

# Questionnaires of Risk Tolerance, Regret, Overconfidence, and Other Investor Propensities

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## Introduction

The crisis of 2008 and 2009 exposed not only the shortcomings of our financial system but also the shortcomings of the tools used by financial advisors to assess and guide investors. These include risk questionnaires. Many investors who were assessed as risk tolerant in 2007 and assigned portfolios heavy in equities dumped their equities in 2008 and 2009 and some even dumped their advisors. In this paper, we attempt to examine the assessment of investors' risk tolerance and what, beyond investors' risk tolerance, should be assessed.

We argue that typical questionnaires are deficient for five reasons. First, each investor has a multitude of risk tolerances. Probing for one global risk tolerance misses that multitude. Specifically, investors consider their portfolios as collections of mental accounts, each devoted to a goal. Goals might include retirement income, college education, or being rich enough to travel first class whenever and wherever desired. Investors' risk tolerance corresponds to their goals. For example, an investor might have low risk tolerance in a retirement mental account, populating it with bonds or Treasury bills, and at the same time have high risk tolerance in a "get-rich" mental account, populating it with aggressive growth funds or even lottery tickets.

Second, guidance toward portfolio asset allocation is one of the most important tasks of financial advisors, and assessment of investors' risk tolerance is essential in this task. Yet existing risk questionnaires offer no clear linkage between risk tolerance scores derived from questionnaires and portfolio asset allocations. Some risk questionnaires provide no links at all to portfolio asset allocations. Others provide links based on opaque rules of thumb.

Third, investors' risk tolerance varies by circumstances and associated emotions. A failure to recognize this nature of risk tolerance is likely to result in disappointment. Vividly high returns on asset classes, whether dot-com stocks in 1999 or gold more recently, induce exuberance, misleading investors into the belief that these assets combine high future returns with low risk. Risk tolerance questions asked after periods of high stock returns are likely to elicit answers tinted by exuberance, exaggerating investors' risk tolerance. Conversely, vividly low returns on asset classes, such as U.S. and international stocks in 2008, induce fear, herding invest-

tors into Treasury bonds and misleading them into the belief that stocks combine low future returns with high risk. Risk tolerance questions asked following periods of low stock returns are likely to elicit answers underestimating investors' risk tolerance.

Fourth, foresight is different from hindsight, and the risk tolerance of investors, assessed in foresight, is likely different from their risk tolerance assessed in hindsight. Investors with low propensity for hindsight and regret might shrug their shoulders when they learn, in hindsight, that their investments delivered poor returns while other investments they could have chosen brought better returns. But investors with high propensity for hindsight and regret might fire their advisors or even file lawsuits, claiming that they have been induced to undertake unsuitable investments.

Fifth, investor propensities other than risk tolerance matter to advisors when they work with their clients. Kahneman (2009) noted, "Advisor and advisee have a common interest: both want the relationship not to end in disappointment, and both want to reduce the potential for regret and for abrupt reversals." Moreover, some propensities are intricately associated with other propensities, and advisors must understand these relations and make appropriate adjustments. For example, investors with high propensity for overconfidence might exhibit high risk tolerance. But are such investors truly risk tolerant or is their measured risk tolerance exaggerated by overconfidence?

We present questions that can form the foundation for a new kind of investor questionnaire, one that probes for risk tolerance, overconfidence, maximization, regret, trust, and life-satisfaction. Our analysis is based on an online survey of 2,512 people (1,076 men and 1,436 women).<sup>1</sup>

We find that people with high risk tolerance tend to be more overconfident, with high propensity for maximization and high levels of trust. Men are generally more risk tolerant than women and the relatively young are more risk tolerant than the relatively old. Women have relatively high propensity for regret but they have relatively low levels of overconfidence and low propensity for maximization.

## Risk Questionnaires

Investors and financial advisors have a wide choice of questionnaires under headings such as Risk Questionnaire,

Investor Questionnaire, and Investment Policy Questionnaire. Most seek to assess both risk tolerance and risk capacity and guide investors toward appropriate portfolios. For example, Question 3 in Vanguard's Investor Questionnaire probes risk tolerance, asking for the level of agreement with the statement: "Generally, I prefer investments with little or no fluctuation in value, and I'm willing to accept the lower return associated with these investments." Investors who strongly disagree with this statement are deemed to have relatively high risk tolerance, tilting recommendations toward relatively high-risk portfolios. Question 1 probes investors' risk capacity. It states: "When making a long-term investment, I plan to hold the investment for:" It offers answers ranging from one–two years to nine–ten-plus years. Investors with shorter horizons are deemed to have lower risk capacities, tilting recommendations toward relatively low-risk portfolios.

Yet many questions are difficult to classify into either the risk-tolerance group or the risk-capacity group. Some are best classified into the regret group, others into the confidence group, yet others into the fear group. For example, Question 13 in FinaMetrica's Risk Tolerance Questionnaire asks whether investors are reluctant to buy a stock they have previously sold at a loss: "Suppose that 5 years ago you bought shares in a highly regarded company. The same year the company experienced a severe decline in sales due to poor management. The price of the shares dropped drastically and you sold at a substantial loss. The company has been restructured under new management and most experts now expect the shares to produce better than average returns. Given your bad past experience with this company would you buy shares now?" Possible answers range from definitely yes to definitely no. This question is about regret aversion, not about risk tolerance. Indeed, Strahilevitz et al. (2011) found that investors are reluctant to buy stocks they have previously sold at a loss and attributed that reluctance to a desire to avoid regret.

