Regret Aversion and False Reference Points in Residential Real Estate

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Abstract	This study empirically exams the combination of regret aversion and false reference points in a residential real estate context. Survey respondents were put in a hypothetical situation, where they had purchased an investment property several years ago. Hindsight knowledge about a foregone all time high was introduced. As hypothesized, respondents on average expressed higher regret if they had actively failed to sell at the all time high (commission scenario) than if they had simply been unaware of the potential gain (omission scenario). Women were found to be more susceptible to regret aversion and false reference points than men.

Traditional financial theory approaches decision making from a very mathematical and logical standpoint. The reality, however, is that *people* make financial decisions. So no matter how quantitative and objective financial models are constructed, people must ultimately make buy and sell decisions. This melding together of mathematics and psychology is known as behavioral finance.

The few studies that use behavioral concepts in real estate have centered primarily on anchoring bias. Anchoring is the notion that people tend not to deviate from a given starting point even if new information dictates they should. For example, Northcraft and Neale (1987) found that once a starting price is given, even real estate professionals suffer from anchoring bias when valuing a home. This bias persists both when the anchor is generated externally and when the prior prices are provided by the appraiser themselves (Geltner, 1993; and Diaz and Hansz, 1997).

The purpose of this study is to test additional behavioral finance theories in a real estate context. That is, this study examines two prevalent psychological biases that are hypothesized to cause real estate investors to deviate from purely mathematical thought processes. Specifically, regret aversion and false reference points are empirically tested.

Literature Review

Regret aversion refers to the phenomenon that people keep the status quo because they know from experience that options that seem to be favorable given the apparently correct information at the time the decision is to be made, may later turn out to be less favorable than previously assumed (Samuelson and Zeckhauser, 1988). Regret aversion therefore is closely linked to the theory of *omission bias*, which holds that people perceive harmful commissions as worse than corresponding omissions and, therefore, prefer omission to commission (Ritov and Baron, 1992). Selection of an alternative also means commitment to the alternative. Psychological commitment claims behavior on behalf of a position, as a change may damage self-esteem.[1] When a poor decision is undeniable to ourselves, the natural survival instinct is to downplay the importance of the event or change the way we think about the outcome altogether. That is, we change the reference point from which the outcome is evaluated.[2] As Arkes and Blumer (1985) emphasized, upward re-evaluation of the chosen alternative may result in an increased willingness to spend further effort on the alternative as compared to the resources that would have been spent voluntarily if no prior commitment had been made.

In their extensive study on status quo bias, Samuelson and Zeckhauser (1988) collected anecdotal evidence, field experiments, and a number of laboratory experiments. A striking example of "real world" status quo bias is that of a small town in Germany that had to be relocated due to a mining project. As Samuelson and Zeckhauser reported, "Government specialists suggested scores of town planning options, but the townspeople selected a plan extraordinarily like the serpentine layout of the old town—a layout that had evolved over centuries without (conscious) rhyme or reason" (p. 10). In their field studies, Samuelson and Zeckhauser were able to demonstrate status quo bias, for instance, for the enrollment of Harvard employees to health plans.[3] A pooled regression based on the data of all their laboratory experiments (concerned with a variety of topics such as automobile safety) revealed that the probability of the status quo alternative to be chosen is significantly higher than a non-status quo alternative and that the prevalence of the status quo alternative increases with the number of options. For example, in a presidential election with only two (otherwise identical) candidates, the incumbent office holder could expect about 58.5% of the votes (a relative benefit of 17%). If the number of candidates increased to four, the predicted voters' share of the incumbent would be 37.75%, that is, a relative advantage of 51% as compared to his "natural" share of 25% (see also Traub, 1999, p. 80).

Quite naturally, strong evidence for regret aversion and false reference points has been reported in risky choice. Kahneman and Riepe (1998) provide a survey of biases of judgment and decision making that can appear in the context of financial investments. Consider a common stock example. Odean (1998) found that when investors need to liquidate stock, they are 1.5 times more likely to sell the one

that has gone up in value. Doing so locks in the confirmation that they made the correct purchase decision. Further, Shefrin and Statman (1985) concluded that people hold onto stocks that are losers far too long and sell winners far too quickly. Both of these tendencies translate into poor investment buy/sell rules. So the conclusion to be drawn is that people's innate need to protect their emotional well-being impacts their desire for wealth-maximizing portfolio decision making.

