

Vanguard®

Equity risk and time: A survey of U.S. investors

Vanguard research

May 2010

Executive summary. Does stock market risk decline with the passage of time? Three in 10 equity investors have a strong belief that it does, while 6 in 10 equity investors take a measured or skeptical view of the idea. Beliefs about market risk and time are strongly linked to portfolio risk, trading behavior during volatile markets, and expectations for future returns.

Overconfident investors. Thirty-one percent of stock market investors believe the stock market “always” outperforms safe investments over a fixed holding period. These overconfident investors are more likely to be male, affluent, and college- or graduate school-educated. They are more likely to invest in the stock market generally and more likely to hold equity allocations of 60% or more. During the 2008–2009 market downturn, overconfident investors were more likely to engage in market-timing behavior (selling out of stocks entirely) or contrarian behavior (increasing equity exposure in falling markets). Their expectations for future market returns are also above average.

Authors

John Ameriks, Ph.D.
Anna Madamba, Ph.D.
Stephen P. Utkus

Measured investors. Forty-two percent of equity investors believe that stocks “generally” outpace safe investments over a fixed period. Measured investors are more likely to be college- or graduate school-educated and have higher asset levels, with men and women more equally represented. They are more likely to be stock market participants and hold more aggressive equity allocations. Measured investors are likely to be either under age 30 or in their 70s—perhaps reflecting age-based experiences with weaker stock markets. They also were less likely to reduce equity exposure during the downturn.

Skeptical investors. Around one-fifth of investors view equities as inherently risky no matter how long the equities are held. These “skeptical” investors are associated with a mix of characteristics typically associated with either low financial experience (lower income, lower wealth) or greater financial experience (higher income, graduate education). They are disproportionately female. Skeptical investors are less likely to invest in stocks or to hold more aggressive allocations when they do. They were more likely to reduce equity holdings during the market decline, and they have below-average expectations for future market returns.

Implications. Our survey suggests that stock market behaviors and expectations are strongly linked to beliefs about the relationship between time horizon and the riskiness of stocks. These findings may be helpful in investor literacy programs. For overconfident investors, such as affluent male investors who maintain aggressive allocations or engage in market-timing, education efforts might focus on challenging the belief that stocks always provide superior returns over long horizons. For less experienced investors—such as low-wealth households that do not invest in equities, or 401(k) participants invested in their plan’s default fund, who may not understand equity market risk—investor education might present a balanced picture of return and risk. In particular, stock market education efforts should point out that, in the past, long-term investors in stocks have been rewarded with higher returns over many periods. Yet stocks remain risky no matter the time horizon, and there is no guarantee that stocks will provide superior returns simply because they are held for a long period.

Introduction

A long-standing debate in the investment community has centered on whether stock market risk is in some way reduced over time. This principle is sometimes known as “time diversification.” It is reflected in the common catch phrase “stocks for the long run”—meaning the longer equity investors hold their investment, the more likely it is that the return on their equity holdings will exceed the return from safer investments like bonds or cash.¹

To date, this debate has centered exclusively on an analysis of the long-term return data available from U.S. and global stock markets. In a 2009 survey of U.S. investors, we sought to address the issue from a different perspective by cataloging the actual beliefs U.S. investors hold about the risks of stocks over time. Moreover, we sought to understand the relationship between these beliefs and a variety of investment behaviors, including the decision to invest in the stock market in the first place (the market participation decision), the proportion invested in stocks (the asset allocation decision), and trading behavior during the 2008–2009 market decline.

Our results are drawn from a national survey of 3,012 U.S. investors. The survey was conducted in May and June 2009, shortly after the onset of a recovery in global stock prices that began in March 2009. The survey was based on a nationally representative sample of investors ages 21 to 79 who have at least \$5,000 in long-term savings or investments. An earlier report describes our initial findings from the survey. The survey methodology is described in Appendix I.²

This report begins with a discussion of risk and time in equity markets. It then summarizes the beliefs held by U.S. investors, and how those beliefs are related to a variety of investment behaviors. Finally, we discuss the implications of this research for investor literacy programs.

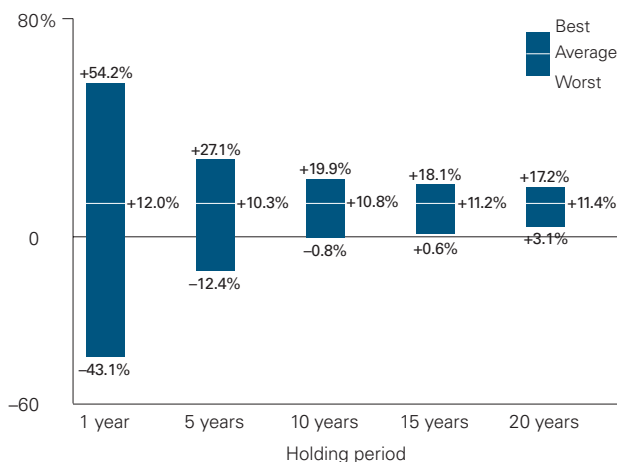
The risk and time debate

There are two opposing lines of thinking about the possible relationship between stock market risk and time. Proponents of time diversification believe that market risk declines with longer investment holding periods. Opponents believe that stocks are risky regardless of how long they are held.

Perhaps the best-known illustration of the time diversification principle is a chart showing the range of historic U.S. stock market returns over various holding periods (Figure 1). The most salient feature of this data is that the range of returns narrows over longer holding periods, thereby showing less risk or volatility in annualized returns with time.

