Advanced Review

Risk attitude and preference

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Citizens of Western countries are asked to make an increasing number of decisions that involve risk, from decisions about how much and how to save for their old age to choices among medical treatments and medical insurance plans. At the same time, uncertainty about choice outcomes has gone up as the result of ever faster social, environmental, and technological change. Accuracy in predicting what choices people will make, at least in the aggregate, is an important determinant for the success of public policy interventions. In addition, corporate and public policy often tries to influence and modify people's choices in the face of risk and uncertainty, for example, getting people to save more of their income or getting women to invest in less conservative instruments. Understanding the processes that underlie risky decisions and the drivers of risk taking is critical to both agendas. *WIREs Cogn Sci* 2010 1 79–88

To introduce the reader to how risk preference and risk attitudes have been modeled, this paper starts out with a historical overview of normative risky choice models from philosophy and economics [Expected Value (EV) and Expected Utility (EU) models] and from modern finance (Risk–Return models). EV and EU theory both assume that (1) people view risky options as distributions of possible outcomes, (2) outcomes (either their objective value or their subjective utility to the decision maker) are discounted as a function of how likely they will occur, (3) these discounted values are integrated over all possible outcomes to provide a measure of the value of each risky option, and (4) the option with the greater overall value is chosen. Risk–Return models, on the other hand, assume that risky options get represented as a trade-off between the first and second moment of their distributions of possible outcomes, and that the value of a risky option increases with its first moment (EV or average outcome) and decreases with its second moment (variance or the degree of unpredictability of its outcomes). These models lie at the root of rational choice theory and thus describe how risky decisions ought to be made within economic definitions of rationality. What they have in common is that individual differences in risk preference are described by a single parameter, which is typically described as the decision makers' risk attitude.

The paper then describes the multiple ways in which people's choices between risky options have been shown to deviate from the predictions of normative risky choice theories. Prospect theory (PT) and regret theory take EU theory as their point of departure, and augment it with auxiliary processes and associated parameters that make for a better fit to observed choice behavior. Psychophysical Risk–Return models take the framework of the EV—Variance model from finance, but broaden it with the assumption that people trade off between their subjective expectations of return and their subjective perceptions of risk, both of which can show both individual and situational differences, unlike the statistical measures of EV and variance. What all of these psychological models have in common is the assumption that risk preference, as expressed in choice or in willingness to pay (WTP) for risky options, is influenced by a broader set of variables than just risk attitude. Perceptions of risk and return are psychological variables that are influenced by analytic evaluations of objective outcomes and their likelihood and their subjective utility for the individual, often relative to aspirations or goals. They are also influenced by emotional processes. Familiarity with decisions in a specific domain (e.g., risky social decisions for women, or risky recreational decisions for sky divers) seems to reduce perceptions of risk, and the excitement of feedback in situations of dynamic risk (e.g., sequential bids in a game of poker or orders of alcohol during an evening out) seems to increase expectations of return. When these situational factors are accounted for by assessing people's subjective

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perceptions of risk and return, the trade-off coefficient between perceived risk and perceived return becomes a less confounded measure of true attitude toward risk, showing whether the decision maker (across a range of situations) sees risk as s/he perceives it as something that is anxiety-provoking for its uncertainty and downside potential or as something that is exciting for its upside potential.

EV AND EU THEORY

How decisions get made in the face of risk and uncertainty is an old topic of theoretical and empirical investigation.[1] The maximization of *expected (monetary) value* (EV) of gamble X, with possible outcomes x that occur with probability $p(x)$:

$$\mathrm{EV}(X) = \sum_{x} p(x) \cdot x \quad (1)$$

was first proposed in the mid-17th century as a way of integrating across possible outcomes, but was rejected as a universally applicable decision criterion based on the so-called St Petersburg paradox, where people are willing to pay only a small price (typically between \$2 and \$4) for the privilege of playing a game with a highly skewed payoff distribution that has infinite EV, as shown in Figure 1.

