

Modelling Operational Risk using Bayesian Approach

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Abstract

To quantify the operational risk capital charge under Basel II requirements, more and more banks adopt the Loss Distribution Approach (LDA). Under the LDA, the bank's internal model must include the use of internal data, relevant external data, scenario analysis and factors reflecting the business environment and internal control systems.

Bayesian inference is a statistical technique well suited for combining expert opinions and historical data. Often, ad-hoc methods are used in practice to combine these data sources. We suggest a new consistent and unified approach that allows for combination of three data sources (relevant external data, bank's internal data and expert opinions) simultaneously using Bayesian inference.

Typically, the capital charge is estimated using the 0.999 quantile of the annual loss distribution calculated using point estimators of the frequency and severity distribution parameters. It is common practice to ignore the uncertainty of the parameter estimates. An unpleasant consequence for banks accounting for the uncertainty is an increase in the capital requirement. We demonstrate how the parameter uncertainty can be taken into account using Bayesian framework and study the impact on the capital charge.

Presented results are outcomes of our work with banking industry, discussions with regulators and joint academic research published in the following papers:

P.V. Shevchenko (2008). *Estimation of Operational Risk Capital Charge under Parameter Uncertainty*. To appear in the Journal of Operational Risk.

D.D. Lambrigger, P.V. Shevchenko and M.V. Wüthrich (2007). *The Quantification of Operational Risk using Internal Data, Relevant External Data and Expert Opinions*. The Journal of Operational Risk 2(3), 3-27.

X.Luo, P.V. Shevchenko and J. Donnelly (2007). *Addressing Impact of Truncation and Parameter Uncertainty on Operational Risk Estimates*. The Journal of Operational Risk 2(4), 3-26.

H. Bühlmann, P.V. Shevchenko and M. V. Wüthrich (2007). *A "Toy" Model for Operational Risk Quantification using Credibility Theory*. The Journal of Operational Risk 2(1), 3-19.

P.V. Shevchenko and M.V. Wüthrich (2006). *The Structural Modelling of Operational Risk via the Bayesian Inference: Combining Loss Data with Expert Opinions*. The Journal of Operational Risk 1(3), 3-26.

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