UBS Investment Bank

Portfolio modelling of operational losses

John Gavin[1]

February 2004

Abstract

Basel II is an emerging regulatory regime for financial institutions. It stipulates that banks must quantify the capital they need to offset operational losses, such as fraud, computer viruses or transaction processing errors. One statistical approach is to assume that risk can be described in terms of a distribution of possible outcomes, over some time horizon, such as one year. The capital charge for operational losses is then based on the difference between the 99.9^{th} percentile and the mean of this distribution.

The distribution of aggregated portfolio losses is a compound distribution, combining loss event frequencies and severities. A key assumption is that historic operational events contain some information about future potential operational risk exposure. So frequency and severity distributions are independently parameterised using this historic data. Then Monte Carlo simulation is used to convolute the distributions. All calculations are implemented in R.

In this paper, the frequency distribution is a negative binomial and the severity distribution is semi-parametric, combining the empirical distribution, for losses below some high threshold, with a generalized Pareto distribution, for excesses above that threshold.

[1] Quantitative Risk Models and Statistics, UBS Investment Bank, 100 Liverpool St., London, EC2M 2RH. U.K.