To resolve the St Petersburg paradox,[2] Bernoulli proposed that people maximize EU rather than EV,

$$\mathrm{EU}(X) = \sum_{x} p(x)u(x) \quad (2)$$

suggesting that money and wealth diminish in utility, as shown by the concave utility function in Figure 2. An increase in wealth of \$10,000 is worth a lot more at lower initial levels of wealth (from \$0 to \$10,000) than at higher initial levels (from \$20,000 to \$30,000). The exponent θ of the utility function $u(x) = x^{\theta}$ describes the function's curvature and serves as an index of an individual's risk attitude. Whereas most individuals are risk averse ($\theta<1$), for example, in the St Petersburg paradox, some are willing to take on great risks in the hope of even greater returns ($\theta>1$). Degree of risk aversion can be expressed by the risk premium an individual is willing to pay to avoid taking a risk, e.g., by being indifferent between getting \$45 for sure and a 50/50 gamble between \$0 and \$100. The \$5 difference between the EV of the gamble (i.e., \$50) and the certainty equivalent of \$45 is the risk premium and greater risk aversion results in a larger risk premium.

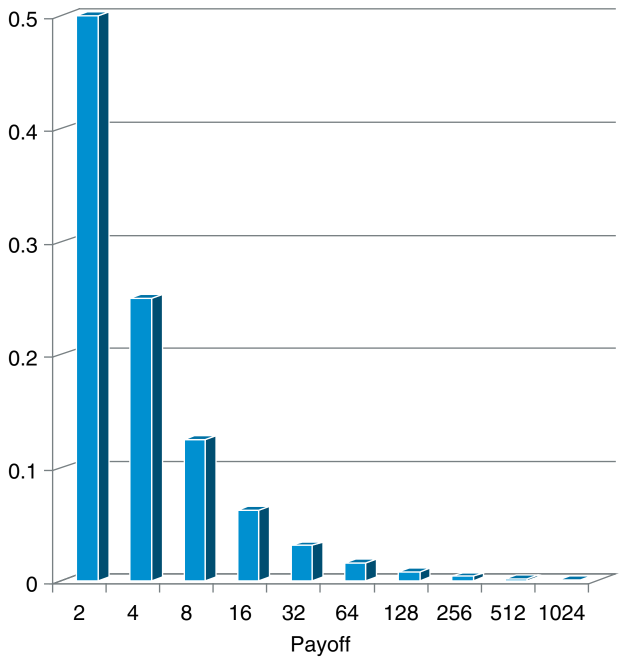

FIGURE 1 | In the St Petersburg paradox game, a fair coin is tossed until the first head is scored. The payoff depends on the trial at which the first head occurs, with \$2 if on the first trial, \$4 if on the second trial, and \$$2^n$ if on the nth trial, as shown in this figure, together with the probability of each outcome. The EV of the game is infinite: $\mathrm{EV(X)} = \sum_x p(x)x = \sum_{n=1}^{\infty} \frac{1}{2^n} 2^n = \infty$.

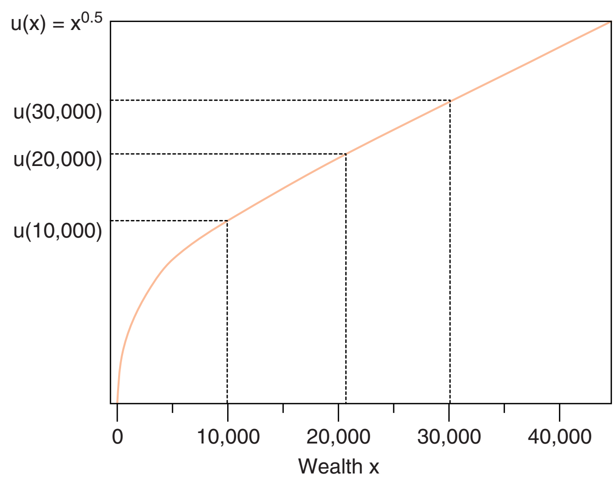

FIGURE 2 | Example of a concave utility function $u(x) = x^{0.5}$ which converts wealth, x, into its utility $u(x)$. An increase in wealth from \$0 to \$10,000 is shown to result in a greater increase in utility than an increase in wealth from \$20,000 to \$30,000.

