

## The Psychology Behind Why Underwater Investment Properties are Not Listed for Sale

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## **Abstract**

This study investigates the reasons why people do not list underwater real estate investment properties for sale. Conventional wisdom is that these investors simply cannot afford to sell (the affordability constraint). However, we demonstrate that economic reasons explain as little as 31.7% of the sample. Behavioral explanations make up the rest. Specifically, familiarity bias, false reference points, and to a lesser extent, status quo deviation aversion are the true drivers of the listing decision. Underlying respondent behavioral traits were not found to systematically explain who would be more likely to follow each behavioral reason not to list. The inability to create a definitive behavioral traits profile is consistent with past studies that were unable to significantly link demographic characteristics to behavior.

*Key words:* behavioral real estate; familiarity bias; false reference point, status quo deviation aversion

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## **The Psychology Behind Why Underwater Investment Properties are Not Listed for Sale**

### **1. Introduction**

The U.S. economy is currently in the throes of arguably the worst recession since the mid-1930s. The real estate crisis was brought on by an excessive amount of risk taking by individuals who had little experience with residential real estate investments. In early 2000 as the dot.com bubble burst, capital flowed out of stocks and needed to be deposited elsewhere. Due to low interest rates, residential real estate prices began to rise. As real estate prices increased, more and more money flowed into the asset class creating an over-supply of funds. Renters watched homeowners make hundreds of thousands of dollars by doing nothing but owning real estate. Popular press documented the “easy money” to be made in real estate, and numerous television shows were created to describe how to capitalize on residential real estate investing (Flip This House, My House is Worth What?, etc.). The herding effect took hold and mom-and-pop investors not only bought homes to live in; they also bought additional homes as investment properties<sup>1</sup>.

With home prices skyrocketing, lenders felt comfortable deviating from traditional lending standards. Far too little money was allowed to be put down when homes were purchased, the borrower’s income and assets were not required to be rigorously documented (or documented at all in many cases), investor loans were written up as owner-occupant loans (a.k.a. liar loans), Interest-Only Adjustable Rate Mortgages (I/O ARMs) were used instead of more conservative Fixed Rate Mortgages (FRMs), and lenders were allowed to sell these toxic loans with unrealistically high bond ratings in the secondary market (thus allowing the hot potato to be

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<sup>1</sup> Home ownership rates climbed to 68.9% in 2006, a historically unsustainable level (<http://www.census.gov/hhes/www/housing/hvs/historic/>).

passed along to someone else). All these things came together to create the perfect storm for excessive risk-taking on the part of individual members of our society.

In late 2006, the house of cards began to collapse. But because we had never seen a real estate market this good before, we had no historical reference point for how far home prices could fall. Not realizing the severity of the coming market correction, many investors decided not to sell their real estate properties thinking the correction would be temporary and mild. As time passed and prices continued to fall, we argue in this study that people who could afford to sell elected not to because of a false reference point bias. Instead of focusing on the current fair market value of the home, people focused on the top price at which they could have sold and viewed the currently lower price as unacceptably low<sup>2</sup>. Not wanting to “take a loss” on their investment, they continued to hold onto residential real estate as an asset and ride out the correction. But, the bottom never came. Instead, home prices continued to fall at an alarming rate. Soon home prices were below the price investors initially paid. The popular press referred to these investments as being “underwater” – characterized by being worth less than the outstanding mortgage balance owed to the bank. We argue that when the price of the home crossed below the original purchase price, this represented another false reference point for investors. Alternatively stated, economists understand that fair market value is not a function of purchase price. However, psychologically speaking, investors do not like to sell investments for less than what they paid for them because doing so locks in the loss and forces the individual to admit they made a poor investment decision (Barberis and Xiong, 2008, 2009; Shefrin and Statman, 1985). The preference for a paper loss over a realized loss is well documented (Odean, 1998; Shiller, 1999). Without selling at a loss, the investor is emotionally able to avoid regret – the pain associated with having made a mistake (Seiler et al., 2008a).

In addition to a false reference point, we argue that investors sought to avoid regret by invoking familiarity bias. Familiarity bias refers to the under-estimation of risk and/or the over-estimation of return which results from being too close to an investment. Specifically, Seiler et al. (2008b) find that homeowners view their properties as being more resistant to future downward price movements. This result holds true even when comparing homes that are right across the street. The finding is stronger as the owner compares their home to homes across the state and country, respectively. In this study, we examine whether familiarity bias is also responsible for people’s unwillingness to list investment properties that are underwater for sale under the reasoning that their home still represents the best possible return for this level of risk (even though it has performed so horribly to date)<sup>3</sup>.

The third behavioral explanation we consider to explain why investors who hold underwater real estate elect not to list their properties for sale is status quo deviation aversion (SQDA). SQDA refers to people’s tendency to stay the current course regardless of the surrounding environment. With investing, this means that people would continue to hold stocks that have gone down (or up) in value too long (Barber and Odean, 2001). In a social setting, SQDA can explain why people stay in relationships that are unhealthy for both parties. We examine whether or not people stay in real estate investments simply because it is a human

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<sup>2</sup> For example, assume a person bought a home at \$300,000. The highest price at which they could have sold was \$500,000, but now the price is down to \$450,000. We argue that people were not willing to sell at a price \$450,000 because they falsely referred to the price of \$500,000 as still being the fair market value of the property.

<sup>3</sup> It is also difficult to justify the rationality of an investor’s opinion that their specific property is a better investment than any other asset (class) of equal risk – even any other residential real estate properties.

tendency to remain along our current path, independent of what the economic indicators are around us.

