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Changes in financial risk tolerance, 1983–2001

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Abstract

Using six Survey of Consumer Finances cross-sectional datasets representing the years 1983 through 2001, this study investigates changes in financial risk tolerance levels over time. Logit analyses are performed to test changes in risk tolerance, controlling for respondent and household characteristics. Willingness to take some risk fell from 1983 to 1989, did not change from 1989 to 1992, increased in 1995, increased again in 1998, then decreased in 2001. Financial risk tolerance tends to increase when stock returns increase and decrease when stock returns decrease. This relationship could lead to buying when prices are high and selling when prices are low. Financial education is needed to help investors overcome the bias of overweighting recent events.

JEL classification: D140; G110

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1. Introduction

Financial risk tolerance is important in household portfolio decisions and the growth of household wealth because investors who tolerate higher risk tend to obtain higher returns over the long run. Households with very low-risk tolerance are unlikely to invest in stocks and thus may have greater difficulty in achieving an adequate retirement and reaching other goals. While stocks have produced very high returns compared to other investments (Ibbot-

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son Associates, 2003, p. 33), until recently most U.S. households did not hold stocks (Haliassos & Bertaut, 1995). The percentage of households directly or indirectly owning stocks has steadily increased, from 32% in 1989 (Kennickell, Starr-Mcluer, & Surette, 2000) to 52% in 2001 (Aizcorbe, Kennickell, & Moore, 2003). Most of the increase may be a result of the growth of defined contribution retirement plans, and the impact of changing risk levels on the increase in stock ownership has not been established.

Recent events might influence attitudes toward risk and cause households to increase or decrease the stock allocation in their portfolios. Responding to recent events could lead to behaviors that lower long-term gains on investments, such as buying when returns are high and selling when returns are low. An analysis of changes in risk tolerance may increase understanding of the factors that influence the propensity of households to take appropriate risks with their investments. Given the increasing importance of defined contribution retirement plans and individual retirement accounts, as well as the ongoing discussion of privatization of part of Social Security, understanding household and societal factors related to risk tolerance attitudes is an important area of study.

This study investigates changes in risk tolerance levels over time and proposes explanations for the changes. The study uses six cross-sectional datasets collected during the period 1983 to 2001 by the Survey of Consumer Finances (SCF), sponsored by the Federal Reserve Board. Starting with the 1983 survey, the same question on financial risk tolerance has been asked of each survey sample.[1] It is noteworthy that the SCF question is the only risk tolerance question that has been asked of national samples representing all adults at several points in time over many years. No prior study has reported the changes in responses to the SCF risk tolerance measure over an 18-year period.

The SCF risk tolerance question is:

> "Which of the statements on this page comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments?

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.
4. Not willing to take any financial risks."

According to Arthur Kennickell, project director of the Survey of Consumer Finances, the SCF investment risk tolerance question was suggested by Marshall Blume of the Wharton School, University of Pennsylvania (Arthur Kennickell, personal communication, April 28, 2003). According to Blume, the question was developed by the New York Stock Exchange (Marshall Blume, personal communication, April 29, 2003). Neither Blume nor Kennickell recall any academic studies justifying or validating the risk tolerance measure. The measure's validity, however, is indicated by its significant relationship to the ownership of risky assets. For instance, Gutter, Fox, and Montalto (1999) find that for 66% of the households in the 1995 SCF there is a consistent relationship between being willing to take risk and holding risky assets. Providing additional support to the use of the SCF risk tolerance question is research conducted by Grable and Lytton (2001), who conclude that the SCF question offers a fairly reliable measure and is useful for research on investment risk tolerance.

2. Literature review

2.1. Factors related to risk tolerance

Using 1992 SCF data, Sung and Hanna (1996) investigate factors related to risk tolerance and show the following variables have a positive effect on whether a household is willing to take some level of risk: non-investment income, having liquid assets greater than three months of income, having non-liquid financial assets being greater than six months of income, the number of years until expected retirement, education, and self-employment. Single females, Hispanics, and respondents in the "other" race category (mainly Asians) are less willing to take some risk.

Grable and Lytton (2001) review seventeen studies that use the SCF risk tolerance measure and report that gender, marital status, wealth, education, ethnicity, and age are related to risk tolerance. Their review of research shows that respondents with higher risk tolerance are more likely to invest in stocks within a retirement plan, save more, are more likely to achieve retirement adequacy, and that investment in risky assets is related to risk tolerance.

Hawley and Fujii (1993) investigate the effect of demographic and financial characteristics on financial risk tolerance. Using 1983 SCF data and ordered logit analysis, they find that men are more risk tolerant than women when controlling for household composition, Whites are more risk tolerant than other race or ethnic groups, respondents age 55 and older are less risk tolerant than younger households, education and income have a positive effect on the willingness to take risk, and wealth has a negative effect. Bajtelsmit, Bernasek, and Jianakoplos (1999) conclude that holding all else constant, women are less risk tolerant than men in the portfolio allocation of their retirement accounts.