Ever since EU maximization was shown to be the only possible decision criterion for individuals wanting to make choices consistent with an intuitively appealing set of consistency requirements (proposed as rationality axioms by von Neumann and Morgenstern[3]), it has become the dominant normative model in the economic analysis of choice under risk and uncertainty.[4,5]

CONSTANT AND RELATIVE RISK AVERSION IN EU

EU explains risk aversion by a concave function that maps objective amounts of wealth into their utility, with increasing amounts of wealth generating increased utility (i.e., a positive first derivative), but less and less so (i.e., a negative second derivative). There are a large number of functions that have this general characteristic, not just the power function shown in Figure 2. Economists Arrow and Pratt tried to derive some measures of risk aversion independent of the utility function's functional form.[6] Their measure of absolute risk aversion is defined as:

$$\mathrm{ARA}_u(x) = -u''(x)/u'(x) \tag{3}$$

where u' and u'' denote the first and second derivative of utility function u, and specifies the absolute value of the risk premium associated with a given lottery. As shown in Figure 3 (left column), exponential utility functions have the property of constant absolute risk aversion, meaning that the decision maker would pay the same risk premium to avoid the uncertainty of a given lottery (e.g., \$5 for the 50/50 lottery between \$100 or nothing) at all levels of wealth. Arrow[7] more realistically assumed that most people show decreasing absolute risk aversion, i.e., would be more likely to play the gamble at higher levels of wealth, and thus pay a smaller risk premium to avoid it.

The other Arrow–Pratt measure, relative risk aversion, is defined as:

$$\mathrm{RRA}_u(x) = -(x \cdot u''(x))/u'(x) \tag{4}$$

and specifies the percentage value of wealth the EU maximizer is willing to put at risk. As shown in Figure 3 (right column), power utility functions have the property of constant relative risk aversion, meaning that the decision maker is willing to put the same percentage of wealth at risk (e.g., 40% in Figure 3), at all levels of wealth. Arrow[7] assumed that instead, most people would show increasing relative risk aversion.