Taken together, this study considers three behavioral reasons why people decide not to list underwater residential real estate investments for sale. Convincingly, we find that the behavioral explanations sum to exceed the affordability or economic reasons not to list. The recent unprecedented decline in real estate prices has created a perfect living laboratory to address these behavioral questions.

## **2. Literature Review**

Familiarity Bias is well documented in the financial literature. Huberman (2001) finds that individuals hold an inappropriately high percentage of their portfolio in the stock of the company for which they work. Frieder and Subrahmanyam (2005) demonstrate that investors overweight their portfolio towards high name recognition retail stocks. Finally, a “home bias,” the observation that investments within one’s home country are safer and/or provide a lower risk is revealed in Ackert et al. (2005), French and Poterba (1991), Grinblatt and Keloharju (2001), Lewis (1999), Massa and Simonov (2006), Seasholes and Zhu (2005), and Stultz (1999). All these studies demonstrate that being too close to an investment can cloud one’s judgment when it comes to assessing risk and return potential.

In real estate, Agarwal (2007) examined homeowners’ estimation about the value of their primary residence. The study finds that people systematically overestimate price on the order of 3%, a statistically significant difference. Seiler et al. (2008a) examine the risk side of the equation and conclude that homeowners also systematically underestimate the risk of their home’s price declining in the future.

Status Quo Deviation Aversion (SQDA), the tendency of investors to remain in their current investments, is formally modeled in Cao et al. (2007). Shugan (1980) argues that people stay in their current rut because information that would be needed to justify a change in direction is costly to gather. As such, the “cost of thinking” is not exceeded by the benefits derived from making an investment change. Despite this justification, the number of studies that followed this dated paper seems sufficient to put this justification to rest (Zhu, 2002; Ahn et al., 2006, and Cao et al., 2007). In real estate, Clauretie and Thistle (2007) examine out of state buyers and find that those who moved from high cost areas are willing to pay significantly more for a property than those who moved from a low cost area. Alternatively stated, people do not change their thinking even when the environment around them changes.

Genesove and Mayer (2001) represent the seminal work in the area of false reference points as it relates to residential real estate. This study examines the listing behavior of sellers in the Boston residential market after a quick run up and decline in home prices. The authors find that those sellers who originally bought at high price points were reluctant to sell their homes at the much lower fair market value. Instead, they listed the homes for sale at unrealistically high prices causing their homes to remain on the market for much longer periods of time. Eventually, the homes that did sell sold at prices on par with homes that were realistically priced near market in the first place. The study concluded that consistent with economic theory, the market does not care at what price the seller originally paid. Buyers only care about current market value. When sellers list based on false reference points, all they do is prolong the time the property sits on the market and increase the seller’s (and listing agent’s) frustration.

More recently, Seiler et al (2008a) acknowledge regret aversion by examining the pain people feel by having missed an opportunity to sell a home at a price in the past that is greater

than the current market value today. In a controlled experiment, the authors describe a setting where investors made a substantial annual return when holding the real estate investment. However, the pain of regret was still statistically significant for those who learned *ex-post* that they could have earned even more had they been watching the market and been aware of the opportunity to sell at a higher price two years earlier. By focusing on the previous highest price – a false reference point – investors reduced their overall utility (happiness).

### 3. Data Collection

Because we are examining the behavior of people who have *not* listed their residential real estate investment property for sale, there is no existing source (like the Multiple Listing Service) where we can go to pull secondary data. Instead, we created a primary dataset. Specifically, we accessed an existing network of individuals who have previously been identified as being willing to answer surveys for research purposes. Once our experiment was designed, we uploaded a Request for Participants (RFP) onto the site containing the database of real estate investors and asked for those who (1) own an investment property that is (2) underwater and who (3) do not have the property listed for sale.

When posting the RFP, we specified that we would like to close the study once 750 participants responded. This caused the survey to be posted from September 27 through October 4, 2009. With any survey, it is important to take measures to ensure that the participants took their time to answer the questions thoroughly and thoughtfully. This was made possible on a number of fronts. First, we only allowed participants who have an overall success rating of greater than or equal to 95%<sup>4</sup>. Second, because the exact start and stop times are recorded for all participants, we can determine exactly how quickly an investor sped through our survey. This completion time is automatically calculated and included as part of our final data file. Third, we embedded two questions (spread out in the survey) that simply ask the respondent to select a number, say “3,” as the answer to the question. If a participant missed either of these two dummy questions, they were jettisoned from the final sample. As a final check for the degree to which respondents took time to thoughtfully answer our questionnaire, we provided an open-ended section where the investor could explain in their own words why they do not have their investment property listed for sale. Based on these qualitative responses, we are convinced that participants took our study very seriously. A second benefit from asking this open-ended question is that were we able to qualitatively confirm that the pre-written reasons we offered to respondents were quite sufficient to capture their motives. Incredibly rare exceptions surrounding unique circumstances were noted.

When conducting a survey on-line, the question arises as to whether or not the sample is representative of the greater group of real estate investors across the country. We find that respondents in our sample tend to be somewhat younger and more educated than the average homeowner<sup>5</sup>. However, our sample is extremely similar to the population of homeowners in terms of income, marital status, gender, and ethnicity. As such, we recognize that our sample is

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<sup>4</sup> Ratings are achieved over time as respondents participate in prior surveys. If the organization deems the individual to have done a satisfactory job, they give credit for their participation. If not, the organization posting the survey can opt to give them a poor rating. This process is in place with the intent of weeding out participants who do not take the process seriously.