Question 12 in the FinaMetrica Risk Tolerance Questionnaire asks: "How much confidence do you have in your ability to make good financial decisions?" This is a question about confidence, or overconfidence, not about risk tolerance. High correlations between risk tolerance, propensity for regret, and overconfidence might indicate that overconfident investors who are good at resisting regret are more risk tolerant. But regret and overconfidence are distinct from risk tolerance.

### Risk Tolerance

The ISO 22222 Personal Financial Planning Standards defines risk tolerance as "the extent to which a consumer is willing to risk experiencing a less favorable financial outcome in the pursuit of a more favorable financial outcome." Barsky et al. (1997) elicited risk tolerance with a question that corresponds well to that definition.

Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) income every year for life. You

are given the opportunity to take a new and equally good job, with a fifty-fifty chance it will double your (family) income and a fifty-fifty chance that it will cut your (family) income by a third. Would you take the new job?

If the answer to the first question is "yes," the interviewer continues:

Suppose the chances were fifty-fifty that it would double your (family) income, and fifty-fifty that it would cut it in half. Would you still take the new job?

If the answer to the first question is "no," the interviewer continues:

Suppose the chances were fifty-fifty that it would double your (family) income and 50–50 that it would cut it by 20 percent. Would you then take the new job?

Barsky et al. (1997) found that the measure of risk tolerance is related to risk-taking behavior. People with high risk tolerance tend to smoke and drink more than people with low risk tolerance, have higher levels of education, be self-employed, live in the western United States, be immigrants, and allocate higher proportions of their portfolios to stocks.

Barsky et al. (1997) also found that risk tolerance is relatively high among people younger than fifty-five and among people older than seventy, but people in the fifty-five to seventy age group have relatively low risk tolerance. Men are more risk tolerant than women, Asians and Hispanics more risk tolerant than whites or blacks, and Jews more risk tolerant than Catholics who, in turn, are more risk tolerant than Protestants.

We know from many studies that women have lower risk tolerance than men, but we know little about the factors that underlie that gender difference. Barber and Odean (2001) found that women trade less than men and hold less-risky portfolios than men. They conjectured that the differences in behavior may be due to higher levels of overconfidence among men but provided no direct evidence for their conjecture. Charness and Gneezy (2007) assembled data from ten sets of experiments conducted by different experimenters who did not set out to look for gender differences in risk tolerance yet found that women are less risk tolerant than men. Beckmann and Menkhoff (2008) found that not even expertise eliminates gender differences in risk tolerance. Women are less risk tolerant than men even among professional fund managers.

### Risk Perception and Risk Tolerance

Wealthy people might have the same risk tolerance as poor people, yet their risk perceptions are likely different. Wealthy people might perceive a fifty-fifty gamble to win \$300 or lose \$100 as low-risk because \$100 is minuscule relative to their wealth, whereas poor people might perceive the same gamble as high-risk because \$100 is substantial relative to their wealth. Failure to distinguish risk perception from risk tolerance can bias the measurement of risk tolerance.

The Vanguard Investor Questionnaire displays a chart that shows the greatest one-year loss and the greatest one-year gain on three different hypothetical investments of \$10,000. The questionnaire then asks: “Given the potential gain and loss in any 1 year, I would invest my money in:” The choices range from a lottery with a fifty-fifty chance for a \$164 loss or a \$593 gain to a lottery with a fifty-fifty chance for a \$3,639 loss or a \$4,229 gain. But stakes affect risk perceptions and risk perceptions affect risk tolerance. Holt and Laury (2002) found that risk tolerance decreases as stakes increase. Many who would be willing to wager \$10,000 on a gamble with fifty-fifty chances for a \$3,639 loss or a \$4,229 gain might not be willing to wager \$100,000 or a \$10-million portfolio on proportionally higher gains and losses.

Barsky et al. (1997, 539) wrote that the “principal requirement for a question aimed at measuring risk aversion is that it must involve gambles over lifetime income.” They added that “experiments in the existing literature typically involve stakes that have little impact on lifetime resources” (1997, 538–539). The arbitrary stake of \$10,000 in the Vanguard question is one such example. To address this problem, Barsky et al. asked people to consider their incomes each year throughout their lives, a stake that has substantial impact on lifetime resources. Moreover, the question is intrinsically calibrated, whether a person’s current income is \$1,000 or \$1 million. It offers a fifty-fifty chance to double one’s income or cut it by some proportion, such as one fifth.

### Measuring Risk Tolerance

We presented people with a modified version of the Barsky et al. (1997) “job” question:

Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current family income every year for life. Now you are given an opportunity to take a new and equally good job. The new job has a fifty-fifty chance to increase by 50 percent your standard of living every year during your lifetime. However, the new job also has a fifty-fifty chance to reduce by X-percent your standard of living every year during your lifetime. Circle the maximum X-percent reduction in standard of living you are willing to accept.

In testing earlier versions of the question, beginning with the version of Barsky et al., we found that people find “standard of living” terminology more descriptive than “income” terminology. We also found that people found it difficult to conjure in their minds a clear picture of a 100-percent increase in their standard of living but found it easier to conjure a 50-percent increase. We let people choose the maximum downside they are willing to accept, from 3 percent to 30 percent, in increments of 3 percent. This range of downside relative to upside overlaps the Barsky et al. (1997) range and extends beyond it.<sup>2</sup>

We also presented to people an analogous question in the context of portfolios.