At first glance, investors have no problem distinguishing what constitutes a loss from a gain. These people know full well what they paid for the stock and they know the price they would receive if they sold it. But our desire to protect ourselves from emotional pain is great even when faced with an obvious loss. The solution relates to a concept known as a False Reference Point.

Assume investors buy a stock for $100 on January 2. Over the next six months, the price escalates to $150. By the end of the year, the price comes all the way back down to $110. Investors can view this erratic return behavior in one of two ways. First, they can calculate the return on the stock to be 10% [($110–$100)/ $100]. This reasonable rate of return will help them sleep at night. Second, they can move their reference point forward to the new higher level of $150 where they once could have sold the stock. In this case, they will feel like they lost 26.7% [($110–$150)/$150] in just six months. So which reference point do investors actually pick?

Poteshman and Serbin (2003) show that to their detriment, investors tend to select a stock's 52-week high as the appropriate reference point. This is disadvantageous for several reasons. First, if we couple this high starting point with the concept of regret aversion, investors will be hesitant to sell stocks that have slipped from their 52-week highs because this will be tantamount to admitting they made a mistake. Granted, the overall investment could have made a positive return, but this higher, false reference point leaves investors with the feeling they lost money—at least on some level. Because investors view the stock purchase as a failure, they will be less likely to sell it even when their quantitative analysis indicates they should sell the stock (Shefrin and Statman, 1985).

So how do regret aversion and false reference points relate to real estate? Home prices escalated rapidly in the Hawaiian market in the late 1980s. Those who bought near the peak had to stomach a downward market for the next decade. In 2001, when the real estate market finally turned around, those who bought in 1989 were still looking at prices below what they paid. These investors were hesitant to sell. For investors who bought near the bottom in 2001, they were willing to sell as soon as one year later because they had already made a profit. But it wasn't until only recently that buyers from the late 1980s began to sell because doing so sooner would have meant selling their home at a loss.

Rational financial theory would indicate that the two groups should be willing to sell based strictly on the prevailing price at the time, not based on the purchase price paid over a decade ago. Genesove and Mayer (2001) observed similar

behavior in the Boston market. They added that those who bought at the peak listed their homes for sale at 25% to 35% higher than fair market value in hopes of avoiding regret aversion. This behavior caused their homes to remain on the market much longer than sellers who purchased more recently and had more realistic asking prices. Rational behavior can also be deviated from when a person's private information is confirmed by an independent, objective external market source. Wang, Zhoa, Chan, and Chau (2000) demonstrate that developers become over-confident and that their over-confidence leads to over-building. These actions are found to cause excessive volatility in the real estate sector and even affect real estate cycles.

While the concept of regret aversion is relatively new to the real estate literature, a number of recent studies do provide evidence that prior expectations of market participants may well alter behavior in potentially sub-optimal manners (i.e., false reference points may be relatively common). For example, Ooi, Webb, and Zhou (2007) provide evidence of underpricing in the market for value REITs, consistent with extrapolation theory. They posit the observed mispricing is due to ''investors over extrapolating past corporate results into the future.'' These behavioral tendencies of investors to rely upon the potentially flawed metric of past corporate performance as an anchor to assess future performance is consistent with the anchoring biases discussed above. Similarly, Peiser and Xiong (2003) argue ''the perception of high crime rates in downtowns has hindered the revitalization of downtown shopping districts and adjacent residential areas.'' Interestingly, they go on to demonstrate that crime rates are actually higher in suburban areas of San Diego and Los Angeles than in their downtown areas, thus the erroneous assumption of higher crime in inner cities may lead to a misallocation of investment dollars. Continuing, traumatic events may also serve as false reference points that serve to temporarily bias valuations in a predictable manner. For example, Bleich (2003) demonstrates that capitalization rates increased dramatically in the Los Angeles, California apartment market following the Northridge earthquake of 1994. This event temporarily shifted market perceptions (i.e., created a false reference point/anchor) of the inherent risk level of these residential units, thus significantly depressing prices. However, within three years market risk perceptions eased, and cap rates (and prices) returned to their previous levels. Finally, while not directly attributable to the regret aversion and false reference point paradigms, which serve as the foundation of the current investigation, two additional studies provide further, related evidence that psychological factors may very well influence decision making in real estate markets. Specifically, Haag, Rutherford, and Thomson (2000) find that realtor comments influence transaction prices by altering perceptions of the subject property's quality, while Evans and Kolbe (2005) demonstrate that home sellers may actually benefit from familiarity biases that induce them to use previous listing agents as the selling agents for their properties. Taken together, these results demonstrate the expanding application of behavioral finance concepts to real estate market activities and transactions.