<sup>5</sup> It should also be noted that real estate investors are typically more sophisticated than the average owner-occupant. As such, it might be argued that real estate investors might be able to remain more economical in their decision-making processes and less behavioral.

not a perfect reflection of the overall population, but warn that telephone surveys and snail-mail questionnaires suffer from their own unique sets of problems. For example, in the firms we spoke with, it was revealed that telephone surveys tend to under-represent young and single people because cellular phone numbers are typically not dialed by automated systems. As time passes, cell phones are being more and more used by young and single people who conclude there is no need for a home phone.

#### **4. Methodology**

To date, behavioral real estate studies have been extremely limited in number. Extant studies test for variations in the dependent variable based solely on respondents' demographic characteristics. We take the next step in the evolution of behavioral real estate studies and attempt to delve deeper into the psychology of the investor. Specifically, we utilize psychological trait questions that have been examined in behavioral finance studies and published in top finance and psychology journals. For example, is it the case that men trade stocks more excessively simply because they are men or do they trade more excessively because men tend to possess a greater degree of underlying risk-seeking and over-confident behavioral traits? If the later is true, then utilizing demographic information as right-hand-side explanatory variables is misleading. This misspecification might explain why all behavioral real estate studies to date have shown weak demographic results. We now turn to the nine behavioral traits (measured through 19 different variables) considered in the current investigation.

##### *Behavioral Traits Considered*

The first behavioral trait we consider is the investor's Degree of Risk Aversion. We capture this measure in two ways. The direct method involves asking, "What is your overall investment philosophy as it relates to taking risks?" The second measure, as provided in Grinblatt and Keloharju (2009), asks "What percentage of your total wealth (including real estate and retirement accounts) is invested in stocks?" The second behavioral trait is knowledge. We ask, "How would you rate your overall level of knowledge of the residential real estate market?" Our measure of Confidence is based off of a Consumer Confidence Index question. Specifically, "Looking ahead, do you think that 12 months from now you (personally) will be financially better off, worse off, or the same as today?"

Optimism is captured as in Scheier, Carver, and Bridges (1994). We select one of the questions from the authors' Lot-R test used extensively in psychology - "Overall, I expect more good things to happen to me than bad." Our first two measures of over-confidence are derived from Hey (1984), Milburn (1978), Feather and Simon (1971), and Langer (1975). We capture this measure by first asking respondents to rate their ability to drive a car relative to the average driver. The second measure asks, "If you played Bingo with your friend, who do you think would be more likely to win the game?" Our third over-confidence variable is achieved by combining two questions from the Consumer Confidence Index. We divide the response to the question, "Looking ahead, do you think that 12 months from now you (personally) will be financially better off, worse off, or the same as today?" by the response to the question, "Looking ahead, do you think that 12 months from now the overall economy will be better off, worse off, or the same as today?"

Sensation seeking has been measured in a number of ways in recent years. We consider 5 total measures. For the first two measures, we call upon the well known Zuckerman (1994) scale which asks for a level of agreement with the following statement, "I like to have new and

exciting experiences and sensations even if they are a little frightening” and secondly, “If you were to visit an amusement park, which group of attractions would you most likely ride?” The choices are between tame rides like the ferris wheel and carousel versus adventurous rides like roller coasters and bungee jumping. Raylu and Oei (2002) suggest our third sensation seeking variable, “If you were to gamble, which group of games would you most likely play? Slot machines and bingo versus black jack, craps, and poker?” Grinblatt and Keloharju (2009), Zuckerman (1994) and Jonah (1997) provide the motivation for asking our fourth sensation seeking question, “Have you received a speeding ticket within the last 10 years?” Grinblatt and Keloharju (2009) also suggest a fifth question, “Do you own a sports car?”

There is an ongoing debate as to our ability to control behavioral biases. Do these conditions exist in our conscious or subconscious? To the extent that they occur in our consciousness, we can control them. We argue that one’s ability to control behavioral biases might be a function of emotional intelligence. Intelligence can be defined in any number of ways. Recent work by Petrides (2010) shares the development of TEIQUe, or Trait Emotional Intelligence Questionnaire. While the complete Petrides instrument is quite lengthy, for practicality purposes, we borrow a single question, “I usually find it difficult to regulate my emotions” on a disagree/agree scale. Two additional emotional intelligence questions are common to both TEIQUe and the Schutte et al. (1998) Schutte Self-Reported Emotional Intelligence Test (SSEIT EI test). Specifically, respondents are asked the extent to which they agree with the following statements, “I am generally aware of my emotions as I experience them” and “When I experience a positive emotion, I know how to make it last.” Intrigued by the possible symmetry of behavioral biases, we were inspired to generate a related question involving negative emotions as follows, “When I experience a negative emotion, I know how to make it go away.”

The final two behavioral traits we consider in this study relate to general intelligence and mood. For general intelligence, it would be ideal to collect an IQ test score, SAT, etc. However, given the natural constraints of collecting such a comprehensive set of behavioral traits as well as restricting our sample to a group of investors that do not appear in any existing database, we are forced to directly ask the respondent for a self-evaluation of intelligence. We fully recognize the potential measurement error involved, but see no other way to compile the current dataset without asking a questionnaire with literally hundreds of questions (that incidentally, no one would complete). Our general intelligence question is, “How would you rate your general level of intelligence relative to the average person?” Mood has been found in mainstream finance studies to affect returns on the stock market over many different time periods and countries (Hirshleifer and Shumway, 2003; and Kamstra, Kramer, and Levi, 2003). If this is true, then mood can certainly affect the responses provided in our survey. As such, we directly ask respondents, “How would you rate your current overall mood?”