2.2. Impact of recent events on decisions

Plous (1993) proposes that decisions are influenced by context and that the timing of information is part of context. Miller and Campbell (1959) find that when presented with two sets of contradictory information, people are more influenced by information just received, whether positive or negative, if time has elapsed between the first and second set of information and the decision is made immediately after the second set of information is presented.

It is plausible that respondents' reported level of risk tolerance is influenced by recent news about stock market returns and general economic conditions. For instance, the historic drop of October 19, 1987, may have had a negative influence on risk tolerance in the years that followed. The stock market's high returns in the years before 1998 might have influenced some respondents in 1998 to be more willing to take above average risks to obtain above average returns.[2] The negative returns in 2000 and 2001, along with the three-year moving average of real returns on large stocks being negative in 2001 for the first time since 1979, also might have led people to be less willing to take investment risk.

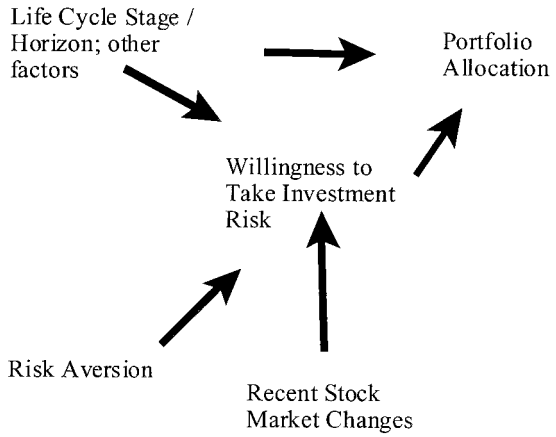


Fig. 1. Conceptual model of determinants of willingness to take investment risk

3. Theoretical basis of the research

3.1. Expected utility theory

Under expected utility theory, households should make decisions that maximize their expected utility. Relative risk aversion is an important parameter of the utility function (Schoemaker, 1982; Grossman & Shiller, 1981) and influences the optimal portfolio (Campbell & Viceira, 2002). Barsky, Juster, Kimball, and Shapiro (1997) define risk tolerance as the inverse of risk aversion.

While the SCF risk tolerance question purportedly measures a household's preference for financial risk, Hanna, Gutter, and Fan (2001) suggest that there is not a rigorous basis for a link between the SCF measure of risk tolerance and the economic concept of risk aversion. It is plausible that the SCF risk tolerance measure reflects what a household would choose if making investments. However, even if relative risk aversion is assumed to be constant, as people age, their optimal portfolio might change because of changes in factors such as human capital (Campbell & Viceira, 2002; Hanna & Chen, 1997).

The SCF risk tolerance measure is presented in this research as an attitude variable because there is no basis for assuming a direct link to the economic concept of risk aversion, even with rational and perfectly informed respondents. The possibility of ignorance and irrationality on the part of some households, some of whom have no experience with investing, is an additional reason to consider the risk tolerance variable as an attitude, not an actual measure of risk aversion.

3.2. The conceptual model

The conceptual model shown in Fig. 1 presents possible determinants of the willingness to take investment risks, which include risk aversion, life cycle stage, and other factors. In addition, recent stock market and economic changes may influence the willingness to take investment risks (Plous, 1993; Miller & Campbell, 1959). In the model, risk aversion

corresponds to the concept of risk aversion in economic theory (Schoemaker, 1982; Grossman & Shiller, 1981). The model presents portfolio allocation as affected by willingness to take risk and by life cycle stage. While risk aversion has implications for the optimal portfolio, changes associated with life cycle stage also can affect optimal portfolio allocation (Campbell & Viceira, 2002). Early in the life cycle, debt and acquiring the down payment for a home may mean that most of the portfolio is oriented to short-term goals. As retirement approaches, the shortness of the horizon, the decreasing relative size of human wealth, and the increase in the size of the portfolio itself may reduce the willingness to take risk.

This research analyzes changes in the willingness to take investment risks, not actual changes in portfolio allocations. It is not possible to accurately infer changes in risk tolerance from changes in portfolio allocation because of the substantial change that has occurred over time in the proportion of households owning stocks directly or indirectly (Kennickell et al., 2000; Aizcorbe et al., 2003). Furthermore, many households have no portfolios to allocate, so it is impossible to infer their risk tolerance from actual portfolio allocations. For those who hold stocks, actual portfolio allocation may change because of factors not related to risk tolerance, including investor inertia, failure to reallocate when stocks increase relative to other investments, having limited funds, and receiving investments as gifts or inheritances.

Economic models of optimal portfolio allocation (Campbell & Viceira, 2002) imply that portfolio allocation should change with age and other factors related to investment horizons and human wealth. Previous research indicates that investment risk tolerance is related to gender and race (Sung & Hanna, 1996; Grable & Lytton, 2001; Bajtelsmit & Bernasek, 1996). Given changes in the demographic composition of U.S. households over time and the impact of life cycle factors on financial decisions, it is appropriate to control for demographic factors, including household composition and race, in analyzing changes in investment risk tolerance over time.

