

Mad Cows, Mad Corn, & Mad Money: Applying What We Know About the Perceived Risk of Technologies to the Perceived Risk of Securities

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Thirty years of research has shown that the concept of risk in people's minds is complex and influenced by many factors. Lessons learned from studies on the perceived risk of technologies and activities (such as eating British beef or genetically modified food) are applied to the perceived risk of securities. How investors may be affected by qualitative dimensions of risk, affect and imagery, and socio-political attitudes and values, are highlighted. Specific recommendations are given for improving portfolio management with a qualitative, multi-dimensional, values-based approach that complements more traditional approaches to analysis of securities.

The perceived risk of agricultural, medical, engineering, and other technologies has been studied intensively for about thirty years. This body of research has shown that the concept of risk in people's minds is complex and influenced by many factors, both technical and non-technical. The present paper describes some of the main themes emerging from research on the perceived risk of technologies, highlighting lessons that may help us understand the perceived risk of securities. In order to understand why investors behave the way they do, the following questions are considered:

1. Why do the risk perceptions of experts and lay people differ?
2. What psycho-social factors might affect investors' judgments?
3. How can understanding risk perceptions help investors improve the management of their portfolios?

Understanding how people perceive risk is important because, in short, perception is reality. As the Editorial Commentary of the first issue of the *Journal of Psychology and Financial Markets* pointed out, mispricing (i.e., overvaluing the prospects of favored stocks and undervaluing those of out-of-favor stocks) "is based on investor perceptions." The tendency for non-optimal investing (e.g., to buy high and sell low) may be the behavioral expression of a perceived reality that in fact under- or over-estimates risk, in acute forms leading to bubbles and panic reactions.

From the perspective of experts, lay people seem to have trouble estimating risk accurately. Experts often

think that lay people take some risks too seriously and other risks too lightly. To understand why one threat is treated as a problem and another is not, we do not need to study risk, but people's views of risk (Stallings [1995]). Individual differences in responses to risk increase the possibility of miscommunication and misunderstanding between advisors and clients. Fortunately, the social and psychological phenomena contributing to people's perceptions of risk can be studied scientifically, just as the market indices of risk can be studied. Making the most of our ability to assess perceived risk will help us to predict how people are likely to respond to crises or opportunities that arise or to more routine policy and communication decisions we make.

While there are many factors that may influence risk perceptions, the present discussion is limited to three main areas. Described below are lessons learned about how risk perceptions are influenced by (1) risk "personality" characteristics, (2) imagery and affect, and (3) gender, race, and socio-political attitudes.

Risk "Personality" Characteristics

Traditional approaches to assessing technological risk typically reflect a narrow view of risk, customarily defined as "the chance of injury, damage, or loss" (Webster [1983]). From this perspective, the probability of an adverse event and the magnitude of its consequences are assumed to come from physical and natural processes in ways that can be objectively quantified by risk assessment. Often, expert analysts see risk of technologies as synonymous with expected mortality (e.g., Cohen [1985]). Similarly, early utility-based models of investment risk suggest that risk should be measured by variance and skewness (Cooley [1977]). Derived from engineering and economic perspectives, this traditional approach has ignored the role of socio-psychological processes in the perception of risk.

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In contrast, some social scientists reject the notion of “real” or “objective” risk and argue instead that risk is inherently subjective (Krimsky & Golding [1992], Slovic [1992]). That is, risk cannot be measured “out there,” independent of our minds and cultures. Rather, risk is a social construct, meaning different things to different people (Slovic & Gregory [1999]). Several decades of psychometric research (see Slovic [1987]) have shown that public conceptions of risk are complex, guided by qualitative features of hazards, or what could be called the “personality” characteristics of hazards. In essence, there are two main qualitative dimensions that seem to drive risk perceptions: “unknown” risk (known vs. unknown) and “dread” risk (not dreaded vs. dreaded). The unknown risk factor reflects the extent to which a hazard is unknown, unobservable, unfamiliar, and has delayed consequences. The dread risk factor reflects the extent to which a hazard is seen as dreaded, uncontrollable, fatal, not equitable, high risk to future generations, not easily reduced, involuntary, and has catastrophic potential.