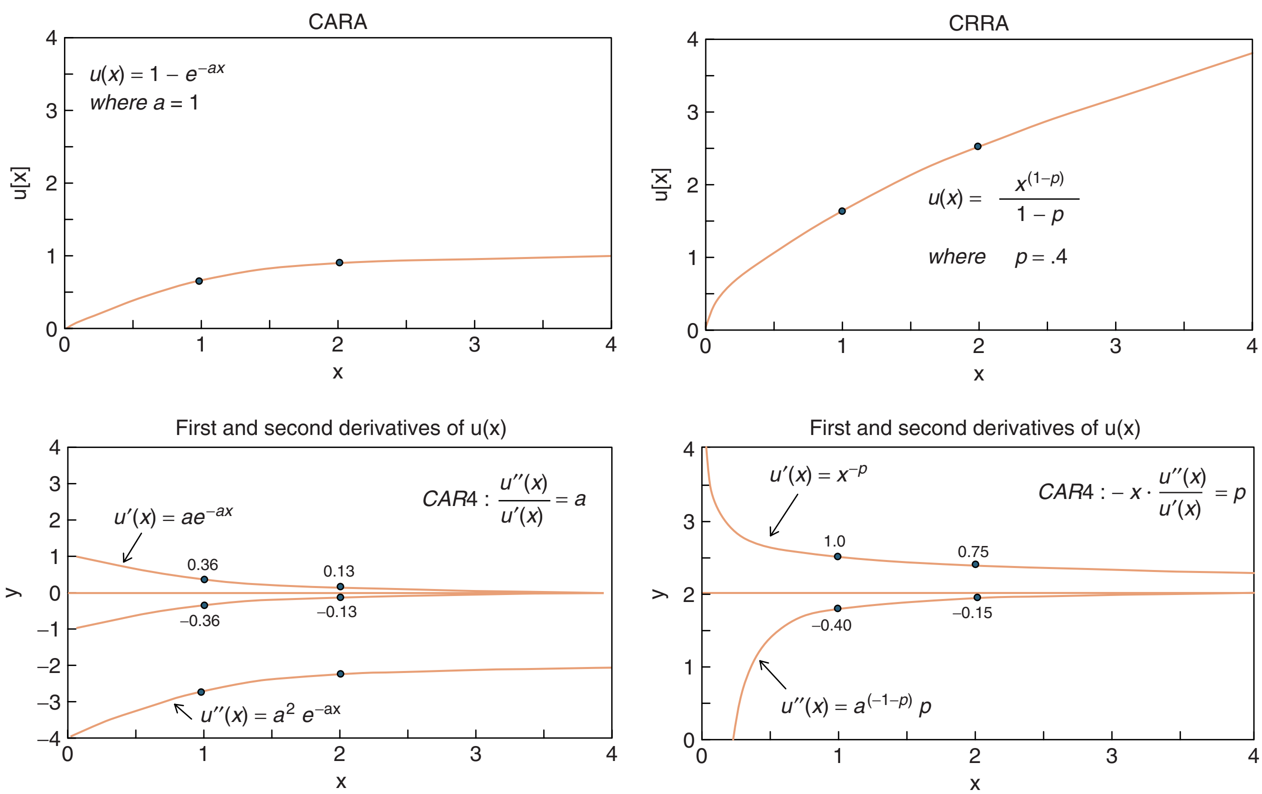

FIGURE 3 | Constant absolute risk aversion (CARA, left column) and constant relative risk aversion (CRRA, right column). The top panel shows the described utility function, the bottom panel its first and second derivative.

FINANCE RISK–RETURN THEORY

Markowitz[8] proposed a somewhat different solution to the St Petersburg paradox in finance, modeling people's WTP for risky option X as a trade-off between the option's return $V(X)$ and its risk $R(X)$, with the assumption that people will try to minimize level of risk for a given level of return:

$$\mathrm{WTP}(X) = V(X) - bR(X) \tag{5}$$

Traditional *Risk–Return models* in finance (e.g., the Capital Asset Pricing Model[9] equate $V(X)$ with the EV of risky option X and $R(X)$ with its variance (i.e., with the average squared deviation of outcomes from their mean), with parameter b describing the precise nature of the trade-off between return and risk and indicating risk attitude. Despite their prescriptive and normative strengths and their wide use in economics and finance, both EU maximization and Risk–Return optimization often fail to describe the choices individuals make in the lab and the real world.[10–12]

REGRET THEORY AND PT

The economic risky choice models described above assume that the utility of decision outcomes or the risk and return of choice options are only a function of the objective value of possible outcomes in a 'reference-independent' way, i.e., in a way that does not depend on what the outcome(s) can be compared to. The receipt of a \$100 is assumed to be processed and experienced in the same way, leading to the same utility, when is it the top prize in the office National Collegiate Athletic Association (NCAA) basketball tournament pool or the consolation prize in a lottery for 10 million dollars. Contrary to this assumption, people's evaluations of outcomes are influenced by such relative comparisons.[13]

People routinely compare the outcome of their chosen option with the outcome they could have gotten under the realized state of the world, had they selected a different option.[14] Such comparisons have an obvious learning function, particularly when the 'counterfactual' outcome (i.e., the outcome that could have been obtained, but was not) would have been better. This unfavorable comparison between what was received and what could have been received with a different (counterfactual) action under the same state of the world, is termed *regret*. When the realized outcome is better than the alternative, the feeling is called rejoicing. Consistent with the negativity effect found in many judgment domains,[15] feelings of regret are typically stronger than feelings of *rejoicing*. Regret theory, independently proposed by Loomes and Sugden[16] and Bell[17] assumes that decision makers anticipate these feelings of regret and rejoicing and attempt to maximize EU as well as minimizing anticipated postdecisional net regret. Susceptibility to regret is a model parameter and an individual difference variable that dictates the specifics of the trade-off between the two choice criteria. Minimization of anticipated decision regret is a goal frequently observed, even if it results in lower material profitability.[18]

PT[19,20] introduced a different type of relative comparison into the evaluation of choice options. As shown in Figure 4, PT replaces the utility function u of EU theory with value function v, which is defined in terms of relative gains or losses, that is, changes from a reference point, often the status quo. PT's value function maintains EU's assumption that outcomes have decreasing effects as more is gained or lost (decreasing marginal sensitivity). An individual's marginal sensitivity is reflected by parameter α in PT's power value function $v(x) = x^{\alpha}$, which plays the same role as the index of risk attitude in EU theory, described above. However, because outcomes are relative to a neutral reference point, the leveling off of increases in value as gains increase ('good things satiate') leads to a concave value function, associated with risk-averse behavior (e.g., preferring the sure receipt of an amount much smaller than the EV of a particular lottery over the opportunity to play the lottery) only in the domain of gains. In contrast, the leveling off of increases in disutility as losses increase ('bad things numb') leads to a convex shape of the value function in the domain of losses, which is associated with risk-seeking behavior (e.g., preferring a lottery of possible losses over the sure loss of an amount of money that is much smaller than the EV of the lottery).