3.3. Hypotheses

The conceptual model provides the basis for the hypotheses of this research. The hypotheses are based on the assumption that people formulate attitudes from expectations based on recent trends in stock returns and economic conditions. The hypotheses are formulated to take into account the fact that households responding to the SCF risk question would not have information about the investment returns for the entire survey year but only up to the time of the survey. Because most interviews were conducted from the middle of the year through November or December, except for 1983 when interviews took place between February and August, only trends earlier in the survey year would be likely to influence responses.

Based on the events occurring during the years 1983 to 2001, it is hypothesized that if recent trends in stock returns affect attitudes toward risk, the following will be true:

1. Risk tolerance decreases from 1983 to 1989.
2. Risk tolerance does not change from 1989 to 1992.
3. Risk tolerance increases from 1992 to 1995.

4. Risk tolerance increases from 1995 to 1998.
5. Risk tolerance decreases from 1998 to 2001.

Hypothesis 1 predicts a decrease in risk tolerance from 1983 to 1989, based on the stock market crash of October 19, 1987. That one-day drop of 22.6% in the Dow Jones Industrial Average is one of the largest in history (Schwert, 1997). Even though total returns were high in 1988 and 1989, the crash was so extreme that it might have been salient for several years and seemed fresh in the minds of 1989 SCF respondents.

Hypothesis 2 predicts no change from 1989 to 1992. By 1992, consumers should have been more positive about taking risks to obtain higher returns because of the real returns on large stocks being over 25% in 1989 and 1991 (Ibbotson Associates, 2003, p. 265). However, despite this increase, the 1992 responses might have been tempered by a recession that occurred in 1990–1991 (*Economic Report of the President*, 1995, p. 49).

Hypothesis 3 predicts an increase in risk tolerance in 1995. The stock market generally improved after 1992, with good returns in the first seven months of 1995 (Ibbotson Associates, 2003, p. 265).

Hypothesis 4 predicts an increase in risk tolerance in 1998, reflecting an expectation of higher returns. By 1998, the three-year moving average of large stock real returns was extremely high by historical standards, so risk tolerance should be higher.

Hypothesis 5 predicts a decrease in risk tolerance in 2001. The 2001 interviews were conducted from May to December, and the timing of the interview for each household might have made a substantial difference in perceptions of risk. Hancock and Kennickell (2002) note that about one-fifth of the interviews were conducted after September 11 and that the later interviews likely do not reflect a random selection of the sample for reasons including being difficult to locate and delays in obtaining the interview. It is not possible to identify the interview date using the public dataset available to researchers.

It is plausible that respondents interviewed as early as May, 2001, might have become less risk tolerant because of the attention paid to the NASDAQ during its increase during the late 1990s and into early 2000. Major stock market indexes in the U.S. reached peaks in early 2000, with the Dow Jones Industrial Average closing at 11,723 on January 14, the S&P 500 closing at 1527 on March 24, and the NASDAQ closing at about 5049 on March 10 (based on tables available at http://finance.yahoo.com). At the beginning of the survey period, May 1, 2001, the Dow was at 93% of its previous peak, the S&P 500 was at 83% of its previous peak, and the NASDAQ index was at 43% of its previous peak. By October 1, 2001, the Dow was down to 75% of its previous peak, the S&P 500 was at 68% of its previous peak, and the NASDAQ index was at 29% of its previous peak. Households interviewed in May and who were aware only of the Dow might have risk tolerance levels similar to 1998, but those interviewed in October might have lower levels of risk tolerance.

4. Data and variables

4.1. Data

This research uses data collected as part of the SCF, conducted by the Board of Governors of the Federal Reserve System in cooperation with the Statistics of Income Division of the

Internal Revenue Service. The survey has been conducted every three years since 1983. The present study uses the six surveys in which the risk tolerance question was asked.

The dataset used in this paper is a combination of the 1983, 1989, 1992, 1995, 1998, and 2001 datasets for a total sample size of 24,132. For the descriptive analysis, data are weighted using the appropriate weight so that results are representative of the U.S. population. The data are not weighted for the multivariate analysis.[3] We weight 1983 data using the Revised SRC Composite Weight (B3019), designed for use with the "cleaned" sample. The cleaned sample does not include 159 households that the SCF deleted because of almost complete lack of information for income and assets. We weight the 1989 to 2001 datasets using the recommended weight for the analysis of that data (X42001), scaled to the actual sample size for each survey so that statistical tests are appropriate.

The SCF method of handling missing data for the 1983 survey is different from the method used for the 1989 to 2001 surveys. In 1983, the SCF imputed missing values on a single basis, item by item, using randomized regression and other generally accepted techniques. Starting in 1989, the SCF imputed missing values using a multiple imputation method with a goal of providing data that is the best possible estimate of the missing data. The imputation method results in five complete data sets for each year. The SCF refers to each dataset as an "implicate." All implicates can be combined into a single dataset for analysis by using a method called the "repeated-imputation inference" (RII). The use of RII results in estimated variances that more closely represent the true variances than would be obtained by using just one implicate (Kennickell & Woodburn, 1999; Montalto & Sung, 1996).