Theory

In regret theory, people are assumed to "remember their previous experiences and form expectations about the rejoicing and regret that the present alternatives might entail," (Loomes and Sugden, 1983, p. 428). The basic model is as follows: there are $S = \{S_1, S_2,..., S_n\}$ states of the world, where each S_k occurs with probability p_k and $\Sigma_{k=1}^n p_k = 1$. An investment strategy is represented by an n-tuple of state contingent consequences $A_i = (w_{i1},..., w_{ik},..., w_{in})$. $w_{ik} \in W$ denotes the monetary consequence in terms of the investor's final wealth position of investment strategy A_i in the state of the world S_k. For any investor, there exists a twice differentiable and concave utility function that maps the set of monetary consequences into the set of real numbers, $U : W \rightarrow R$. Loomes and Sugden referred to it as "choiceless utility function," that is, $U(w_{ik})$ represents the anticipated utility of having to experience the monetary consequence w_{ik} as if it were imposed exogenously (and not due to an active choice).

Suppose that the investor has to choose between two alternative investment strategies, A_i and A_j. If he chooses A_i and the state of the world S_k occurs, he will experience w_{ik} but at the same time pass up w_{jk}. Hence, in addition to $U(w_{ik})$, he will feel rejoice if $w_{ik} > w_{jk}$ and he will feel regret if $w_{ik} < w_{jk}$. Regret and rejoice are also anticipated by the investor. They are represented by the regret function, $g(\cdot)$, which is strictly increasing and $g(0) = 0$. The *modified utility* of choosing A_i instead of A_j, given that the state of the world S_k occurs, incorporates anticipated utility and anticipated regret:

$$V(w_{ik}, w_{jk}) = U(w_{ik}) + g(U(w_{ik}) - U(w_{jk})). \tag{1}$$

In regret theory, the decision maker is assumed to minimize anticipated regret by maximizing $E_i = \Sigma_{k=1}^n p_k V(w_{ik}, w_{jk})$, that is, the expected utility of (1).

Our study differs from original regret theory insofar as we model a decision maker who considers the consequences of her own decision *in retrospect*. That is, we focus our attention on experienced regret rather than anticipated regret. Humphrey (2004) recently emphasized the importance of feedback information (foregone act resolution) on anticipated regret aversion. Alternatively stated, the experience of regret is conditional on the knowledge of the outcome of the foregone act. Hence, we will consider a setting where the investor receives full feedback information, both on the return of the chosen investment strategy and the hypothetical return of the forgone alternative. As a by-product of focusing on experienced regret instead of anticipated regret, we are able to disentangle regret aversion from risk aversion.[4]

In our model, the investor's initial wealth amounts to w_s. He faces a choice set $\{A_i =$ "buy", $A_s =$ "not buy"$\}$ with regard to a risky asset, where s denotes the

status quo alternative. The status quo alternative leaves the wealth position of the investor completely unaffected, that is, we have $w_{sk} \equiv w_s \; \forall \; S_k \in S$. We assume that the anticipated expected utility of buying the asset exceeds the anticipated expected utility of keeping the status quo, that is, $E_i > E_s$. Hence, the investor favors buying the asset over staying inactive ($A_i > A_s$). After some time the state of the nature switches to S_k and the investment is sold for a "reasonable" price such that the investor's wealth rises to w_{ik}. However, after having sold the asset the investor comes to know that if he had sold it a bit earlier, the state of the nature would have been S_n, where $w_{in} > w_{ik} > w_s$. For example, S_n could mark the all time high of the asset.

