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HEILBRONN UNIVERSITY
OF APPLIED SCIENCES

DERIVING TOTAL PROJECT COSTS FROM WBS ELEMENTS' COST PROBABILITY DISTRIBUTIONS

OVERVIEW

1 Probabilistic project costing

2 Problem description

3 Proposed Cost Growth Factor probability distributions

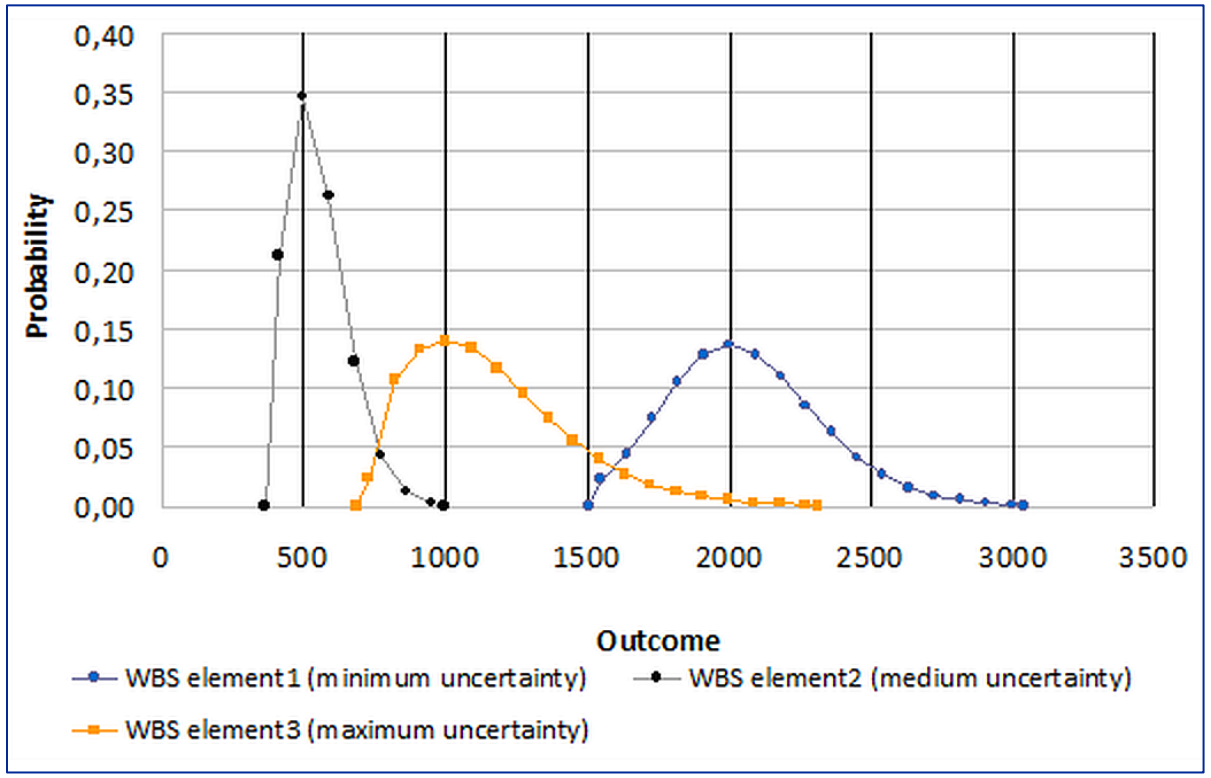
4 Data points for discretization

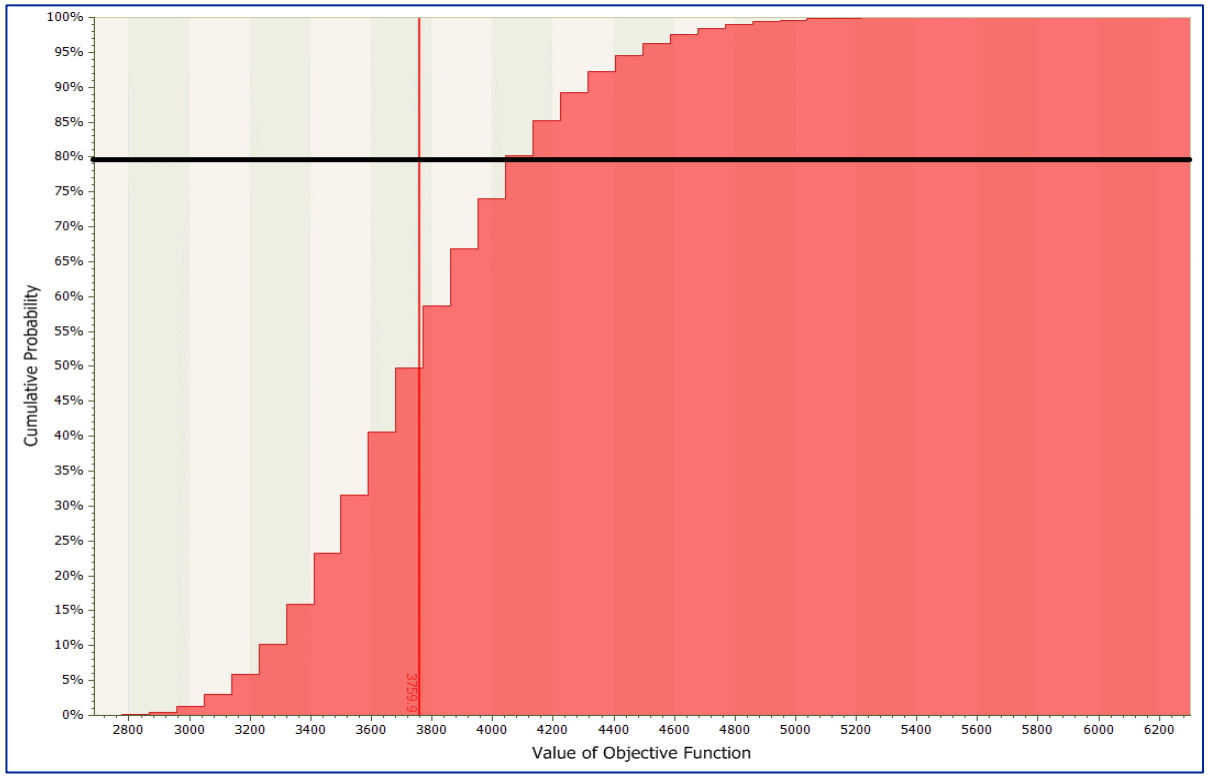
5 Further criteria for choosing the right number of intervals