The present research pools all five implicates from each survey year from 1989 to 2001 and merges the combined dataset with the 1983 dataset. The research uses the RII technique in multivariate analyses. Montalto and Sung (1996) and Gutter et al. (1999) provide additional discussion of the multiple imputation technique and RII. Kennickell and Woodburn (1999) provide a detailed discussion of the weighting of variables.

4.2. Dependent variable

The dependent variable in this research is financial risk tolerance. The SCF risk tolerance question has four possible responses, reflecting the household's willingness to take *substantial, above average, average,* or *no* financial risk.[4] For this research, two additional risk tolerance categories (*high risk* and *some risk*) are calculated by combining responses to the SCF question. The dichotomous composite variable *high risk* combines the responses to the *substantial* and *above average* SCF risk tolerance categories (1 = substantial or above average risk, 0 = average or no risk). The dichotomous composite variable *some risk* combines the responses to the *substantial, above average,* and *average* SCF risk tolerance categories (1 = substantial, above average, or average risk, 0 = no risk). The resulting composite variables permit trends to be demonstrated more concisely and serve as the basis for the dummy dependent variables used in the cumulative logistic regression analysis.

4.3. Independent variables

The independent variables used in the multivariate analysis include the year of the survey (coded as a series of dummy variables), demographic characteristics, economic character-

istics, and attitudes. The demographic variables include age of the respondent (a series of dummy variables for age categories), education of the respondent (a series of dummy variables for educational levels), race/ethnicity of the respondent (a series of dummy variables for categories), gender/marital status of the respondent (dummy variables for four gender/marital status combinations), presence of related children under 18 (dummy variable), employment status of the respondent (dummy variables for four employment options), and homeownership (dummy variable).

Unlike most previous studies of the SCF risk tolerance variable, in this study the gender, age, education, race, and employment status variables refer to the respondent, who is not necessarily the household head. Previous studies attribute risk tolerance levels to the household head, whether or not that person was the respondent. The SCF attempts to schedule interviews with the person in the household who is most knowledgeable about the household's finances. However, regardless of who is the respondent, the SCF designates the male as head in married couple households. Such attribution leads to the possibility that a risk level identified with a male may actually be the response of a female. The present analysis can more accurately ascertain the effects of demographic and employment variables on the willingness to take risk because those factors reflect the person who actually answers the questions.

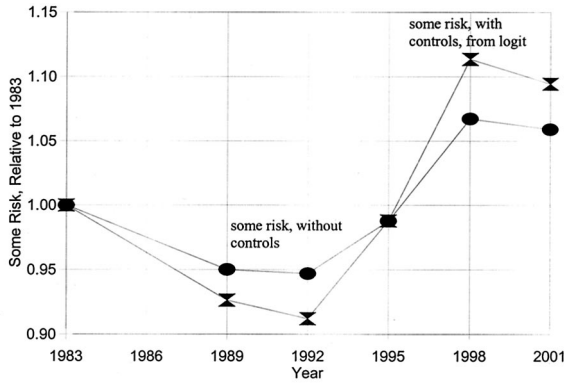
The economic variables include whether the household's monetary assets exceed three months' income (dummy variable), the level of non-financial assets (series of dummy variables for financial asset categories), and household income (series of dummy variables for income categories). Household incomes are adjusted to constant 2000 dollars by multiplying the reported income by the ratio of the 2000 Consumer Price Index to the Consumer Price Index of the income year.

The opinion/attitude variables include whether the respondent expects to receive a substantial inheritance or transfer of assets in the future (dummy variable) and the respondent's self-perceived health condition (dummy variables for four health categories).

5. Method of analysis

Cross-tabulations of risk level by year provide comparisons of the actual responses to the risk tolerance question for each survey year. *t* tests are used to analyze the significance of changes from one survey year to the next, in each of the four SCF risk tolerance categories as well as the two composite risk categories.

Multivariate analysis that controls for household variables is used to answer the question of whether any changes as proposed in the hypotheses are significant when controlling for other variables, because changes in risk tolerance levels could be a result of changes in the factors associated with risk tolerance. If significant time trends are evident after controlling for demographic factors, the changes over time can be interpreted to be related to changes in attitudes toward risk, not changes because of other factors. Cumulative logistic regression analysis is used for the multivariate analyses in this research because of its suitability when dependent variables are not continuous.[5] The dependent variables in the three models analyzed are:



The responses are indexed relative to 1983 (1983 = 1)

Some risk without controls is based on actual responses, Table 1.
Some risk with controls for other factors is based on cumulative logistic analysis, Table 2

Fig. 2. Willingness to take *some risk*, 1983 to 2001, relative to 1983, with and without controls for other factors. The responses are indexed relative to 1983 (1983 = 1). *Some risk* without controls is based on actual responses, Table 1. *Some risk* with controls for other factors is based on cumulative logistic analysis, Table 2.

1. *Some risk* (substantial, above average, and average risk) versus *no risk;*
2. *High risk* (substantial and above average risk) versus *low risk* (average and no risk); and
3. *Substantial risk* versus *less risk* (above average, average, and no risk).