Adapting Equation (1) to our framework means that we can focus all our attention on experienced regret $g(\cdot)$. False reference points hold that the "choiceless utility" of the status quo alternative $U(w_s)$ has to be replaced by $U(w_{in})$. It is straightforward to show that the investor's experienced regret with adoption of a false reference point is strictly greater (g is smaller) than the regret the investor experiences if she compares her current wealth with the status quo alternative:

$$g(U(w_{ik}) - U(w_{in})) < g(U(w_{ik}) - U(w_s)). \tag{2}$$

As previously discussed, regret aversion maintains that people prefer harmful omission over harmful commission. In our context, omission is equivalent with not having followed the market in the course of the investment period. Therefore, there exists, if at all, only hindsight knowledge about the all time high. In contrast, commission means that the investor has full knowledge about having missed the opportunity to sell the asset with maximum return. Let g^C denote the experienced regret from commission (the expression on the left side of (2)) and g^O the experienced regret from omission (the expression on the right side of (2)).

The previous discussion is summarized in the following definition of regret aversion and false reference points.

Regret Aversion and False Reference Points

If an investor satisfies regret aversion and false reference points, then the inequality $g^O > g^C$ must hold for all states of the world $S_k, S_n \in S$ and investment strategies $A_i > A_s$ for which $w_{in} > w_{ik} > w_s$.

Survey Design

Like most initial studies in psychology and behavioral research, our work is an experiment conducted under controlled conditions. In order to test for regret aversion and false reference points, respondents are asked to assess their

experienced regret on a scale from 1 to 9, where higher numbers represent higher experienced regret. Respondents are described a situation where they purchased an investment property five years ago for $200,000. Today, the home was sold for $300,000. That's roughly a 10% return per year.[5] When considering the leverage effect of the investor who typically has a down payment of, say 20%, the return is more like 50% per year.[6] Either way, most would agree that this turned out to be a great investment.

Next, hindsight knowledge about a foregone all time high is introduced. It is brought to the investor's attention that two years ago, he or she could have sold the home for $350,000 and made even more money. The investor was completely unaware of the potential additional gain before (omission scenario). But now, the scenario is changed, and it is assumed that the investor did not sell two years ago because the individual thought the home's price would continue to increase (commission scenario).

In both scenarios, the investor made the exact same rate of return. In the first scenario, the investor lost part of his potential return as a result of an omission. However, in the second scenario, the investor made a conscious decision (commission) to hold onto a property that subsequently went down in value. While from a traditional financial theory perspective the investor should have equal utility (because the outcomes are the same), regret aversion and false reference points are hypothesized to cause the investor to report higher regret in response to the second scenario. The difference in the average responses between these two questions represents a measure of the regret aversion effect.

Empirical Test and Formal Hypotheses

As outlined above, regret aversion and false reference points should lead to higher experienced regret if the perceived loss is caused by a commission instead of an omission. Hence, under the null hypothesis, we do not expect hindsight knowledge to influence the size of decision regret. Let μ^k, $k \in \{O, C\}$, denote the respondent's mean answer to the omission scenario and the commission scenario, respectively. Formally, we have:

> **Regret Aversion and False Reference Points:**
>
> $H_0 : \mu^C \leq \mu^O$ vs. $H_1 : \mu^C > \mu^O$.