6 Interpretation of not-defined areas on the joint CDF

7 Lessons learned

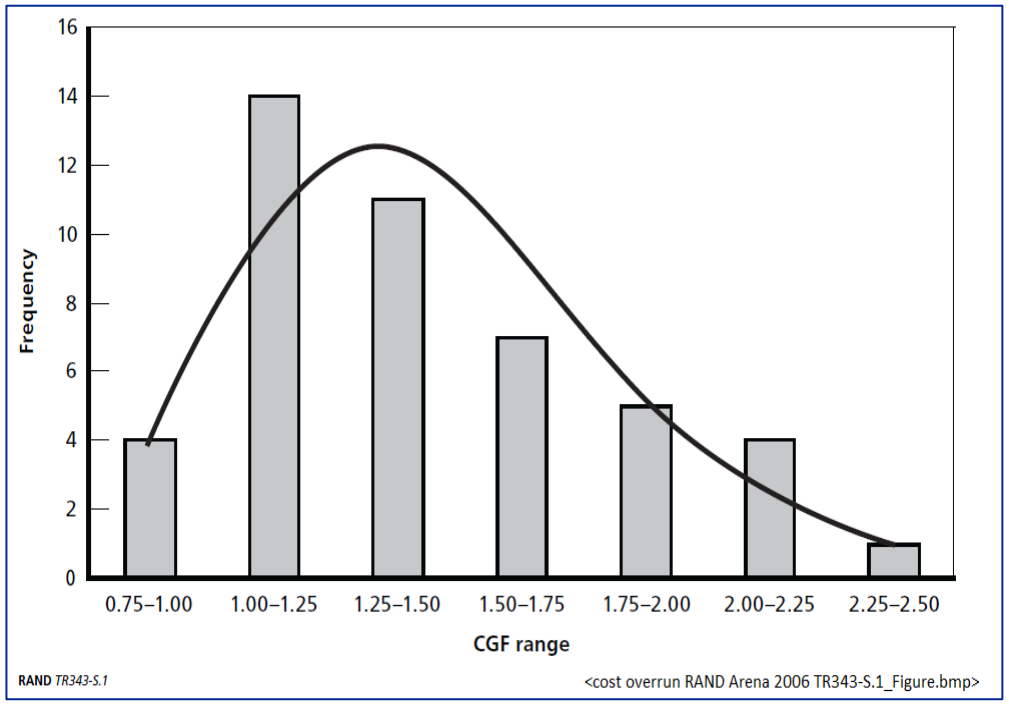
1 PROBABILISTIC PROJECT COSTING

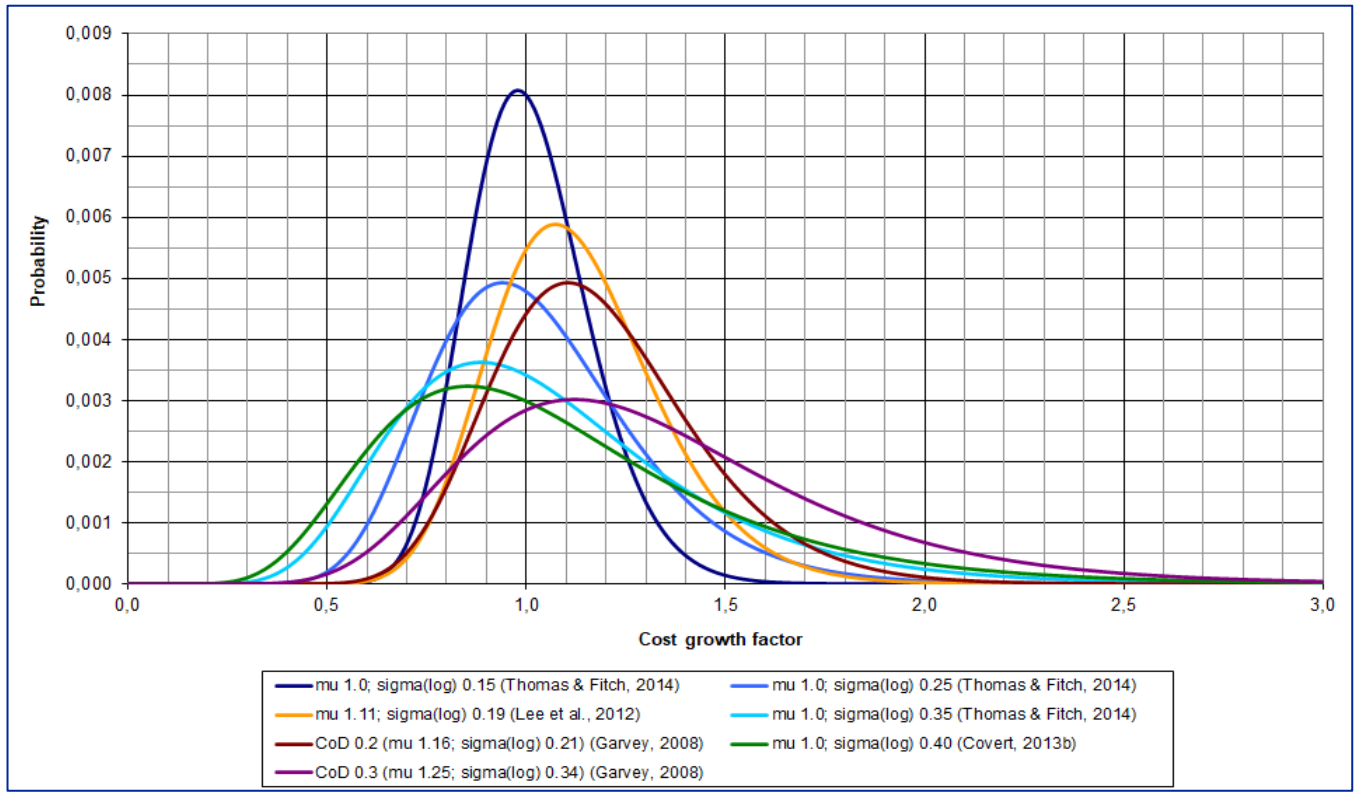




2 PROBLEM DESCRIPTION

Modelling of cost variances as “Cost Growth Factor”