Three logistic regression (logit) analyses are performed with 1983 as the reference year to enable the comparison of the risk tolerance levels in each survey year to those in 1983 and to determine the significance of that relationship with other independent variables controlled. These analyses are the basis of the study's conclusions regarding the relationship of demographic and other independent variables to risk tolerance.

Additional cumulative logistic regression analyses are conducted to test the five hypotheses when controlling for the independent variables. Separate analyses are performed for each survey year, with that survey year serving as the reference category for the series of survey year dummy variables. This method enables a comparison of each survey year to the previous survey year to determine whether any change in risk tolerance level is significant when the other independent variables are controlled.

6. Results

6.1. Actual risk tolerance changes from 1983 to 2001

The general pattern of risk tolerance over time, as measured by the percentage willing to take *some risk,* is that risk tolerance decreases from 1983 to 1989, stays about the same in 1992, increases in 1995 and again in 1998, and then decreases slightly in 2001 (Fig. 2; Table 1).

Examination of the patterns for all levels of risk tolerance shows that willingness to take risk decreases between 1983 and 1989, with a significantly lower percentage of respondents willing to take *substantial, above average, high,* and *some* risk*,* and a significantly higher percentage willing to take *no risk* (Table 1). The percentage willing to take *some risk* (and correspondingly, *no risk)* does not change from 1989 to 1992, but there is a shift from both the *substantial* and *average risk* categories to *above average risk.* Between 1992 and 1995, there is a shift from the *no risk* category into risk-taking categories, with significant increases in *high, above average, and some risk.* Between 1995 and 1998, there is again a shift from the *no risk* category into the risk-taking categories with significant increases in the percentage willing to take risk at all levels. In 2001, four of the risk tolerance levels are significantly different from the corresponding 1998 levels, with small but significant decreases in *substantial, average,* and *some risk,* and an increase in *no risk.*

Particularly noteworthy in all years is the high proportion who would take *no risk,* with a peak at almost 50% in 1992, and a minimum of 39% in 1998. The proportion willing to take *substantial risk* is never higher than the 6% level in 1983, and reaches a low of just over 3% in 1992. The proportion willing to take *high risk,* after a drop from 17% in 1983 to 13% in 1989, steadily increases to 23% in 1998 and stays the same in 2001.

6.2. Logistic results—each year compared to 1983

The logistic regressions show the risk tolerance in each survey year compared to 1983 for each of three dependent risk tolerance measures (*substantial, high,* and *some*) controlling for demographic and other variables. Each survey year is represented by a dummy variable, with the reference year set at 1983. The "odds ratio" included in the table for each variable indicates the relative effect of the variable at the mean value of other variables. For example, households in 1989 are 0.596 times as likely to take substantial financial risk as otherwise similar households in 1983 (Table 2).

The general risk tolerance pattern when controlling for other variables, as measured by the *some risk* category, is shown in the adjusted graph line in Fig. 2. The following are patterns of risk tolerance for each survey year compared to 1983 for each of the three risk tolerance variables used as a dependent variable:

Substantial risk: Controlling for everything else, households in each survey year after 1983 are significantly less likely to be willing to take *substantial* financial risk than in 1983.

High risk: Controlling for everything else, households in 1989 and 1992 are less likely to take *high* risk than households in 1983 whereas households in 1998 and 2001 are more likely than households in 1983 to be willing to take *high* risk.

Some risk: Controlling for other variables, households in 1989 and 1992 are significantly less likely to be willing to take *some risk* than households in 1983, and households in 1998 and 2001 are significantly more likely to be willing to take *some risk* than households in 1983.

Table 1
Risk tolerance levels, 1983–2001

	Year of survey					
	Percent distribution for each year					
	1983	1989	1992	1995	1998	2001
SCF risk tolerance categories						
Substantial	6.1	4.2*	3.2*	3.5	4.9*	4.5*
Above average	11.0	8.8*	11.0*	13.6*	17.9*	18.2
Average	38.0	37.9	35.9*	37.2*	38.5*	37.4*
No risk	45.0	49.1*	49.8	45.7*	38.7*	39.8*
Composite risk tolerance categories‡						
High	17.1	13.1*	14.3*	17.1*	22.8*	22.8
Some	55.0	50.9*	50.2	54.3*	61.3*	60.2*
Sample Size	4037†	3143	3906	4299	4305	4442

* Difference from previous year significant at the 5% level based on one-tail *t* test, except for the null hypothesis (1989–1992) where two-tail test is used.

† The sample size of the cleaned sample in 1983 is 4,103. There are 66 NA cases deleted for this analysis (see footnote 4) but the weighted number of NA cases is 57, so the weighted N for the 1983 analyses is 4046.

‡ High = substantial + above average (combined); some = substantial + above average + average (combined).

Computed by authors based on 1983, 1989, 1992, 1995, 1998, and 2001 Surveys of Consumer Finances, weighted.