While the dread and unknown risk dimensions were surmised from studies primarily of technological hazards (e.g., nuclear power), particular types of securities seem likely to reflect these elements also. For instance, new companies, such as those involved in initial public offerings (IPOs), may be considered high in unknown risk given their often limited track record. And firms involved in processes or products viewed to pose a threat to health, safety, and the environment may be considered by some investors as high in dread risk. The importance of developing knowledge about the “personality” characteristics of securities will be discussed shortly; first, however, the lessons learned from research on technologies are reviewed.

Several insights have been gleaned from examining the location of a technology in the two-dimensional space of unknown and dread risk, including predictions related to social phenomena such as the potential for the stigmatization of the technology, the desire for strict regulation, and the intensity and tone of media coverage (Slovic [1992]). To illustrate, consider how British beef and genetically modified organisms (GMOs) appear on unknown and dread risk characteristics.

British Beef

Since the mid-1990s, British beef has had features of *unknown risk* through its association with “mad cow” disease (Bovine Spongiform Encephalopathy or BSE) and variant Creutzfeld-Jacob Disease (vCJD) in humans. Many things about BSE in general and the relationship between BSE and vCJD in particular, remain unclear. Science still does not understand BSE or vCJD adequately (there is still no readily available vaccine or cure for either virus), and farmers and suppliers often do not know what parts of animals may end up in the feed or

supplements given to cows, let alone to humans. Further, the effects of a disease such as BSE in cows or variant Creutzfeld-Jacob Disease (vCJD) in humans are latent and not easily observed at first (Granot [1999]).

In addition, British beef has elements of high *dread risk*—individual consumers cannot easily control the spread of contamination and symptoms of BSE and vCJD are horrific and potentially fatal. The risk is also involuntary—unless recipients make their own meat products from their own cows they know have not been fed anything containing the meat, bone, fat, or nervous tissue derived from other ruminants, they have little choice in the matter (except to stop eating beef and beef products altogether). Also, the meat used in human food products seems to come from an uncontrollable source. That is, meat is delivered by strangers, and is processed, stored, and distributed by large companies, none of which can be influenced to any great extent by an individual consumer.

Genetically Modified Organisms

Genetic engineering provides a second example of the complexity in public reactions to technological risk. The use of GMOs in agriculture (e.g., GM corn or soy crops) presents several distinct benefits (including enhanced farming productivity, reduced pesticide use and run-off, tailored micronutrient enrichment of food, and reduced food costs for consumers). However, *unknown risk* is also salient. To some, GM foods seem very risky because they are based on relatively new science (so scientists do not have enough knowledge to estimate the risks accurately); the inadvertent introduction of harmful changes in DNA structure may not be immediately obvious (the effects may be delayed); and consumers do not necessarily know when they are exposed because they are not well-informed about which products contain GM ingredients and genetic engineering is not obvious to the casual observer. In contrast, GM medicines are seen as less risky because they are targeted at a very specific audience who is likely to be well informed (by someone considered trustworthy, such as a primary-care doctor) and likely to be expecting beneficial outcomes (Marris [2000]).

GM foods also have features of *dread risk*: Many people are exposed to them (signaling global catastrophic potential); it is the food growers who decide whether to use GM seeds or other products (such as recombinant Bovine Growth Hormone, rBGH) so consumers do not necessarily have a choice and inconsistent labeling laws mean that available choices are not always clear (involuntary exposure); the risks and benefits are not fairly distributed (currently the benefits are greatest for farmers and GMO manufacturers rather than consumers); and children are heavy consumers of some products (e.g., milk), making parents especially sensitive to potential harm to future generations. Fur-

thermore, GM foods are morally disgusting to some people: moving genes from one species to another is “not natural” and likened to “playing god” (Shepherd, Manaras, & Sparks [2000]). Consumers of GM medicines, on the other hand, are usually given the choice of whether or not to accept the treatment and will potentially benefit from their exposure.