We use the preceding 19 variables to represent the 9 behavioral traits that might explain the three behavioral reasons why investors who are underwater in their residential real estate investment properties do not list the property for sale. Specifically,

$$\begin{aligned} \text{Reason (Familiarity Bias, Status Quo} & \\ \text{Deviation Aversion, False Reference} & \\ \text{Point)} & = f(\text{Risk Aversion 1-2, Knowledge, Confidence,} \\ & \text{Optimism, Over-confidence 1-3, Sensation Seeking 1-5,} \quad (1) \\ & \text{Emotional Intelligence 1-4, Intelligence, and Mood)} \end{aligned}$$

Where the variables are defined as:

### **A. Dependent Variables**

Familiarity Bias	I do NOT have my investment property listed for sale because I believe my property will yield a better return over the next 12 months when compared to other investments (stocks, bonds, gold, other real estate, etc.) of equal risk. 9 = agree
Status Quo Deviation Aversion	I do NOT have my investment property listed for sale because I already own it, so I might as well keep it. 9 = agree
False Reference Point	I do NOT have my investment property listed for sale because while I do have sufficient cash available to sell the property, I am NOT willing to sell it for a price below what I paid for it. (As an example, you paid \$400,000, but its current market price is \$395,000). 9 = agree

### **B. Behavioral Traits - Individual**

Risk Aversion 1	What is your overall investment philosophy as it relates to taking risks? 9 = willing to take extreme risks when investing
Risk Aversion 2	What percentage of your total wealth (including real estate and retirement accounts) is invested in stocks?
Knowledge	How would you rate your overall level of knowledge of the residential real estate market? 9 = extremely knowledgeable
Confidence	Looking ahead, do you think that 12 months from now you (personally) will be financially better off, worse off, or the same as today? 9 = much better off
Optimism	Overall, I expect more good things to happen to me than bad. 9 = agree
Over-Confidence 1	Compared to the average driver, rate your ability to drive a car. 9 = far above average
Over-Confidence 2	If you played Bingo with your friend, who do you think would be more likely to win the game? 9 = I am more likely to win
Over-Confidence 3	“Looking ahead, do you think that 12 months from now you (personally) will be financially better off, worse off, or the same as today?” DIVIDED BY “Looking ahead, do you think that 12 months from now the overall economy will be better off, worse off, or the same as today?” 9 = much better off
Sensation Seeking 1	I like to have new and exciting experiences and sensations even if they are a little frightening. 9 = agree
Sensation Seeking 2	If you were to visit an amusement park, which group of attractions would you most likely ride? 1 = ferris wheel, carousel; 9 = roller coasters, bungee jumping
Sensation Seeking 3	If you were to gamble, which group of games would you most likely play? 1 = slot machines, bingo; 9 = black jack, craps, poker
Sensation Seeking 4	Have you received a speeding ticket in the last 10 years? 1 = yes; 0 = no.



Sensation Seeking 5	Do you own a sports car?; 1 = yes; 0 = no
Emotional Intelligence 1	I usually find it difficult to regulate my emotions. 1 = disagree; 9 = agree. We then reverse the scale within the analysis for consistency.
Emotional Intelligence 2	I am generally aware of my emotions as I experience them. 9 = agree
Emotional Intelligence 3	When I experience a positive emotion, I know how to make it last. 9 = agree
Emotional Intelligence 4	When I experience a negative emotion, I know how to make it go away. 9 = agree
General Intelligence	How would you rate your general level of intelligence relative to the average person? 9 = far above average intelligence
Mood	How would you rate your current overall mood? 9 = I am currently in a wonderful mood

### C. Behavioral Traits - Composite

Risk Aversion	Stock investment percentages above 25% (roughly the mean) are coded as 1. Willingness to take risk above 5 is coded as a 1. The result of these two dummies is averaged
Over-Confidence	Over-Confidence measures 1 and 2 are converted to dummies if the score is above 5. Over-confidence 3 is set equal to 1 if the ratio > 1. The result of these three dummies is averaged
Sensation Seeking	Sensation Seeking measures 1 through 3 are coded as 1 if the score is above 5. These three variables are then averaged with the two remaining dummies
Emotional Intelligence	The four variables are averages to remain on a 9-point scale

## 5. Results

(insert Table 1 here)

It is widely known that one reason why people will not list their underwater investment property for sale is because they do not have the cash to complete the transaction (the affordability constraint). Our central hypothesis is that behavioral reasons explain why countless others who can afford to sell make a conscious decision not to. Table 1 provides insight into the magnitude of these choices. In Part A, the full sample of 750 respondents is considered. Average sample means are compared to the “neither agree nor disagree” reference point of “5.” On the whole, familiarity bias and false reference points are statistically significant reasons why people decide not to list. Status quo deviation aversion is significantly not a reason to avoid listing. Comparing to the affordability reason not to sell, at first glance, it appears that the affordability constraint is the number one reason. Still, given that many set aside the possibility of behavioral reasoning, these results are quite robust.

Part B of Table 1 breaks down the responses for those who agree with each reason not to list the property for sale. Consistent with the figures from Part A, we see a relatively similar pattern of frequencies. Interestingly, the affordability constraint and the familiarity bias reasons are exactly equal in occurrence. What stands out the most in this section of the table is that status quo deviation aversion, which is significantly not a reason in the full sample, is still a reason not to list for 292 of the 746 people who responded to the question. As such, status quo deviation aversion is not a problem for all, but it is certainly a problem for some.

