The Concept of Risk Tolerance in Personal Financial Planning

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Assessment of risk tolerance is fundamental to proper asset allocation within a household portfolio. It is also a frequently misunderstood concept and difficult to measure practically. We discuss the relationship between risk aversion and portfolio recommendations based on an expected utility approach, review selected empirical research on risk tolerance, and propose to separate risk capacity, expectations, and other factors from the concept of risk tolerance.

Risk tolerance is an extremely important topic in financial planning. One financial planning textbook (Dalton & Dalton, 2004, p. 898) gave this definition:

> "The level of risk exposure with which an individual is comfortable; an estimate of the level of risk an investor is willing to accept in his or her investment portfolio."

The textbook also listed ways to estimate a client's risk tolerance (p. 464):

> "There are two common ways a planner estimates a client's tolerance for risk. The first method is a clear understanding of the client and the client's history with investment securities. The second method is to use a questionnaire designed to elicit feelings about risky assets and the comfort level of the client given certain changes in the portfolio. These two methods combined can guide the planner in assessing a client's risk tolerance."

There have been many academic discussions of composite risk tolerance measures that include questions related to attitudes, current behavior, and feelings (Grable & Joo, 2004; Grable & Lytton, 2001; Roszkowski, Davey, & Grable, 2005; Roszkowski & Grable, 2005). It is also common in the business press to use the term "risk tolerance" to refer to investor feelings that might change with events and perceptions. For instance, in the *Wall Street Journal*, the following statement was made: "The risk tolerance of investors had been rising for many months, in part because there was a growing perception that the economy was becoming more stable" (Lahart, 2007).

Aversion to risk is what makes the study of capital markets interesting. Without risk aversion, all capital assets would be priced based on their expected payout and duration. Bonds would have the same yield over time as stocks and portfolio construction would simply be an exercise in organizing the timing of expected asset payoffs. The capital asset pricing model relies on the inclination to prefer less variation in asset returns.

Underlying the preference for reduced variation in returns is the notion that each additional dollar earned provides a little less happiness than the last. As our incomes increase, the satisfaction gained from consuming each additional $100 declines. This is represented by the concave slope of observed utility functions. A steeper slope implies greater aversion to risk because a loss hurts more in terms of utility than an equal dollar gain (see Hanna, 1989 for a simple introduction to utility and risk). When faced with an investment whose payout is variable, a risk-averse investor will require some added compensation for accepting uncertainty. This concept is operationalized in research (for example Barsky, Juster, Kimball, and Shapiro, 1997) as risk aversion (the inverse of risk tolerance.) When economists discuss risk aversion, they sometimes mean relative risk aversion.[1]

During our lives we experience circumstances that impact our willingness to accept investment uncertainty. A young family may see the loss of $5,000 as a serious event that requires sacrifices to meet a budget and compromises financial security. The

[1] If the utility function is expressed as U(W), where W=wealth, the slope of the utility curve is the first derivative, U'. The second derivative, U'', is the rate of change in the slope. The usual assumptions include U'>0, U"<0. Many economists have assumed that what is called relative risk aversion, -WU"/U', does not change with wealth. This is a property of the natural log utility function, U=ln(W), since relative risk aversion =-WU"/U' =1. There is a class of other utility functions that exhibit constant relative risk aversion, and for all of those you would value a given percentage loss in wealth the same, whether your wealth is $100,000 or $1,000,000.

same family later in life may have built up an investment portfolio large enough that the loss of $5,000 has little impact on their lifestyle. The perceived consequences of a loss may also vary among investors of the same means. Some have the ability to shrug off a loss to their portfolio while others fret during a bear market and become stressed after reading a negative quarterly statement. Every financial planner who adheres to standard financial planning practices must assess the risk tolerance of a client in order to make informed portfolio recommendations. The process of risk tolerance assessment is in its infancy.

Households in the United States have substantial levels of non-investment wealth, and investment portfolios typically amount to small proportions of total wealth when human wealth is included. Gutter (2000) found that for over 80% of U.S. households in 1998, investment assets amounted to less than 20% of total wealth. (The median level of total wealth was about $471,000.) The median proportion of investment assets to wealth increased with age, but was small even for those aged 65 and over.

