Stock Market Volatility and Changes in Financial Risk Tolerance During the Great Recession

Abed G. Rabbani,[a] John E. Grable,[b] Wookjae Heo,[c] Liana Nobre,[d] and Stephen Kuzniak[e]

This study investigated the degree to which the financial risk tolerance of individuals was influenced by volatility in the U.S. equities market during the period of the Great Recession. Based on data from a valid and reliable risk tolerance scale and return information for the Standard and Poor's (S&P) 500 index, there does appear to be some associations between daily market volatility and changes in risk tolerance scores. Changes in risk tolerance scores were also calculated using short- and intermediate-term volatility measures. The relationships do vary, however, with evidence supporting the relationship only 64% of the time. Overall, changes in financial risk tolerance scores were found to be modest. Although not following hypothesized directions at all times, risk tolerance was not influenced by the length of volatility measurements.

Keywords: Great Recession, risk taking, risk tolerance, volatility

There is a general consensus among researchers that risk tolerance involves the willingness, rather than preference or capacity, to trade off the possibility of incurring an almost certain small gain with the potential of making a larger gain with an equally high potential of losing wealth (Davies & Brooks, 2013; Grable & Joo, 2004; Pan & Statman, 2012). Given that wealth is associated with income and expenditures, it is a person's willingness to accept variability in lifetime income (Guillemette, Finke, & Gilliam, 2012; Hanna, Fan, & Chang, 1995).

Financial risk tolerance has emerged as a very important variable needed to match the suitability of financial management recommendations to the clients' needs (Hung et al., 2008). Risk tolerance evaluation became a requirement in Australia since 2001 (Gilliam, Chatterjee, & Grable, 2010) and in United States since at least 2006. However, Bhattacharya, Hackethal, Kaesler, Loos, and Meyer (2012) and Roth and Voskort (2014) highlighted the danger of using a measurement tool that is not valid or reliable.

Many economists mathematically measure risk tolerance as the reciprocal of risk aversion (Barsky, Juster, Kimball, & Shapiro, 1997; Gron & Winton, 2001; Walls & Dyer, 1996), which describes an investor as risk averse if she always prefers a sure wealth level to a lottery, as risk seeking if opposite, and as risk neutral if indifferent. Within modern portfolio theory and the capital asset pricing model, when the level of risk aversion is identified, investors can select their preferred allocation from several efficient portfolios. In practice, self-developed or commercially available questionnaires are used widely to frame financial management recommendations that provide the highest level of benefit for a given level of risk.

It was speculated in the public media that the Great Recession (from late 2007 to early 2010) prompted households to become less risk tolerant in reaction to volatility in the securities markets. The Standard and Poor's (S&P) 500 fell 51.7% from its high point during this period (Guillemette & Finke, 2014). Some financial pundits question the validity of risk tolerance questionnaires as a tool for use within the financial counseling and planning process (e.g., Roth, 2013),

[a]*Assistant Professor, Department of Personal Financial Planning, 239E Stanley Hall, University of Missouri, Columbia, MO 65203. E-mail: rabbania@missouri.edu*
[b]*Professor, Department of Financial Planning, Housing, and Consumer Economics, University of Georgia, Athens, GA 30602. E-mail: grable@uga.edu*
[c]*Assistant Professor, Department of Consumer Science, South Dakota State University, Brookings, SD. E-mail: wookjae.heo@sdstate.edu*
[d]*Adjunct Professor, Universidade Federal Rural do Semi-Árido, Mossoro, RN, Brazil. E-mail: liananobre@ufersa.edu.br*
[e]*Financial Planner, Cannon Financial Strategists, Inc. 649-8 South Milledge Avenue, Athens, GA 30605. E-mail: kuzniak@gmail.com*

http://dx.doi.org/10.1891/1052-3073.28.1.140

and they argue that the risk tolerance questionnaires do not account for the emotional tendencies of investors. Critics also point out that investor behavior appears to be driven by the market environment changes (Guiso, Sapienza, & Zingales, 2013; Hoffmann, Post, & Pennings, 2013; Sahm, 2007; Yao & Curl, 2011). If true, this would seriously undermine the assumption that risk attitudes are relatively stable (Yao & Curl, 2011). Making recommendations based on such an unstable tool could be detrimental especially during high volatility period, such as the Great Recession. A significant instability in risk tolerance may cause corresponding changes in portfolio holdings, hence may decrease a household's potential to accumulate wealth.

The purpose of this study was to test the degree to which risk tolerance attitudes of individuals are influenced by volatility in the equities markets. It may be that risk attitudes are most influenced by periods when volatility increases rather than periods when volatility decreases or through normal patterns of price changes. Data from a unique multiyear survey that included information covering the Great Recession and recovery period were analyzed to address the research purpose. It was determined that market volatility does, as questionnaire skeptics claim, influence risk attitudes, but counter to such claims, the overall effect of such changes was found to be relatively small. Investor behavior that appears to be disjointed from assessed risk attitudes (e.g., selling portfolio holdings after a steep decline in equity prices) may be related to other investor attitudes, needs, and capacities rather than significant shifts in risk tolerance.

Literature Review and Hypotheses

A noticeable increase in interest about investor risk tolerance attitudes occurred during and shortly after the Great Recession. This interest was driven, in part, by the apparent association between investor risk attitudes and market volatility (Yao & Curl, 2011). Oscillating equity prices signaled a change in market participants' feelings regarding the stability of prices. For some, price instability can and did result in portfolio losses. For others, the same volatility provided an opportunity for future gains. Conceptually, investors with a long-term outlook should not be influenced by unpredictable short-term instability. Those with a higher tolerance for risk should be willing to accept more volatility in pursuit of higher returns, regardless of short-term trends in prices. Investors with a lower willingness to engage in risky financial behavior should likewise be less willing to hold volatile assets.