In short, risk perception research has shown that there are reliable qualitative dimensions of hazardous activities and technologies that people consider when they assess risk. Generally, these dimensions can be reduced to dread risk and unknown risk factors, which are important predictors of consumer preferences.

The Personalities of Securities

To the extent that we can identify how individuals perceive the personalities of products or production processes, we can (1) predict the social acceptability of particular firms and their attractiveness to investors and (2) reduce miscommunications and misunderstandings between advisors and their clients facing risky options.

Social Acceptability

Predicting the social acceptability of firms and their attractiveness is important because these things impact a firm’s share price or values. Arguably, investors make optimal decisions when they are well informed about a firm’s economic fundamentals and likely collective action for or against the firm.

Fischhoff, Nadai, & Fischhoff [2001] recently presented a framework for determining the unacceptability of one group of technologies (namely, industrial activities perceived as producing risks to health, safety, and the environment) from current consumer boycotts and the screening criteria of socially responsible investment firms. While acknowledging the complexity and confounding of socio-political processes that impact behavioral fallout from the social stigmatization of firms, Fischhoff et al. argued that dimensions of the perceived risk of technologies translate into reliable patterns of principled investor behavior (to buy or avoid particular products). Given that “frankenfirms” (e.g., firms producing GM foods, hazardous waste, ozone-depleting or agricultural chemicals) are typically high in unknown and dread risk characteristics, they are most likely to be targeted by investment sanctions.

Miscommunication

Insight into the multidimensional nature of investment risk can help also in reducing miscommunications and misunderstandings between financial advisors and their clients. Different individuals may respond to different dimensions of a risk, resulting in individuals perceiving different levels of risk.

One study that adopted the psychometric method to develop a deeper understanding of how financial judgment is related to other properties or characteristics of investments was done by MacGregor, Slovic, Berry, and Evensky [1999]. They asked financial advisors (N = 265) to judge a set of 19 potential investments—from small-cap stocks to life insurance, to mutual funds to foreign bonds—on a set of 14 evaluative scales, such as how well-known each investment form is, to what degree experts can predict the long-term performance of the investment form, its volatility, and how much worry is associated with it. They found that volatility was not the sole basis for judging risk. Rather, perceived risk was largely predictable from judgments of worry and volatility (which were highly intercorrelated themselves), and the degree of knowledge about them. That is, perceived risk was judged as greater to the extent that the advisor would worry about the investment, that the investments had greater variance in market value over time, and how knowledgeable the advisor was about the investment option.

Similarly, Olsen [1977] conducted multiple studies utilizing alternative experimental designs and demonstrated that sophisticated investors have a multidimensional perceptions of investment risk. The critical dimensions included dread risk (a below-target return, the potential for a large loss, the investor’s feeling of control) and unknown risk (the level of ambiguity or knowledge about an investment). The relative importance of these dimensions was found to be a function of investor and asset characteristics. Importantly, the dimensions appeared to explain historical returns better than did historical standard deviation of the returns. Olsen and Troughton [2000] have suggested that observed market returns should reflect ambiguity premiums as well as risk premiums. Ambiguity is directly related to lack of information and lack of confidence in estimating future distributions of possible returns and the possibility of incurring a loss.

The above characterization is a very different approach to measuring risk than is used by the theoreticians who built the “efficient market hypothesis” and who typically define risk by volatility (the greater the volatility of a stock or portfolio—measured by standard deviation or beta—the greater the risk). The advantage of the volatility measure of risk is its simplicity—it is easy to use to build complex market models. The disadvantage is that it is not based on research into what investors really use to gauge the risk of stocks (Dreman [1998]) and thus fails to capture important dimensions in investors’ judgments that motivate their behavior. While professional financial advisors tend to define risks for some investment forms in terms similar to those of classical economic theory, they (like their clients) tend to perceive risk not only in terms of market factors (i.e., price variations), but also in terms of the psychological burden associated with monitoring

and evaluating an asset's ongoing performance. Thus, advisors appear to perceive and respond to financial risk in multidimensional terms, just as previous research has shown that risks to health and safety are judged along multiple qualitative dimensions.