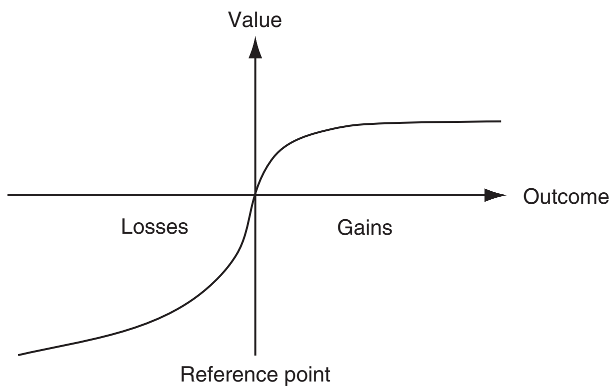

FIGURE 4 | The value function of prospect theory, where outcomes are defined as gains or losses relative to a reference point, with a concave function for gains and a convex and steeper function for losses.

Another important characteristic of PT's value function is the asymmetry in the steepness of the function that evaluates losses and gains, with a much steeper function for losses ('losses loom larger'), also shown in Figure 4. The ratio of the slope of the loss function over the slope of the gain function is referred to as *loss aversion* and is reflected by parameter λ. Loss aversion has been shown to be an important predictor of risk preference in many real world applications, as much or more than risk aversion or decreasing marginal sensitivity α.[11,21] For example, loss aversion is seen as the explanation for the endowment effect,[22] the status quo bias,[23,24] and the equity premium puzzle,[25] all phenomena that describe behavior that deviates from the normative predictions of classical EU theory and Risk–Return models.

RISK PREFERENCE = RISK ATTITUDE?

EU and Risk–Return theories explain risk taking (in risky choice or WTP for risky options) with a single parameter, estimated from a person's choices or prices that quantifies the curvature of the utility function or the slope of the Risk–Return trade-off. This parameter is typically referred to as risk attitude or risk tolerance, which suggests that risk taking reflects a general attitude toward risk, i.e., liking it for its upward potential and excitement or fearing it for its downward potential and the anxiety it provokes. However, risk taking is far from stable across situations.[26,27] The same person often shows different degrees of risk taking in financial, career, health and safety, ethical, recreational, and social decisions.[28–30] People may not have a stable risk attitude across domains or we need to assess a person's general attitude toward risk in a way that shows stability across domains by factoring out other (more situationally determined) contributors to observed risk taking.[31]

PT, introduced earlier, provides several determinants of risk taking. Like EU theory, it has an index of nonconstant marginal utility α. However, decreasing marginal utility produces a concave function and thus risk-averse choice for gains, but a convex function and thus risk-seeking choices for losses. In addition, the loss function has a steeper slope than the gain function (loss aversion). A further mechanism is that the probabilities of outcomes influence choice in nonlinear ways.[32] Outcomes that occur with probability 1 or 0 get more weight than outcomes that occur with almost the same probabilities, but are short of certainty (e.g., 0.999999 or 0.000001). In addition, decision weight gets redistribute as a function of the attention that outcomes receive.[33] In this way, PT can account for unstable risk taking across domains in multiple ways. First, the representation of choice problems might have different reference points, with resulting differences in apparent risk attitude. Second, to the extent that a person's decreasing marginal utility or degree of loss aversion differs for outcomes in different domains, PT could account for domain differences in risk taking. Gaechter et al.[34] show that loss aversion can differ across attributes, in their case as a function of attribute importance and the decision maker's expertise in the domain. Third, in different domains attention might be directed in different ways and for different reasons to high, low, or intermediate outcomes of risky choice options, with resulting shifts in decision weight.[35]

Affective reactions (in addition to the more analytic evaluations discussed above) also play a large role in risky choice. For example, there is greater volatility in decisions based on feedback from personal experience, where behavior is influenced more by more recent experiences, relative to decisions based on a verbal, numeric, or graphic description of possible outcomes and their probabilities,[36] as a result of fluctuating emotional reactions to recent outcomes. Familiarity with risky choice options or a risky choice domain lowers the feeling of riskiness of choice options. The home bias effect in investing, i.e., the tendency to invest a larger than prudent amount of one's assets into stocks in one's home country or into stock of the company one works for (see[37]), has been shown to be mediated by such reduction in the feeling of being at risk with familiar investment opportunities.[38] Factors such as familiarity and other emotional reactions can, of course, differ systematically across situations, thus accounting for differences in observed risk taking of people across domains.