Suppose that you are given an opportunity to replace your current investment portfolio with a new portfolio. The new portfolio has a fifty-fifty chance to increase by 50 percent your standard of living every year during your lifetime. However, the new portfolio also has a fifty-fifty chance to reduce by X-percent your standard of living every year during your lifetime. Circle the maximum X-percent reduction in standard of living you are willing to accept.

### From Risk Tolerance to Mean-Variance Efficient Portfolios

Investors who speak the language of standard deviations and correlations are able to locate their optimal mean-variance portfolios easily once they know the available combinations of expected returns and standard deviations on the mean-variance efficient frontier. But for most investors, the language of standard deviations and correlations is foreign. The language investors speak corresponds better to the “downside risk” language of the ISO 22222 Personal Financial Planning Standards. These standards define risk tolerance as “the extent to which a consumer is willing to risk experiencing a less favorable financial outcome in the pursuit of a more favorable financial outcome.” This is also the language of our risk question. We ask about “the extent to which a customer is willing to risk experiencing a less favorable outcome,” represented by an X-percent decline in their standard of living, “in the pursuit of a more favorable financial outcome,” represented by a 50-percent increase in their standard of living. Moreover, answers to our risk-tolerance question offer a one-to-one correspondence to optimal asset allocation in portfolios on the mean-variance efficient frontier.

Each choice of a maximum percentage reduction in standard of living for a fifty-fifty chance at a 50-percent increase in standard of living is a choice about downside risk, following the ISO 22222 definition of risk. Each choice also corresponds to a level of risk tolerance, measured by its reciprocal, the coefficient of risk aversion. Each choice also corresponds to an optimal portfolio on the mean-variance efficient frontier. Assuming that the degree of risk tolerance for each respondent remains constant for relatively small changes in standard of living, we can calculate the coefficient of risk aversion as

$$\rho = -C \frac{U''(C)}{U'(C)}$$

where  $C$  denotes a standard of living, and  $U(C)$  denotes utility derived from a standard of living of  $C$ . For example, the coefficient of risk aversion of those who were willing to accept a maximum reduction of 30 percent in their standard of living in exchange for a fifty-fifty chance at a 50-percent increase is 1.34, whereas the coefficient of risk aversion for those who were willing to accept only a maximum reduction of 3 percent is 23.75.<sup>3</sup> Table 1 presents the coefficients of risk aversion associated with each possible choice of a maximum reduction in the standard of living.

**TABLE 1: FROM RISK TOLERANCE TO OPTIMAL PORTFOLIOS ON THE MEAN-VARIANCE EFFICIENT FRONTIER**

Maximum decrease in standard of living one is willing to accept for a 50-50 chance at a 50% increase	Optimal Portfolios on the MV Efficient Frontier					
	Coefficient of Risk Aversion	Expected Return (%)	Standard Deviation (%)	Percent in Treasury Bills	Percent in Long-term Treasury Bonds	Percent in Stocks
3%	23.75	4.40	3.31	80	13	7
6%	12.11	4.88	4.13	69	18	13
9%	8.04	5.39	5.24	59	22	19
12%	5.86	5.95	6.63	47	27	26
15%	4.46	6.59	8.33	33	33	34
18%	3.47	7.36	10.44	17	39	44
21%	2.73	8.23	12.85	0	44	56
24%	2.16	8.83	14.66	0	32	68
27%	1.71	9.59	17.16	0	17	83
30%	1.34	10.40	20.00	0	0	100

The annual returns, standard deviation of annual returns, and correlation of the annual returns are from Ibbotson 2008 Stocks, Bonds, Bills, & Inflation (SBBi) yearbook. Expected returns are assumed to be 3.7 percent, 5.5 percent, and 10.4 percent for Treasury bills, Treasury bonds, and stocks, respectively. These returns are the geometric mean of the annual returns during 1926–2007 from Table 2-12 in SBBi 2008. Corresponding standard deviations are assumed to be 3.1 percent, 9.2 percent, and 20.0 percent. These standard deviations are the standard deviations of annual returns during 1926–2007 from Table 2-12 in SBBi 2008. The correlation coefficients are assumed to be 0.04, 0.05, and 0.27 between Treasury bills and Treasury bonds, Treasury bills and stocks, and Treasury bonds and stocks, respectively. The correlation coefficients come from Table 9-2 in SBBi 2008. The optimal portfolios are constructed following Das et al. (2010) under the assumption that short selling is prohibited.

To see how these coefficients of risk aversion correspond to particular portfolios on the mean-variance efficient frontier, consider an efficient frontier of portfolios composed of three asset classes: cash, bonds, and stocks. The expected annual returns and standard deviations of the returns are their historical long-run averages, which we obtained from the Ibbotson 2008 Stocks, Bonds, Bills, & Inflation (SBBi) Yearbook. The three asset classes are Treasury bills, long-term Treasury bonds, and stocks. The average annual returns were 3.7 percent for Treasury bills, 5.5 percent for long-term Treasury bonds, and 10.4 percent for stocks. The corresponding standard deviations were 3.1 percent, 9.2 percent, and 20.0 percent. Ibbotson adjusted historical correlations to 0.04 between Treasury bills and long-term Treasury bonds, 0.05 between Treasury bills and stocks, and 0.27 between long-term Treasury bonds and stocks. We use these adjusted correlations in our analysis.