Implications

Acknowledging the multidimensional nature of risk suggests that assessing (1) social acceptability or (2) clients' "risk tolerance" with unidimensional indices may lead to non-optimal investment strategies or communication difficulties. Since individuals (including planners and advisors themselves) may view risk with varying rich definitions, measurements that reflect a more psychologically-rich definition (as demonstrated by MacGregor et al. [1999], Olsen [1997]) would provide a better guide for judging the quality or suitability of investment types. In short, narrow, statistical definitions of risk are limited in their descriptive and predictive capacity and may lead to misunderstandings and unhappy clients. The main message from this research for financial advisors, at least for now, is that better judgments are likely with an improved understanding of what is important to specific clients and to society in general when assessing financial risk.

In addition, investors have the opportunity to capitalize on the potential market volatility created by swings in social acceptability. Social norms can change so dramatically that whole groups of companies suddenly go out of favor. Such volatility is perfect for Contrarian investors and speculators.

Overall, the psychologically rich aspects of financial risk perceptions have yet to be explored thoroughly. To what extent are perceptions of the risk of specific securities psychologically richer than technical definitions suggest? What exactly are different securities' risk personalities or profiles? To what extent can we predict risk perceptions and specific investment behavior from qualitative dimensions of securities? And how are investment decisions influenced by the *interaction* between the personalities of securities and various personality characteristics of investors? These are important empirical questions awaiting investigation.

Imagery & Affect

A second area of research on risk perception has focused on the role of imagery and affect (feelings). Unlike the traditionally narrow focus on only cognitive aspects of investment judgments (e.g., Slovic [1972]), the latest research in the field of judgment and decision making suggests that there are in fact two systems through which we can process information. This school of thought has come to be known as "dual-process theories" of thinking, knowing, and deciding. The two systems – analytic and experiential – are compared in Table 1, adapted from Epstein [1994]. Notice that one of the characteristics of the experiential system is its affective basis. Although analysis is certainly important in many decision-making circumstances, reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world.

Affective evaluation is one of the most fundamental psychological processes that people use to comprehend their world, and thus many theorists have given affect a direct and primary role in motivating behavior (Damasio [1994], Zajonc [1980]). Recent decision theory highlights the importance of what we call the affect heuristic in human judgment and decision making (Finuane, Alhakami, Slovic & Johnson [2000]). The basic idea is that objects and events are represented in peoples minds with "images" (broadly construed to include perceptual and symbolic representations) and these images are tagged to varying degrees with affect. The affective tags develop via the linking (consciously or unconsciously) of positive and negative feelings to the images through life experience. In the process of making judgments, people may consult or refer to the pool of positive and negative affective tags they have associated with the images because it can serve as a cue for the probability or consequence of an outcome.

The idea that images and affect are integral in judgments of securities is not new. In his book, Dreman [1977] quoted Le Bon [1960] in trying to explain what motivates investors during manias, such as the tulipmania of the 17th century (when people sold or exchanged the more traditional expressions of wealth like

Table 1. *Comparison of the Analytic and Experiential Modes of Thinking*

Analytic System	Experiential System
Analytic	Holistic
Logical: Reason oriented (what is sensible)	Affective: Pleasure-pain oriented
Logical connections	Associationistic connections
Behavior mediated by conscious appraisal of events	Behavior mediated by "vibes" from past experiences
Encodes reality in abstract symbols, words, and numbers	Encodes reality in concrete images, metaphors, and narratives
Slower processing: Oriented toward delayed action	More rapid processing: Oriented toward immediate action
Requires justification via logic and evidence	Self-evidently valid: "experiencing is believing"

Source: Adapted from Epstein (1994).

gold, property, and precious gems to get their hands on tulip bulbs):

A crowd thinks in images, and the image itself calls up a series of other images... a crowd scarcely distinguishes between the subjective and the objective ... These image-like ideas are not connected by any logical bond or analogy or succession and may take each other's place like the sides of a magic lantern... Crowds being only capable of thinking in images are only to be impressed by images.