We will also investigate our hypothesis for different subgroups of the sample. Hence, we collected the respondents' gender, marital status, age, and country of origin. In the context of decision making under risk and uncertainty, gender differences have been demonstrated by many authors [for a survey, see Powell, Schubert, and Gysler (2001)]. Generally speaking, women seem to be more risk

averse than men.[7] Kahneman and Riepe (1998, p. 19) asked a large sample of financial investors to recall the financial decision that they regretted the most, and to state whether it was an omission or commission: "As in other groups, most of these wealthy people reported that their worst regret was about some action they had taken." However, a minority of investors—those who took disproportionately high risks—had more regrets about omitted opportunities than committed failures. Hence, we expect men on average to exhibit a smaller regret aversion effect than women. Furthermore, we recorded the participants' marital status in order to explore interactions between marital status and gender. Note, however, that Powell, Schubert, and Gysler demonstrated that gender differences are model specific. Therefore, general predictions about gender difference are hardly possible.

Cross cultural studies on event probability calibration[8] (e.g., Wright et al., 1978; and Yates et al., 1989) have shown that "Asians seem to have high resolution—they use extreme probabilities a lot—but are very badly calibrated," (Camerer, 1995, p. 594). Wang and Fischbeck (2004) compared the risk attitudes of Chinese and U.S. students, recruited from economics and psychology classes.[9] They found Chinese participants to be generally less risk averse than U.S. participants—a result well in line with the literature. Hence, we would expect Asian participants on average to exhibit a lower regret aversion effect than North American or European participants.

In their field studies, Samuelson and Zeckhauser (1988) found the strongest status quo bias among older participants (50 years and older). Therefore, we also collected the age of our participants.

As the data was collected in two different class types (night/day), a dummy variable was created with day classes as the benchmark category. During the time of this study, the real estate market shifted from bull to bear. To capture the impact this might have had on respondents, another dummy variable was used (the benchmark category being "bull").[10]

Results

The Data

All data are collected from MBA students in a masters' level required finance course at Hawaii Pacific University each semester from the fall of 2004 through the spring of 2006. All 225 students who took this course completed a survey that was handed out in class. The first part of the survey collects demographic information. The 225 students come from 33 different countries on five different continents. Because of the tremendous diversity in the student body, North America is the origin of only 38% of the sample; Asia represents the same percentage, while Europe drops down to 25.8%. Respondent ages range from 20 to 57 years old, with an average of 27.53 years. Men compose 58.7% of the respondents. Finally, only 12.4% of the participants are married.

Regret Aversion and False Reference Points

Regret aversion and false reference points are examined in Exhibit 1. Columns 3 and 4 give the mean regret scores without (μ^O) and with (μ^C) knowledge. Standard errors are given in parentheses. Case numbers can be taken from Column 2. In Column 5, we report the results of within-groups tests for regret aversion and false reference points. We apply one-tailed *T*-tests (for two related samples).[11] The first row gives the T-value while the second row shows the significance level of the test *p*. Results that are significant at the 10% level (5% level) are marked with one (two) asterisk(s). Column 6 states the results of the respective between-groups test. Here, we apply two-tailed independent sample *T*-tests if there are only two subgroups (e.g., women vs. men), and median-tests if there are more than two subgroups (e.g., the interaction between gender and marital status). In the latter case, we report chi-squared-values (of the parametric approximation of the exact median test) instead of *T*-values.[12]

In the overall model, Exhibit 1 clearly demonstrates the presence of regret aversion and false reference points (at the 5% significance level). The within-groups analysis with respect to gender and marital status shows that these financial biases are significant only for women, singles, and single women. A between-groups analysis, however, rejects the null hypothesis only for the test women versus men (only on the 10% significance level) but not for the other two categories. Note that the median-test underlying the between-groups analysis of the composite characteristic (gender × marital status) does not take into account the strength of the bias, and it reports a sample median of zero. Hence, the conclusion may be drawn that on the one hand the majority of respondents in each of the four subgroups does not exhibit regret aversion; on the other hand, among those respondents who are susceptible to this mental pitfall, single women seem to suffer most in terms of the strength of the bias. Given the empirical observation that women are usually found to be more risk averse than men (Powell, Schubert, and Geysler, 2001), this result supports earlier findings by Kahneman and Riepe (1998) that financial investors who take disproportionately high risk feel more regret in omission scenarios than in commission scenarios.