For each risk aversion coefficient, we construct a mean-variance optimal portfolio following Das et al. (2010) under the assumption that short sales are not allowed. Table 1 presents the one-to-one mapping from answers to our risk question to the corresponding optimal portfolios on the mean-variance efficient frontier. For example, the optimal portfolio for people who are willing to accept a maximum reduction of 3 percent in their standard of living consists of 80 percent in Treasury bills, 13 percent in long-term Treasury bonds, and 7 percent in stocks. This portfolio has a 4.40-percent expected return with a 3.31-percent standard deviation. The optimal portfolio for people who are willing to accept a maximum 24-percent reduction in their standard of living is composed of no Treasury bills, 32 percent in long-term Treasury bonds, and 68 percent in stocks. The optimal portfolio for people close to the average of our sample who are willing to accept a maximum 12-percent reduction in their standard of living is

composed of 47 percent in Treasury bills, 27 percent in long-term Treasury bonds, and 26 percent in stocks (see figure 1).

Our examples of the correspondence between answers to our risk-tolerance question and asset allocation assume that returns follow a multivariate normal distribution with particular parameters of expected returns, standard deviations, and correlations. Yet our method can accommodate other return distributions such as asymmetric distributions or distributions with fat tails, which better characterize the disastrous returns we have recently endured (see Das and Statman 2011).

### Goals and Their Mental Accounts

A central feature in the behavioral portfolio theory of Shefrin and Statman (2000) is the observation that investors view their portfolios not as a whole, as prescribed by mean-variance portfolio theory, but as distinct layers in a pyramid of assets, where layers are associated with particular goals and where attitudes toward risk vary across layers. One layer might be a “downside protection” layer, designed to protect investors from being poor. Another might be an “upside potential” layer, designed to give investors a chance at being rich. Investors might behave as if they have low risk tolerance in the downside protection layer while they behave as if they have high risk tolerance in the upside potential layer. In the complete version of the behavioral portfolio theory, investors divide their money into many layers corresponding to many goals with various levels of aspiration. These are normal, familiar investors, investors who buy insurance policies while they also buy lottery tickets.

The structure of behavioral portfolios as pyramids of assets is part of common investment advice, described by Statman (1999) and Fisher and Statman (1997a, b). The pyramid structure of behavioral portfolios is also reflected in the upside potential and downside protection layers of “core and satellite” and “risk budget” portfolios. Pietranico and Riepe

(2002) described Core & Explore, Schwab's version of core and satellite, as comprised of a well-diversified "core" serving as the "foundation" layer of the portfolio and a less-diversified layer of "explore" seeking "returns that are higher than the overall market, which entails greater risk."

One might argue that while portfolios are described as layered pyramids, consistent with behavioral portfolio theory, investors consider them as a whole, consistent with mean-variance portfolio theory. But such argument is not supported by the evidence. Consider, for example, Question 13 in the Asset Allocation Planner of Fidelity Investments (2003):

If you could increase your chances of improving your returns by taking more risk, would you:

1. Be willing to take a lot more risk with all your money.
2. Be willing to take a lot more risk with some of your money.
3. Be willing to take a little more risk with all your money
4. Be willing to take a little more risk with some of your money.
5. Be unlikely to take much more risk.

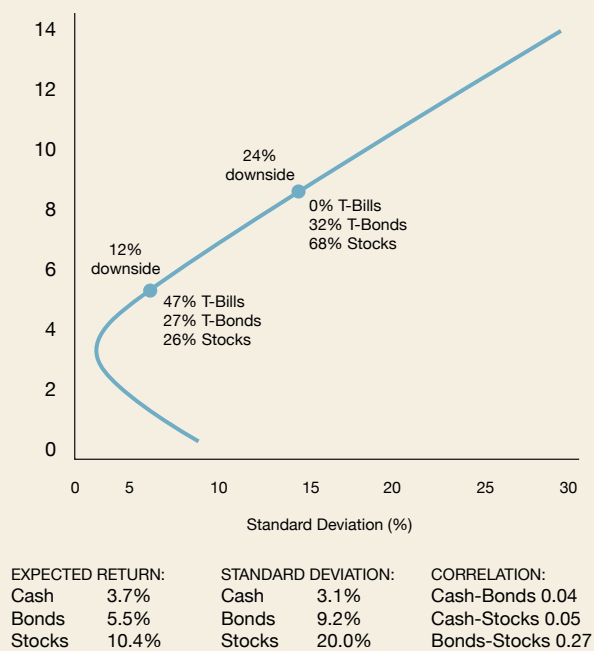
Answers 1 and 3 make sense within a framework in which only the risk of the overall portfolio (i.e., all your money) matters. But answers 2 and 4 make no sense within such a framework. This is because answers 2 and 4 segment the portfolio into layers where investors are willing to take a lot more risk or a little more risk with some of their money. Investors who consider their portfolios as a whole have a single attitude toward risk, not a set of attitudes, layer by layer. In contrast, behavioral investors have many attitudes toward risk, layer by layer. So they might be willing to take a lot more risk with some of their money.

A risk questionnaire cognizant of the mental accounting structure of portfolios would feature one question, analogous to the one we presented, for each mental account. For example, a \$1-million portfolio might be divided into an \$800,000 mental account for a retirement goal that is fifteen years away, a \$150,000 mental account for a college education goal that is three years away, and a \$50,000 mental account for a bequest goal that is twenty-five years away.

The question about the retirement mental account can be phrased as follows:

Suppose that you are given an opportunity to replace the current \$800,000 in the mental account of your portfolio devoted to retirement with a new mental account. The new mental account has a fifty-fifty chance to increase by 50 percent your standard of living during retirement. However, the new mental account also has a fifty-fifty chance to reduce by X-percent your standard of living during retirement. Circle the maximum X-percent reduction you are willing to accept in standard of living during retirement.

