point exacerbation problem is reasonably consistent no matter who the investor.

CONCLUSION

This study is the first to examine an extension of the prospect theory by considering a natural human tendency to comfort ourselves after experiencing a financial loss. Specifically, investors who lose money in real estate will subconsciously try to avoid experiencing regret first by employing the prospect theory (or becoming risk-seeking). Failing their ability to get back to even, it is human nature to minimize regret by changing the way we think about our loss in an investment. One way to minimize regret is by introducing a false reference point. While this may provide comfort in the short run, we empirically demonstrate that this will cause an investor to be more likely to hold onto this losing investment thus further exacerbating the situation and increasing their losses. In the long run, this will cause even greater realized regret as losses continue to mount.

It is our hope that this new understanding of human behavior will allow investors to avoid false reference points, face up to losses as they occur, and minimize the pain of regret. The results in this study vary little by demographics, which means they can generally be applied as good advice to all of us.

Future studies should examine whether or not false reference points might work in our favor when considering assets that have increased in value. While too early to say, we suspect the effect will not be symmetrical because when investors experience gains, they tend to form separate mental accounts to maximize their pleasure. Alternatively, when gains are experienced, investors stop and celebrate their brilliance. When losses accrue, investors try to avoid regret by reframing the issue and trying to find any light in which the investment choice they made can be interpreted as a good one—no matter how illogical the internalized justification.

This is the first study of its kind and lays the foundation for how future research might examine investor behavior as it relates to real estate investments. Because real estate is gaining increasing attention as an asset class in portfolios, research on whether people perceive changes in the value of real estate in isolation or at a portfolio level is critical for better management and performance of institutional portfolios.

NOTES

1. See Ling and Archer [2008].
2. See Shefrin and Statman [1985] for a discussion on the Disposition Effect.

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