And in explaining the pattern of speculative mania through images, Dreman highlighted the role of affect: "When the bubble bursts, when the 'image of the magic lantern' changes, an almost inevitable reaction sets in and the crowd becomes as extreme in its panic as it had been in its euphoria." In other words, rational deliberation is abandoned and affect takes over as people rush to sell.

Modern newspaper columns on individual investing also reflect the motivational forces of emotion. According to Clements [1997], a columnist for the *Wall Street Journal*, some financial planners set up "mad-money accounts" that clients can use to gamble on hot stocks. This approach recognizes that hope and fear, rather than rational deliberation, are key feelings driving speculative investment behaviors.¹

Recently, MacGregor, Slovic, Dreman, and Berry [2000] examined the role of affect as a quality assigned to a company or an investment opportunity (typically in the form good versus bad, attractive versus unattractive, or pleasant versus unpleasant) in various investment-related judgments. They hypothesized that affective evaluations contribute significantly to other judgments about the same stimulus object. For instance, a highly positive affective evaluation of a stock offering that is based on the stock's association with glamorous qualities of its business sector is likely to influence the judgments of the stock on other dimensions, such as how well it is managed or its long-term success prospects. Yet the actual management quality or financial goodness may have little to do with the overall worth. In other words, the image of the company may result in neglect of other, more technical information important in a sound evaluation of its overall quality. For new companies that lack a financial history, such as initial public offerings that have a very limited track record, "the image of the company and its affective evaluation may be a major basis on which potential investors make investment decisions" (MacGregor et al. [2000]).

In the MacGregor et al. [2000] study, advanced business students in a securities analysis course were asked to evaluate several industry groups represented on the New York Exchange in terms of (1) returns of the group in the past year relative to the market, (2) pre-

dicted returns relative to the market for the coming year, (3) the likelihood that they would buy an IPO of a company belonging to the group, and (4) imagery and affect. The first three judgment measures were highly correlated with each other, but only modestly correlated with the actual market performance of all the industry groups studied. In contrast, the three behavioral judgment variables were highly predictable from a combination of the imagery and affective ratings. In short, the results revealed a high level of internal consistency: Judgments of financial performance of industry groups were strongly related to a combination of the strength of imagery associated with the various industry groups studied as well as affective evaluations based on semantic differential ratings (Shefrin [2000]).

Similarly, Olsen and Troughton [2000] have shown that the presence of a company name has an independent influence on perceived risk; identifying companies helps investors "frame" information and interpret the meaning of the quantitative risk and ambiguity measures. This view of human financial judgment contrasts sharply with traditional theories of finance that equate price with the quality of an investment's underlying technical fundamentals.

Implications

Fund managers could take advantage of imagery and affect in selling their products through promotional messages based on general concepts that tap into potential investors' affective mode of information processing. For instance, some advertising campaigns are promoting investments with messages highlighting physical beauty. Global mutual funds are being associated with fashion models and the tag line "The most beautiful investment in the world," rather than the traditionally masculine, performance-driven themes (Kapner [2000]).

Given that imagery and affect may have low validity for predicting performance, however, fund managers and individual investors should ensure they thoroughly consider technical indices. Unfortunately, this may be more easily said than done because of the automatic or subconscious nature of affective processes. Deliberative approaches to evaluating the quality of financial stimuli should be pursued vigorously, particularly when individuating company information is absent and only very general and somewhat vague information about a financial offering (i.e., industry groups) is available.

Keep in mind, however, that exhaustive searching for or presentation of data can be overdone. While we may expect or hope that rich data about a financial offering diminishes the role that affect and imagery play in judgments of financial performance, exactly the opposite may occur (MacGregor et al. [2000]). As the quantity or complexity of information increases, human judgment

tends to become more reliant on simplifying rules (in order to process information more efficiently). Compared with technical indices, affective cues may become more salient as complexity of a financial problem increases (Finucane, Peters, & Slovic, *in press*).

