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How risky is a random process?

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Abstract

The riskiness of random processes is compared by (a) employing a decision theoretic equivalence between processes and lotteries on path-spaces to identify the riskiness of the former with that of the latter, and (b) using the theory of comparative riskiness of lotteries over vector spaces to compare the riskiness of lotteries on a given path-space. We derive the equivalence used in step (a) and contribute a new criterion to the theory applied in step (b). The validity of the new criterion, which applies second order stochastic dominance to utility distributions, is established by showing its equivalence to the benchmark decision theoretic criterion when comparing the riskiness of lotteries over *any* vector space. We demonstrate the theory's tractability *via* diverse economic applications.

JEL classification: C02, D01, D63, D81

Key words: random processes, vector outcomes, comparative riskiness, utility-based second order stochastic dominance, monotone comparative statics

1 Introduction

The answer to the above question will rely on the theory of comparative riskiness of lotteries. The cornerstone of this theory is the decision theoretic criterion (henceforth, DTC): one lottery over a set of outcomes is said to be riskier than another one if every decision-maker with an admissible concave (Bernoulli-von Neumann-Morgenstern) utility defined on the outcomes derives at least as much expected utility from the latter as from the former.[1]

The comparative riskiness of random variables can be assessed by identifying it with the comparative riskiness of their distributions on the real

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[1]Given an outcome space, the "admissible" utilities are those that DTC, or any other criterion dependent on utilities, takes into account when comparing lotteries. Different sets of admissible utilities yield various versions of such a criterion.