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Working Paper 2021-06

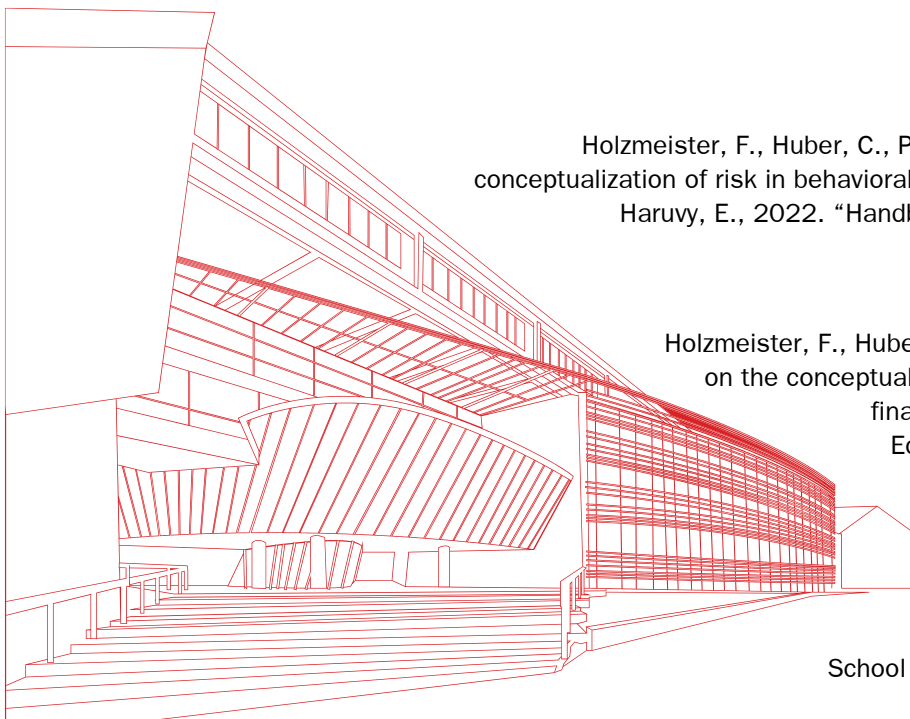
September 15, 2021

**Subsequently published as:**

Holzmeister, F., Huber, C., Palan, S., 2022. "A critical perspective on the conceptualization of risk in behavioral and experimental finance", in: Füllbrunn, S., Haruvy, E., 2022. "Handbook of Experimental Finance", Edward Elgar, Cheltenham, 408-413.

**Recommended citation:**

Holzmeister, F., Huber, C., Palan, S., 2021. "A critical perspective on the conceptualization of risk in behavioral and experimental finance", University of Graz, School of Business, Economics and Social Sciences Working Paper 2021-06.



Working Paper Series  
School of Business, Economics and Social Sciences  
University of Graz  
ISSN 2304-7658

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# A critical perspective on the conceptualization of risk in behavioral and experimental finance

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## Abstract

Risk is one of the key aspects in financial decision-making and therefore an integral part of the behavioral economics and finance literature. Focusing on the conceptualization of the term "risk", which researchers have addressed from numerous angles, this comment aims to offer a critical perspective on the interactions between risk preferences (a latent trait), risk perceptions (how individuals judge whether something is risky), and risk-taking behavior as distinct concepts, and hence to guide future research on (individual-level) decision-making processes in this direction.

**Keywords:** risk-taking behavior, risk preferences, risk perception

**JEL:** D81, D91, G41

Graphic art by Roman Klug, Presse + Kommunikation, University of Graz © 2018

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# A Critical Perspective on the Conceptualization of Risk in Behavioral and Experimental Finance

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## Abstract

Risk is one of the key aspects in financial decision-making and therefore an integral part of the behavioral economics and finance literature. Focusing on the conceptualization of the term “risk”, which researchers have addressed from numerous angles, this comment aims to offer a critical perspective on the interactions between risk preferences (a latent trait), risk perceptions (how individuals judge whether something is risky), and risk-taking behavior as distinct concepts, and hence to guide future research on (individual-level) decision-making processes in this direction.

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Alongside returns, risk is one of the key facets characterizing the trade-off investors typically face in financial decision-making. This being the case, it comes as no surprise that research in finance and economics addresses the notion of “risk” from various angles. This article focuses on the meaning and conceptualization of the term “risk” in behavioral and experimental finance research addressing (individual-level) decision-making processes and aims to offer a critical perspective with respect to risk preferences, risk perceptions, and risk-taking behavior.

When confronted with the term “risk,” we all feel that we understand its intended meaning. Yet its inherent meaning may vary substantially with the context—as a result, the definition and description of risk differs between different fields of application. As an international standard for managing risk in a broad spectrum of applications, the International Organization for Standardization (2018, §3.1), for example, defines risk as the “*effect of uncertainty on objectives*.”<sup>1</sup> Obviously, this definition is relatively unspecific and involves uncertainty about its objectives—i.e., the description of risk can be argued to entail risk itself. To systematically study different aspects of risk, however, a clear-cut and unambiguous definition of the term appears to be a crucial prerequisite.