**FIGURE 1: PORTFOLIOS ON THE MEAN-VARIANCE EFFICIENT FRONTIER**



The question about the college education mental account can be phrased as follows:

Suppose that you are given an opportunity to replace the current \$150,000 in the mental account of your portfolio devoted to college education with a new mental account. The new mental account has a fifty-fifty chance to add 50 percent to the amount available to you when it is time to pay for college education. However, the new mental account also has a fifty-fifty chance to reduce by X-percent the amount available when it is time to pay for college education. Circle the maximum X-percent reduction you are willing to accept in the amount available when it is time to pay for college education.

The question about the bequest mental account can be phrased as follows:

Suppose that you are given an opportunity to replace the current \$50,000 in the mental account of your portfolio devoted to bequest with a new mental account. The new mental account has a fifty-fifty chance to add 50 percent to the amount available when it is time to leave a bequest. However, the new mental account also has a fifty-fifty chance to reduce by X-percent the amount available when it is time to leave a bequest. Circle the maximum X-percent reduction you are willing to accept in the amount available when it is time to leave a bequest.

**TABLE 2: RISK TOLERANCE VARIES ACROSS PORTFOLIOS AND JOBS**

Age Group	Number of responses	Mean risk tolerance toward portfolios (Maximum decrease (%) in standard of living one is willing to accept for a 50-50 chance at a 50% increase)	Mean risk tolerance toward jobs (Maximum decrease (%) in standard of living one is willing to accept for a 50-50 chance at a 50% increase)	Difference	
				Mean (%)	t-statistic
18–24	810	14.08	12.07	2.01***	8.80
25–34	703	11.98	10.60	1.38***	5.72
35–44	536	10.99	9.59	1.40***	5.45
45–54	349	11.16	10.38	0.78**	2.26
55+	336	10.65	11.54	–0.89**	–2.35
Total	2,734	12.14	10.92	1.22***	9.84

\*\*\*, \*\*, and \* indicate 1-percent, 5-percent, and 10-percent statistical significant levels, respectively.

Das et al. (2010) have shown that if each mental account is optimized on the mean-variance efficient frontier, the aggregate portfolio also lies on the mean-variance efficient frontier.

### The Mental Accounts of Jobs and Portfolios

The risk tolerance question of Barsky et al. (1997) concerns jobs, not portfolios. The distinction is important because incomes from a job likely reside in a mental account distinct from the mental accounts that contain incomes from an investment portfolio. Jobs offer downside protection for people during their working years and portfolios offer mostly upside potential during those years. Portfolios might be invested primarily in stocks during working years rather than in bonds, reflecting relatively high risk tolerance toward portfolios. But as people age and retire, jobs decrease in importance as sources of downside protection and portfolios increase in importance. The portfolios of older people might be invested mostly in bonds rather than in stocks, reflecting relatively low risk tolerance toward portfolios. We test this hypothesis by comparing answers to our questions on risk tolerance toward jobs and toward portfolios.

Barsky et al. (1997) found that young people have relatively high risk tolerance toward jobs, but they also found that risk tolerance does not decline monotonically with age. People younger than fifty-five are more risk tolerant than people between the ages of fifty-five and seventy, but people older than seventy are more risk tolerant than people in the fifty-five to seventy group.

Few people in our sample are older than seventy years. To better understand the relation between risk tolerance and age documented in Barsky et al. (1997), we supplement our main sample with a secondary sample that consists of 222 clients of an investment company who responded to a mail survey. The ages of these clients vary from forty-one to eighty-eight with an average age of sixty-five years. We use the combined sample in this part of our analysis. Among the 2,734 subjects in the combined sample approximately 12 percent are fifty-five years old or older.

Our evidence is consistent with a mental accounting structure. Table 2 shows that younger people have higher

risk tolerance toward portfolios than toward jobs, while older people have greater risk tolerance toward jobs than toward portfolios. People in the eighteen to twenty-four age group are willing to accept a 14.08-percent downside in a portfolio but only a 12.07-percent downside in a job. The difference is statistically significant. In contrast, people in the fifty-five and older age group are willing to accept a 10.65-percent downside in a portfolio but an 11.54-percent downside in a job. This difference, too, is statistically significant.

We also find a U-shaped relation between risk tolerance toward jobs and age, consistent with Barsky et al. (1997). Table 2 shows that people in our sample who are in the thirty-five to forty-four age group have the lowest risk tolerance toward jobs. Risk tolerance toward portfolios, on the other hand, declines almost monotonically with age.

### Overconfidence

Investors' overconfidence might be correlated with their risk tolerance. Overconfident investors might perceive risk as lower than less-overconfident investors, biasing upward the measure of their risk tolerance. Advisors need to adjust downward their assessment of the risk tolerance of overconfident investors and perhaps tamp down their overconfidence as well. Even if overconfidence is unrelated to risk tolerance, it still matters to financial advisors as they guide investors toward fitting portfolios. Investors who are overconfident in their stock-picking skills are likely to resist advice to buy diversified portfolios and hold them rather than trade.

A manifestation of investment overconfidence is a belief that one has the skill to pick winning stocks with above-average returns. Consider the following question:

Some people believe that they can pick stocks that would earn higher-than-average returns. Other people believe that they are unable to do so. Please indicate your belief by circling the number on a scale ranging from "Strongly believe I cannot pick higher-than-average stocks" to "Strongly believe I can pick higher-than-average stocks." Scores range from 1 to 10 where high numbers indicate a belief that one is able to pick higher-than-average stocks.