6.3. Relationship of independent variables to risk tolerance

The conceptual model proposes that life cycle and other demographic factors relate to financial risk tolerance level. The logit analyses (Table 2) support the conceptual model in finding significant relationships between the year variables and financial risk tolerance, controlling for the other independent variables. Variables that have a significant negative relationship with risk tolerance include age, being female, and being married. In addition, the presence of related children under 18 has a significant, negative relationship with *some risk.* Variables that generally have a significant positive relationship with risk tolerance include the level of non-financial assets, being self-employed, income level, education, expecting a substantial inheritance, being an unmarried male, and level of health. Having monetary assets worth more than three months income has a positive and significant relationship to *some risk* but is not significantly related at the two higher risk levels. All three minority status categories (Black, Hispanic, and Other) have a significant negative relationship with *some risk,* but Black and Hispanic have a significant positive relationship with *substantial risk.* Variables that do not show a significant relationship to any of the risk levels include not working, being retired, and owning a home.

6.4. Hypotheses tests

Table 3 lists the hypotheses of this research, based on the premise that recent events influence willingness to take risk, predicting decreases from 1983 to 1989, no change from

Table 2
Risk tolerance levels controlling for survey year and other variables, cumulative logistic analysis

Parameter	Risk Level					
	Substantial		High		Some	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Intercept	−2.2788‡		−1.1619‡		1.0049‡	
Year of survey: reference category = 1983						
Year 1989	−0.5171‡	0.596	−0.4493‡	0.638	−0.2078‡	0.812
Year 1992	−0.5513‡	0.576	−0.2144‡	0.807	−0.2607‡	0.771
Year 1995	−0.4805‡	0.618	0.0310	1.031	0.0287	1.029
Year 1998	−0.3217‡	0.725	0.3157‡	1.371	0.2512‡	1.286
Year 2001	−0.4068‡	0.666	0.2404‡	1.272	0.1510†	1.163
Demographic characteristics						
Age: reference category = 30 to 34						
Less than 30	−0.0320	0.969	0.1650*	1.179	0.1577*	1.171
35 to 39	−0.3900†	0.677	−0.1143	0.892	−0.1552*	0.856
40 to 44	−0.3367†	0.714	−0.1656*	0.847	−0.2202†	0.802
45 to 49	−0.4976‡	0.608	−0.4345‡	0.648	−0.3437‡	0.709
50 to 54	−0.6867‡	0.503	−0.4685‡	0.626	−0.3924‡	0.675
55 to 59	−0.6374‡	0.529	−0.5374‡	0.584	−0.4320‡	0.649
60 to 64	−0.6434‡	0.526	−0.7646‡	0.466	−0.6867‡	0.503
65 to 69	−0.8139‡	0.443	−0.9051‡	0.404	−0.8379‡	0.433
70 to 74	−0.9395‡	0.391	−1.1574‡	0.314	−0.9940‡	0.370
75 and above	−1.1524‡	0.316	−1.3712‡	0.254	−1.4114‡	0.244
Education: reference category = high school diploma						
Less than a high school diploma	−0.1339	0.875	−0.1413	0.868	−0.4025‡	0.669
Some college	0.0449	1.046	0.2687‡	1.308	0.3881‡	1.474
Bachelor's degree and above	0.0159	1.016	0.5492‡	1.732	0.7878‡	2.199
Race/ethnic background: reference category = White						
Blacks	0.2205*	1.247	0.0070	1.007	−0.2295‡	0.795
Hispanics	0.3231*	1.381	0.0017	1.002	−0.6219‡	0.537
Other race (Asian, etc.)	0.0186	1.019	−0.1653	0.848	−0.5640‡	0.569
Marital status/gender: reference category = married male						
Married female	−0.2573†	0.773	−0.5186‡	0.595	−0.5077‡	0.602
Unmarried female	−0.0794	0.924	−0.3004‡	0.741	−0.3612‡	0.697
Unmarried male	0.4937‡	1.638	0.3066‡	1.359	0.1773†	1.194
Presence of related children under age 18	−0.0212	0.979	−0.0492	0.952	−0.1139†	0.892
Economic characteristics						
Monetary assets ≥ 3 times monthly income	−0.0138	0.986	0.0293	1.030	0.4117‡	1.509
Level of non-financial assets: reference category = non-financial assets between $150,000 to $499,999						
Non-financial assets <$50,000	−0.2248	0.799	−0.3884‡	0.678	−0.4923‡	0.611
Non-financial assets = $50,000 to $149,999	−0.1058	0.900	−0.2326‡	0.792	−0.2720‡	0.762
Non-financial assets = $500,000 to $999,999	0.3374*	1.401	0.2130†	1.237	0.3650‡	1.440
Non-financial assets ≥ $1,000,000	1.1130‡	3.044	0.6344‡	1.886	0.5574‡	1.746

(*Continued*)