Ever since the delineation proposed by Knight (1921), economics—as opposed to many other fields of application—distinguishes between risk and ambiguity: “*It will appear that a measurable uncertainty, or ‘risk’ proper, as we shall use the term, is so far different from an unmeasurable one that it is not in effect an uncertainty at all.*” (Knight, 1921, p. 20). Obviously, setting apart uncertainty that can be quantified according to objective or subjective expectations about likelihoods and outcomes from uncertainty that cannot be readily quantified is a first step towards narrowing down the meaning of the term “risk.” In the context of finance and economics, at least since Markowitz (1952) introduced a conceptual framework for risk-return trade-offs in a portfolio context, the notion of “risk”—in most applications—is inextricably linked to return volatility (the standard deviation of returns), i.e., the mean deviation from the expected return. Consequently, the use of volatility as a measure to quantify risk has soon evolved to become a standard in this field, both in scholarly work and in practical applications. Many theoretical models building upon utility frameworks, however, only indirectly define risk, namely through the curvature of a decision-maker’s utility function. In other words, risk is characterized by the decision-maker’s preference relation concerning higher and lower levels of—or changes in—wealth. Consider, for example, the classical expected utility framework: there, any measure that is monotonically related to the preference parameter of the utility function qualifies as a measure of risk.

Once we concentrate our attention on empirical questions of decision-making at the level of the individual, we need to introduce another layer to our conceptualization of “risk.” In behavioral economics and finance, a large and growing literature is concerned with two aspects directly related to risk: *risk preferences* and *risk-taking*. In this literature, preferences are typically discussed in the context of a particular model and are thus associated with theoretical considerations. Furthermore, they are usually conceived of as a latent trait. They thus cannot be directly observed or measured. Em-

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<sup>1</sup> Notes to this definition further specify that “*an effect is a deviation from the expected,*” which can be “*positive, negative or both, and can address, create or result in opportunities and threats.*” Furthermore, it is annotated that “*objectives can have different aspects and categories, and can be applied at different levels.*”

empirical investigations—including controlled experimentation—only permit observing and categorizing behavior and the corresponding outcomes. Over decades, however, these two concepts have often been equated with one another. Risk-taking behavior—i.e., the observable outcome stemming from *revealed preferences* in a (frequently experimental) decision environment—is commonly taken to be a proxy for risk preferences. Yet in doing so, we implicitly assume that risk preferences are the only driver of the extent to which an individual engages in risky behavior. Experiments investigating whether risk preferences are stable over time constitute a prime example of the implicit equalization of (latent) preference relations and (observed) behavior. Another example emphasizing a lack in the delineation of preferences and risk-taking are studies investigating the external validity of risk preference elicitation tasks: rather than addressing the question whether risk preferences explain risk-taking behavior, these studies in fact provide evidence on the question to which extent risk-taking behavior in one context explains risk-taking behavior in another. While it seems obvious that risk preferences and risk-taking must be correlated, empirical tests of the underlying hypothesis are condemned to failure, as latent traits are *per se* unobservable and can only be proxied-for by choice behavior or by survey questions.<sup>2</sup>

Considering not only (financial) economists’ understanding of “risk,” but also integrating psychologists’ take on the topic, introduces another crucial dimension: *perceptions*. To make sense of an uncertain world, humans typically rely on intuitive judgments, i.e., heuristics—in the context of risk commonly referred to as “risk perceptions” (see, e.g., Slovic, 1987). Slovic (1972) considers risk a multi-faceted psychometric construct and assumes various psychological mechanisms to impact the way individuals judge whether or not something is risky. The account of risk perception being determined by psychological constructs closely relates to the notion of “risk as feelings” (Loewenstein et al., 2001; Slovic and Peters, 2006) as opposed to “risk as analysis” (Slovic, Finucane, et al., 2004). Yet answering the question of how best to integrate risk perceptions into an empirically testable conceptualization of “risk” is far from straightforward. Weber, Anderson, et al. (1992, p. 493) distills the challenge down to its essence:

“When instructed to judge ‘risk,’ there exists no comparable behavioral standard against which to compare the judgment. Instead, risk seems to fall into the category of other abstract concepts (e.g., ‘beauty’) that elude precise definition, yet which people are willing to judge. The well-known statement of a supreme court justice about pornography (‘I don’t know whether I can define pornography, but I know it when I see it’) could just as well have been made in reference to risk.”