Risk Tolerance as a Preference

Normative financial recommendations based on neoclassical economic theory suggests that differences in risky choices are closely tied to wealth, including human wealth, since resource availability reduces the relative impact of an investment loss (Hanna & Chen, 1997). Several normative analyses of portfolio recommendations show changes in the riskiness of portfolios of the lifecycle without resorting to the assumption that preferences change with age (Hanna & Chen, 1997; Campbell & Viceira, 2002; Cocco, Gomes, & Maenhout, 2005). For instance, Hanna and Chen's simple model

assumes that the investment portfolio is only for retirement. They showed that for a "typical" given level of risk aversion, the optimal portfolio proportion in stocks would be 100% when the investment portfolio was less than 20% of total wealth, including human wealth, regardless of risk tolerance. Then when the investment portfolio exceeded 20% of total wealth, the optimal stock proportion of the investment portfolio would gradually decrease until retirement. Other normative analyses have generally similar results, even though the analyses do not assume changes in risk preferences.

Two eminent economists, George Stigler and Gary Becker, proposed that " … tastes neither change capriciously nor differ importantly between people" (Stigler & Becker, 1977). The authors attempted to justify this audacious proposal with examples where the differing prices, income, and amounts of information available at different points in time or to different individuals could provide an explanation of why behaviors changed or were different between individuals, without resorting to differences in tastes as an explanation.

If risk tolerance is a preference, it might be related to gender differences due to genetic differences and/or very early socialization (e.g., Yao & Hanna, 2004). However, it seems unlikely that there should be differences in true risk tolerance based on racial/ethnic status, age, or education differences, yet those differences have been reported in studies using the investment risk tolerance measure in the Federal Reserve Board's Survey of Consumer Finances (SCF). Yao, Gutter, and Hanna (2005) and Wang and Hanna (2007) found that Blacks and Hispanics were more likely than otherwise similar Whites to be unwilling to take investment risks, yet also more likely to be willing to take substantial risks. Responses to the SCF measure have changed over time (Yao,

Hanna, & Lindamood, 2004; Wang & Hanna, 2007). Table 1 shows changes in the responses to the SCF risk tolerance measure, so if Stigler and Becker's (1977) proposition is correct, the SCF risk tolerance measure might not really be a measure of preference.

More sophisticated discussions of risk tolerance have considered the idea that there is a difference between an individual's attitudes (preferences) and ability to tolerate risk. For instance, Cordell (2002) noted risk tolerance can be analyzed "… in two dimensions: risk attitude and risk capacity." However, in many ways these multidimensional views of risk tolerance can be expressed in a classical expected utility framework.

Hanna and Chen (1997) differentiate subjective from objective risk tolerance. Their definition of objective risk tolerance is consistent with Cordell's (2002) use of risk capacity, and subjective risk tolerance relates to Barsky, Juster, Kimball, and Shapiro's (1997) characterization of risk tolerance. It is only when the attitudes of investors of comparable wealth are compared that we can begin to observe variation in subjective preference for risk. Without accounting for wealth, we are measuring both the risk tolerance that is related to financial resource availability (risk capacity or objective risk tolerance) and the risk tolerance that is related to a true willingness to accept variation in asset returns (subjective risk tolerance).

Bakshi and Chen (1994) tested the lifecycle risk aversion hypothesis, that an investor's relative risk aversion increases with age. However, they also tested the lifecycle investment hypothesis, that the investment needs of households will tend to be different at different ages, with buying a home and related durable goods being important

when consumers are in their 20s and 30s, etc. Even though the Bakshi and Chen article is sometimes cited as providing evidence that risk aversion decreases with age, their analyses were based on the assumption that aggregate changes in the risk premium for equity assets were due to changes in risk aversion. Similar analyses of household survey data, e.g. Wang and Hanna (1997), were based on the assumption that differences in the risky asset proportion of wealth were related to differences in risk aversion.

A Model for the Determinants of Investment Choices

Empirical studies on investment choices may reflect influences other than true risk tolerance as defined by economists. Figure 1 shows a simple model of investment choices. Risk tolerance is the inverse of risk aversion, which Barsky et al. (1997) assumed can be measured by answers to a series of hypothetical income gamble questions (see also Hanna & Lindamood, 2004). Risk capacity might be related to the total household wealth and the current allocation of that portfolio, including human capital (Hanna & Chen, 1997) and its correlation with financial investments (Campbell & Viceira, 2002).