Just as PT represents an attempt to keep the general form of EU theory but to modify and extend it in ways that make it more predictive of observed choice behavior, finance versions of Risk–Return theory have been modified and extended to provide models that can account, among other things, for domain differences in risk taking.[39] While studies of financial decisions typically find that the EV of risky investment options is a good approximation of expected returns,[38] survey data assessed in populations known to differ in risk taking in specific domains (e.g., in recreational behavior) suggest that risk takers judge the expected benefits of risky choice options to be higher than control groups.[28] A large and growing literature has also examined perceptions of risk, by assessing people's judgments or rankings of the riskiness of risky options and modeling these, often on an axiomatic basis, or by trying to infer the best fitting metric of riskiness from observed choices under the assumption of Risk–Return trade-offs.[40] These studies show that the variance or standard deviation (SD) of outcomes fails to account for perceived risk, for a variety of reasons. First, deviations above and below the mean contribute symmetrically to the mathematically defined variance, whereas perceptions of riskiness are affected far more by downside variation.[41] Second, variability in outcomes is perceived relative to average returns. A SD of ±\$100 is huge for a risky option with a mean return of \$50 and amounts to rounding error for a risky option with a mean return of one million dollar. The coefficient of variation (CV), defined as the SD that has been standardized by dividing by the EV:

$$\mathrm{CV}(X) = \mathrm{SD}(X)/\mathrm{EV}(X) \tag{6}$$

provides a relative measure of risk, i.e., risk per unit of return. It is used in many applied domains and provides a superior fit to risk taking observed in foraging animals and in people who make repeated decisions based on learning from experience.[42] Weber et al.[42] show that simple reinforcement learning models that describe choices in such learning environments predict behavior that is proportional to the CV and not the variance. Scalar Utility Theory, which postulates that the cognitive representation of outcomes follows Weber's Law (1834), namely that the spread of the distribution of expected outcomes is proportional to its mean[43] also predicts animal risk taking that is proportional to the CV.

RISK TAKING AND RISK ATTITUDE IN PSYCHOPHYSICAL RISK–RETURN THEORY

Psychophysics maps the physical features of stimuli (decibels) into their subjective perception (loudness), reporting such mappings to be not only nonlinear, but also subject to context effects, just like perceptions of the utility of outcomes (see[44]). Researchers from several disciplines have recently extended normative finance Risk–Return theory[39] to allow for subjective perception of risks and returns that deviate from such objective indices like outcome variance and EV in nonlinear and context-specific ways. However, just as before, expected return and perceived risk are assumed to be traded off to determine WTP for risky option X:

$$\mathrm{WTP}(X) = V(X) — bR(X) \tag{7}$$

In these psychophysical Risk–Return models, all three components, $V(X)$, $R(X)$, and trade-off parameter b are psychological variables. The same objective outcome variability can be perceived in systematically different ways by different individuals and cultures.[45] Contrary to managerial folklore, the characteristic that differentiates entrepreneurs from other managers, for example, is *not* a more positive attitude toward risk, but instead an overly optimistic perception of the risks involved.[46] While it may seem that entrepreneurs take greater risks, when differences in risk perception are factored out, entrepreneurs—just as other managers—prefer options that they see as only moderate in risk.[47]

When perceived risk and return replace the statistical moments of variance and EV in the prediction equation for WTP, the trade-off coefficient b can be interpreted as an index of true attitude toward risk, called *perceived risk attitude* (PRA; see[48]). PRA quantifies the degree to which a person finds perceived risk attractive (or unattractive) and therefore will choose alternatives that carry greater (or less) risk, all other things being equal.

