

VaR and CVaR with Uncertainty and Concave Distortion

Fei Lung Yuen¹, Ka Chun Chung²

¹*Department of Actuarial Mathematics and Statistics,
and the Maxwell Institute for Mathematical Sciences, Heriot-Watt University,
Edinburgh EH14 4AS, United Kingdom.*

E-mail: F.Yuen@hw.ac.uk, telephone number: (44) 131 451 8158.

²*Department of Statistics and Actuarial Science,
The University of Hong Kong, Pokfulam Road, Hong Kong.
E-mail: kccg@hku.hk, telephone number: (852) 2857 1987.*

Abstract

VaR (value at risk) and CVaR (conditional value at risk) are two risk measures commonly used in different aspects of financial mathematics. They indicate the possible loss due to randomness under an extreme condition. In this paper, we apply the concept of relative entropy to model the uncertainty of the loss distribution and study its effects on these two risk measures. We focus on the two risk measures under the worst scenario in the analysis. The forms of the risk measures and the worst scenarios are identified. VaR-worst scenario is found to be a concave distortion on the physical probability measure and it is suggested to be used to illustrate the effect of uncertainty on different distortion risk measures.

Keywords Uncertainty, Relative Entropy, Value at Risk, Conditional Value at Risk, Distortion.