For example, examining one-year periods over the 1926–2009 time frame, we see that the broad U.S. stock market rose 54.2% in its best year (1933), and declined 43.1% in its worst year (1931), a difference of nearly 100 percentage points.³ By comparison, when examining 20-year periods, we see that U.S. stocks produced an average annual return of 17.2%

Figure 1. Holding period returns on U.S. stocks



Note: Calendar year returns on Standard & Poor's 500 Index, 1926–1974, and Dow Jones Wilshire 5000 Index, 1975–2009. Past performance is no guarantee of future results. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

Source: Vanguard, 2010.

1 The time diversification argument is summarized in Bennyhoff (2008). See also Kritzman (2003), Samuelson (1994), and Bodie (1995).

2 For our initial findings on the survey, and a complete discussion of the survey methodology, see Ameriks, Madamba, and Utkus (2009).

3 These figures use calendar year returns for simplicity's sake.

per year over the best 20-year period (1979–1998) versus a return of 3.1% per year over the worst 20-year period (1929–1948), a difference of around 14 percentage points per year. Given the narrower range of annualized returns over time, an advocate of the time diversification view would argue that, as holding periods increase, a diversified stock portfolio is more likely to generate a positive return that outpaces safer investments.

By contrast, critics of time diversification argue that time has no special moderating effect on stock market returns. They point to the cumulative impact of returns as a better measure of the inherent risks of equities. For instance, a \$10,000 lump sum invested in stocks during the best 20-year period for stocks (1979–1998) would have grown to more than \$239,000, based on a 17.2% average annual return (Figure 2, panel A). In the

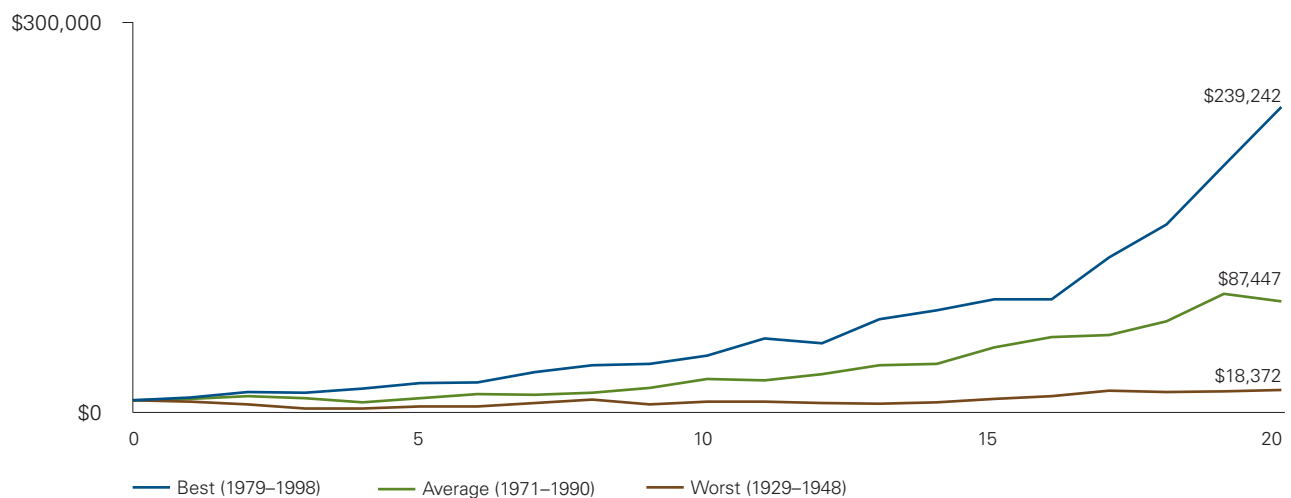
worst period (1929–1948), that same \$10,000 lump sum would have grown to just over \$18,000, based on returns of 3.1% per year.

Viewed from this standpoint, the difference between best and worst wealth outcomes is a factor of 13 (Figure 2, panel B). Critics of time diversification would emphasize that these differences in wealth outcomes become more extreme with time. The best one-year wealth outcome is only about three times the worst one-year wealth outcome, versus 13 times over 20 years. This difference factor grows with time. In this sense, risk increases, not decreases, with time. For the opponents of time diversification, this dispersion of wealth outcomes, and the growing disparity between best- and worst-case outcomes, is more representative of the inherent risks of equities.

Figure 2. Stock market wealth over time

Assuming a \$10,000 lump sum investment

A. Growth of \$10,000 lump sum over 20 years



B. Growth of \$10,000 lump sum over various periods

	Holding period				
	1 year	5 years	10 years	15 years	20 years
Best period	\$15,420	\$33,116	\$61,606	\$121,365	\$239,242
Average	11,196	16,289	27,955	49,081	86,889
Worst period	5,687	5,154	9,182	11,014	18,372
Best versus worst period	2.7	6.4	6.7	11.0	13.0

Note: Balances shown do not reflect the impact of investment fees and expenses or taxes. Calendar year returns on Standard & Poor’s 500 Index, 1926–1974, and Dow Jones Wilshire 5000 Index, 1975–2009. Average period in Panel A is an example of one representative period with average returns; averages in Panel B are for all periods. This hypothetical example does not represent the return on any particular investment.

Source: Vanguard, 2010.

The dilemma facing investors is that they do not know whether they will be investing over a “best,” “worst,” or “average” period. This risk is sometimes referred to as “cohort risk”—the risk that equity returns depend on the particular time period over which a specific group of individuals has invested.