In sum, affect plays an important role in judgment and decision making, especially in complex environments, by providing a coherent psychological framework for evaluating classes of securities. Judgments of financial performance are strongly related to the strength and affective content of imagery associated with various industry groups. Yet affect may have low validity for predicting performance. Thus, investors need to match the extent to which they rely on affective or analytic processes with their goals and objectives for optimal outcomes.

Gender, Race and Perceived Risk: The “White-Male” Effect

The third and final area of risk perception research discussed in this paper concerns the role of gender, race, and socio-political attitudes. Gender differences in the perception of technological risk are well established. Typically, women perceive more risk than men from hazards such as nuclear power, hazardous waste, and pesticides. And there is good reason to suspect the same occurs in the domain of financial risk. According to Cruz [1999], the Women’s Retirement Confidence Survey showed that when compared with men, women are not as confident when it comes to money, worry more about their financial futures, and are less willing to take risks with their investments to increase their returns. Furthermore, non-professional women investors appear to be more conservative and more risk averse than their male counterparts after controlling for factors such as age, education, wealth, race, etc. Studies of portfolio compositions have found that women hold larger proportions of wealth in financial assets with lower volatility of return (Sunden & Surette [1998]). Barber & Odean [2001] have found in a discount brokerage firm that men tend to trade more and earn less on the stock market than women do (on a risk-adjusted basis). For professional investors, Olsen and Cox [2001] suggest that women place greater weight on downside or loss potential than men do.

Traditionally, one explanation for gender differences in technological risk perceptions is based on an assumption of differences in rationality and education. However, empirical research does not support this view: Research has shown that reliable risk perception differences can be found between men and women toxicologists, all of whom we can assume have the appropriate technical understanding of risk and knowledge of risk assessment procedures (see Slovic, Malmfors, Mertz, Neil, & Purchase [1997]). Thus, individual dif-

ferences in the perceived risk of securities may not necessarily arise from a lack of understanding of complex technical information. Clients and advisors may differ in their views due to other factors.

A second common explanation for gender differences in risk perceptions is based on biological differences. For example, women have been characterized as being inherently programmed to nurture and maintain life. However, research done by Flynn et al. [1994] showed that (1) nonwhite males and nonwhite females are more similar in their perceptions of risk than are white males and females and (2) white males are different from everyone else in their perceptions and attitudes toward risk. Biological explanations for differences require that the differences between men’s and women’s risk perceptions transcend racial boundaries, which was clearly not what was found.²

An alternative explanation is that risk perceptions may reflect deep-seated values about technology and its impact on society. That is, risk perception differences may be due to differences in people’s world-views (general attitudes towards the world and its social organization) and their attitudes toward, trust, control, and other sociopolitical factors. White males may perceive less risk than others because they are more involved in creating, managing, controlling, and benefiting from it. Women and nonwhite men may perceive greater risk because they tend to be more vulnerable, have less control, and benefit less.

Data reported by Finucane, Slovic, Mertz, Flynn, & Satterfield [2000] support a more sociopolitical explanation: Compared with others, white males seem to promote individual achievement, initiative, and self-regulation, trust in experts and risk proponents, and intolerance of community-based decision and regulation processes. Consequently, these authors speculate that the world seems safer and hazards seem more beneficial to white males than to others. For people who place less weight on the importance of individual achievement, and more weight on distributing wealth equitably and endorsing community-based regulation, many hazardous technologies and activities are viewed as posing great risks. In the investment context, perhaps securities are seen as more dangerous by many clients than advisors, because clients tend to be in positions of less power and control. Naturally, sociopolitical attitudes may vary within groups too.

Implications

What implications does the white-male effect have for the financial world? One direct implication is depicted well in this quote from Adam Smith [1968]:

You are—face it—a bunch of emotions, prejudices, and twitches, and this is all very well as long as you

know it. Successful speculators do not necessarily have a complete portrait of themselves, warts and all, in their own minds, but they do have the ability to stop abruptly when their own intuition and what is happening Out There are suddenly out of kilter.

