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Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance

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Abstract

This article incorporates a time-varying severity of disasters into the hypothesis proposed by Rietz (1988) and Barro (2006) that risk premia result from the possibility of rare large disasters. During a disaster an asset's fundamental value falls by a time-varying amount. This in turn generates time-varying risk premia and, thus, volatile asset prices and return predictability. Using the recent technique of linearity-generating processes, the model is tractable and all prices are exactly solved in closed form. In this article's framework, the following empirical regularities can be understood quantitatively: (i) equity premium puzzle; (ii) risk-free rate puzzle; (iii) excess volatility puzzle; (iv) predictability of aggregate stock market returns with price-dividend ratios; (v) often greater explanatory power of characteristics than covariances for asset returns; (vi) upward-sloping nominal yield curve; (vii) predictability of future bond excess returns and long-term rates via the slope of the yield curve; (viii) corporate bond spread puzzle; (ix) high price of deep out-of-the-money puts; and (x) high put prices being followed by high stock returns. The calibration passes a variance bound test, as normal-times market volatility is consistent with the wide dispersion of disaster outcomes in the historical record. The model extends to a setting with many factors and to Epstein-Zin preferences.

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