For example, consider stock market investors with a ten-year horizon (Figure 3, panel A). In the past, a broad stock market investment has:

- Underperformed bonds by more than 7% per year for the ten years ended 2009.
- Outperformed bonds by more than 4% per year for the ten years ended 2004.

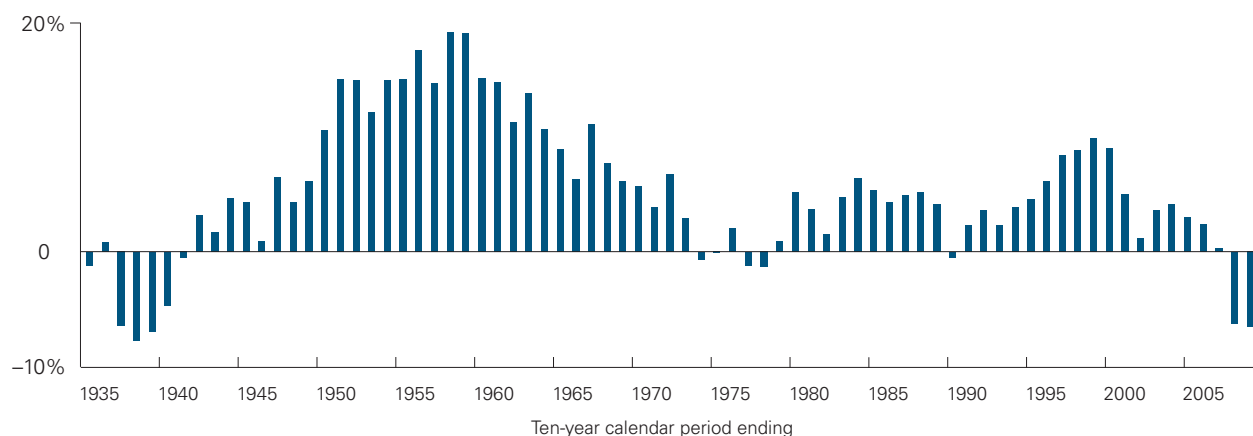
- Outperformed bonds by more than 10% per year for the ten years ended 1999.

Similarly, over 20-year periods, stocks in the past have (Figure 3, panel B):

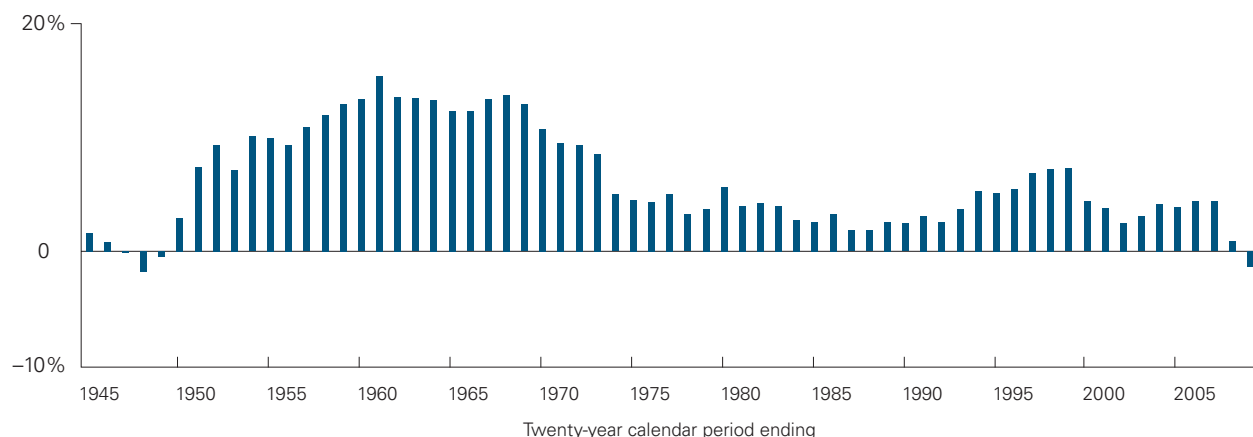
- Outperformed bonds by less than 1% per year for the 20 years ended 2008.
- Outperformed bonds by nearly 4% per year for the 20 years ended 2005.
- Outperformed bonds by about 7% per year for the 20 years ended 1999

Figure 3. Equity risk premium over various periods

A. Equity risk premium (stocks less bonds) over 10-year periods



B. Equity risk premium (stocks less bonds) over 20-year periods



Note: Calendar year returns on Standard & Poor's 500 Index, 1926–1974, and Dow Jones Wilshire 5000 Index, 1975–2009, for stocks; Vanguard corporate bond index, 1926–1975, and Barclays Aggregate Bond Index 1976–2009, for bonds.

Source: Vanguard, 2010.

In all cases, relatively modest changes in the end dates of the holding period—from 2005 to 2008, for example—result in large differences in realized returns.

In the end, the time diversification debate can be restated as a debate over opposing views of risk. Supporters of the time diversification perspective perceive risk as the chance that an equity portfolio will underperform a low-risk portfolio. The historic record suggests that such risk declines with time. Critics of time diversification perceive risk as variations in the final wealth value of a portfolio and uncertainty about the returns investors will experience during specific time periods. The historic record suggests that the range of such outcomes, from best to worse, widens with time.⁴

Investor beliefs

What do American investors believe about the risks of equities over time? Among stock market investors (about 75% of our survey respondents), 31% have what we would call a “strong form” belief in time diversification, believing that “stocks always do better than safer investments” over a fixed period (Figure 4, second column). More than half of this group believes that stocks always outperform over five or ten years, despite the fact that U.S. and global equities have underperformed safer investments over the past decade. As a result, we refer to this group as “overconfident” investors, although not all in this group are necessarily overconfident.⁵

Figure 4. Stock market and time question

Which of the following statements best reflects your view of the risks of the stock market investing and the time horizon you have to invest?

