

## STANDARD RISK AVERSION

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This paper introduces the concept of *standard risk aversion*. A von Neumann-Morgenstern utility function has standard risk aversion if every risk that has a negative interaction with a small reduction in wealth also has a negative interaction with any undesirable, independent risk. It is shown that, given monotonicity and concavity, the combination of decreasing absolute risk aversion and decreasing absolute prudence is necessary and sufficient for standard risk aversion. Standard risk aversion is shown to imply not only Pratt and Zeckhauser's "proper risk aversion" (an undesirable risk always remaining undesirable in the presence of an independent undesirable risk), but also that being forced to face an undesirable risk reduces the optimal investment in a risky security with an independent return.

KEYWORDS: Amelioration, aggravation, independence, loss-aggravating, patently more risky, portfolio, precautionary, proper, prudence, substitute, temperance.

### INTRODUCTION

MULTIPLE SOURCES OF RISK are a fact of life. Only rarely will decisions concerning various individual risks be neatly separable. Intuitively, even when risks are statistically independent, bearing one risk should make an agent less willing to bear another.<sup>2</sup> In other words, even independent risks should act as substitutes.<sup>3</sup> Though any correlation is weak, medical risk should make one less willing to bear burglary risk, and personal unemployment risk should make one less willing to bear the risk inherent in broad stock aggregates, for reasons that would hold in the absence of *any* statistical relationship.

This paper develops the concept of *standard risk aversion*, a specific formalization of the notion that bearing one risk should make an agent less willing to bear another risk, even when the two risks are independent. The time-honored concept of *decreasing absolute risk aversion* says that a nonrandom reduction in wealth should increase an agent's sensitivity to a wide range of risks. *Standard risk aversion* says that any undesirable risk should increase an agent's sensitivity to independent risks whenever a nonrandom reduction in wealth would.

In order to give a precise definition of standard risk aversion, it is necessary to focus on a particular type of substitutability between risks; substitutability is an economic notion with many variants. In the context of expected utility maximization, the axiomatically based cardinality of the von Neumann-

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<sup>2</sup> The most obvious grounds for decisions about various risks to be intertwined is correlation or some other statistical relationship between the risks. This is the cause of interaction between risks emphasized in portfolio theory, but one excluded here by the assumption of independence.

<sup>3</sup> The principle of diversification guarantees only that independent risks are not *perfect* substitutes. See the discussion in Pratt and Zeckhauser (1987) about the "false law of large numbers."