Although the aforementioned relationships may represent normative predictions, researchers such as Yao and Curl (2011) have noted attitudes and behavior that diverge from predictions in practice. They found that exhibiting either very low or very high risk tolerance can hinder wealth accumulation over the lifespan. Extraordinarily high risk-tolerance often leads to excessive trading (Barber & Odean, 2001) and problematic asset allocation frameworks for investors nearing retirement (Hariharan, Chapman, & Domian, 2000). On the other hand, very low risk tolerance can create a myopic investing outlook that limits an investor's willingness to take necessary risks (Barsky et al., 1997; Hariharan et al., 2000). In addition, switching from a low- to high-risk tolerance, or vice versa, can cause problems if an investor's goal is wealth accumulation (Friesen & Sapp, 2007). This phenomenon of risk tolerance shift can sometimes be confused with the use of tactical asset allocation strategies. For example, Glumov (2013) noted that at the moment of transition from bear to bull market in 2010, the portfolio allocation to risky assets declined to its lowest level in the history of the Survey of Consumer Finances (SCF) for people younger than the age of 35 years. Was this because investor risk tolerance fell or was this a result of tactical reallocations unrelated to risk attitudes? It is possible that risk tolerance did fall, which, in turn, generated a need to reallocate portfolio assets. Whether or not such a change was (or is) prudent is beyond the scope of this review. What is of relevance is the extent to which investor risk tolerance changes in practice. This is the reason it is important to have a better understanding of the stability assumption underlying most financial risk tolerance attitudinal assessments.

Several studies conducted prior to the Great Recession were able to document that investor risk attitudes appear to vary based on environmental factors (Grable & Joo, 2004; Sung & Hanna, 1996). Clarke and Statman (1998) concluded that risk tolerance tends to fall after financial newsletter writers' sentiment declines. Shefrin (2000) pointed to a positive association between shifts in the markets and the risk-taking preferences of professional investors. More recently, others have confirmed that risk tolerance is less stable than previously thought. For example, Yao, Hanna, and Lindamood (2004) tracked changes in risk attitudes measured in the SCF. The SCF uses a single-item risk tolerance measure. Although the SCF risk measure suffers from validity and reliability complications (Grable & Lytton, 2001), general

risk attitudes varied based on patterns in the stock market (Yao et al., 2004). Grable, Lytton, and O'Neill (2004) and Grable, Lytton, O'Neill, Joo, and Klock (2006) related changes in risk tolerance attitudes to investors engaging in projection bias by forecasting recent price changes in the stock market into the future. They concluded that as prices increase, risk attitudes increase. On the other hand, when prices in a previous period fall, investors tend to project this into the future and reduce their willingness to take risk.

Data published after the Great Recession generally supports the hypothesis that risk tolerance is somewhat variable in the short run (Guillemette & Finke, 2014), although there is also some evidence to suggest that risk tolerance is not affected by shifts in the markets (Weber, Weber, & Nosic, 2013). Yao and Curl (2011) noted that the association between risk tolerance attitudes and market returns was positive during the Great Recession. Van de Venter, Michayluk, and Davey (2012) examined this issue in greater detail using risk tolerance data collected over a 5-year period. The aim of their study was to test the proposition that risk tolerance was a stable personality trait. They noted that risk attitudes did appear to shift over time; however, unlike previous reports, annual changes in risk tolerance were subtle and likely not significant (Van de Venter et al., 2012). Rather than being linked to market expectations, they suggested that changes in risk attitudes might be more closely aligned with household size change and help-seeking behavior. It is worth noting, however, that this study did not track variations in risk tolerance in relation to either change in market conditions or market volatility.

Hoffmann et al. (2013) looked specifically at investor perceptions and behavior during the period of September and October 2008, which represented a time in which stock market experienced significant losses. They found investors' expectations declined during these months. Of more importance in the context of this study, they noted that risk tolerance decreased. Although investor risk tolerance does appear to vary with market fluctuations, the changes tend to be temporary (Hoffmann et al., 2013). Rather than creating a permanent shift in attitude, changes in market prices (either up or down) do not appear to last long. Investor attitudes tend to revert to their mean starting point. Their findings were supported by Grable and Rabbani (2014) that showed that individuals held risk tolerance as a generalized attitude. Although there were changes in trading volatility (Hoffmann et al., 2013), this study did not explicitly report the extent to which volatility was associated with risk tolerance.

The most relevant study conducted on the topic of risk tolerance attitude stability was published by Guillemette and Finke (2014). They set about attempting to determine if risk tolerance attitudes vary over time and, if so, whether this variability is large enough to influence portfolio choices. Their secondary purpose was to test whether changes in risk tolerance correlate with the market environment. In this study, the authors used 5 years of data from FinaMetrica (i.e., a risk-assessment questionnaire used by financial planning professionals) to test their research questions. They noted an overall significant positive ($r = .70$) correlation between risk tolerance scores and changes in the S&P 500 over the period. However, this correlation varied during the bear market period and the recovery period. During the bear market timeframe, the correlation was .90; on the other hand, during the recovery period, there was little correlation ($r = .01$). Their conclusions highlighted the tendency of investor risk attitudes to move in step with the markets. When stock prices were bullish during the 5-year period, investor risk attitudes hardly changed. Alternatively, when prices were bearish, risk tolerance fell. However, the potential drawback with this scenario is that investors might have been selling winning stocks too early and riding losing stocks too long, which Shefrin and Statman (1985) called the "disposition effect," which is, of course, the opposite of what a rational investor ought to do in practice.

There is evidence in the FinaMetrica dataset that investor risk tolerance was somewhat time-varying (Guillemette & Finke, 2014). There is also support for this claim from a study conducted by Barberis, Huang, and Santos (2001). They developed a model based on prospect theory and used varying levels of weights for losses. They found that investors are loss averse over fluctuations in the value of their financial wealth. They also reported that the degree of loss aversion depends on prior investment performance. This finding is in line with Thaler and Johnson's (1990) "house money effect," which states that the degree of loss aversion increases after a prior gain and decreases after a prior loss.

However, Guillemette and Finke (2014) reported an essential caveat associated with the findings of Barberis et al. (2001); namely, the change in magnitude of market

changes was significantly larger than changes in risk tolerance scores. In other words, there was no evidence showing that if the markets fell by, for example, 5% risk tolerance scores would also drop by 5%. Although the correlation was evident, particularly in the bear market period, the level of comparative change in risk tolerance scores, based on market movements, was relatively modest.

Three observations emerge from the literature. First, it does appear that risk tolerance is variable. The key question is to what extent the variability is meaningful. Second, early reports of variability were based on nominal changes in market prices, not the volatility in prices. It may be that risk attitudes are most influenced by highly volatile periods rather than through normal patterns of price changes. Third, and most important, only a handful of studies have explicitly documented the level of change in risk attitudes associated with shifts in the markets. Sahm (2007) investigated risk tolerance and asset allocation of investors and found that heterogeneity in risk preferences is an important source of the heterogeneity in financial portfolios. As noted by Guillemette and Finke (2014) and Van de Venter et al. (2012), risk tolerance attitudes may, in fact, be variable, but it may also be true that the variability is not significant enough to impact most financial counseling and planning decisions. Hence, it was hypothesized in this article that

1. Risk tolerance scores would fall during periods of increased volatility
2. Risk tolerance scores would increase during periods of decreased volatility
3. Changes in risk tolerance scores would be large and meaningful

Method

Data

Data for this study were obtained from a proprietary multiyear data gathering survey hosted online by Rutgers New Jersey Agricultural Experiment Station (Cooperative Extension, http://njaes.rutgers.edu:8080/money/riskquiz/). Daily data were collected from users who visited the website to obtain a risk tolerance assessment. Access to the survey was free and open to anyone with Internet access. The number of survey respondents ranged from a handful to several hundred per day. This study's analyses were based on data collected from 2008 through 2013.