**TABLE 3: RELATIONS BETWEEN INVESTOR PROPENSITIES, AGE, AND GENDER**

Dependent variable	Risk tolerance toward portfolios	Overconfidence	Propensity for maximization	Propensity for regret	Propensity to attribute success to luck over skill	Trust	Satisfaction with life
Age group	-0.943*** (0.122)	-0.145*** (0.043)	-0.290*** (0.046)	-0.221*** (0.044)	-0.026 (0.042)	0.254*** (0.040)	0.070* (0.038)
Female	-1.292*** (0.295)	-0.571*** (0.103)	-0.290** (0.113)	0.232** (0.107)	0.294*** (0.100)	-0.096 (0.097)	0.019 (0.094)
Constant	15.176*** (0.350)	5.414*** (0.118)	6.357*** (0.132)	6.337*** (0.125)	4.258*** (0.117)	4.570*** (0.117)	6.485*** (0.111)
Observations	2,512	2,498	2,499	2,495	2,505	2,498	2,498
Adjusted R <sup>2</sup>	0.033	0.018	0.018	0.011	0.003	0.015	0.001

Age group ranges from one (18–24), two (25–34), three (35–44), four (45–54), to five (55+). Female is an indicator variable that equals one for female respondents. Reported are regression coefficients and robust standard errors (in parenthesis). \*\*\*, \*\*, and \* indicate 1-percent, 5-percent, and 10-percent statistical significant levels, respectively.

We find that men are more overconfident than women and that the relatively young are more overconfident than the relatively old (see table 3). We also find that the risk tolerance of highly overconfident people is indeed higher than the risk tolerance of those who are less overconfident (see table 4).

### Propensity for Maximization

Propensity for maximization matters to financial advisors for two reasons. First, investors with high propensity for maximization are likely to be demanding investors, not easily satisfied. Second, propensity for maximization also might be related to risk tolerance. Investors with high propensity for maximization might set high standards of investment returns, motivating them to tolerate more risk in exchange for a chance to reach these high returns.

Schwartz et al. (2002) measured propensity for maximization by levels of agreement with thirteen statements such as “I never settle for second best.” Subsequently, Nenkov et al. (2008) divided the statements into three groups. We adopt from Nenkov et al. (2008) the two statements that reflect high standards: “No matter what I do, I have the highest standards for myself,” and “I never settle for second best.” We combined the two into one and asked people for their levels of agreement with the statement: “I always want to have the best. Second best is not good enough for me.” Scores range from 1 to 10, where high scores indicate high propensity for maximization.

We find that men have a higher propensity for maximization than women and that the relatively young have a higher propensity for maximization than the relatively old (see table 3). We also find that high propensity for maximization is associated with high risk tolerance and high overconfidence (see table 4).

### Regret, Responsibility, Luck, and Skill

Schwartz et al. (2002) found that people with high propensity for maximization tend to have high propensity for regret. As Nenkov et al. (2008) wrote: “[T]he potential for regret is ever present because maximizers are always asking themselves if the outcome they chose is the best and are always experiencing lingering doubt that they could have made a better

choice.” Propensity for regret matters to financial advisors even if it is unrelated to risk tolerance because all financial choices, from the choice to buy one stock to the choice to sell all stocks, open the door to regret. Portfolios heavy in stocks and other relatively volatile securities might open the door wider than portfolios heavy in cash, but portfolios heavy in cash do not afford perfect shields from regret. Investors are likely to complain to advisors if their portfolios idle in cash while stocks zoom. Still, low-risk portfolios shield advisors from lawsuits by investors who may claim, in hindsight, that advisors recommended to them unsuitable portfolios.

To assess propensity for regret we asked people to state their level of agreement with the statement: “Whenever I make a choice, I try to get information about how the other alternatives turned out and feel bad if another alternative has done better than the alternative I have chosen.” Scores range from 1 to 10, where high scores indicate high propensity for regret.

Women have a higher propensity for regret than men and the relatively young have a higher propensity for regret than the relatively old (see table 3). We also find that, consistent with Nenkov et al. (2008), people with a relatively high propensity for maximization tend to have a relatively high propensity for regret. Nevertheless, we find that a propensity for regret is not associated with risk tolerance or overconfidence (see table 4). This indicates that the propensity for regret is distinct from risk tolerance even though the two are often commingled.

A belief that successful outcomes of choices depend on luck more than on skill reduces responsibility for choices and the potential for regret. Indeed, some people might adopt such belief strategically to reduce the potential for regret. To assess beliefs about the roles of luck and skill in investment success we asked people to rate their levels of agreement with the statement: “Some people believe that success in picking stocks that earn higher-than-average returns is mostly due to skill. Other people believe that success in picking stocks that earn higher-than-average returns is mostly due to luck.” Scores range from 1 to 10 where high scores indicate a belief that success is due to luck.

**TABLE 4: CORRELATION BETWEEN RISK TOLERANCE AND OTHER INVESTOR PROPENSITIES**

	Risk tolerance toward portfolios	Overconfidence	Propensity for maximization	Propensity for regret	Propensity to attribute success to luck over skill	Trust
Overconfidence	0.186***					
Propensity for maximization	0.048**	0.179***				
Propensity for regret	-0.011	-0.011	0.242***			
Propensity to attribute success to luck over skill	0.048**	-0.082***	0.021	0.099***		
Trust	0.081***	0.026	-0.020	-0.034*	0.051**	
Satisfaction with life	0.014	0.065***	0.023	-0.067***	0.004	0.257***

\*\*\*, \*\*, and \* indicate 1-percent, 5-percent, and 10-percent statistical significant levels, respectively.

