

Department of Decision Sciences

De Finetti Risk Seminar

## Evaluation of long-dated investments under uncertain growth trend, volatility and catastrophes

**Christian Gollier**

Toulouse School of Economics

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### Abstract

In this paper, we examine the term structures of interest rates and risk premia when the random walk of economic growth is affected by some parametric uncertainty. Using a time-consistent expected utility framework, we show that parametric uncertainty does not affect assets prices of short maturities. We also show that the same arguments proposed in the literature to justify a decreasing term structure for the safe discount rate also apply to justify an increasing term structure for the risk premium. Another important consequence of parametric uncertainty is that the risk premium is not proportional to the beta of the investment. We apply these general results to the case of an uncertain probability of macroeconomic catastrophes à la Barro (2006), and to the case of an uncertain trend or volatility of growth à la Weitzman (2007). Finally, we apply our findings to the evaluation of climate change policy. We argue in particular that the beta of actions to mitigate climate change is relatively large, so that the term structure of the risk-adjusted discount rates should be increasing.

Keywords: asset prices, term structure, risk premium, decreasing discount rates, uncertain growth, climate beta, rare events, long-term risk.

JEL Codes: G11, G12, E43, Q54.