As noted earlier, the online survey was open to anyone who had Internet access during the survey period. Thirteen risk tolerance questions, as originally compiled by Grable and Lytton (1999), were asked of each survey respondent. In addition, basic demographic inquiries were made, including questions about the gender, income, and marital status of respondents. A separate question asked each respondent to indicate whether they made their own investment decisions, relied on someone else, or had no investable assets at the time of survey completion. In total, 152,766 useable responses were available for analysis. Respondent characteristics for these factors are shown in Table 1. The following scoring guidelines (Grable & Lytton, 1999) were provided to those who completed the risk questionnaire online: (a) 13–18 = *low tolerance for risk*, (b) 19–22 = *below-average tolerance for risk*, (c) 23–28 = *average/moderate tolerance for risk*, (d) 29–32 = *above-average tolerance for risk*, and (e) 33–47 = *high tolerance for risk*. Readers are encouraged to review their original article for further details.

Analysis Method

Risk tolerance scores were calculated for each respondent by summing answers to the 13 risk tolerance questions, in the manner as described by Grable and Lytton (1999). The closing value of the S&P 500 was then matched to each respondent's survey completion day. For example, if someone completed the online survey on March 14, the closing value of the S&P 500 would be recorded for that person as of the 14th of March. In situations where someone completed the survey over a weekend, the closing value of the last previous trading day was matched to the respondent's risk tolerance score. The study used the nominal value of the S&P 500. This choice of measurement instead of inflation-adjusted measurement was based on the assumption that investors evaluate markets in nominal terms, not inflation-adjusted terms, primarily because nominal returns are reported by those in the media. Market data were then used to calculate volatility estimates. Rather than correlate changes in risk tolerance scores to nominal changes in S&P values, it was hypothesized that what investors may actually be responding to volatility in the markets. For example, when viewed over an extended period, there may be little change in the nominal value of a market index. For instance, a Monday opening value may be very close to that week's closing Friday value. If viewed this way, the change in value would be close to zero. However, during the week (or, say,

TABLE 1. Descriptive Statistics for Respondents

Variable	Frequency (*n*)	%	*M* Risk Score	*SD* of Risk Score
Gender				
Female	64,492	42.22	25.94	4.94
Male	88,274	57.78	28.72	5.54
Age (years)				
Younger than 25	81,926	53.63	27.37	5.53
25–34	27,865	18.24	27.93	5.38
35–44	13,934	9.12	28.26	5.39
45–54	13,176	8.62	27.77	5.29
55–64	11,143	7.29	27.02	5.10
65–74	3,596	2.35	26.60	5.19
75 and older	1,126	0.74	27.57	8.42
Marital status				
Never married	89,544	58.62	27.51	5.51
Living with significant other	9,474	6.20	27.54	5.41
Married	43,576	28.52	27.70	5.30
Separated or divorced	6,747	4.42	27.12	5.47
Widowed	1,516	0.99	26.96	6.66
Shared living arrangement	1,909	1.25	27.80	6.39
Education				
Some high school or less	34,698	22.71	27.31	5.87
High school diploma	21,032	13.77	27.16	5.51
Some college	26,485	17.34	26.88	5.21
Associate's degree	10,527	6.89	26.81	5.26
Bachelor's degree	35,308	23.11	28.11	5.20
Graduate or professional degree	24,716	16.18	28.43	5.39
Household income				
Less than $25,000	34,949	22.88	27.08	5.58
$25,000–$49,999	29,924	19.59	26.84	5.34
$50,000–$74,999	29,642	19.40	27.27	5.31
$75,000–$99,999	20,316	13.30	27.72	5.27
$100,000 or more	37,935	24.83	28.65	5.52
Decision making				
Make own investment decisions	90,197	59.04	27.89	5.53
Rely on the advice of professional	17,869	11.70	27.78	5.13
Do not have investment assets	44,700	29.26	26.76	5.40

a 20-day period) the level of volatility could be quite large. In fact, throughout 2008 this happened several times. During some weeks, the intra-week market moved up or down on a given day by more than 10%; however, this volatility was disguised when viewed on an average basis. To account for volatility, an absolute value change variable was created for three periods: (a) daily, (b) weekly, and (c) over a 20-day cycle. These periods were chosen based on commonly used technical trading standards (Weinstein, 1988; Wilder, 1978). Volatility, as defined in this study, was a

measure of the magnitude of market fluctuations. Volatility was estimated as a local average of absolute price changes $\left|G(t)\right|$ over a suitable time interval (see Wilder, 1978). Large values of $\left|G(t)\right|$ represent crashes and big rallies. In this study, Z(t) represented the closing value of the S&P 500 index. As such, the absolute price change was measured as: $G(t)\left| = \right|[Z(t + \Delta t) - Z(t)]/ Z(t)\left|\right.$.

Full-year data for 2008, 2009, 2010, 2011, 2012, and 2013 were compiled based on respondent risk tolerance scores and market volatility. Changes in risk tolerance scores by year were then calculated and compared against volatility estimates. Correlation coefficients were used to measure the level of association between the different measures of volatility and risk tolerance scores. In addition, periods of volatility were categorized as either increasing or decreasing over a monthly cycle. These categorized volatility estimates were then compared to changes in risk tolerance scores during these periods to determine if risk tolerance scores were affected by shifts in volatility.

Results

The 152,766 respondents were quite diverse. Approximately 58% of respondents were male. The age of respondents skewed younger, with nearly 70% reporting being 35 years of age or younger. Approximately 10% of respondents were older than age of 55 years. Given the age of respondents, it is not surprising that the majority were also single. Approximately 28% of respondents were married. In terms of educational attainment, the sample was well educated. Approximately 45% of respondents reported having an associate's degree or higher level of education. About 23% of respondents earned less than $25,000 per year, whereas about 24% reported earnings of more than $100,000 per year. In general, respondents were more likely to report making their own investment and financial decisions (59%), compared to those who relied on others for advice (11.7%) and those who did not make meaningful financial decisions because of a lack of assets (29%).