Table 2
Continued

Parameter	Risk Level					
	Substantial		High		Some	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Annual household income year before survey: reference category = $25,000 to $49,999						
Income less than $10,000	0.0843	1.088	−0.1003	0.905	−0.5077‡	0.602
Income between $10,000 and $24,999	−0.0089	0.991	−0.1418*	0.868	−0.3230‡	0.724
Income between $50,000 and $99,999	0.0387	1.039	0.3154‡	1.371	0.4157‡	1.515
Income more than or equal to $100,000	0.0097	1.010	0.5818‡	1.789	0.8586‡	2.360
Employment status: reference category = salary earner						
Self-employed	0.3806‡	1.463	0.1591‡	1.172	0.1120*	1.119
Not working	−0.0765	0.926	−0.1059	0.900	0.0065	1.007
Retired	−0.1755	0.839	−0.0722	0.930	−0.0284	0.972
Homeowner: reference category = renter	−0.1409	0.869	−0.1182	0.888	−0.0752	0.928
Opinions/attitudes						
Expect to receive substantial inheritance or transfer of assets in the future	−0.0540	0.947	0.1261*	1.134	0.1894‡	1.209
Health: reference category = good health						
Excellent health	0.0902	1.094	0.0800	1.083	−0.0095	0.991
Fair health	0.0958	1.101	−0.0510	0.950	−0.2426‡	0.785
Poor health	0.1591	1.172	0.0295	1.030	−0.5253‡	0.591
Concordance	69.6%		75.0%		81.5%	
χ^2 test of the likelihood ratio	2862.1004	<.0001	15839.1616	<.0001	32088.541	<.0001

* $p < .05$, † $p < .01$, ‡ $p < .001$; two-tail test.

Analysis based on 1983, 1989, 1992, 1995, 1998, and 2001 Surveys of Consumer Finances, excluding respondents in 1983 who did not answer the risk tolerance question or were not asked the question; unweighted data; RII technique is used.

1989 to 1992, increases from 1992 to 1995 and again from 1995 to 1998, and decreases from 1998 to 2001. While the analysis of changes based on *t* tests (Table 1 and the "Actual" section of Table 3) show some significant changes in risk tolerance levels, the results could be a result of changes in factors related to risk tolerance such as age and gender. Therefore, change results are also analyzed based on the logit analyses,[6] controlling for the independent variables (Table 3).

The changes in risk tolerance over time with controls are generally similar to the changes observed without controls, as *substantial, high,* and *some risk* decrease significantly from 1983 to 1989, followed by a significant increase at the *high-risk* level from 1989 to 1992, then a significant increase at both the *high* and *some risk* levels from 1992 to 1995. Even greater increases in risk tolerance are shown between 1995 and 1998, with significant

Table 3
Hypothesis tests, changes in financial risk tolerance 1983–2001

		Actual changes in risk levels			Changes controlling for other variables (logits)		
Period	Hypothesis	Some	High	Substantial	Some	High	Substantial
1983–1989	Decreases	D	D	D	D	D	D
1989–1992	No change	NS	I	D	NS	I	NS
1992–1995	Increases	I	I	NS	I	I	NS
1995–1998	Increases	I	I	I	I	I	I
1998–2001	Decreases	D	NS	D	D	NS	NS

I = Increase significant at 0.05 level using a one-tail test, except for 1989–1992, where a two-tail test is used.
D = Decrease significant at 0.05 level using a one-tail test, except for 1989–1992, where a two-tail test is used.
NS = No significant change at 0.05 level using a one-tail test, except for 1989–1992, where two-tail test is used.

increase at all three levels. From 1998 to 2001, a significant decrease occurs at the *some risk* level, but no significant change is seen at the *substantial risk* and *high-risk* levels.

The specific hypotheses generally are confirmed as discussed below and summarized in Table 3.

Hypothesis 1, that risk tolerance will decrease from 1983 to 1989, is confirmed for all three risk tolerance levels for both the actual and the logit results. There is a significant decrease in the willingness to take risk at each of the three levels, s*ubstantial*, *high*, and *some risk.*

Hypothesis 2, that risk tolerance will not change from 1989 to 1992, is confirmed for *some risk* based on both actual and logit results. The hypothesis is also confirmed for *substantial risk*, however, not consistent with the hypothesis, there is a significant increase in willingness to take *high risk*.

Hypothesis 3, that risk tolerance will increase from 1992 to 1995, is confirmed for *some risk* and for *high risk* for both the actual and logit results. However, there is a no significant change in the willingness to take *substantial risk* in either the actual or the logit results.

Hypothesis 4, that risk tolerance will increase from 1995 to 1998, is confirmed for all three levels of risk for both actual and logit results.

Hypothesis 5, that risk tolerance will decrease from 1998 to 2001, is confirmed for *some risk* based on the logit results, and for *substantial risk* in the actual results.

7. Discussion

The findings in this research generally are consistent with the hypotheses, indicating that risk tolerance level is affected by recent events. The year 1989 shows significant decreases compared to 1983, both with and without controlling for other variables. This is consistent with the proposal that the stock market crash in October 1987 affected households other than those who already held stocks, because in 1989 only 32% of households owned stocks directly or indirectly (Kennickell et al., 2000).

In 1992 there is a significant increase in the *high risk* category but no significant change in the other two levels in the logit results, partially confirming the hypothesis of no change. The uncontrolled results confirm the hypothesis of no change for *some risk* and for *high risk*, but there is a significant decrease in *substantial risk* from 1989 to 1992. Despite the recession of 1990 to 1991, stock returns in 1989 and 1991 were good, so perhaps the logit result of a significant increase in *high risk*, controlling for other variables, is based on the recent increases.