Table 1, Parts C and D break the sample down into the top reason why people do not list. In other words, many behavioral reasons might be weighing on the minds of investors, but which reasons are the most influential? In Part C, we consider the possibility that two or more reasons might be equally important to the real estate investor. In Part D, we tally the results for those who indicated a unique top reason (no ties allowed). The economically-based affordability constraint emerges as the number one reason not to list, as expected. However, the behavioral explanations remain plentiful, accounting in aggregate for 68.3% (Part C) and 55.6% (Part D) of respondent reasoning.

(insert Table 2 here)

Now that it has been established that behavioral biases occupy a substantial place in the thought process of the underwater real estate investor, we next address the question as to whether or not these tendencies vary by the behavioral traits that lie within all of us. Recall that past studies have been extremely unsuccessful in linking demographic data to behavior. The question we address now is why. Is it that demographics are superficial distinctions that do not go deep enough to uncover the true reasons for behavior? Or is it that psychological considerations cut through all demographic barriers and are common in all of us? We now turn our focus to these questions. Table 2 provides descriptive statistics for each of the 19 variables used to capture 9 behavioral traits used in the remainder of the study. Note that while each answer has a sample size very near 750, our list-wise full sample of responses is down to 665 observations based on the sprinkling of omitted answers to certain questions.

(insert Tables 3-5 here)

Tables 3-5 show the regressions for the full sample as well as the samples when broken down by the top behavioral reasons people decide not to list (with and without ties allowed). While there are many significant variables, the same variables are not consistent in each table. Moreover, while there are significant relationships, several have the wrong sign. All variables within the regressions are expected to carry a positive sign except “sensation seeking 1.”

Several reasons might explain why an investor profile of those more likely to rely on psychological reasoning is not possible to identify at this time. First, some of the questions are from scales that contain 30 total measures of, for example, emotional intelligence. Can we expect that pulling a single question from a 30 question scale will capture that construct? This truncating step was taken so as to avoid a survey with 200 questions on it. Second, it might simply be that behavioral considerations are pervasive throughout our psychological make-up. We leave it to future studies to attempt to fully and better capture all 9 behavioral traits and examine their impact on various psychologically-based decision-making. Since this avenue of research was not our primary focus in this study, we leave the work to be performed in this area to future efforts.

(insert Figure 1 here)

As a final robustness check, we consider the direction of the market at the time this data was collected as a potential explanation of the familiarity bias results. It can be argued that a homeowner might believe his home to go up in value more within the next 12 months than other

investments of similar risk because it will. Figure 1 displays the before data collection home price movements in all 20 Case-Shiller cities as well as their two overall, composite measures. The figure shows that home prices consistent across the entire U.S. remained relatively flat during the periods both before and after our study. As such, it appears unreasonable to conclude that these investors had accurate, private information that their homes would appreciate at a rate greater than other similar risk investments – or even at all for that matter.

## **6. Conclusions**

This study examines the behavioral explanations as to why residential real estate investors who owe more to the lender than they could yield from the sale of their investment property decide not to list the property for sale. Counter to the traditional assumptions made in financial studies, we find that behavioral reasons collectively explain more investor decision-making than the economic reason of butting up against an affordability constraint.

As a robustness check, we further divide the sample into just those who agree with each reason not to list and those who list a top reason (unique and otherwise). The results remain steady in the demonstration that behavioral explanations for real estate investor behavior are alive and well. Even the status quo deviation aversion, which was not found to be a global explanation, was significant for a great number of individuals. In order, the behavioral reasons not to list are best explained by familiarity bias, false reference points, and finally, status quo deviation aversion.

In considering whether or not respondents possess underlying behavioral traits that would allow us to systematically identify an ex-ante tendency to rely more heavily on behavioral considerations not to list a property for sale, we utilize 19 variables to represent 9 underlying traits. While several of the variables are at times significant with the correct signs, no such profile is possible to derive at this time.

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**Table 1. Mean Score Differences and Frequency for Reasons Not to List the Underwater Investment Property for Sale**

This table shows the mean score differences and frequencies reported for the behavioral explanations of why underwater investment properties are not listed for sale for the full sample of 750 respondents and two sub-samples that are restricted to the top reasons (with and without ties allowed, respectively).

	<b>Affordability Constraint</b>	<b>Familiarity Bias</b>	<b>Status Quo Deviation Aversion</b>	<b>False Reference Point</b>
<b>A: Full Sample of Mean Score Differences</b>				
Full sample means <sup>1</sup>	5.75***	5.67***	4.44***	5.20*
(P-value)	(.000)	(.000)	(.000)	(.056)
Sample size	743	748	746	748
<b>B: Number of People Answering 6 through 9 (in agreement with the reason not to list)</b>				
Respondents who reported a “6”	N = 68	N = 81	N = 64	N = 60
Respondents who reported a “7”	N = 100	N = 140	N = 81	N = 101
Respondents who reported a “8”	N = 87	N = 87	N = 66	N = 79
Respondents who reported a “9”	N = 182	N = 129	N = 81	N = 138
Sum of agreement	∑ = 437	∑ = 437	∑ = 292	∑ = 378
<b>C: Restricted Sample of Mean Score Differences (ties allowed)<sup>2</sup></b>				
Top reason (ties allowed) and a response > 5 (average = 218)	N = 303	N = 244** (p=.048)	N = 156 *** (p=.000)	N = 253*** (p=.000)
<b>D: Restricted Sample of Mean Score Differences (no ties allowed)<sup>2</sup></b>				
Top reason (ties not allowed) and a response > 5 (average = 66)	N = 158	N = 82* (p=.065)	N = 52 ** (p=.042)	N = 64 (p=.776)

Notes:

1. The reference point is equal to “5.”

2. Tests exclude the Affordability constraint column as this is not a behavioral reason not to list the property for sale.