As a reference point, it is important to note statistics about the S&P 500 during the periods of analysis. The mean level of the S&P 500 was 1,348.86 (SD = 228.41), which was close to the median (1,338.31). The range in value during the periods of analysis was relatively large at 1,171.83, with a minimum of 676.53 and high of 1,848.36. This indicates that all of the data points were fairly close to each other or at least were distributed somewhat evenly around the mean and more than the total range.

Table 2 provides a snapshot of yearly risk tolerance score and volatility data over the three evaluation periods. The first number shown represents the average risk tolerance score and volatility estimate for the year, respectively. The second figure is the matching standard deviation. The third number represents the percentage increase or decrease in the average risk tolerance score from the previous year (December 2007 data were used as the baseline for the 2008 changes). The final figure represents Cronbach's alpha, which is a measure of scale reliability for the risk tolerance scale scores. In general, risk tolerance scores changed very little, whereas there was more movement in year-over-year changes in volatility. During the period of greatest market stress—corresponding to the Great Recession—daily, weekly, and 20-day volatility was large. Even so, the standard deviation associated with volatility was relatively modest. This is somewhat surprising given the previous literature. One would have expected to see greater variability in risk tolerance scores from 1 year to the next. However, others might argue that this stability of risk tolerance score is indicative of the true nature of a person's willingness to engage in risky financial behavior. In addition, the stability in average risk tolerance scores points to the overall reliability of the risk-assessment scale.

Figure 1 provides a visual interpretation of the data over the periods of study. As shown, risk tolerance scores remained relatively stable year-over-year, as measured by average scores and standard deviations, especially when compared to the volatility measures.

Table 3 provides data that help address the key question of interest in this study. The second column reports the correlation coefficient between risk tolerance scores and each of the three measures of volatility. The third column reports the actual percentage change in risk tolerance scores when volatility increased. The fourth column shows the percentage change in risk tolerance scores when volatility decreased. It is hypothesized that when volatility increased, in any of the three evaluation periods, risk tolerance scores would fall. Conversely, during periods of reduced volatility, risk tolerance scores were hypothesized to increase.

All of the correlation coefficients reported in Table 3 were significant at the $p < .01$ level. Figure 2 shows that risk

TABLE 2. Risk Tolerance Score and Volatility Descriptive Data

		Risk Tolerance Score	Daily Volatility	Weekly Volatility	20-Day Volatility
		SD	*SD*	*SD*	*SD*
		% Change[a]	% Change[a]	% Change[a]	% Change[a]
Year	*N*	Alpha			
2008	13,077	27.86	15.33	95.41	408.22
		0.39	7.96	46.73	214.99
		−0.15	19.82	13.34	38.17
		.78			
2009	14,178	27.67	8.95	52.94	240.70
		0.34	3.52	18.41	69.30
		0.03	−5.04	−9.17	−9.23
		.76			
2010	18,592	27.56	8.04	45.49	190.52
		0.53	4.84	21.19	65.45
		0.03	19.74	11.31	8.30
		.77			
2011	33,692	27.65	10.21	60.19	264.92
		0.54	5.11	29.03	131.78
		0.17	17.65	19.45	13.45
		.75			
2012	33,897	27.35	6.38	38.45	167.43
		0.33	1.62	10.52	36.80
		−0.13	1.42	2.09	−1.71
		.76			
2013	39,330	27.76	7.13	42.26	186.47
		0.28	2.43	12.83	34.95
		0.14	10.63	9.52	1.87
		.75			

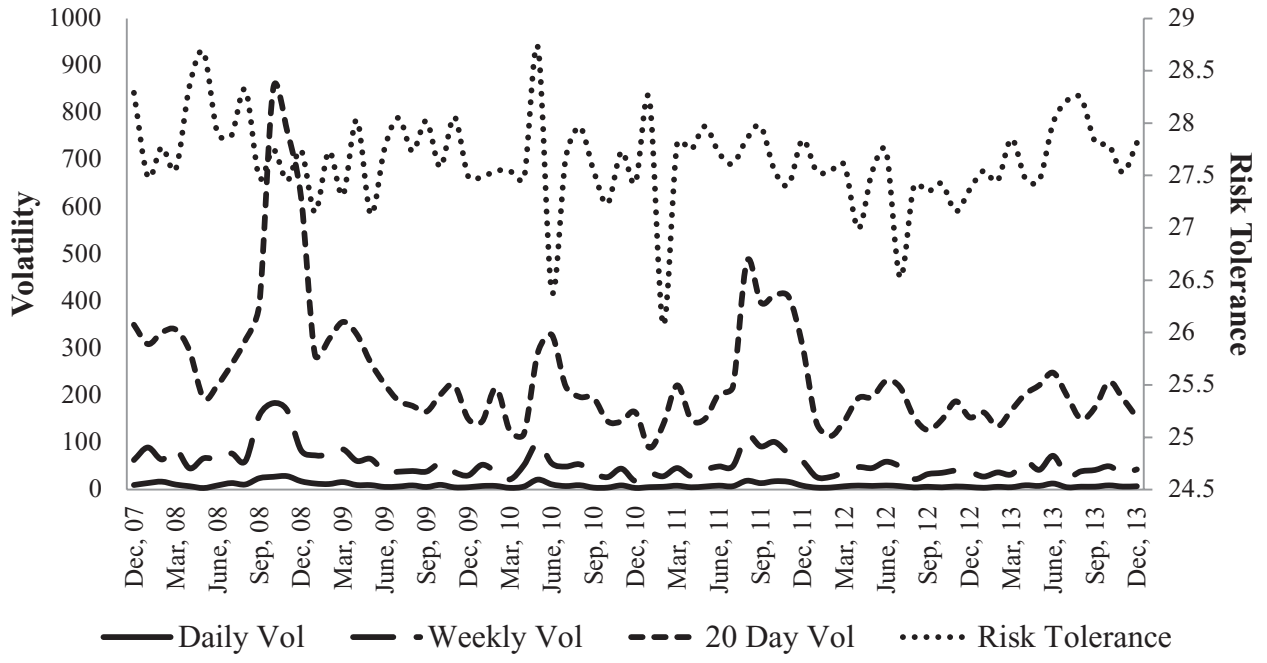
[a]Values are in average.

tolerance scores, although not following the hypothesized directions at all times, were not influenced by the time boundaries associated with volatility measurement.

