Dynamic Safety First Expected Utility Model

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Abstract

Roy (1952) pioneers the safety-first principle for portfolio selection with an aim of minimizing the disaster probability subject to the mean constraint that the expected final wealth is not less than a pre-selected disaster level. However, Levy and Levy (2009) empirically show that the choice of decision maker cannot explained by safety first principle alone although it plays an important role in the decision-making process. Their experiment indicates that decision is probably made by combining the safety first principle and the expected utility approaches. This safety first expected utility (SFEU) supplements prospect theories for human decision. We extend their SFEU model to the optimal dynamic investment in a continuous-time economy. We derive the analytic optimal trading strategy using the martingale approach. Interestingly, the optimal trading strategy replicates a portfolio of a vanilla call, a vanilla put, a digital option and a cash reserve. As vanilla range accrual note is a sum of digital options, this replicating portfolio implies that vanilla call, put and range accrual notes are popular in the derivatives market because a combination of these derivatives matches with investors' investment objectives.

Keywords: Safety-first principle; Expected utility; Martingale approach

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