

# An Importance Sampling of Conditional Tail Expectations for Functions of Random Variables

黃士峰、林家嬋\*

Institute of Statistics, National University of Kaohsiung

## Abstract

In complex stochastic models, conditional tail expectation (CTE) for a function of random variables plays an important role in many fields, but it usually has no closed form solution. In this study, two applications of the considered problem are discussed. The first one is to compute the  $p$ -value of a self-normalized test statistic, which is a nonlinear function of random variables. The second application is to compute the multi-step-ahead CTE of a conditional heteroscedastic model. Traditionally, Monte Carlo (MC) simulation is used to generate random samples for computing CTE, but it is usually time consuming. This study proposes a sequential importance sampling scheme based on truncated exponential distribution. The proposed estimator is proved to be unbiased and more efficient than the MC estimator. Simulation findings are consistent to the theoretical results and indicate that the proposed method improves the computing efficiency more remarkably, especially when the number of components of the test statistic decreases or a small step-ahead CTE of a conditional heteroscedastic model is considered.

Keywords : conditional tail expectation, importance sampling, multistep prediction, self-normalized test statistic , tail probabilities.