The percentage change in risk tolerance score data in Table 2 is of particular importance. Although it is true that risk attitudes and volatility were correlated, the actual change in risk tolerance scores was very modest. The greatest shift in scores was, at most, close to 2%. This means changes in risk tolerance scores, on average, were not large enough to move a respondent from, say, a high-risk tolerance category (i.e., risk tolerance score of 33–47) to a moderate category (i.e., risk tolerance score of 29–32) with regularity. In other words, although scores did vary, the variability within categories of risk tolerance was very restrained.

It is important to note, however, that the observed relationships did not always match what was originally hypothesized. Figure 3 provides a visual summary of the findings. As illustrated, the hypotheses were confirmed in 2008, which happened to be the most volatile of the six market periods. As market volatility increased, risk tolerance

Figure 1. Variations in risk tolerance scores compared to market volatility.



scores dropped. When volatility decreased, risk tolerance scores increased. However, the percentage change in scores was not that great. The strength of the hypothesized associations weakened in 2009, 2010, 2011, and 2012, only to come back into line with the hypotheses in 2013.

Consider the market in 2010 and 2011. Counter to expectations, risk tolerance scores actually tracked positively with daily and weekly market volatility during this period. As volatility increase, so did risk tolerance scores in two of the daily and weekly scenarios. When volatility decreased, so did risk tolerance scores. These results suggest that although there does appear to be some association between market volatility and risk tolerance scores, the relationship did not always conform to expectations. Overall, the observed relationships matched the hypotheses approximately 64% of the time. This can be seen in Figure 4. The lines represent the average percentage change in daily volatility from Table 2 and the risk tolerance and daily volatility correlation from Table 3. Had the relationship been more robust, the two lines should have moved in diverging directions.

Discussion

It was hypothesized at the outset of this study that (a) risk tolerance scores would fall during periods of increased volatility, (b) risk tolerance scores would increase during periods of decreased volatility, and (c) changes in risk tolerance scores would be large and meaningful. Data from a unique multiyear survey that included data covering the Great Recession and subsequent recovery period showed that risk tolerance scores do, in fact, vary based on environmental factors. There does appear to be some evidence of association between market volatility and changes in risk tolerance; however, the relationship was not consistent. The relationship matched the hypothesis for daily volatility 64% of the time. The relationship matched the hypothesis for weekly volatility 50% of the time. It is important to note that the overall effect of these changes was relatively small. Over the period from January 2008 through December 2013, risk tolerance scores ranged from 13 to 47, with average scores falling between 26 and 28. According to Grable and Lytton (1999), the average score is indicative of an average/moderate willingness to engage in a risky financial behavior.

Results from this study indicate that although risk tolerance scores are likely to vary based on market volatility, the actual magnitude of such changes will generally be quite modest. Even during periods of extreme market volatility, for example, risk tolerance scores rarely moved by more than 2% points. It would take a much larger percentage change in a risk tolerance score to move someone from

TABLE 3. Correlation Estimates and Changes in Risk Tolerance Score Data

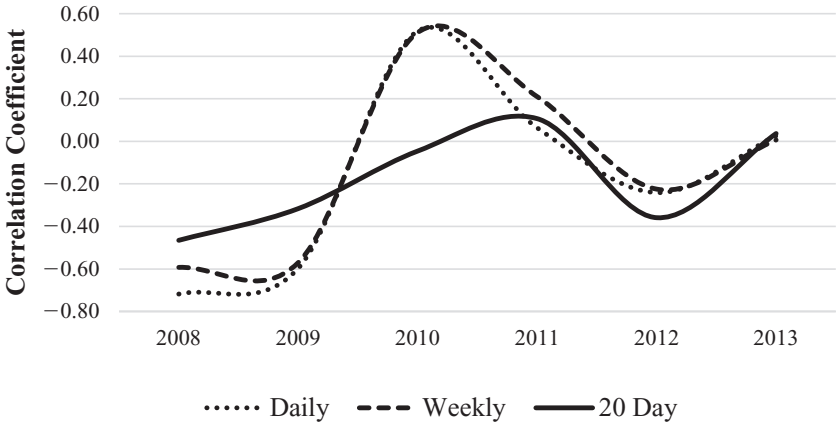
Volatility	Correlation With Changes in Risk Tolerance Score	*p* Value	Changes in Risk Tolerance Score During Period of Increased Volatility	Changes in Risk Tolerance Score During Period of Decreased Volatility
2008				
Daily	−.72	.009*	−1.08%	1.13%
Weekly	−.59	.042*	−0.41%	1.04%
20 day	−.47	.127	−0.07%	1.06%
2009				
Daily	−.60	.041*	−1.51%	1.74%
Weekly	−.57	.053*	−1.51%	1.39%
20 day	−.32	.317	0.11%	−0.02%
2010				
Daily	.52	.084*	0.54%	−1.07%
Weekly	.51	.089*	1.08%	−1.07%
20 day	−.05	.888	−0.43%	−0.01%
2011				
Daily	.06	.845	0.80%	−0.24%
Weekly	.21	.513	0.80%	−0.24%
20 day	.11	.742	−0.37%	0.42%
2012				
Daily	−.24	.450	−0.10%	0.52%
Weekly	−.22	.483	0.00%	0.77%
20 day	−.36	.252	0.24%	0.10%
2013				
Daily	.03	.937	−0.12%	0.65%
Weekly	.01	.984	−0.12%	0.65%
20 day	.04	.910	−0.06%	0.08%

*$p = .10$.

one category of risk tolerance (e.g., low, below-average, high) to another.

If fluctuations in risk tolerance scores do not necessitate changes in most people's household financial plans, then why do financial counselors and planners witness sometimes odd behavioral changes in clients who are experiencing dramatic market volatility? Merkle and Weber (2014) reported that higher risk expectations lead to decreases in risk tolerance in terms of volatility among investors, whereas lower risk expectations have the opposite effect. They also found evidence that investors counteract changes in market volatility by reducing their portfolio risk relative to the market. The change in risk tolerance may also be related to the change in wealth during the Great Recession. It is likely that households who reported a decrease in risk tolerance may have experienced a decrease in wealth, whereas households who reported an increase in risk tolerance may have experienced an increase in wealth. Necker and Ziegelmeyer (2014) found that among German households who attributed losses in wealth to the Great Recession, many reported a decreased risk tolerance, whereas those who did not attribute losses to the global financial crisis reported no change in risk tolerance. Shin and Hanna

Figure 2. Risk tolerance and yearly volatility correlation coefficients.



(2015) reported that minority investors seem to react more strongly to Great Depression than White investors because the minority investors are more risk averse (Hanna, Wang, & Yuh, 2010).