The effect of risk tolerance on optimal investment choices depends on risk capacity. According to Hanna and Chen's (1997) analysis, all households with high risk capacity should have a risky portfolio, regardless of risk tolerance. Expectations might be related to education and assumptions about future asset return characteristics (Viceira, 2007), for example the expected equity premium and benefit from time diversification. Feelings about volatility tap into the notion that risk aversion can be disentangled from the intertemporal rate of substitution; that is, investors have attitudes about when they

prefer to consume over time (thrift or impatience) that are separable from their risk-aversion (Epstein & Zin, 1989).

Some measures of risk tolerance include all of the items on the left side of Figure 1. However, given that the expected utility model is the basis of stating that risk tolerance should be considered in portfolio recommendations, only the first item shown in Figure 1 is consistent with the normative economic concept of risk tolerance. Economists have attempted to estimate the slope of the utility curve by asking respondents hypothetical questions about willingness to accept, for example, a 50/50 chance of a higher or lower income versus a certain income (Barsky et al., 1997; Hanna & Lindamood, 2004). Other examples of measures of individual risk aversion can be calculated from actual risk-related choices such as the proportion of risky assets within a portfolio or a contestant's willingness to accept an offer on the television show "Deal or No Deal" (Post, Van Den Assem, Baltussen, & Thaler, 2008). Often these observations of actual risk-related decision making lead to the conclusion that many individuals do not act in a manner that would be predicted by expected utility theory. However, deviations from the predictions of expected utility theory do not necessarily imply that the normative guidance of expected utility theory is invalid. To the contrary, the fact that many people seem to be incapable of making good investment choices provides a justification for careful default choices for retirement plan participants (Beshears, Choi, Laibson, & Madrian, 2008) and for use of professional financial planner services.

Practical Application

Assessment of risk tolerance in financial planning as a means of constructing optimal portfolios may be far more complex if preferences are inconsistent or if the disutility from an investment loss exceeds the utility from what could have been consumed with that money. An advisor may assume a 20% quarterly loss to be trivial on a $100,000 investment within a million dollar portfolio of a client with a long-run investing horizon, given its impact on expected future consumption. This advisor may also find herself with one fewer client if that client suffers from behavioral biases that show up consistently in empirical studies of risky financial choices, for example the tendency to overweight small losses and to frame each financial decision independently from an aggregate portfolio (Kahneman & Tversky, 1979).

In Post et al. (2008), risk aversion is observed to vary depending on prior outcomes. Those who had recently experienced bad luck suddenly became risk averse, and a string of good luck led to increasing risk tolerance. Sahm (2007) found that some variation in observed risk tolerance using the Barsky et al. (1997) measure available in the Health and Retirement Study (HRS) arose from current macroeconomic conditions. In an expanding economy, individuals were more risk tolerant. However, given the defects of the HRS measure noted by Hanna and Lindamood (2004), it is possible that the variation in responses to the HRS measure with changes in economic expectations were not indicative of true changes in risk tolerance, but rather changes in respondent's assessments of the chances of finding another job if they lost the hypothetical income gamble.

Planners are placed in the unenviable position of having a fiduciary responsibility to construct a portfolio that may be considered efficient according to economic theory while simultaneously catering to the wishes of clients whose preference may not be at all consistent with that theory. Recommending a portfolio that will provide the highest return given the client's goals and ability to withstand risk may require countering a client's less rational tendencies through counseling. Playing to a client's time varying risk aversion, on the other hand, may lead to unethical rent extraction through excessive investment shifting. If clients want to move money out of their mutual funds following a bad year and then move it back after a good year (or shift from growth to value or vice versa), advisors may have little incentive to talk clients out of demanding actions that generate additional transaction costs.

Implications for Research

It is important for researchers to disentangle other possible influences on investor choices from risk aversion. It is possible that hypothetical income gamble questions such as those presented in the Health and Retirement Study (Barsky et al., 1997; Kimball, Sahm, & Shapiro, 2007) may produce a valid estimate of true risk aversion, though the cognitive complexity of the questions (Kimball, Sahm, & Shapiro, 2005) may distort the results. Any measure of risk tolerance/aversion that changes quickly over time should also be suspect as a measure of risk aversion since innate preferences (our utility function) should vary little over time. The hypothetical pension gamble questions proposed by Hanna and Lindamood (2004) may be superior to the HRS job risk questions, as they reduce the chance that respondents will imagine the possibility of

finding another job if they lose the income gamble. The SCF measure of risk tolerance has changed over time, as shown in Table 1. Even multivariate analyses of this measure (Yao, Hanna, & Lindamood, 2004; Wang & Hanna, 2007) show that there have been significant changes over time.