In many instances in which groups show differences in risk taking as inferred from their WTP for risky options, an analysis of their risk taking by a psychophysical Risk–Return model [Eq. (7)] shows that the differences in risk taking are a result of group differences in the perceptions of risks or returns, and *not* the result of differences in PRA. Weber and Hsee,[49], for example, compared risk taking (assessed by minimum buying prices for a range of risky financial investment options) between decision makers from the USA, Germany, the People's Republic of China, and Poland. Risk taking differed significant across countries, with Americans appearing to be most risk-averse and Chinese being close to risk-neutral, based on their WTP. However, investors from different countries also perceived the risks of the investment options in different ways, whereas their return expectations were very similar and closely related to the options' EV. When these differences in their ratings of the option's risk were taken into consideration [by using them in the regression of Eq. (7)], the proportion of individuals who were perceived-risk averse or perceived-risk seeking were not significantly different in the four countries. Similar results have been reported about gender differences in risk taking. The observed lower risk taking by women is not the result of a different attitude toward risk (i.e., gender differences in PRA), but is typically completely accounted for by gender differences in perceived risks and returns.[29] One individual difference variable for which group differences in PRA have been identified is age. Older adults differ from younger adults in their perceptions of the risks and benefits of risky activities (perceiving the risks to be higher and the benefits to be lower), but also show a more negative attitude toward risk (PRA), even after their differences in risk and benefit perceptions have been taken into consideration.

Sensation seeking,[50] which has a biological basis and varies with age and gender,[51] has been linked to greater risk taking, especially in the health/safety and recreational domain.[26,52] In the context of psychophysical Risk–Return theory, one can distinguish between two (not mutually exclusive) reasons for this association. Greater sensation seeking could be correlated with a more positive PRA, i.e., sensation seekers like risk more. Alternatively, sensation seeking might influence the decision maker's perceptions of risks and return. Weber et al.[29] found a relationship between sensation seeking (and its subscales) and risk taking in several content domains, with especially high correlations between the thrill-and-adventure-seeking subscale and recreational risk taking and the disinhibition subscale and ethical risk taking. When risk taking was decomposed into perceived risks and returns and inferred PRA, sensation seeking was correlated with perceptions of risks and expectations of benefits in those domains where it affected risk taking, but not with PRA.

CONTEXT- AND PROCESS-DEPENDENCE OF RISK TAKING

Normative economic models of risk taking do not care how knowledge about choice outcomes and their likelihood is acquired (e.g., by trial and error learning vs. by vicarious description in the form of a statistical summary), as long as the accuracy of knowledge and source credibility are controlled for. Psychological models, on the other hand, make different predictions for decisions from experience and decisions from description.[36,42] Empirical evidence is on the side of psychological model predictions, showing, for example, that people overweight small-probability events in decisions from description (consistent with PT theory), but underweight small-probability events in decisions from experience (consistent with reinforcement learning models). As another example, a large number of lab studies and real world observations show risk taking that is consistent with reference-point relative encoding of outcomes, with resulting differences in the effect of decreasing marginal utility as risk aversion for gains and risk seeking for losses and with a greater impact of losses than gains (loss aversion), as described by PT. Recent functional Magnetic Resonance Imaging studies have reported neural equivalents of loss aversion, but find further process-dependence in the form of different patterns of brain activation in response to relative gains or losses as a function of whether decision makers receive feedback after each choice[53] or not.[54]

RISK-TAKING AND RISK-ATTITUDE ASSESSMENT TOOLS

Because risk taking is context- and process-dependent, people's willingness to take risks and the multiple determinants of their risk taking described above need to be assessed in context- and process-sensitive ways. There is no single best way in which risk attitude can be assessed or risk taking predicted. EU-based lottery choice methods (e.g.,[55]) predict risk taking mostly for contexts similar to the assessment method, i.e., for other monetary lottery choices. Without a high-fidelity match between the assessment tool(s) and the nature of the situation for which one is trying to predict or modify risk-taking behavior, researchers as well as practitioners will continue to find low accuracy for their predictions and limited success for their interventions. Situational matching of assessment tool(s) to situation should be done on both concrete and abstract characteristics.