Another potential source of behavior change is the notion of loss aversion. Benartzi and Thaler (1995) found that loss aversion amplifies risk aversion in standard utility models leading to inconsistent preferences. For example, the level of investor loss aversion fluctuates depending on prior investment performance (Barberis et al., 2001). Findings reported by Barberis et al. (2001) suggest that after prior gains, an investor may become more risk tolerant and, conversely, after prior losses, the same investor may become more risk averse. Therefore, financial counselors and planners may find it useful to monitor market performance as a precursor to client discussions about risk and risk taking. Negative performance may cause a client to become increasingly loss averse, which can lead to a reduced willingness to hold risky asset (e.g., equities).

Shifts in risk tolerance witnessed during periods of market volatility may also be because of several behavioral finance biases that cause investors to misjudge environmental cues. For example, Chatterjee (2015) reported that false confidence is a predictor of volatility in stock holdings within one's portfolio. False confidence has been found to increase investments following years of strong equity performance followed by decreased investments during periods following low returns. Rather than changing portfolio holdings because of a change in willingness to take risk, overconfident investors may be falling prey to a recency bias. This bias causes investors to ignore the actual risks inherent in a situation and instead conclude that the recent past will continue into the future. Yao and Curl (2011) reported that the fluctuation of risk tolerance in relation to market returns may be because of projection bias and the recency effect. Significant volatility may create a psychological marker that prompts behavioral change even though the underlying willingness of the investor to take risk remains unchanged.

Limitations and Future Research

Although the findings from this study are noteworthy, it is important to evaluate the results within the context of the sample. The data were obtained from an open-access Internet survey. It is possible that a response bias was present in the data and that respondents did not represent the typical investor. It is also possible that a self-selection bias existed in relation to those who completed the survey. Readers need to remember that the measure of risk tolerance used in this study was designed to measure a person's willingness to take financial risk. It is possible that had a measure of loss aversion been used, a different result might have been found. In addition, it should be noted that the measure of risk tolerance used in this study was limited in its ability to suggest any particular portfolio allocation for a given level of risk tolerance score. Finally, results may have differed had other measures of volatility been used or had the volatility measurement periods been different. Regardless of these potential limitations, however, this research does

Figure 3. Variation in the observed relationships compared to the hypothesized associations.

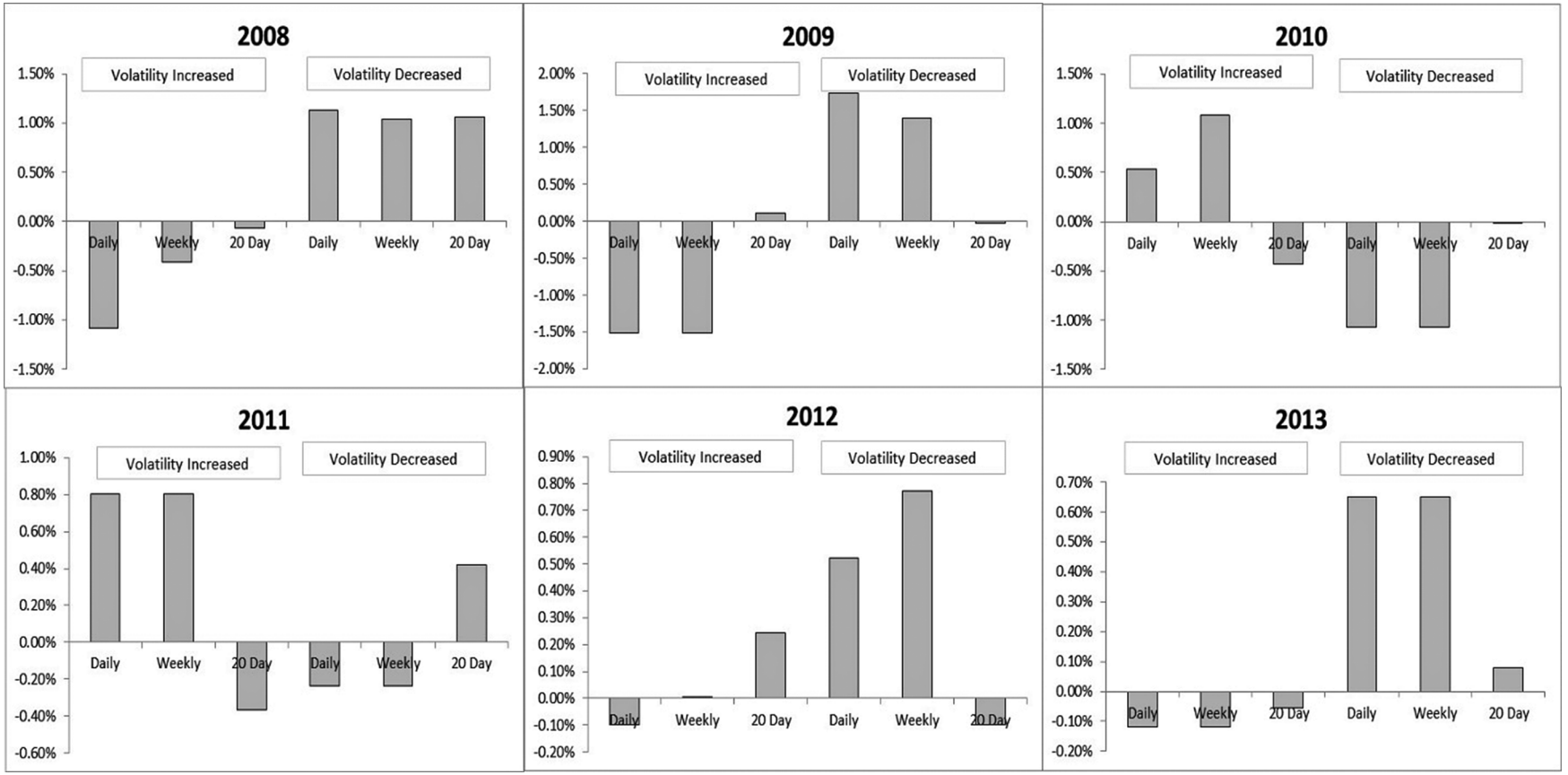
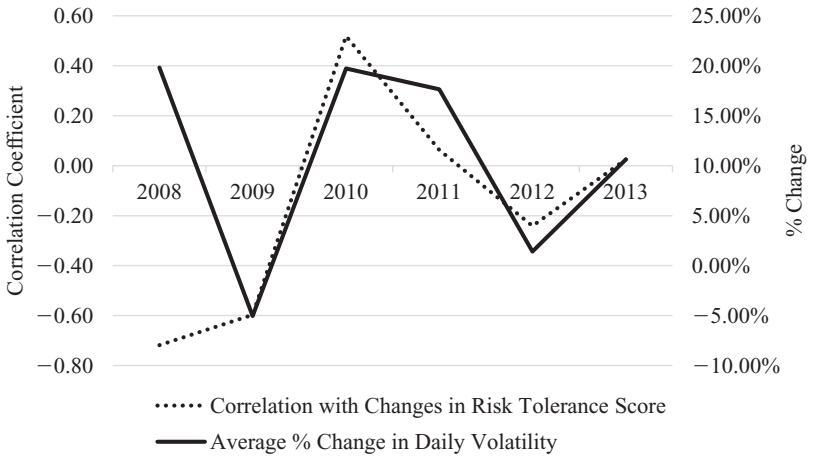