The real return on large stocks in 1994 was negative (Ibbotson Associates, 2003, p. 265), which might be related to the lack of a significant increase in 1995 in the proportion saying they would take *substantial risk*. However, consistent with predictions, there is a significant increase in the *high risk* and *some risk* levels of risk tolerance, both for the logit and the uncontrolled results.

All three levels of risk tolerance have significant increases in 1998 for both the logit and the uncontrolled results, confirming the hypothesis. From 1995 to 1998, large company stocks performed very well, and the economy was generally improving. In 1998, the unemployment rate fell to the lowest point since 1969, having dropped almost continuously since the 1990–1991 recession, and inflation was low (*Economic Report of the President*, 1999, pp. 43–44). The Asian and Russian financial crises of 1997 had some impact on the U.S. economy but not much of an impact on households (*Economic Report of the President*, 1999, p. 47).

In 2001, *some risk* and *substantial risk* have small but significant decreases in the actual results, and *some risk* has a significant decrease in the logit. The *high-risk* category, however, does not show significant change in either the logit or the uncontrolled results. The 2001 survey was conducted from May 2001 until December, so for respondents who paid little attention to the NASDAQ Index, it is plausible that they would not have changed their perceptions if they were interviewed before September 11. One-fifth of the respondents were interviewed after September 11 (Hancock & Kennickell, 2002), and their responses might have been affected by the September 11 attacks and the resulting drops in stock market indexes.

In terms of the conceptual model in Fig. 1, the significant effects of many of the independent variables related to life cycle stage and other household characteristics support part of the model proposed. There are significant results supporting the effect of recent stock market changes on willingness to take investment risk, particularly for the 1983 to 1989 and the 1995 to 1998 periods. The 1998 to 2001 changes are not as consistent as the changes in the earlier years, but, as noted previously, about 80% of the 2001 sample might not have concluded that the downturn in the market was going to be severe, since that proportion of the interviews were conducted before September 11.

Obviously, among those who do invest, changes in portfolio allocation over time can reveal reactions to stock market and other events, but this study provides insights for all households, not just those with portfolios.

8. Implications

Financial risk tolerance, as measured by the SCF, changes over the years of the survey. The magnitude of the change is larger when statistically controlling for the effects of

household characteristics (Fig. 2). There are not enough time periods in the available datasets to rigorously infer that risk tolerance increases when the stock market generally increases and decreases when the stock market generally decreases. However, the patterns found for 1983 to 2001 are consistent with the idea that individual risk tolerance fluctuates and is overly influenced by recent events.

If investor risk tolerance changes in the way that the results in this study indicate, there is a risk of buying when prices are high and selling when prices are low, which would tend to make realized returns over the long run much lower than would be possible from simply keeping the same portfolio allocation. An important part of financial education may be to overcome the bias of overweighting recent events.

Notes

1. The 1986 survey was conducted with the same households as in 1983 and the risk question was not repeated.
2. The annual total real returns of large stocks were positive for almost all years from 1981 to 1999, except for 1990 and 1994 (Ibbotson Associates, 2003, p. 88). The three-year moving average for large stocks was positive from 1980 to 2000. The stock market crash of October 19, 1987 is not apparent in the annual stock returns because the extreme one day collapse, with a 22.6% drop in the Dow Jones Industrial Average (Schwert, 1997), came after a large increase in stock indexes for much of that year, resulting in little net change during 1987.
3. As Deaton (1997, pp. 66–73) suggests, weighting regression analyses when the weights are endogenous is suspect for hypotheses testing.
4. In the 1983 dataset, the risk tolerance question has 28 "Don't Know" (DK) responses and 66 "Not Answered" (NA) responses. These risk tolerance responses are not present in the later survey datasets. According to the 1983 SCF codebook, NA ". . . . indicates either that the interviewer inadvertently did not ask a question or that a respondent refused to answer." The DK respondents in 1983 are significantly older and less educated than the *no risk* respondents who in turn are significantly older and less educated than the respondents willing to take average and higher levels of risk. In this study, households with DK responses in 1983 are assigned to the *no risk* category and households with NA responses are deleted from the analyses.
5. Several statistical techniques are available for developing a multivariate model of risk tolerance choice. The cumulative logistic model is selected as most appropriate for this study because it can account for the discrete and rank ordered nature of the SCF responses that are used to create the dependent variables. Ordinary linear regression assumes a continuous linear dependent variable, so it is not appropriate. With an ordered logistic model, each category of the dependent variable is evaluated simultaneously with respect to the independent variables so that it is not possible to obtain different sets of estimates for different dependent variable categories, and a statistical test shows that it is not appropriate for the analyses. A multinomial logistic model ignores the ordered nature of the dependent variable and therefore is rejected.

6. As mentioned in Section 5, logits are conducted with survey years other than 1983 as the reference category to obtain a direct statistical test for each adjacent pair of survey years. Table 2 compares each survey year to 1983. The logits providing the basis for Hypotheses 2 to 5 have the same variables as the logits shown in Table 2, except that the reference year is different for each hypothesis.

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