

Solving Complex Risk Analysis Problems in Insurance and Finance

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Crystal Ball[®]

2007 Crystal Ball User Conference



Putting Crystal Ball and ModelRisk together

Crystal Ball

- Mature product, an industry standard
- Sophisticated features, easy to use
- Excellent reporting, graphics
- OptQuest
- Used a lot in finance and insurance markets

ModelRisk

- Compliments the modelling flexibility of Crystal Ball and Excel
- Allows users access to a range of highly specialised insurance and finance tools
- These tools have not previously been available in Excel environment
 - Because of grid nature of spreadsheets, memory, speed
- Analysts have reverted to C++, R, etc
 - Familiar to few, easy to make mistakes
 - Non-intuitive interface



Some applications using Crystal Ball with ModelRisk



The number 1 insurance problem

Calculating the aggregate risk from a set of policies

Many texts devoted to just this problem:

- Need:
 - Frequency distribution of exposure
 - Severity distribution of random individual claim
- What is then the total (aggregate) claim distribution?
- Also has a LOT of application for finance (e.g. credit & operational risk)

Methods

- Simulation (like Crystal Ball)
- Recursive methods (Panjer, dePril)
- FFT methods (univariate, multivariate)
- Poisson mixture approximation
- Method of Moments based fitting

- All have their pluses, minuses
- All directly implemented in ModelRisk through the 'VoseAggregate' set of tools



The number 2 insurance problem: Determining the risk premium

First determine the cost distribution of covering a policy:

- Frequency
- Severity
- This determines the mean, spread
- Premium is set by some risk-based policy
 - > mean cost

Methods

- Expected value (calculation): $(1 + \theta)E[X]$
- Standard deviation (calculation): $E[X] + \alpha\sigma[X]$
- Esscher (internal simulation): $\frac{E[Xe^{hX}]}{E[e^{hX}]}$
- Risk adjusted (numerical integration): $\int_{\min}^{\max} [1 - F(x)]^{1/\rho} dx$



Some more applications

- Correlating with copulas
- Time series models
- Handling risk events as single elements
- Probability calculations
- Extreme value simulations and calculations
- Splicing distributions
- Ruin models



Would you like a play?

... take a demo CD

(full functioning time limited beta version)

Thank you

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