\* indicates significance at the 10% level; \*\* indicates significance at the 5% level; \*\*\* indicates significance at the 1% level.



**Table 2. Descriptive Statistics for Respondent Behavioral Characteristics**

This table shows descriptive statistics associated with respondent behavioral characteristics. Panel A contains: *Risk Aversion 1* captures willingness to take risk when investing, while *Risk Aversion 2* is the percentage of stock in their portfolio. *Knowledge* measures degree of real estate knowledge. *Confidence* is a 12-month forward looking measure of predicted personal prosperity. *Optimism* measures the extent to which people expect good things to happen to them. *Over-confidence 1-3* measures driving ability, the probability of winning a random event, and a 12-month forward looking measure of predicted personal prosperity relative to others, respectively. *Sensation Seeking 1-5* relates to pursuing new and exciting experiences, amusement park attraction preferences, gaming preferences, whether or not they have received speeding tickets, and whether or not they own a sports car, respectively. *Emotional Intelligence 1-4* captures emotion regulation abilities, awareness of emotional state, the ability to make last a positive emotion, and the ability to dismiss a negative emotion, respectively. *Intelligence* is a measure of general, overall intelligence, while *Mood* captures their current mood when completing the survey. Panel B contains the four composite behavioral trait measures.

	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Panel A: 19 Individual Trait Measures</b>					
Risk Aversion 1	745	1	9	5.33	1.852
Risk Aversion 2	732	0	100	24.60	23.241
Knowledge	747	1	9	5.77	1.759
Confidence	745	1	9	6.47	1.584
Optimism	742	1	9	6.85	1.754
Over-Confidence 1	748	1	9	7.17	1.534
Over-Confidence 2	743	1	9	5.24	1.575
Over-Confidence 3	744	0.25	9	1.21	0.826
Sensation Seeking 1	743	1	9	6.32	1.821
Sensation Seeking 2	748	1	9	6.53	2.450
Sensation Seeking 3	748	1	9	5.62	2.888
Sensation Seeking 4	744	0	1	0.60	0.490
Sensation Seeking 5	743	0	1	0.15	0.358
Emotional Intelligence 1	744	1	9	6.21	2.181
Emotional Intelligence 2	746	1	9	6.82	1.838
Emotional Intelligence 3	748	1	9	6.39	1.800
Emotional Intelligence 4	743	1	9	5.50	2.174
General Intelligence	745	1	9	6.96	1.254
Mood	743	1	9	6.26	1.572
<b>Panel B: 4 Composite Behavioral Traits</b>					
Risk Aversion	727	0	1	0.45	0.383
Over-Confidence	737	0	1	0.50	0.261
Sensation Seeking	728	0	1	0.54	0.254
Emotional Intelligence	734	2.25	9	6.22	1.313
N (list wise)	665				

**Table 3. Estimates of Behavioral Explanations by Respondent Behavioral Trait: Full Sample**

This table shows the results from a series of regressions to determine if behavioral explanations for the shadow market are a function of respondent behavioral traits. The dependent variable in each regression is one of the three reasons why real estate investors do not have their investment properties listed for sale: *Familiarity Bias*, *Status Quo Deviation Aversion*, and *False Reference Point*. The independent variables in Panel A include 9 behavioral traits represented by 19 variables. Panel B contains the four composite behavioral trait measures. *Risk Aversion 1* captures willingness to take risk when investing, while *Risk Aversion 2* is the percentage of stock in their portfolio. *Knowledge* measures degree of real estate knowledge. *Confidence* is a 12-month forward looking measure of predicted personal prosperity. *Optimism* measures the extent to which people expect good things to happen to them. *Over-confidence 1-3* measures driving ability, the probability of winning a random event, and a 12-month forward looking measure of predicted personal prosperity relative to others, respectively. *Sensation Seeking 1-5* relates to pursuing new and exciting experiences, amusement park attraction preferences, gaming preferences, whether or not they have received speeding tickets, and whether or not they own a sports car, respectively. *Emotional Intelligence 1-4* captures emotion regulation abilities, awareness of emotional state, the ability to make last a positive emotion, and the ability to dismiss a negative emotion, respectively. *Intelligence* is a measure of general, overall intelligence, while *Mood* captures their current mood when completing the survey. The full sample is utilized.

	Only Panel A Variables included			Both Panels A&B Variables included		
	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point
Constant	1.283(.821)	2.450(.924)	4.005(.967)	1.574(.731)	3.95(.818)	4.541(.849)
<b>Panel A: 19 Individual Trait Measures</b>						
Risk Aversion 1	.009(.064)	-.014(.073)	.106(.076)			
Risk Aversion 2	-.004(.004)	.001(.005)	.000(.005)			
Knowledge	.069(.065)	-.047(.074)	.055(.077)	.068(.063)	-.075(.071)	.060(.073)
Confidence	.343(.072)***	.135(.082)*	-.033(.085)	.335(.071)***	.122(.081)	-.026(.083)
Optimism	-.002(.068)	.103(.077)	.088(.081)	.042(.067)	.107(.075)	.110(.079)
Over-Confidence 1	-.104(.072)	-.102(.081)	-.100(.085)			
Over-Confidence 2	.124(.067)*	.070(.075)	.156(.079)**			
Over-Confidence 3	-.266(.119)**	.116(.134)	.089(.140)			
Sensation Seeking 1	.087(.068)	-.039(.077)	-.100(.080)			
Sensation Seeking 2	.021(.048)	.075(.055)	.032(.057)			
Sensation Seeking 3	.035(.036)	.028(.041)	-.018(.043)			
Sensation Seeking 4	-.476(.202)**	-.023(.227)	-.188(.238)			
Sensation Seeking 5	.226(.275)	.299(.311)	-.112(.324)			
Emotional Intelligence 1	.058(.047)	.190(.053)***	.043(.056)			
Emotional Intelligence 2	.009(.061)	-.123(.068)*	-.120(.072)*			
Emotional Intelligence 3	.141(.069)**	-.024(.078)	.120(.082)			