The SCF measure, which asks respondents whether they are willing to take greater risk to achieve greater returns, may be an imperfect measure of risk tolerance, as people may be thinking of all four elements on the left side of Figure 1 in stating how much investment risk they would be willing to take. Figure 2 shows an empirical analysis of the relationship between answers to the SCF risk tolerance question and the net worth decile of households. The decreasing risk tolerance as net worth increases may reflect the increasing risk capacity of higher net worth households rather than higher true risk tolerance. The changes in risk tolerance over time (Table 1) may be related to changes in expectations rather than changes in true risk tolerance. Therefore, the SCF risk tolerance question and all composite risk tolerance indexes are imperfect measures of the concept of risk tolerance used by financial economists deriving optimal portfolio recommendations.

Final Comments

In determining the optimal risk exposure given a client's preferences for risk, be it in risk management or portfolio allocation, financial planners can choose from a number of risk-tolerance questionnaires that may or may not be a true measure of the slope of the household's utility function. In terms of Figure 1, financial planners should attempt to assess the risk tolerance of the client and the makeup of their current household portfolio

(risk capacity), and educate clients about reasonable expectations. For instance, understanding the risk of a diversified portfolio versus an undiversified investment can help a client accept predictable return variation that arises from greater expected reward. Feelings about volatility may be related to expectations - for instance, investors who have suffered poor returns in the recent past may be more pessimistic when estimating future returns. Making assumptions about clients based on ad-hoc, rather than theory-based, measures of risk tolerance may lead to inappropriate recommendations as these measures have very limited validity in terms of portfolio theory.

Risk tolerance measures not based on theory may actually encourage behavorial biases, such as framing, by focusing on response to a single hypothetical investment without considering its impact on consumption when incorporated into the household's current portfolio. Roszkowski (1992) recommends that financial planners follow their own advice and diversify their use of risk measures to hedge against the risk of one particular questionnaire measuring something other than simply risk aversion in the economic sense. Financial planners must be able to estimate a client's risk tolerance in order to make appropriate investment recommendations.

Inappropriate assumptions about risk tolerance may be particularly harmful to clients who have limited experience with investing by themselves and/or the ability to draw from the experiences of family and social acquaintances. For example, minority groups including Blacks and Hispanics may appear to have low investment risk tolerance based on many measures of risk tolerance, yet have the same optimal portfolios as Whites in similar circumstances. Therefore it is crucial for financial planners, as well as researchers, to avoid using the term "risk tolerance" when in fact they are discussing a

composite measure including components other than the true risk tolerance implied by modern portfolio theory. Viceira (2007) notes that there might be heterogeneity in investor risk tolerance, but also discussed the importance of objective characteristics such as the volatility of the investor's earned income and the level of correlation between the investor's earned income and equity returns. Financial planners should carefully consider the objective situation of each client when making investment recommendations, rather than relying on some composite measure of risk tolerance that is not linked to portfolio theory.

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Table 1

Percent of Respondents Choosing Risk Tolerance Levels, Surveys of Consumer Finances, 1992-2004

	1992	1995	1998	2001	2004
Substantial	3.2	3.5	4.9*	4.5*	3.4*
Above average	11.0	13.6*	17.9*	18.2	15.9*
Average	35.9	37.2*	38.5*	37.4*	38.4*
No risk	49.8	45.7*	38.7*	39.8*	42.3*
High‡	14.3	17.1*	22.8*	22.8	19.3*
Some‡	50.2	54.3*	61.3*	60.2*	57.7*
Sample Size	3906	4299	4305	4442	4519

*Difference from previous year significant at the 5% level based on 2-tail t-test using repeated-imputation inference method combining five implicates of each dataset.