Despite this challenge, the concept of perceived risk and benefits has been studied and discussed from different viewpoints in the literature. The study by Weber, Anderson, et al. (1992)—building on an early investigation by Nygren (1977)—, for example, tries to add structure to the conceptual problem and aims to uncover potential relationships between risk and attractiveness judgments. Their results suggest that the common mediator hypothesis—i.e., the assumption that a single latent psychological construct mediates both perceived risk and perceived attractiveness—is ruled out by empirical observations. Rather,

<sup>2</sup> While self-reports on risk-taking behavior potentially suffer from hypothetical bias, recent evidence suggests that such a “stated preferences approach” outperforms choice-based “revealed preferences approaches” regarding the measures’ reliability and stability (e.g., Arslan et al., 2020; Charness et al., 2020; Lönnqvist et al., 2015).

their findings support the notion that both risk and attractiveness are distinct and accessible psychological constructs. Indeed, Weber, Anderson, et al.'s account of the foundations of perceived risk and perceived benefits appears to be in line with early empirical results. Studies by Slovic and Lichtenstein (1968) and Lichtenstein and Slovic (1971), for example, examine the influence of information processing on the perception of risk and attractiveness. They find that individuals' risk judgments are predominantly determined by a prospect's probabilities, whereas attractiveness judgements are most influenced by the potential sizes of a prospect's positive outcomes.

Focusing solely on risk perceptions, Brachinger and Weber (1997) review various measures of perceived risk and discuss these measures' theoretical foundations. They conclude that it is difficult to choose any of the proposed measures by means of convincing ex-ante arguments, and that more empirical investigations are needed to evaluate different approaches. Empirical studies show that risk perceptions tend to adhere to some basic axioms (Jia et al., 1999; Keller et al., 1986; Weber and Bottom, 1989). In particular, risk judgments increase when a lottery's outcomes are multiplied by a constant greater than one (Coombs and Meyer, 1969), when a positive constant is added to all potential outcomes (Keller et al., 1986), and when range, variance, or expected loss increase (Coombs and Huang, 1970). Furthermore, recent empirical investigations provide evidence that the probability of incurring losses strongly drives what is perceived as risky, whereas return volatility—the most common measure of risk in economics and finance—does not systematically relate to the heterogeneity in individuals' risk perceptions (see, e.g., Holzmeister, Huber, et al., 2020). The latter results clearly indicate a mismatch between the way risk is commonly conceived of in theoretical and practical applications and the way individuals actually perceive risk.

From a methodological point of view, the variability in individuals' risk perceptions has been discussed as a factor contributing to inconsistencies in experimental participants' revealed preferences across different methods (see, e.g., Crosetto and Filippin, 2016, and Pedroni et al., 2017, for evidence on the “risk elicitation puzzle”). While research in behavioral economics typically assumes that different methods of eliciting risk preferences are procedurally invariant (Tversky et al., 1988), Holzmeister and Stefan (2021) show that part of the across-methods heterogeneity in revealed preferences can be explained by participants' perceptions of risk. These insights call into question the common assumption that risk-taking behavior is solely determined by (latent) preference relations. Instead, risk perceptions may well be another important driver of risk-taking behavior.

If we accept the assumption that risk preferences, risk perceptions, and risk-taking behavior are conceptually distinct, the question of how these three concepts are interrelated naturally arises. Yet few attempts have been made to integrate the different concepts into one model of decision-making under risk. Among those who stick their neck out on this terrain, Nosić and Weber (2010) argue that risk-taking is a function of perceived returns, perceived risk, and risk preferences, and show that intuitive measures of risk and returns, i.e., participants' inherently subjective risk and return perceptions, are better proxies of risk-taking behavior in a financial context than objective measures. While several other contributions try to integrate (i) risk-taking and risk preferences (e.g., Arrow, 1965; Camerer,

1992; Sarin and Weber, 1993; and Apesteguia and Ballester, 2018), and (ii) risk-taking and risk perceptions (e.g., Weber and Milliman, 1997, Jia et al., 1999, Hertwig et al., 2004), potential interaction effects between risk preferences and risk perceptions have yet to be addressed in the literature. It seems intuitively plausible, however, that an individual's attitude towards risk—in the sense of a personal trait—and the way risk is perceived are not orthogonal to one another. Specifically, a particular action in a particular choice environment will likely be perceived as more risky by a risk-averse decision-maker than by a risk-seeking decision-maker. The interaction between preferences and perceptions may thus be another factor driving some of the variation in risk-taking behavior.

Despite the vast body of important research on “risk” in the behavioral sciences, we thus feel that there is more to be learnt about how risk preferences, risk perceptions, and the interaction between these concepts impact economic and financial decision-making. Given the lack of a clear-cut conceptualization of risk, what is the correct way to interpret various empirical results reported in the literature remains *per se* unclear. To avoid concerns that insights gained from behavioral and experimental research may be inconclusive due to an insufficient delineation of various concepts of risk, it is our belief that scholars in the behavioral sciences should continue to strive towards well-founded models and theories.

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