We next examine cultural differences.[13] Regret aversion is significant for North American and Asian respondents, but it is not for European respondents. It is slightly stronger for North Americans (0.53) than for Asians (0.40), but the difference is insignificant. The median-test does not reject the null hypothesis of independence between the respondents' country of origin and regret aversion. Accordingly, our hypothesis that Asians are generally less risk averse than North Americans (and Europeans) and, therefore, are less susceptible to the regret aversion effect is not confirmed. However, Wang and Fischbeck (2004, p. 25) issue the warning that cross-cultural differences are largely context-dependent and that "the influence from researchers could be greater than cultures." Further research involving different settings seem to be required before drawing final conclusions.

Exhibit 1 | Regret Aversion and False Reference Point Tests

Classification	Sample Size	Mean Score Without Knowledge (μ^O)	With Knowledge (μ^C)	Test Within Groups	Between Groups
Overall	225	4.69 (0.17)	5.08 (0.15)	2.70** 0.01	—
Women	93	4.45 (0.24)	5.13 (0.22)	3.11** 0.00	1.66*
Men	132	4.86 (0.23)	5.05 (0.21)	0.98 0.16	0.10
Single	197	4.71 (0.17)	5.13 (0.16)	2.69** 0.01	0.46
Married	28	4.57 (0.55)	4.79 (0.44)	0.50 0.31	0.65
Single Women	84	4.52 (0.25)	5.19 (0.22)	2.95** 0.00	
Married Women	9	3.78 (0.95)	4.56 (0.93)	0.94 0.19	1.60
Single Men	113	4.85 (0.24)	5.08 (0.23)	1.10 0.14	0.66
Married Men	19	4.95 (0.66)	4.89 (0.55)	−0.11 0.46	
North America	65	4.05 (0.30)	4.58 (0.27)	2.20** 0.02	
Asia	60	4.67 (0.30)	5.07 (0.30)	1.33* 0.10	0.18
Europe	40	5.13 (0.41)	5.15 (0.35)	0.08 0.47	0.92
Day	101	5.01 (0.24)	5.35 (0.23)	1.61* 0.06	−0.34
Night	124	4.44 (0.22)	4.87 (0.20)	2.17** 0.02	0.74
Bear	131	4.33 (0.21)	4.71 (0.20)	2.11** 0.02	−0.08
Bull	94	5.20 (0.26)	5.61 (0.22)	1.69** 0.05	0.94

Notes: Standard errors in parentheses. Within-groups test: one-tailed T-test for two related samples, $H_0 : \mu^O \geq \mu^C$ (first row: T-value, second row: significance level p). Between-groups test: either two-tailed T-test for two unrelated samples, $H_0 : (\mu_i^C - \mu_i^O) = (\mu_j^C - \mu_j^O)$ (first row: T-value, second row, significance level p) or Median-test for k unrelated samples, H_0: independence (first row: χ^2-value, second row: significance level p).

$*p \leq 0.10.$

$**p \leq 0.05.$

Analogous to gender, the majority of respondents in all subgroups do not exhibit the bias. Among those who do, North Americans and Asians exhibit a relatively strong bias. A possible explanation for Europeans seeming to be immune against regret aversion and false reference points could have been that home ownership is less frequent in the sample among Europeans (5/40 = 12.5%) than among North Americans (14/65 = 21.5%) and Asians (17/60 = 28.3%).

The correlation between the age (not included in the exhibit) and the regret aversion effect turns out to be insignificant (Spearman's rho = −0.05, $p = 0.943$). Evidently, our sample is biased towards the young (with a mean below age 28), and it exhibits a relatively low variance (the standard deviation is only 5.74) as compared with the field data of Samuelson and Zeckhauser (1988).

Finally, we consider the day/night and bear/bull dummies. As can be taken from Exhibit 1, the bias is significant within all groups and equally strong between the subgroups. As a by-product, we are able to study the influence of the bear/bull environment on the mean regret scores: in the bull period, regret was much more pronounced than under the bear period, for both the setup without ($T = 2.629$, $p = 0.009$) and with ($T = 2.987$, $p = 0.003$) knowledge. This highlights that the respondents were relatively well informed about the development of the real estate market and that regret aversion and false reference points are very robust to changes of exogenous background variables.