Women have a higher propensity than men to attribute success to luck, but the relatively young and the relatively old show no statistically significant difference (see table 3). High propensity to attribute success to luck is associated with high propensity for regret (see table 4), consistent with the notion that a propensity to attribute success to luck lessens responsibility for choice, serving as a defense against regret. High propensity to attribute success to luck is also associated with low propensity for overconfidence and high risk tolerance. It might seem odd that a high propensity to attribute success to luck is associated with a low propensity for overconfidence, yet both propensities are associated with high risk tolerance. It is possible that a high propensity to attribute success to luck increases risk tolerance by serving as a shield against regret, while overconfidence increases risk tolerance as it reduces the salience of risk.

**Trust**

Trust is the subjective probability that people attribute to the possibility of not being cheated. Advisors care about trust not only because it might affect risk tolerance but also because trusting investors are easier to guide than less trusting ones. We measure the propensity for trust by the level of agreement with a statement modified from the World Values Survey: “Generally speaking, would you agree that most people can be trusted, or that you always have to be careful in dealing with people other than your family?” The scale ranged from 1 to 10, where low numbers are closer to “Strongly disagree that most people can be trusted” and high numbers are closer to “Strongly agree that most people can be trusted.”

The relatively old have a higher propensity for trust than the relatively young, but the difference between the propensity for trust among men and women is not statistically significant (see table 3). We also find that people with relatively high levels of trust have relatively high risk tolerance, relatively high propensity to attribute success to luck, and relatively low propensity for regret (see table 4).

**Satisfaction with Life**

Financial advisors often describe themselves as wealth managers, but wealth is only a way station on the road to life-satisfaction, well-being, and happiness. The life-satisfaction

of the wealthy generally exceeds that of the poor, but wealthy people with \$1-million annual incomes suffer low life-satisfaction if they set their benchmarks at \$2 million. Conversely, relatively poor people with \$50,000 annual incomes enjoy high life-satisfaction if they set their benchmarks at \$40,000.

Consider the following question:

On the whole, how satisfied are you with your life?  
Please rate your level of satisfaction with your life by circling a number on a scale ranging from “Not at all satisfied” to “Very satisfied.” Scores range from 1 to 10 where high scores indicate higher levels of satisfaction.

Men and women show no statistically significant difference in life-satisfaction, but older people enjoy greater life-satisfaction than younger ones (see table 3). The objective situation of older people generally places them at a worse spot than that of younger people; they are likely to be in worse health than younger people, out of a job, possibly widowed. Yet older people have had time to adapt to their situations such that their expectations match their reality. In contrast, the expectations of younger people might exceed their reality.

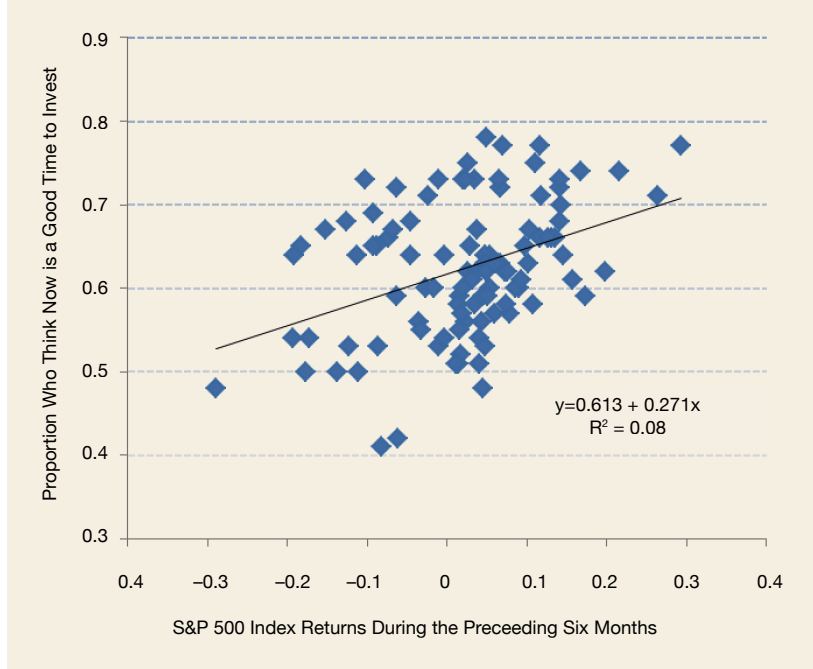
We also find that people who are more satisfied with their lives have relatively high propensity for overconfidence, relatively low propensity for regret, and relatively high propensity for trust. But we find no statistically significant relation between life-satisfaction and risk tolerance (see table 4).

**Exuberance, Fear, and Risk Tolerance**

Stocks induce exuberance after they have risen and fear after they have fallen. We can see evidence of exuberance and fear in investors’ answers to the Gallup survey question: “Do you think that now is a good time to invest in the financial markets?” We use monthly survey results from 1998 to 2007.<sup>4</sup> We find, as presented in figure 2, that high past stock returns induce investors to invest in financial markets, whereas low past returns induce them to shy away from investing. Investors who are asked about their risk tolerance following high past returns are likely to overestimate it,



**FIGURE 2: THE RELATION BETWEEN PAST STOCK RETURNS AND INVESTORS' BELIEF THAT "NOW IS A GOOD TIME TO INVEST IN FINANCIAL MARKETS"**



swayed by exuberance. Investors who are asked following low past returns are likely to underestimate it, swayed by fear. Advisors need to adjust for such overestimation and underestimation.