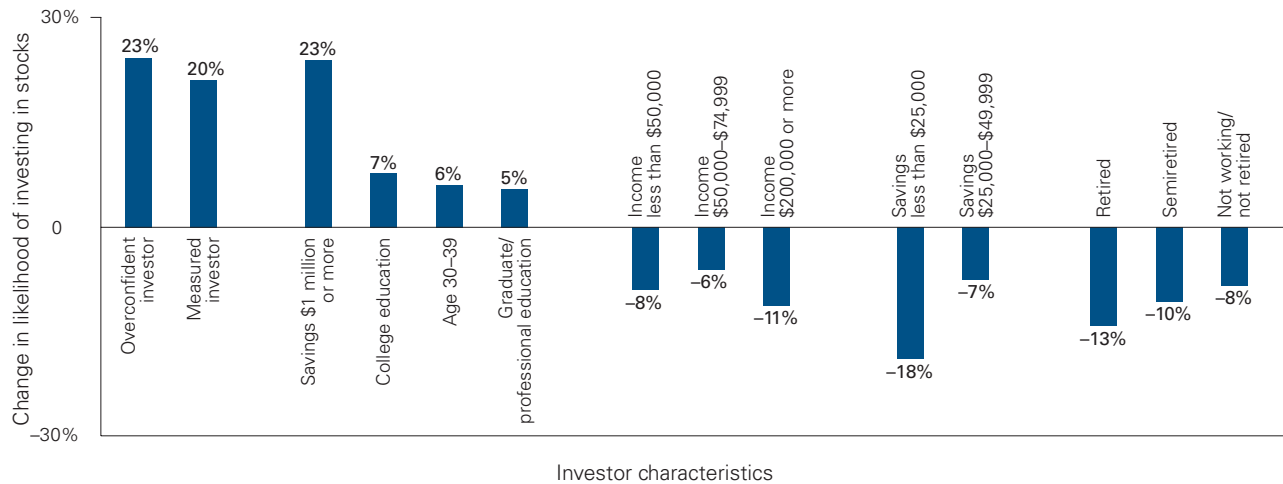
	Among all respondents (n=3,012)		Among stock market investors (n=2,244)	
	Percentage	Category total	Percentage	Category total
Stocks <i>always</i> do better than safe investments if you invest for . . .				
5 years	4%		4%	
10 years	11		13	
15 years	5		6	
20 years	6	26%	8	31%
Stocks <i>generally</i> do better than safe investments if you invest for . . .				
5 years	9%		10%	
10 years	14		15	
15 years	5		6	
20 years	9	37%	11	42%
Stocks are risky no matter how long you invest				
	24%	24%	18%	18%
Not sure				
	13	13	9	9
Total				
	100%	100%	100%	100%
<i>Subtotal: Stocks “always” or “generally” do better</i>				
	63%		73%	
<i>Subtotal: Stocks do better over 5 or 10 years</i>				
	38%		42%	

Source: Vanguard, 2010.

- 4 These arguments, whether in favor of time diversification or against it, are based on the historic pattern of equity returns. A related risk, although tangential to our current study, is that the historic pattern of returns is not representative of the future because of possible fundamental changes in the economy or financial markets. This risk remains, regardless of whether an investor adheres to the time diversification argument or not.
- 5 The use of “overconfident” may be an overstatement because some investors in this group believe more realistically that stocks outpace investments only over long periods such as 15 or 20 years. However, we also drew the “overconfident” label from their demographic characteristics, since affluent, educated, and wealthy men have been associated with overconfidence in portfolio trading studies.

Figure 5. Stock market participation

Marginal effects associated with being a stock market investor (n=2,244)



Note: All factors shown are statistically significant at the 5% or 1% level. For a complete list of variables and reference categories, see Appendix II.

Source: Vanguard, 2010.

A second group of households, 42% of all stock investors, has what we refer to as a more “measured” view of the risks of stocks over time. They believe that “stocks generally do better than safe investments” over certain holding periods. Again, a time horizon of five or ten years is the most popular, although investor views encompass longer periods as well.

Finally, 18% of stock market investors believe that stocks are “risky no matter how long” they are held, while 9% are unsure about the time and risk properties of the stock market. These are our “skeptical” and “unsure” investor groups, respectively.

These beliefs about risk and time are strongly linked to the decision of a household to invest any savings in the equity market. We examined households’ market participation decisions using a statistical model described in more detail in Appendix II. The regression considers whether households reported investing any of their long-term savings in stocks.

In our survey, 75% of respondents were stock market investors. In our regression model, being an overconfident or measured investor was associated with an increase of 23 and 20 percentage points, respectively, in the probability of investing any savings

in stocks (Figure 5). That’s a relative increase of about one-third (i.e., 23 divided by 75). The effects of being an overconfident or measured investor were similar to those of being very wealthy: Having \$1 million or more in financial assets increased the probability of stock ownership by 23 points. These effects were also substantially larger than the effects of education: A college degree increased the probability of stock ownership by 7 points; graduate school by 5 points.

Prior research on market participation has linked education and wealth levels to stock ownership. Our results suggest that beliefs about risk and time have an independent and powerful relationship to stock market participation. Indeed, having an overconfident or measured view of risk and time has just as significant an effect on stock ownership as being a millionaire.