Figure 4. Comparison of risk tolerance scores and daily volatility correlations and percentage changes.



add to the existing literature by both confirming that risk attitudes do appear to shift in relation to the market environment and that such changes are most often very modest.

Future studies should be conducted to verify the results presented in this article. Specifically, it would be useful to compare shifts in risk tolerance based on the socioeconomic profile of respondents. In this study, for example, respondents included the very young and very old and those who owned and did not own securities. Based on the baseline data reported here, follow-up studies can be conducted to compare results of targeted samples, including pre- and postretirees, those who hold significant equity positions, and those just beginning their careers. It may be that risk tolerance varies not only by market conditions but also by the way those sharing certain socioeconomic characteristics view the markets.

Implications for Financial Counselors and Planners

The findings from this research have several important implications for financial counselors and planners. First, during a period of market volatility, financial counselors and planners should assume that the willingness of their clients to invest aggressively will change. In general, increased volatility appears to dampen risk tolerance, whereas decreased volatility increases risk tolerance. Second, it is important for financial counselors and planners to remember that multiple factors may be at play when clients alter their financial behavior in the context of market volatility. Although risk tolerance may shift, the actual magnitude of such a change is unlikely to be large enough to warrant a significant modification in someone's household financial plan. It is more likely that other behavioral biases are at play. As such, it is important for financial counselors and planners to develop techniques to evaluate potential behavioral biases and intervention techniques to ensure that biases do not unduly influence client decisions.

Financial counselors and planners may wish to incorporate aspects of behavioral portfolio theory (BPT; Shefrin & Statman, 2000) into their practice. A working assumption within BPT is that portfolio allocations may be based on a combination of "insurance" (protection against losses) and "lotteries" (small odds of a large gain). According to this theory, investors consider their portfolios as pyramids of goal-based mental accounts and have as many risk attitudes as mental accounts (Shefrin & Statman, 2000). Griesdorn, Lown, DeVaney, Cho, and Evans (2014), in their investigation of how self-control, mental accounting, and framing are related to risk tolerance, found a significant positive association between mental accounting and risk tolerance. They reported that the use of mental accounts is common among low- to moderate-income households, but their usage does not appear to influence household risk tolerance unless the household owns a brokerage account. If true, this means that the impact of market fluctuations may influence a client in multiple ways. When thinking about retirement assets, one client may move to protect a portfolio from losses. At the same time, the client may make unreasonably large bets with more speculative money. Behavioral finance

technique, such as framing, can be used to successfully predict risk tolerance (Griesdorn et al., 2014). Financial counselors and planners should counsel clients to evaluate their financial assets with the widest "frame" possible and avoid focusing on individual securities, instruments, or accounts. Financial management and portfolio discussions should be framed in terms of long-term goals and each client's total wealth picture.

Another useful tool may be to implement precommitment strategies to help clients formalize their household financial management objectives and requirements in a written investment policy statement (IPS) to help them make optimal long-term decisions (Winchester, Huston, & Finke, 2011). Laibson (1997) noted that individuals often forsake their long-term goals for instant gratification. Precommitment in this context can be thought of as a strategy where an individual with a conflict between present and future objectives can strengthen their position by cutting off options for instant gratification. The "Save More Tomorrow" strategy suggested by Thaler and Benartzi (2004) is an example of a precommitment strategy where individuals commit in advance to allocating a portion of their future salary increase toward retirement savings. As markets move and emotions take hold, the IPS, coupled with some precommitment strategies, can help prevent people from making snap judgments.

Financial counselors and planners should also visit with their clients about the concept of risk tolerance, how risk tolerance is measured, and why risk tolerance is important when making household financial management decisions. This is especially important in light of the call for increased diligence because of market volatility. Financial professionals can assist clients in maintaining a sense of perspective during market volatility and keep a long-term focus by reminding the client of the written IPS that was signed to help them accomplish their long-term goals. A long-run strategy that reduces the temptation to buy high and sell low can be a significant source of value provided by a financial counselor or planner (Guillemette & Finke, 2014).

References

Barber, B., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, *116*, 261–292.

Barberis, N., Huang, M., & Santos, T. (2001). Prospect theory and asset prices. *Quarterly Journal of Economics*, *116*, 1–53.

Barsky, R. B., Juster, F. T., Kimball, M. S., & Shapiro, M. D. (1997). Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *Quarterly Journal of Economics*, *112*, 537–579.

Benartzi, S., & Thaler, R. (1995). Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics*, *110*, 73–92.

Bhattacharya, U., Hackethal, A., Kaesler, S., Loos, B., & Meyer, S. (2012). Is unbiased financial advice to retail investors sufficient? Answers from a large field study. *Review of Financial Studies*, *25*, 975–1032.

Chatterjee, S. (2015). *False confidence, stock market participation, and wealth accumulation of households: An examination*. Retrieved from http://ssrn.com/abstract=2566622

Clarke, R. G., & Statman, M. (1998). Bullish or bearish? *Financial Analysts Journal*, *54*, 63–72.

Davies, G. B., & Brooks, P. (2013). Risk tolerance: Essential, behavioural and misunderstood. *Journal of Risk Management in Financial Institutions*, *7*, 110–113.

Friesen, G., & Sapp, T. (2007). Mutual fund flows and investor returns: An empirical examination of fund investor timing ability. *Journal of Banking and Finance*, *31*, 2796–2816.

Gilliam, J., Chatterjee, S., & Grable, J. (2010). Measuring the perception of financial risk tolerance: A tale of two measures. *Journal of Financial Counseling and Planning*, *21*(2), 30–43.

