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Anxiety in the face of risk☆

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ABSTRACT

We model an anxious agent as one who is more risk averse with respect to imminent risks than with respect to distant risks. Based on a utility function that captures individual subjects' behavior in experiments, we provide a tractable theory relaxing the restriction of constant risk aversion across horizons and show that it generates rich implications. We first apply the model to insurance markets and explain the high premia for short-horizon insurance. Then, we show that costly delegated portfolio management, investment advice, and withdrawal fees emerge as endogenous features and strategies to cope with dynamic inconsistency in intratemporal risk-return trade-offs.

1. Introduction

Ample evidence exists that people behave in more risk averse ways with respect with risks that are close in time compared to risks that are distant. We term such behavior horizon-dependent risk aversion (HDRA) or more informally anxiety.[1] Despite abundant experimental evidence that people exhibit HDRA preferences, economists have not yet developed a formal way of thinking about such preferences and the implications for economics and finance. This paper takes first steps toward such a framework by modeling an agent whose risk aversion explicitly depends on the temporal distance to the resolution and payoff of a lottery.

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[1] The *New Oxford American Dictionary* defines anxiety as a "feeling of worry, nervousness, or unease, typically about an *imminent* event or something with an *uncertain* outcome" (emphasis added). This paper does not discuss anxiety disorder, which is a psychopathological condition.

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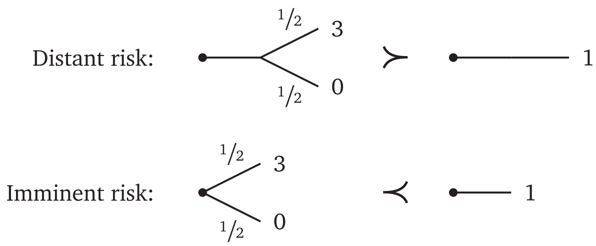

Fig. 1. Horizon-dependent risk aversion.

Fig. 1 illustrates HDRA with a simple example. In both the top and the bottom depictions, the agent has to choose between a risky alternative on the left and a safe alternative on the right. In the top comparison, the risk is distant. As a result, the agent has low risk aversion with respect to the gamble. If her risk aversion is low enough, she could choose the risky over the safe alternative. In the bottom comparison, the risk is imminent. As a result, the agent has high risk aversion and could choose the safe over the risky alternative. The agent's preference implies different choices depending on the temporal distance of the risk. That is, she could pull back from risks she previously intended to take, even absent new information and even if her beliefs have not changed for any other reason.

As an intuitive example, consider a parachute jump. An agent could sign up for a jump several days or weeks in advance, thinking the thrill of the jump would be well worth the risk of an accident. However, when looking out the plane's door at the moment of truth, the agent is likely to reconsider and could decide not to jump. Such behavior of parachutists, as well as similar examples, e.g., stage fright of performers, has been studied extensively in the psychology literature (see Section 2). The parachuting example suggests that HDRA has its proximate cause in an emotional reaction to the proximity of risk. We discuss evidence supporting this interpretation (Section 2). However, our analysis does not depend on that interpretation. In our analysis, we postulate an expected utility specification that captures the observed behavior without making a formal claim as to the reasons for such preferences.

The behavior our HDRA preferences capture differs from the behavior captured by related but conceptually orthogonal nonstandard preferences, such as time-varying risk aversion, preference for the timing of resolution of uncertainty, or preferences with nonexponential discounting (which include the quasi-hyperbolic discounting case). Quasi-hyperbolic discounting represents dynamic inconsistency for intertemporal consumption-savings trade-offs and gives rise to a demand for illiquid assets and other commitment devices to prevent overconsumption and facilitate saving (Laibson, 1997). Risk is not a central element of such models. In contrast, HDRA represents dynamic inconsistency for intratemporal risk-return trade-offs and, therefore, has implications in many domains of decision making under uncertainty. For example, we show that HDRA can address key features of short-horizon insurance markets, which represent puzzles for standard preferences. Moreover, our modeling approach allows us to distinguish between the behavior of naive and sophisticated HDRA agents, with distinct predictions for consumer choice and investor behavior. For a related analysis with dynamically inconsistent time preferences, see, e.g., O'Donoghue and Rabin (1999). Such analysis is not possible with preference formulations featuring temptation utilities that imply sophistication throughout (Gul and Pesendorfer, 2001; 2004). Finally, HDRA has the potential to account for features of equilibrium asset prices, as well as particular variation in the cross-sectional pricing of risk, for which nonstandard time preferences have no implications (Luttmer and Mariotti, 2003).

Modeling preferences with HDRA presents several challenges, particularly if one wants to maintain dynamic consistency for intertemporal trade-offs. We show that, in a time-separable framework with more than two periods, HDRA necessarily leads to dynamic inconsistency in consumption even when the increased flexibility of nonexponential discounting is taken into account. This insight complements that of Strotz (1955). That is, we show that to achieve dynamic consistency, not only does discounting have to be exponential, but the utility indexes also must be identical. The only way to maintain time-separability and have HDRA without dynamic inconsistency for intertemporal consumption trade-offs is to restrict analysis to a two-period setting. We choose this approach because it allows for analytical transparency and application to a wide range of settings. We drop time-separability in Andries, Eisenbach and Schmalz (2014) and develop generalized preferences based on Epstein and Zin (1989) to derive asset pricing implications in a fully dynamic model.

After discussing these modeling challenges, we apply our model to consumer demand for insurance and for commitment devices to take risk. Given the potential of dynamically inconsistent risk taking, we can distinguish between naive and sophisticated HDRA agents. Only naive agents buy very high-priced short-term insurance in the presence of cheaper alternatives that, however, would require more foresight. By incorporating such decisions in an otherwise standard framework, we show that HDRA behavior is not necessarily inconsistent with standard von Neumann–Morgenstern utility functions, resolving the puzzle posed by Eisner and Strotz (1961).

By contrast, only an agent who is sophisticated about her dynamic inconsistency is willing to pay for commitment devices to take risk. Lacking the resolve to personally manage an equity portfolio, she is willing to pay a fee to delegate her investment decisions. Thus, sophisticated agents with HDRA preferences generate a demand for delegated portfolio management, even if these services are costly and known to under-perform passive benchmarks that are available at low costs (Gruber, 1996). Moreover, the HDRA model predicts that demand for investment advice is particularly strong for agents who would otherwise not invest in risky assets at all, as shown by Foerster, Linnainmaa, Melzer and Previtero (2014). Our results therefore suggest that firms respond to the presence of HDRA agents in the population and that features of different markets can be understood by allowing for heterogeneity in agents' levels of sophistication.

Finally, we show in a stylized setting that investors with HDRA require more compensation for short-run risks