‡High = Substantial + Above Average (Combined)
Some = Substantial + Above Average + Average (Combined)

Computed by author based on 1992, 1995, 1998, 2001, and 2004 Surveys of Consumer Finances, weighted

Figure 1

Conceptual Model of Investment Choices Involving Risk

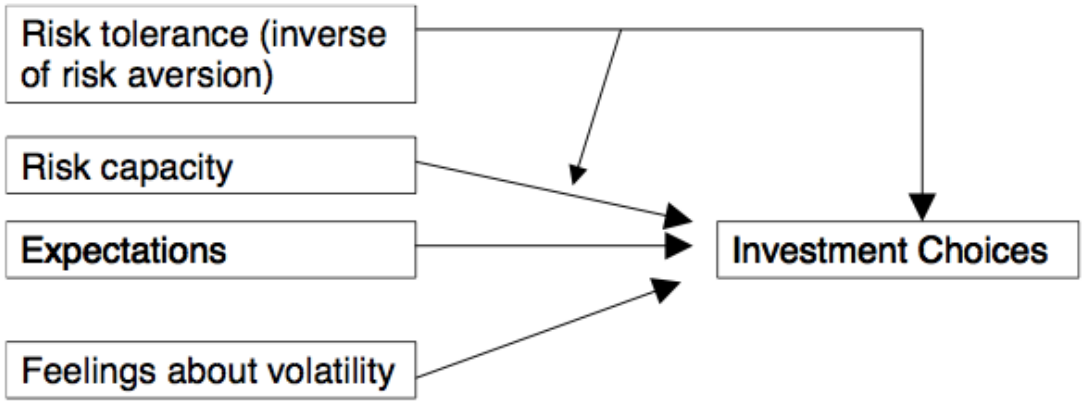
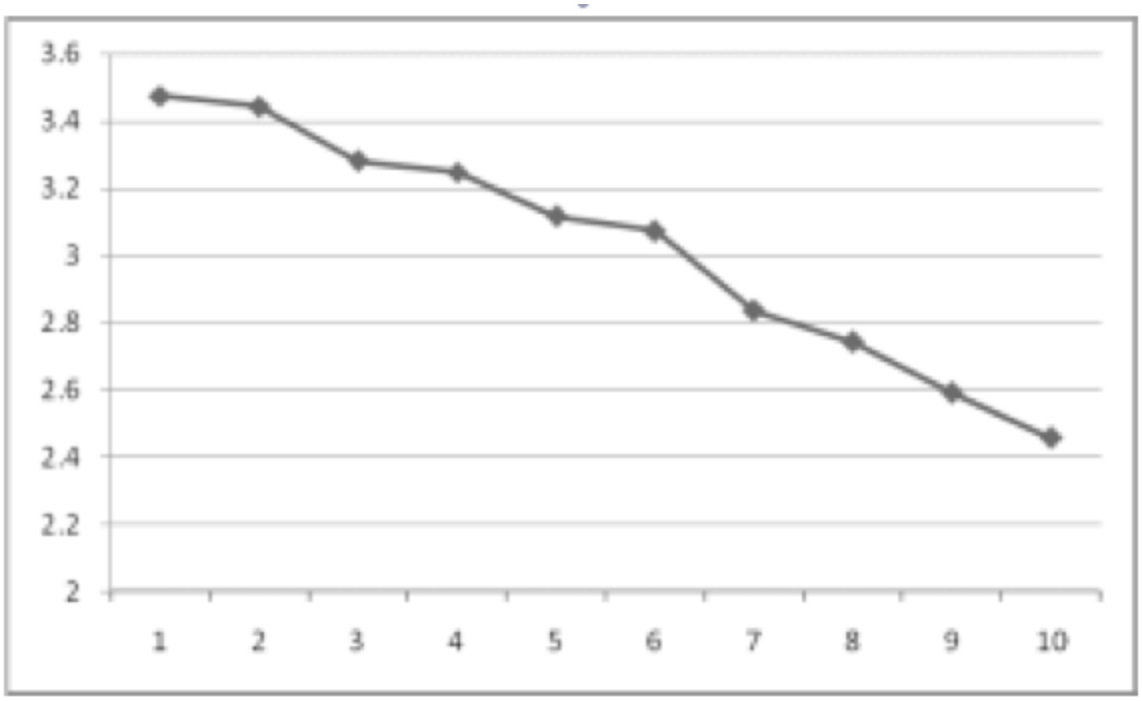


Figure 2

Risk Aversion by Wealth Decile



Data taken from the 2004 Survey of Consumer Finances. Possible responses include 1 - take substantial financial risks expecting to earn substantial returns, 2 - take above average financial risks expecting to earn above average returns, 3 - take average financial risks expecting to earn average returns, and 4 - not willing to take any financial risks. Higher scores indicate greater risk aversion.