Investor demographics

How do these investor groups differ demographically? One important distinction is in the gender of the respondents (Figure 6, page 8). Among overconfident investors, 70% are male, 30% female. Among skeptical investors, it is about half and half. Education is also important. Overconfident and measured investors are more likely than skeptical or unsure investors to have college or graduate training.

Figure 6. Investor demographics

Stock market investors (n=2,244)

	Investor type			
	Overconfident	Measured	Skeptical	Unsure
Percentage of investors	31%	42%	18%	9%
Sex				
Male	70%	58%	48%	44%
Female	30	42	52	56
Total	100%	100%	100%	100%
Age				
< 30	11%	12%	7%	12%
30–39	17	17	16	18
40–49	23	22	24	27
50–59	25	22	28	19
60–69	17	16	16	18
70–79	7	11	9	6
Total	100%	100%	100%	100%
Income				
< \$75,000	30%	33%	44%	41%
\$75,000–\$149,999	49	45	38	31
\$150,000+	12	11	10	7
Missing	9	11	8	21
Total	100%	100%	100%	100%
Education				
High school or less	24%	24%	37%	34%
Some college (2 year)	26	22	31	36
College (4 year)	30	31	20	20
Graduate school	20	23	12	10
Total	100%	100%	100%	100%
Savings/Investments				
< \$25,000	12%	16%	17%	20%
\$25,000–\$99,999	27	22	28	20
\$100,000–\$249,999	18	17	16	14
\$250,000–\$500,000	17	14	7	5
> \$500,000	14	15	10	6
Missing	12	16	22	35
Total	100%	100%	100%	100%
Household status				
Married/partnered	80%	76%	78%	79%
Single/widowed/other	20	24	22	21
Total	100%	100%	100%	100%

Source: Vanguard, 2010.

We examined the independent effects of these demographic elements on investor type using a statistical model described in Appendix II. Our three main investor types can be arrayed in a spectrum based on gender, education, wealth, and income levels.

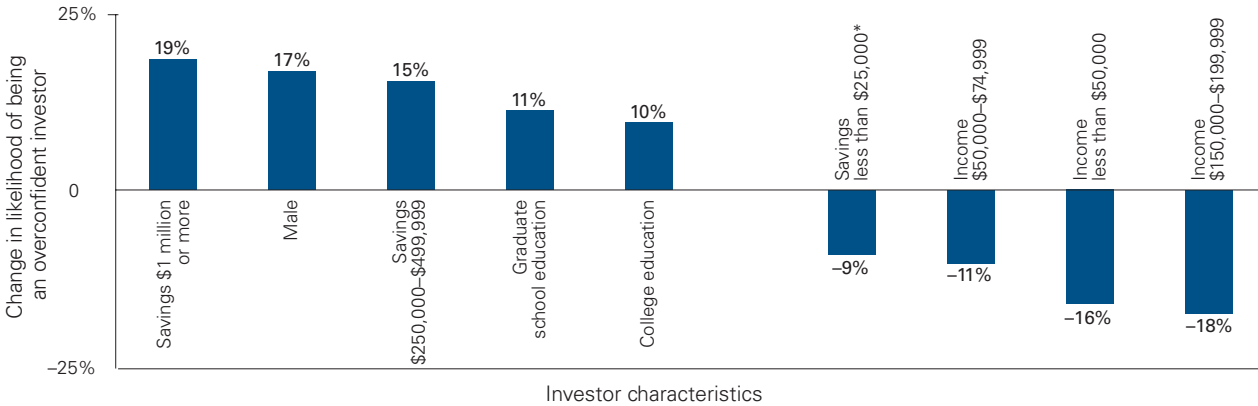
Overconfident investors are disproportionately affluent and male, with college and graduate school education (Figure 7, panel A). For example, among the 31% of stock market investors identified as overconfident, being male increases the chances of being overconfident by 17 percentage points. That is a more than 50% relative increase (17 divided by 31).

Like overconfident investors, measured investors are also more likely to be affluent and educated (Figure 7, panel B). Yet both men and women are proportionately represented in this group. Measured investors are also more likely to be either younger (under 30) or older (age 70–79). We surmise that these age effects may in part be related to investor experience on the one hand and recent risk levels on the other—older households are more likely to be more risk averse generally, while younger investors have been investing during a particularly weak decade for equity markets.

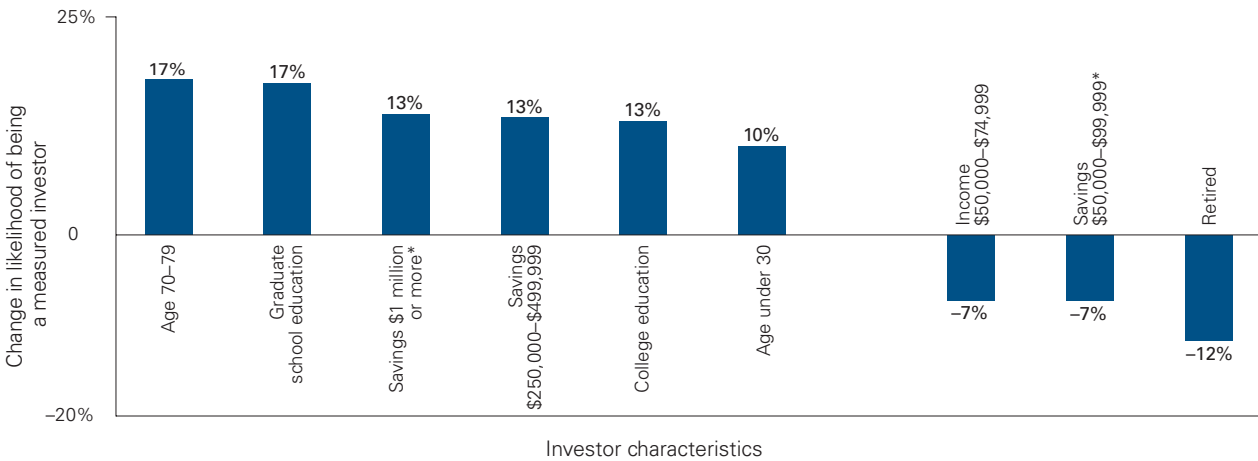
Figure 7. Overconfident and measured investors