If you don't know who you are, this is an expensive place to find out.

In other words, the judgments we make are, at least in part, a function of our value system, so we had better know our values and worldviews or those of the individual and/or society whose judgments we are trying to predict.³ One way to identify your values or those of your clients is to use a tool such as a "values ladder" (for e.g., see Bach, [1999]). This tool uncovers what it is that an individual is looking for in life by starting with the question "What's important about money to you?" and then uncovering successively deeper personal values. More formal techniques could also be used to clarify worldviews, drawing on questionnaires with established reliability and validity (e.g., Dake [1991]) to guide values-based financial planning. Similarly, risk-tolerance measures could be developed on the basis of assessments of values and worldviews, helping advisors and investors to construct portfolios that best meet their needs.

Identifying individuals' values and worldviews will help to predict the perceived risk of securities and subsequent investment behaviors. One way in which different values may be expressed is through overconfidence on the part of investors who believe they have greater control. An overconfident investor tends to trade too much, often ending up with a net effect of reduced returns because of trading costs. This tendency is compounded by the availability of online trading that has made it cheaper and easier for individual investors to trade stocks (Shefrin [2000]). Another expression of different values may be in the failure of some investors to diversify. Less risky securities will probably dominate the portfolios of individuals who feel vulnerable or powerless, while relatively risky securities may dominate for those who feel in control. In either case, systematic biases can mean that the benefits of a diversified investment strategy are not realized.

In sum, the tailoring of financial advice and individual investor behavior could be dramatically improved through a better understanding of gender and race differences in risk perceptions and how these relate to worldviews. Correctly identifying tendencies to be under- or over-confident or to engage in other value-driven behaviors will ultimately result in better investment performance and more satisfied investors.

Conclusions

The main take-home message in this paper is that the perceived risk of technologies is influenced by

many non-technical factors, some of which may apply directly to the perceived risk of securities. Although many observers have labeled public perceptions of technological risk irrational, the research and analyses described above paint a much different picture. Whereas experts define risk in a narrow, quantitative way, the public has a wider view, qualitative and complex, incorporating legitimate value-laden considerations such as uncertainty, dread, catastrophic potential, and controllability into the risk equation.

Five easy steps to a values-based investment approach are:

1. Identify what things—other than volatility—are important to you or your clients when judging the risk of securities. Measure risk tolerance multi-dimensionally.
2. Clarify where others' perceptions and values differ from your own. As an advisor, this will improve your ability to satisfy clients; as an investor, this will improve your ability to anticipate what motivates other investors.
3. When making investments jointly with others, or advising couples or groups, identify and communicate where differences occur regarding diverse aspects of each individual's risk perception and tolerance.
4. Use affect (experience) and analysis wisely. Affective processing of information may be appropriate when a quick, holistic judgment is needed, but in-depth evidenced-based analysis will be appropriate when trying to predict performance.
5. Just as you evaluate the performance of your portfolio, review your own performance as well. Take time to learn where you failed and where you succeeded in correctly identifying and communicating your own or others' views and values regarding the risk of specific securities and investment strategies.

Perception of risk is a reality in itself; we will be better positioned to understand and predict market behavior if we take advantage of our ability to measure risk perceptions in a psychologically rich way. Risk personality characteristics, imagery, affect, and sociopolitical attitudes play important roles in judgment and decision making, but how this plays out with regard to investment behavior has not yet been studied in detail. Overall, by introducing a richer definition of risk and a better understanding of the roles of various psychological factors into both risk assessment and risk decision making, the relevance and quality of securities analyses will be improved, and public satisfaction with the resulting decisions will be increased.

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Notes

1. I am grateful to Hersh Shefrin for bringing this quote to my attention.
2. Furthermore, although perceived risk was inversely related to income and educational level, controlling for these differences statistically did not reduce much of the white-male effect on risk perception.
3. This interpretation of Smith's quote contrasts with the more cognitively focused interpretation thirty years ago by Slovic [1972].

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