Conclusion

This study examines the combination of regret aversion and false reference point bias (people's tendency to base their judgments on prominent, but wrong reference points and to perceive harmful commissions as worse than corresponding omissions) in real estate decision making. Specifically, regret aversion and false reference points are tested in a hypothetical real estate investment setup with an induced false reference point. While the majority of subjects do not exhibit the bias (the median regret difference is zero for the overall data set and all sub-samples), a large minority of respondents perceive losses that are due to a commission as more severe than losses that are due to an omission. Regret aversion turns out to be most widespread and strongest for single women. Furthermore, the bias is insignificant for the European sub-sample.[14]

Future studies should attempt to identify the underlying causes of each. Follow-up examinations should continue to incorporate the demographics collected here and should consider issues such as whether or not residential real estate is a primary residence or an investment property. Moreover, it seems to be worthwhile to collect field data to investigate whether or not these biases have a real impact on real estate markets.[15] For example, it is of particular interest to learn whether biased judgments (stated behavior) translate into biased investment decisions and to compare the market performance of biased investors with a normative benchmark.

Endnotes

[1] The example of Ulysses and the Sirens demonstrates that pre-commitment can be used to bind oneself to courses of action in the face of anticipated contrary temptations (Elster, 1979).

[2] The adjacency to Festinger's (1957) theory of *cognitive dissonance reduction* is obvious (see also Elster, 1990).

[3] The health plan taking the status quo position was chosen more frequently by employees who had to renew their health plans than by new employees.

[4] As Zeelenberg (1999) and Humphrey (2004) note, regret aversion cannot be directly tested without giving feedback information on the forgone act. A risk averse expected utility maximizer would always reject a fair gamble. Hence, if the gamble was not resolved after the choice has been made, the decision maker would not only have avoided the risk of the gamble but also be insured against post-decision regret.

[5] [($300,000 − $200,000)/($200,000), and then divided by 5 years].

[6] [($300,000 − $200,000)/($40,000), and then divided by 5 years].

[7] Consistent with such gender based behavioral differences being observable in real estate markets, Simons and Winson-Geideman (2005) find men to be less risk averse than women, as evidenced by their finding that males are significantly more likely than their female counterparts to bid on residential properties impacted by Leaking Underground Storage Tanks (LUST).

[8] Calibration is how well an event forecast matches the actual relative frequency of the event.

[9] Wang and Fischbeck (2004) also review the literature on cross-cultural differences in risk judgment and decision making.

[10] A third dummy {beginning/end of term} was found to be highly correlated with {bull/bear} and is therefore excluded from further analysis.

[11] First a Levine-test for the equality of variances is performed and the T-test is based on the result of this test. For technical details see Seiler (2004).

[12] A standard chi-squared test cannot be applied here. For example, the respective cross table would have 4 [gender × marital status] × 14 [difference of mean regret scores from +6 to −7] = 56 cells (the test would have 39 degrees of freedom). However, since we have at maximum 225 observations, this gives a very large number of cells with fewer than 5 (or even zero) observations. Hence, we used the chi-squared approximation of the nonparametric median test: the four subsamples are split at the overall median of the regret score (which is zero), this gives a table with 4 [gender × marital status] × 2 [number of people above median/below median] = 8 cells and a test with 3 df. Note that calculating the exact median test is very complex and therefore usually approximated by the corresponding chi-squared test.

[13] Case numbers for South America and Africa were too small to be included in the analysis.

[14] Note that in all geographical regions considered the composition of the sample of male and female respondents was quite homogenous (a chi-squared test does not reject homogeneity: $X^2 = 5.046$, $p = 0.168$). Hence, the regret aversion effect cannot be traced back to a pure gender effect.

[15] Field evidence collected by Samuelson and Zeckhauser (1988) and Johnson, Hershey, Meszaros, and Kunreuther (1993) suggests that status quo bias, omission bias, and related phenomena are ubiquitous in economic decision making. Fernandez and Rodrick (1991) were able to show that status quo bias even impedes political reforms at the national level.

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