

Transform approach for operational risk modelling: VaR and TCE

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Abstract

To quantify the aggregate losses from operational risk, we employ actuarial risk model, i.e. we consider compound Cox model of operational risk to deal with stochastic nature of its frequency rate in reality. A shot noise process is used for this purpose. A compound Poisson model is also considered as its counterpart for the case that operational loss frequency rate is deterministic. As the loss amounts arising due to mismanagement of operational risks are extremes in practice, we assume the loss sizes are Loggamma, Fréchet and truncated Gumbel. We also use an exponential distribution for the case of non-extreme losses. Employing loss distribution approach, we derive the analytical/explicit forms of the Laplace transform of the distribution of aggregate operational losses. The Value at Risk (VaR) and tail conditional expectation (TCE, also known as TailVaR) are used to evaluate the operational risk capital charge. Fast Fourier transform is used to approximate VaR and TCE numerically and the figures of the distributions of aggregate operational losses are provided. Numerical comparisons of VaRs and TCEs obtained using two compound processes are also made respectively.

Keywords: Operational risk; total loss; the compound Poisson/Cox process; shot noise process; loss distribution; VaR; tail conditional expectation (TCE); Fast Fourier transform.