Marginal effects associated with being a given type of stock market investor

A. Factors related to being an overconfident investor (31% of stock market investors)



B. Factors related to being a measured investor (42% of stock market investors)



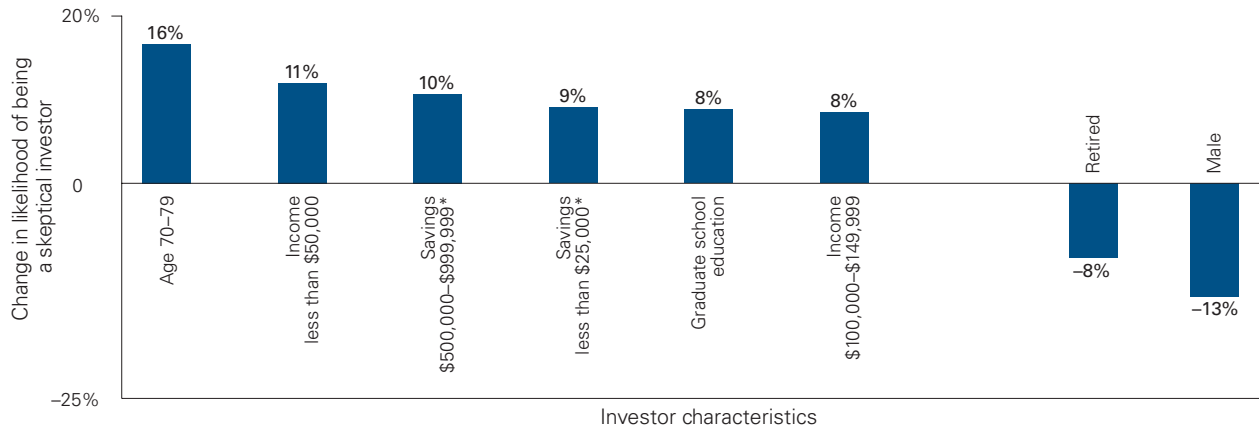
Note: All factors shown are statistically significant at the 5% or 1% level (except for * at the 10% level). For a complete list of variables and reference categories, see Appendix II.

Source: Vanguard, 2010.

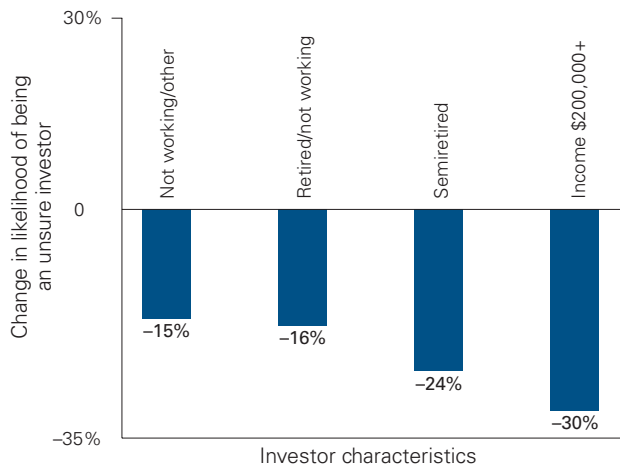
Figure 8. Skeptical and unsure investors

Marginal effects associated with being a given type of stock market investor

A. Factors related to being a skeptical investor (18% of stock market investors)



B. Factors related to being an unsure investor (9% of stock market investors)



Note: All factors shown are statistically significant at the 5% or 1% level (except for * at the 10% level). For a complete list of variables and reference categories, see Appendix II.

Source: Vanguard, 2010.

Skeptical investors are a study in contrasts (Figure 8, panel A). On the one hand, they are more likely to have lower incomes and lower wealth, factors often associated with low levels of financial literacy. On the other hand, they are more likely to have low six-figure incomes and a graduate school education, factors often linked to greater financial experience. The group is also disproportionately female. Our hypothesis is that this group consists of both a low-wealth, low-literacy group of investors, unfamiliar with or wary of the stock market, as well as a higher-income, better-educated group, with a subtle view of stock market risk and time diversification.

Finally, the small group of unsure investors (Figure 8, panel B) is characterized by a series of negative effects in our model—not being retired, not being semiretired, or not having incomes over \$200,000. In other words, they are disproportionately those who are working, with incomes below \$200,000.

Trading decisions

Investor behavior during the 2008–2009 market decline is also related to beliefs about risk and time. We related investor type (and other demographic characteristics) to the decision to increase, decrease, or sell entirely

out of equities during the 2008–2009 market decline, versus making no changes at all. Our statistical model is described in more detail in Appendix II.

Overconfident investors were more likely to be contrarian traders (Figure 9). Being overconfident was associated with a five-percentage-point increase in the chance of raising equity exposure during the downturn, as compared with skeptical investors (our reference group). Although this figure is low on an absolute basis, on a relative basis it is still meaningful. Only 18% of our respondents reported shifting more assets into equities during the market decline. As a result, a five-point change represents a relative increase of close to 30% (5 divided by 18).