Domain-Specific Risk Taking

Speaking to the concrete features of a situation, risk taking is often domain specific, which makes ostensibly 'content-free' utility assessment tools like the Holt and Laurie[55] lotteries better predictors of risk taking in monetary gambling choices than in risky agricultural production decisions.[56] Weber et al.[29] developed a Domain-Specific Risk Taking (DOSPERT) scale (with a shorter, updated scale in Ref [30]) that assesses risk taking in five content domains (financial, ethical, health/safety, social, and recreational), and also allows for the measurement of perceived benefits and risks of activities in those domains, which can then be regressed on risk taking [see Eq. (7)] to determine the decision maker's PRA. The DOSPERT scale has been used and its factor structure replicated in a wide range of settings and populations (see http://www4.gsb.columbia.edu/decisionsciences/research/tools/dospert/). Zuniga and Bouzas,[57] for example, found that scores on the health/safety and recreational risk-taking subscales significantly predicted estimated blood alcohol concentrations in Mexican high-school students. Hanoch et al.[28] used the DOSPERT Scale to show that individuals selected to exhibit high levels of risk taking in one content area (e.g., bungee jumpers taking recreational risks) can be quite risk averse in other risky domains (e.g., financial decisions). After reviewing a large number of risk taking scales used in healthcare decisions, Harrison et al.[58] recommend the DOSPERT Scale as one of three for directly measuring risk taking across a number of everyday situations and for its simultaneous measurement of risk taking, risk perception, and perceived-risk attitude.

Related to abstract features of the situation, apparent risk taking has been shown to vary when preferences between risky options are expressed in different ways, e.g., by choices versus bids versus buying prices versus selling prices.[59] Other abstract features that should be equated between assessment instrument and the to-be-predicted risky choice situation include the framing of choice options (as relative gain vs. loss) and the way decision makers have learned about outcome distributions affects risky choice (by personal experience or statistical summary description).

Static versus Dynamic Risks

Another important abstract feature of risk-taking situations is the distinction between static and dynamic risks. Much real world risk taking is incremental and dynamic, involving sequential risk-taking with feedback, from taking risks in traffic to risky substance (ab)use. Risk taking in such dynamic contexts is typically not predicted by static assessment tasks, like one-shot lottery choices that are not resolve until the end of the assessment.[60] If the risk taking to be predicted is dynamic, dynamic task assessment tools like the Balloon Analog Risk Task[61] or the diagnostically richer Columbia Card Task (CCT; see[62]) should be employed. The CCT provides an assessment of risk taking in either an emotionally engaging (hot) and more analytic (cold) context and also yields a measure of the complexity of information use.

CONCLUSIONS

Psychological models of risk preference have modified and augmented economic rational choice theory by adding explanatory constructs above and beyond risk attitude. PT, for example, adds loss aversion and nonlinear probability weighting to EU theory. Psychophysical Risk–Return models assume that people's expectations of returns do not coincide with the EV of possible outcomes and that perceptions of risk do not coincide with outcome variance, as presumed by the Risk–Return models of finance. Both analytic and affective processes (which can differ between situations and between individuals) give rise to these subjective assessments of risk and return. When these differences are taken into consideration, the trade-off coefficient b between perceived risks and expected benefits (perceived-risk attitude) yields a better measure of true (positive of negative) attitude toward risk, which has been shown to have far greater cross-situational consistency than other measures of risk attitude.

Risk preference appears to be domain specific, i.e., inconsistent across different domains of risk taking, because domains of risky decisions can differ in familiarity or perceived controllability, variables known to affect perceptions of risk. The way in which information about possible outcomes has been acquired (by personal experience or by statistical description) also influences risk taking, especially when small-probability events are involved. Some decisions are all-or-none, whereas others are incremental and some risks as static, whereas others increase or decrease over time. Because all of these situational variables have been shown to influence risk taking, it is important to use a risk-preference assessment tool that is as similar as possible in these respects to the decision in which risk taking is to be predicted. When risk preference is assessed for the purpose of possible intervention, i.e., to reduce risk-taking judged to be excessive or encourage risk taking in individuals judged to be too cautious, it is even more important to examine all possible processes causally involved in determining the behavior. Distinguishing differences in marginal utility from differences in loss aversion, or realistic or unrealistic expectations of return or perceptions of risk from differences in true attitude toward risk matters, because different causes of the observed apparent degree of risk taking give rise to different interventions.

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