Emotional Intelligence 4	.029(.053)	.113(.059)**	-.120(.062)*			
General Intelligence	-.005(.090)	-.028(.101)	.104(.106)	-.021(.088)	-.083(.099)	.069(.102)
Mood	.056(.078)	.058(.088)	.034(.093)	.146(.075)*	.107(.085)	.098(.088)

**Panel B: 4 Composite Behavioral Traits**

Risk Aversion			.160(.272)	.357(.307)		.572(.318)*
Over-Confidence			-.570(.409)	.128(.460)		-.436(.478)
Sensation Seeking			.499(.416)	.712(.467)		-.116(.486)
Emotional Intelligence			.074(.086)	-.211(.096)**		-.212(.100)**
Degrees of Freedom	663	660	663	660	662	662
$\bar{R}^2$	.122	.056	0.088	.028	.020	.020
F-Test	4.730***	1.996**	6.974***	2.116**	1.498	1.498

Notes:

1. \* indicates significance at the 10% level; \*\* indicates significance at the 5% level; \*\*\* indicates significance at the 1% level.
2. Standard errors are given in parentheses.
3. Standard errors were computed using White's heteroskedasticity robust covariance matrix. Null hypothesis: homoskedasticity.

**Table 4. Estimates of Behavioral Explanations by Respondent Behavioral Trait: Sample Restricted to the Top Reason and Scores above 5 (Ties Allowed)**

This table shows the results from a series of regressions to determine if behavioral explanations for the shadow market are a function of respondent behavioral traits. The dependent variable in each regression is one of the three reasons why real estate investors do not have their investment properties listed for sale: *Familiarity Bias*, *Status Quo Deviation Aversion*, and *False Reference Point*. The independent variables in Panel A include 9 behavioral traits represented by 19 variables. Panel B contains the four composite behavioral trait measures. *Risk Aversion 1* captures willingness to take risk when investing, while *Risk Aversion 2* is the percentage of stock in their portfolio. *Knowledge* measures degree of real estate knowledge. *Confidence* is a 12-month forward looking measure of predicted personal prosperity. *Optimism* measures the extent to which people expect good things to happen to them. *Over-confidence 1-3* measures driving ability, the probability of winning a random event, and a 12-month forward looking measure of predicted personal prosperity relative to others, respectively. *Sensation Seeking 1-5* relates to pursuing new and exciting experiences, amusement park attraction preferences, gaming preferences, whether or not they have received speeding tickets, and whether or not they own a sports car, respectively. *Emotional Intelligence 1-4* captures emotion regulation abilities, awareness of emotional state, the ability to make last a positive emotion, and the ability to dismiss a negative emotion, respectively. *Intelligence* is a measure of general, overall intelligence, while *Mood* captures their current mood when completing the survey. The sample is restricted to those who rated the reason as the top (or tied for the top) reason the property was not listed for sale.

	Only Panel A Variables included			Both Panels A&B Variables included		
	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point
Constant	6.739(.627)	6.174(.696)	6.490(.549)			
<b>Panel A: 19 Individual Trait Measures</b>						
Risk Aversion 1	-.074(.041)*	-.030(.053)	-.029(.042)			
Risk Aversion 2	-.002(.003)	.006(.004)	.000(.003)			
Knowledge	.001(.048)	.020(.060)	.033(.044)	-.027(.044)	.036(.054)	.021(.041)
Confidence	.031(.053)	.055(.068)	.065(.048)	.038(.052)	.046(.060)	.065(.046)
Optimism	.061(.048)	.041(.055)	.058(.047)	.077(.047)	.072(.051)	.050(.044)
Over-Confidence 1	-.060(.044)	-.058(.059)	-.038(.043)			
Over-Confidence 2	.009(.047)	-.050(.057)	.024(.044)			
Over-Confidence 3	-.070(.095)	.033(.098)	.082(.061)			
Sensation Seeking 1	.024(.047)	-.002(.065)	-.033(.041)			
Sensation Seeking 2	-.015(.033)	.027(.050)	.003(.029)			
Sensation Seeking 3	.001(.025)	.010(.034)	.024(.022)			
Sensation Seeking 4	.003(.139)	.191(.180)	-.183(.126)			
Sensation Seeking 5	.550(.190)****	.140(.235)	.304(.179)*			
Emotional Intelligence 1	.009(.030)	.001(.040)	-.024(.030)			

Emotional Intelligence 2	.107(.042)**	.074(.058)	.027(.036)				
Emotional Intelligence 3	.027(.052)	.065(.061)	.022(.042)				
Emotional Intelligence 4	.078(.037)**	.011(.050)	.004(.033)				
General Intelligence	.043(.061)	.026(.076)	.043(.058)	.040(.058)	.023(.069)	.057(.056)	
Mood	-.023(.053)	.045(.066)	.080(.050)	.032(.050)	.063(.062)	.077(.047)	

**Panel B: 4 Composite Behavioral Traits**

Risk Aversion				-.077(.191)	.311(.228)	.060(.165)	
Over-Confidence				-.617(.271)**	-.557(.330)*	.110(.233)	
Sensation Seeking				.166(.310)	.203(.399)	-.224(.243)	
Emotional Intelligence				.135(.057)**	.079(.068)	.075(.053)	
Degrees of Freedom	216	134	224	216	134	224	
$\bar{R}^2$	.164	.167	.160	.105	.145	.130	
F-Test	2.031***	1.213	2.061***	2.699***	2.363**	3.569***	

Notes:

1. \* indicates significance at the 10% level; \*\* indicates significance at the 5% level; \*\*\* indicates significance at the 1% level.
2. Standard errors are given in parentheses.
3. Standard errors were computed using White's heteroskedasticity robust covariance matrix. Null hypothesis: homoskedasticity.