Overconfident investors were also linked to what appears to be market-timing behavior. Only 2% of stock market investors report selling out of the market entirely during the downturn. But being an overconfident investor was associated with a one percentage point increase in that level—a relative increase of 50% (1 divided by 2).

Measured investors were less likely to reduce equity exposure during the downturn than skeptical investors. In total, 23% of stock market investors reduced their stock holdings in the downturn. Measured investors were less likely to do so by five percentage points. In terms of other behaviors, measured investors were

Figure 9. Changes in stock market holdings

Marginal effects of factors influencing decision to change stock holdings (n=2,244)

	Changes in stock holdings 2008–2009			
	Reduced	Sold all	Increased	No changes
Percentage of stock market investors taking action	23%	2%	18%	57%
	Likelihood of changes to stock holdings			
Overconfident investor	—	1%	5%	—
Measured investor	-5%	—	—	—
Unsure investor	-9*	—	-9*	9%*
Male	—	—	10%	-10%
Age < 30	—	1%*	15%	-15%
Age 30–39	—	1	—	—
Age 50–59	—	—	—	—
Age 60–69	12%	—	-9	9
Age 70–79	—	—	-24	24
Income \$100,000–\$149,999	—	1%	8%	-8%
Income \$150,000–\$199,999	-11%	—	—	—
Income \$200,000+	19	2	—	—
Savings < \$25,000	—	—	-10%	10%
Savings \$25,000–\$49,999	-12%	1%*	-8	8*
Savings \$50,000–\$99,999	—	—	—	—
Savings \$1 million+	—	—	14	-14
High school or less education	—	1%	—	—
College education	—	—	—	—
Graduate school education	—	—	9%	-9%
Not working	—	1%	—	—

Note: All factors shown are statistically significant at the 5% or 1% level (except for * at the 10% level). For complete list of variable and reference categories, see Appendix II.

Source: Vanguard, 2010.

just as likely as skeptical investors (our reference group) to increase or decrease equity holdings, or stay the course.

Meanwhile, unsure investors were most likely to stay the course and make no changes to their portfolios during the downturn. They were very unlikely to increase or decrease equity holdings, and so appear to be the least engaged.

Other characteristics and attitudes

Our survey asked households about portfolio characteristics as well as other market attitudes and beliefs (Figure 10, panel A). In terms of overall equity exposure, overconfident and measured investors had somewhat higher average equity allocations (57% and 56%, respectively) compared with skeptical and unsure investors (48% and 45%, respectively). Perhaps more notable is that about half of overconfident and

measured investors had 60% or more of assets invested in the stock market; for skeptical and unsure investors, it was one-third or less.

Investors were also asked about future market return expectations, which we further classified as low (less than 6% per year), medium (6% to 10% per year), or high (above 10% per year) (Figure 10, panel B). These expectations were directly linked to respondents' views of equity risk and time. Eighty-two percent of overconfident investors had medium or high return expectations. Yet only around 60% of skeptical or unsure investors had a similar outlook. The differences among the groups occurred mostly among low return expectations. Nearly 4 in 10 skeptical investors expected returns below 6%, but only about 2 in 10 overconfident investors had similar expectations.

Respondents were also asked a series of questions about stock market risk. They ranked their agreement on a scale ranging from 1 ("strongly disagree") to 5 ("strongly agree") (Figure 10, panel C). Thirty percent

Figure 10. Stock investors' characteristics and beliefs

Among stock market investors (n=2,244)

	Overconfident	Measured	Skeptical	Unsure	Total/ Average
Percentage of stock market investors	31%	42%	18%	9%	100%
<i>A. Investor characteristics</i>					
Average equity exposure	57%	56%	48%	45%	50%
Percentage with 60% or more in stocks	47	48	34	31	41
<i>B. Return expectations</i>					
Low (< 6%)	18%	23%	37%	40%	22%
Medium (6–10%)	54	53	39	34	46
High (11% or more)	28	24	24	26	23
Total	100%	100%	100%	100%	
<i>Subtotal: Medium or high expectations</i>	<i>82%</i>	<i>77%</i>	<i>63%</i>	<i>60%</i>	<i>69%</i>
<i>C. Reaction to market decline*</i>					
The risks of stocks are not worth taking	14%	11%	30%	16%	16%
Stocks are riskier than I thought	34	31	51	33	36
My retirement has been impaired by the market decline	30	31	43	32	33

* Percentage of those choosing 4 or 5 on a 1 to 5 scale of agreement.
Source: Vanguard, 2010.

of skeptical investors felt that the “risks of stocks are not worth taking” (responding 4 or 5). For other investor groups, the level of agreement with that statement was half that. Skeptical investors also were more likely to believe that the stock market was “riskier than I thought” after the 2008–2009 downturn, compared with other groups. They were also more likely to feel that their “retirement has been impaired” by the market decline.

Implications

Prior research on the decision to invest in equities has focused on the role of demographic variables, such as income, education, or wealth, on investor risk-taking. Our results suggest that beliefs about the nature of equity returns and time are strongly related to behaviors and attitudes in stock market investing. All things equal, believing in a relationship between time and stock prices is linked to a higher probability of participating in the stock market, holding a more aggressive equity allocation, trading behavior during the 2008–2009 market decline, and future expected returns.

About 3 in 10 stock market investors reported that they expected stock returns to “always” outpace safer investments over fixed horizons—that is, they are strict advocates of time diversification. Meanwhile about 6 in 10 take a more measured or skeptical view.