### Conclusion

Information about risk tolerance is crucial to advisors as they guide clients, but so is information about clients' overconfidence, propensities for maximization, regret, attributing success to luck over skill, trust, and life-satisfaction. We present questions that distinguish risk tolerance from other investor propensities and explore relations among them. This exploration might be a first step in the construction of a new kind of investor questionnaire, one that goes beyond risk tolerance and risk capacity and offers financial advisors better tools for serving their clients. Still, a questionnaire, even one that goes beyond risk tolerance, is only one tool within an advising process that connects investments to life. The process includes asking clients about their wants and goals, listening carefully and empathizing, educating, prescribing, and following up, again and again.

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### Endnotes

- 1 The survey was conducted in 2007 on Keirseey.com.
- 2 The questionnaire was designed by the authors and conducted by Keirseey.com, a personality research company. Users can assess their personality by completing a questionnaire on the site (<http://www.keirseey.com>). However, this was a one-time questionnaire that is not available from Keirseey.com.
- 3 Participants in our survey choose a new job (or portfolio) only if  $U(C) \geq 0.5U(C_1) + 0.5U(C_2)$ , where  $C$  denotes current standard of living,  $C_1 = 1.5C$  and  $C_2 = (1-\lambda)C$  denote the two possible outcomes associated with the new job (or portfolio). We assume participants

have a power utility function,  $U(C) = \frac{C^{1-\lambda}}{1-\lambda}$ , where  $\lambda$  is the risk aversion coefficient.

We can numerically solve for  $\lambda$  by setting  $2 - 1.5^{(1-\lambda)} - (1-\lambda)^{(1-\lambda)} = 0$ . For example, for participants who are willing to accept a maximum reduction of 30 percent in their standard of living in exchange for a fifty-fifty chance at a 50-percent increase, we numerically search for a  $\lambda$  that satisfies  $2 - 1.5^{(1-\lambda)} - (1-0.3)^{(1-\lambda)} = 0$ . The solution is 1.34.

- 4 The Gallup survey terminated at the end of 2007.

### References

- Barber, Brad M., and Terrence Odean. 2001. Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment. *Quarterly Journal of Economics* 116, no. 1 (February): 261–292.
- Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, and Matthew D. Shapiro. 1997. Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study. *Quarterly Journal of Economics* 112, no. 2 (May): 537–579.
- Beckmann, Daniela, and Lukas Menkhoff. 2008. Will Women Be Women? Analyzing the Gender Difference among Financial Experts. *Kyklos* 61, no. 3 (August): 364–384.
- Charness, Gary, and Uri Gneezy. 2007. Strong Evidence for Gender Differences in Investment. Working paper, University of California, Santa Barbara. <http://ssrn.com/abstract=648735> or <http://dx.doi.org/10.2139/ssrn.648735>.
- Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2010. Portfolio Optimization with Mental Accounts. *Journal of Financial and Quantitative Analysis* 45, no. 2 (April): 311–334.
- Das, Sanjiv R., and Meir Statman. 2011. Options and Structured Products In Behavioral Portfolios. Working paper, Santa Clara University. <http://algo.scu.edu/~sanjivdas/bptderiv.pdf>.
- Fidelity Investments. 2003. Asset Allocation Planner Questionnaire. [www.fidelity.com](http://www.fidelity.com).
- Fisher, Kenneth L., and Meir Statman. 1997a. The Mean Variance Optimization Puzzle: Security Portfolios and Food Portfolios. *Financial Analysts Journal* 53, no. 4 (July–August): 41–50.
- . 1997b. Investment Advice from Mutual Fund Companies. *Journal of Portfolio Management* 24, no. 1 (fall): 9–25.

- Holt, Charles A., and Susan K. Laury. 2002. Risk Aversion and Incentive Effects. *American Economic Review* 92, no. 5 (December): 1,644–1,655.
- Kahneman, Daniel. 2009. The Myth of Risk Attitudes. *Journal of Portfolio Management* 36, no. 1 (fall): 1.
- Nenkov, Gergana Y., Maureen Morrin, Andrew Ward, Barry Schwartz, and John Hulland. 2008. A Short Form of the Maximization Scale: Factor Structure, Reliability and Validity Studies. *Judgment and Decision Making* 3, no. 5 (June): 371–388.
- Pietranico, Paul, and Mark Riepe. 2002. Core & Explore—Details. Charles Schwab and Company. <http://www.schwab.com>.
- Schwartz, Barry, Andrew Ward, Sonja Lyubomirsky, John Monterosso, Katherine White, and Darrin R. Lehman. 2002. Maximizing versus Satisficing: Happiness Is a Matter of Choice. *Journal of Personality & Social Psychology* 83, no. 5: 1,178–1,197.
- Shefrin, Hersh, and Meir Statman. 2000. Behavioral Portfolio Theory. *Journal of Financial and Quantitative Analysis* 35, no. 2 (June): 127–151.
- Statman, Meir. 1999. Behavioral Finance: Past Battles, Future Engagements. *Financial Analysts Journal* 55, no. 6 (November/December): 18–27.
- Strahilevitz, Michal, Terrance Odean, and Brad Barber. 2011. Once Burned, Twice Shy: How Naïve Learning, Counterfactuals, and Regret Affect the Repurchase of Stocks Previously Sold. *Journal of Marketing Research* 48 (Special Issue 2011): S102–S120.