Glumov, D. (2013). How did the great financial crisis affect portfolio allocations and attitudes towards risk? Evidence from the "Survey of Consumer Finances." Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2293189

Grable, J. E., & Joo, S.-H. (2004). Environmental and biopsychosocial factors associated with financial risk tolerance. *Journal of Financial Counseling and Planning*, *15*(1), 73–82.

Grable, J. E., & Lytton, R. H. (1999). Financial risk tolerance revisited: The development of a risk assessment instrument. *Financial Services Review*, *8*, 163–181.

Grable, J. E., & Lytton, R. H. (2001). Assessing the concurrent validity of the SCF risk tolerance question. *Journal of Financial Counseling and Planning*, *12*(2), 43–53.

Grable, J. E., & Rabbani, A. G. (2014). Describing risk tolerance: Does a risk characterization portrait exist? *Journal of Financial Counseling and Planning*, *25*(2), 174–183.

Grable, J. E., Lytton, R. H., & O'Neill, B. (2004). Projection bias and financial risk tolerance. *The Journal of Behavioral Finance*, *5*, 142–147.

Grable, J. E., Lytton, R. H., O'Neill, B., Joo, S-H., & Klock, D. (2006). Risk tolerance, projection bias, vividness and equity prices. *Journal of Investing*, *15*(2), 68–74.

Griesdorn, T., Lown, J., DeVaney, S., Cho, S., & Evans, D. (2014). Association between behavioral life-cycle constructs and financial risk tolerance of low-to-moderate -income households. *Journal of Financial Counseling and Planning*, *25*(1), 27–40.

Gron, A., & Winton, A. (2001). Risk overhang and market behavior. *The Journal of Business*, *74*, 591–612.

Guillemette, M. A., & Finke, M. (2014). Do large swings in equity values change risk tolerance. *Journal of Financial Planning*, *27*(6), 44–50.

Guillemette, M. A., Finke, M., & Gilliam, J. (2012). Risk tolerance questions to best determine client portfolio allocation preferences. *Journal of Financial Planning*, *25*(5), 36–44.

Guiso, L., Sapienza, P., & Zingales, L. (2013). *Time varying risk aversion* (NBER Working Paper No. 19284). Retrieved from http://www.nber.org/papers/w19284

Hanna, S. D., Fan, J. X., & Chang, R. (1995). Optimal life cycle savings. *Journal of Financial Counseling and Planning*, *6*(1), 1–15.

Hanna, S. D., Wang, C., & Yuh, Y. (2010). Racial/ethnic differences in high return investment ownership: A decomposition analysis. *Journal of Financial Counseling and Planning*, *21*(2), 44–59.

Hariharan, G., Chapman, K. S., & Domian, D. L. (2000). Risk tolerance and asset allocation for investors nearing retirement. *Financial Services Review*, *9*, 159–170.

Hoffmann, A. O. I., Post, T., & Pennings, J. M. E. (2013). Individual investor perceptions and behavior during the financial crisis. *Journal of Banking & Finance*, *37*, 60–74.

Hung, A. A., Clancy, N., Dominitz, J., Talley, E., Berrebi, C., & Suvankulov, F. (2008). *Investor and industry perspective on investment advisers and broker-dealers: Technical report*. Santa Monica, CA: RAND Institute for Civil Justice.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics*, *112*, 443–477.

Merkle, C., & Weber, M. (2014). Do investors put their money where their mouth is? Stock market expectations and investing behavior. *Journal of Banking & Finance*, *46*, 372–386.

Necker, S., & Ziegelmeyer, M. (2014). *Household risk taking after the financial crisis* (MEA Discussion Paper Series No. 14279). Munich, Germany: Munich Center for the Economics of Aging at the Max Planck Institute for Social Law and Social Policy.

Pan, C. H., & Statman, M. (2012). Questionnaires of risk tolerance, regret, overconfidence, and other investor propensities. *Investment Consulting*, *13*(1), 54–63.

Roth, A. S. (2013). *Why risk tolerance questionnaires don't work?* Retrieved from https://www.financial-planning .com/news/why-risk-tolerance-questionnaires-dont-work

Roth, B., & Voskort, A. (2014). Stereotypes and false consensus: How financial professional predict risk preferences. *Journal of Economic Behavior & Organization*, *107*, 553–565.

Sahm, C. R. (2007). *How much does risk tolerance change?* Washington, DC: Federal Reserve Board.

Shefrin, H. (2000). *Beyond greed and fear: Understanding behavioral finance and the psychology of investing*. Cambridge, MA: Harvard University Press.

Shefrin, H., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance*, *40*, 777–790.

Shefrin, H., & Statman, M. (2000). Behavioral portfolio theory. *Journal of Financial and Quantitative Analysis*, *35*, 127–151.

Shin, S. H., & Hanna, S. D. (2015). Decomposition analyses of racial/ethnic differences in high return investment ownership after the Great Recession. *Journal of Financial Counseling and Planning*, *26*(1), 43–62.

Sung, J., & Hanna, S. (1996). Factors related to risk tolerance. *Journal of Financial Counseling and Planning*, *7*(1), 11–19.

Thaler, R. H., & Benartzi, S. (2004). Save more tomorrow: Using behavioral economics to increase employee saving. *Journal of Political Economy*, *112*(Suppl. 1), S164–S187.

Thaler, R. H., & Johnson, E. J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science*, *36*, 643–660.

Van de Venter, G., Michayluk, D., & Davey, G. (2012). A longitudinal study of financial risk tolerance. *Journal of Economic Psychology*, *33*, 794–800.

Walls, M. R., & Dyer, J. S. (1996). Risk propensity and firm performance: A study of the petroleum exploration industry. *Management Science*, *42*, 1004–1021.

Weber, M., Weber, E. U., & Nosic, A. (2013). Who takes risks when and why: Determinants of changes in investor risk taking. *Review of Finance*, *17*, 847–883.

Weinstein, S. (1988). *Secrets for profiting in bull and bear markets*. Burr Ridge, IL: Irwin.

Wilder, J. W. (1978). *New concepts in technical trading systems*. Greensboro, NC: Trend Research.

Winchester, D. D., Huston, S. J., & Finke, M. S. (2011). Investor prudence and the role of financial advice. *Journal of Financial Service Professionals*, *65*(4), 43–51.

Yao, R., & Curl, A. L. (2011). Do market returns influence risk tolerance? Evidence from panel data. *Journal of Family Economic Issues*, *32*, 532–544.

Yao, R., Hanna, S. D., & Lindamood, S. (2004). Changes in financial risk tolerance, 1983–2001. *Financial Services Review*, *13*, 249–266.