It is worth emphasizing that these findings are likely influenced by the timing of our survey, which was administered in May and June 2009. The views of survey respondents came not only on the heels of one of the largest declines in stock prices in modern market history, but also after a decade of negative equity market performance. In some sense, they are a worst-case or minimum estimate of investor beliefs in time diversification.

On a practical level, our findings may be useful in improving investor literacy programs, specifically those focused on improving equity decision-making. Many low-wealth households invest little or nothing in equities, while other inexperienced investors, such as 401(k) participants invested in their plan’s default fund, are likely to know little about stock market returns. For such groups, investor education might emphasize a balanced approach to stock market benefits and risks, pointing out that, in the past, long-term investors have often been compensated with higher returns from the stock market than from safer investments. But at the same time, such education efforts should note that stocks remain risky, regardless of how long they are held, and there are long periods in which they can underperform safer investments.

Conversely, plan sponsors and financial advisors are sometimes concerned with discouraging excessive risk-taking or trading among affluent investors. One strategy might be to focus on the pitfalls of the belief that stocks always outpace safe investments over a fixed time horizon.

Appendix I. Survey methodology

Our survey respondents were drawn from an online panel managed by Harris Interactive, Inc. The survey was conducted between May 19, 2009, and June 2, 2009. Over this period, the Dow Jones Industrial Average began at 8,475, fell by 2% in subsequent days, and then returned to 8,475 on the final day of the survey. A total of 3,012 respondents completed the survey. Within this sample, a total of 2,244 respondents, or 75% of the total, indicated they were stock market investors.

Respondents were required to be between ages 21 and 79 and have at least \$5,000 in total long-term savings and investments (i.e., generally excluding transaction accounts). The survey's results were weighted to the Current Population Survey of the U.S. Census Bureau using age, income, education, gender, race/ethnicity, and region. The weightings also include a Harris-proprietary factor reflecting the propensity for certain demographic groups to be online. The weighting factors are based on both respondent and nonrespondent demographics. The result was a survey population with varying demographic characteristics in terms of age, income, total savings and investments, education levels, work status, and race/ethnicity.

Data for this survey were collected by Harris Interactive, Inc., on behalf of Vanguard. Harris Interactive was responsible for the online data collected and Vanguard was responsible for the survey design, data analysis, and reporting.

Appendix II. Regression methodology

Our regression models include bivariate logistic models of stock market participation (1=household invests any assets in the stock market; 0=otherwise); an unordered multinomial logistic regression model of types of investors (3=overconfident, 2=measured, 1=skeptical, and 0=unsure); and an unordered multinomial logistic regression of changes made during the 2008–2009 market decline (3=increased equities; 2=reduced equities; 1=sold all equities; 0=made no equity changes).

The independent variables in each model are summarized below. All regression results are weighted (see Appendix I). Full results are available from the authors.

Our regressions use dummy variables representing the following demographic factors drawn from self-reported survey responses:

- *Age*. The age variables use the following ranges: under age 30, 30–39, 40–49 (reference category), 50–59, 60–69, and 70–79.
- *Income*. The income variables use the following ranges: less than \$50,000; \$50,000–\$74,999; \$75,000–\$99,999 (reference category); \$100,000–\$149,999; \$150,000–\$199,999; \$200,000 and above; and a no response category.
- *Savings/investments*. The total savings and investments variables use the following ranges: less than \$25,000; \$25,000–\$49,999; \$50,000–\$99,999; \$100,000–\$249,999 (reference category); \$250,000–\$499,999; \$500,000–\$999,999; \$1 million and above; and a no response category.
- *Education levels*. The education variables include high school or less, 2-year (or some four-year) college (reference category), college (defined as a four-year degree), and graduate school (which includes professional degrees).
- *Household status*. The household status variables include married/partnered (reference category), and a category for single, divorced, and widowed.
- *Investor types*. The investor type variables include overconfident, measured, skeptical (reference category), and unsure.

References

Bennyhoff, Donald G. 2008. *Time Diversification and Horizon-Based Asset Allocations*. Vanguard Investment Counseling & Research. <https://institutional.vanguard.com/iip/pdf/timediversification.pdf>

Bodie, Zvi. 1995. "On the Risk of Stocks in the Long Run." *Financial Analysts Journal*. CFA Institute. May/June 1995. 51(3): 18–22.

Kritzman, Mark P. 2003. "Time Diversification." in *The Portable Financial Analyst*, 2nd edition. John Wiley and Sons, Hoboken, New Jersey. 75–84.

Samuelson, Paul A. 1994. "The Long-Term Case for Equities And How It Can Be Oversold." *Journal of Portfolio Management*. Fall: 17–18.



P.O. Box 2600
Valley Forge, PA 19482-2600

Connect with Vanguard® > www.vanguard.com

Vanguard research >

Vanguard Center for Retirement Research
Vanguard Investment Counseling & Research
Vanguard Investment Strategy Group

E-mail > research@vanguard.com

All investing is subject to risk. Investments in bond funds are subject to interest rate, credit, and inflation risk. Diversification does not ensure a profit or protect against a loss in a declining market.

Standard & Poor's 500 is a trademark of The McGraw-Hill Companies, Inc., and has been licensed for use by The Vanguard Group, Inc. Vanguard mutual funds are not sponsored, endorsed, sold, or promoted by Standard & Poor's, and Standard & Poor's makes no representation regarding the advisability of investing in the funds.

© 2010 The Vanguard Group, Inc. All rights reserved.