**Table 5. Estimates of Behavioral Explanations by Respondent Behavioral Trait:  
Sample Restricted to the Top Reason and Scores above 5 (no ties allowed)**

This table shows the results from a series of regressions to determine if behavioral explanations for the shadow market are a function of respondent behavioral traits. The dependent variable in each regression is one of the three reasons why real estate investors do not have their investment properties listed for sale: *Familiarity Bias*, *Status Quo Deviation Aversion*, and *False Reference Point*. The independent variables in Panel A include 9 behavioral traits represented by 19 variables. Panel B contains the four composite behavioral trait measures. *Risk Aversion 1* captures willingness to take risk when investing, while *Risk Aversion 2* is the percentage of stock in their portfolio. *Knowledge* measures degree of real estate knowledge. *Confidence* is a 12-month forward looking measure of predicted personal prosperity. *Optimism* measures the extent to which people expect good things to happen to them. *Over-confidence 1-3* measures driving ability, the probability of winning a random event, and a 12-month forward looking measure of predicted personal prosperity relative to others, respectively. *Sensation Seeking 1-5* relates to pursuing new and exciting experiences, amusement park attraction preferences, gaming preferences, whether or not they have received speeding tickets, and whether or not they own a sports car, respectively. *Emotional Intelligence 1-4* captures emotion regulation abilities, awareness of emotional state, the ability to make last a positive emotion, and the ability to dismiss a negative emotion, respectively. *Intelligence* is a measure of general, overall intelligence, while *Mood* captures their current mood when completing the survey. The sample is restricted to those who rated the reason as uniquely the top reason (no ties are allowed) the property was not listed for sale.

	Only Panel A Variables included			Both Panels A&B Variables included		
	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point	Familiarity Bias	Status Quo Deviation Aversion	False Reference Point
Constant	8.326(1.394)	7.082(1.906)	6.022(1.514)			
<b>Panel A: 19 Individual Trait Measures</b>						
Risk Aversion 1	-.014(.084)	-.070(.141)	-1.71(.128)			
Risk Aversion 2	-.003(.006)	.008(.009)	.007(.008)			
Knowledge	.002(.087)	.183(.150)	.020(.134)		.144(.104)	-.042(.105)
Confidence	.167(.119)	.129(.152)	.173(.129)	-.031(.082)	.120(.118)	.187(.105)*
Optimism	-.050(.096)	-.017(.131)	-.094(.125)	.152(.096)	.008(.109)	-.105(.110)
Over-Confidence 1	-.072(.082)	.128(.220)	.035(.140)	-.040(.094)		
Over-Confidence 2	-.060(.077)	-.160(.142)	-.082(.130)			
Over-Confidence 3	-1.132(.684)	-.152(.719)	-.531(.587)			
Sensation Seeking 1	.146(.102)	.019(.172)	.096(.121)			
Sensation Seeking 2	-.067(.064)	-.005(.138)	.002(.078)			
Sensation Seeking 3	-.093(.051)*	-.005(.074)	-.003(.062)			
Sensation Seeking 4	.020(.250)	.230(.368)	-.149(.374)			
Sensation Seeking 5	-.039(.364)	-.530(.505)	-.604(.554)			
Emotional Intelligence 1	.073(.055)	-.164(.140)	.030(.098)			

Emotional Intelligence 2	.100(.097)	-.038(.137)	.176(.112)						
Emotional Intelligence 3	-.021(.097)	-.065(.146)	-.035(.095)						
Emotional Intelligence 4	.102(.066)	-.016(.126)	-.092(.074)						
General Intelligence	.077(.147)	-.053(.172)	.069(.148)	-.042(.131)	-.037(.120)	.165(.133)			
Mood	-.140(.098)	.131(.149)	.215(.132)	-.073(.092)	.111(.116)	.200(.098)**			

**Panel B: 4 Composite Behavioral Traits**

Risk Aversion				.192(.367)	.279(.399)	.153(.356)			
Over-Confidence				-.632(.544)	-.742(.675)	-.462(.454)			
Sensation Seeking				-.190(.571)	-.684(.784)	-.972(.536)*			
Emotional Intelligence				.054(.107)	.106(.158)	-.050(.122)			
Degrees of Freedom	78	47	54	78	47	54			
$\bar{R}^2$	.277	.276	.400	.074	.182	.256			
F-Test	1.192	0.561	1.227	.0614	0.938	1.724			

Notes:

1. \* indicates significance at the 10% level; \*\* indicates significance at the 5% level; \*\*\* indicates significance at the 1% level.
2. Standard errors are given in parentheses.
3. Standard errors were computed using White's heteroskedasticity robust covariance matrix. Null hypothesis: homoskedasticity.

**Figure 1. Case-Shiller 20 City Home Price Indexes from January 2006 through July 2010.**

This figure displays the movements of the Case-Shiller indexes before and after the data collection period used in this study.