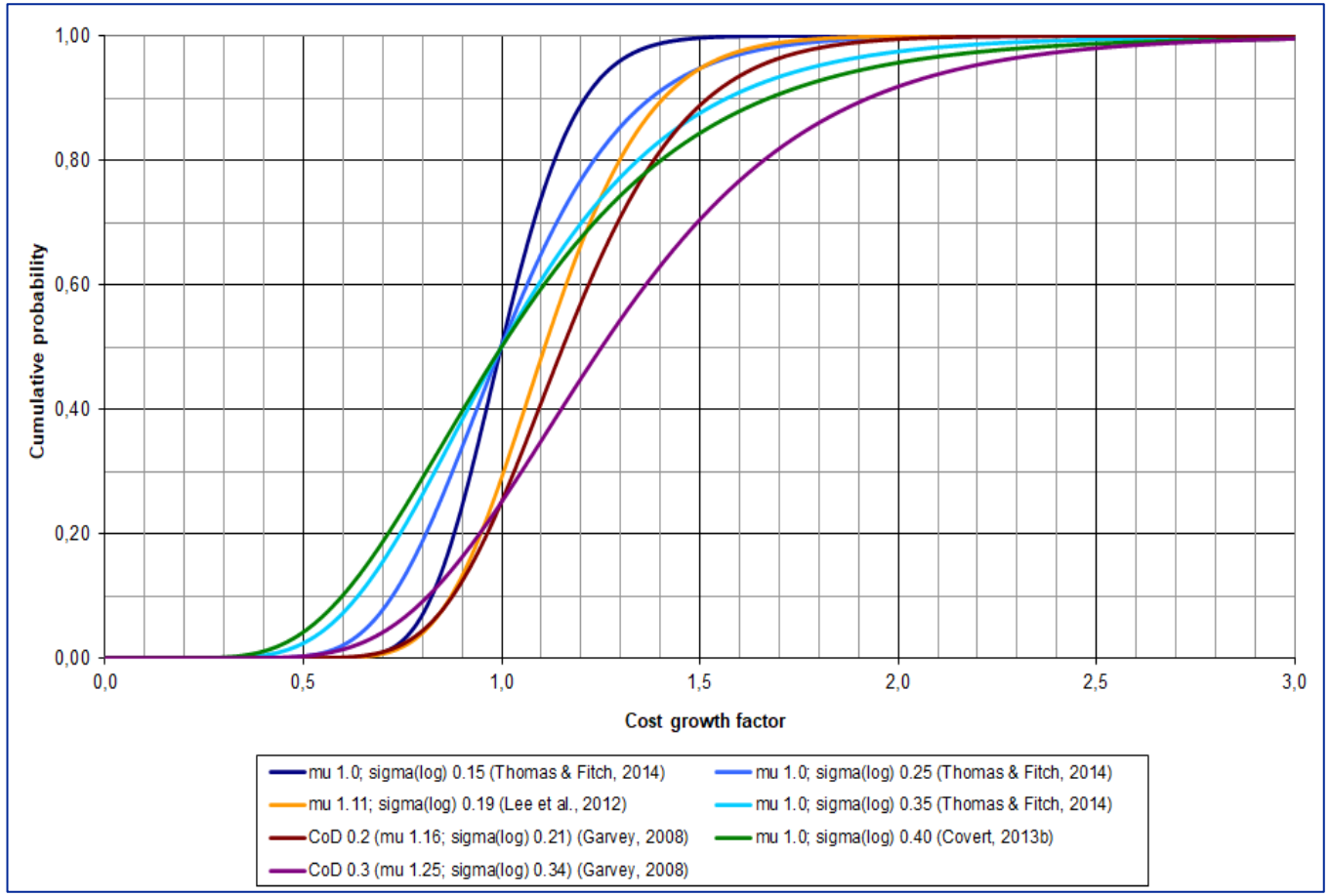




3 PROPOSED COST GROWTH FACTOR PROBABILITY DISTRIBUTIONS

Assumptions

- Planned cost are most likely costs.
- Planned costs (CGF=1) lay below the median (mu > 1.00).
- The Lognormal CGF distribution is restricted to relevant CGF values (0.75 < CGF < 3.00) and is truncated.

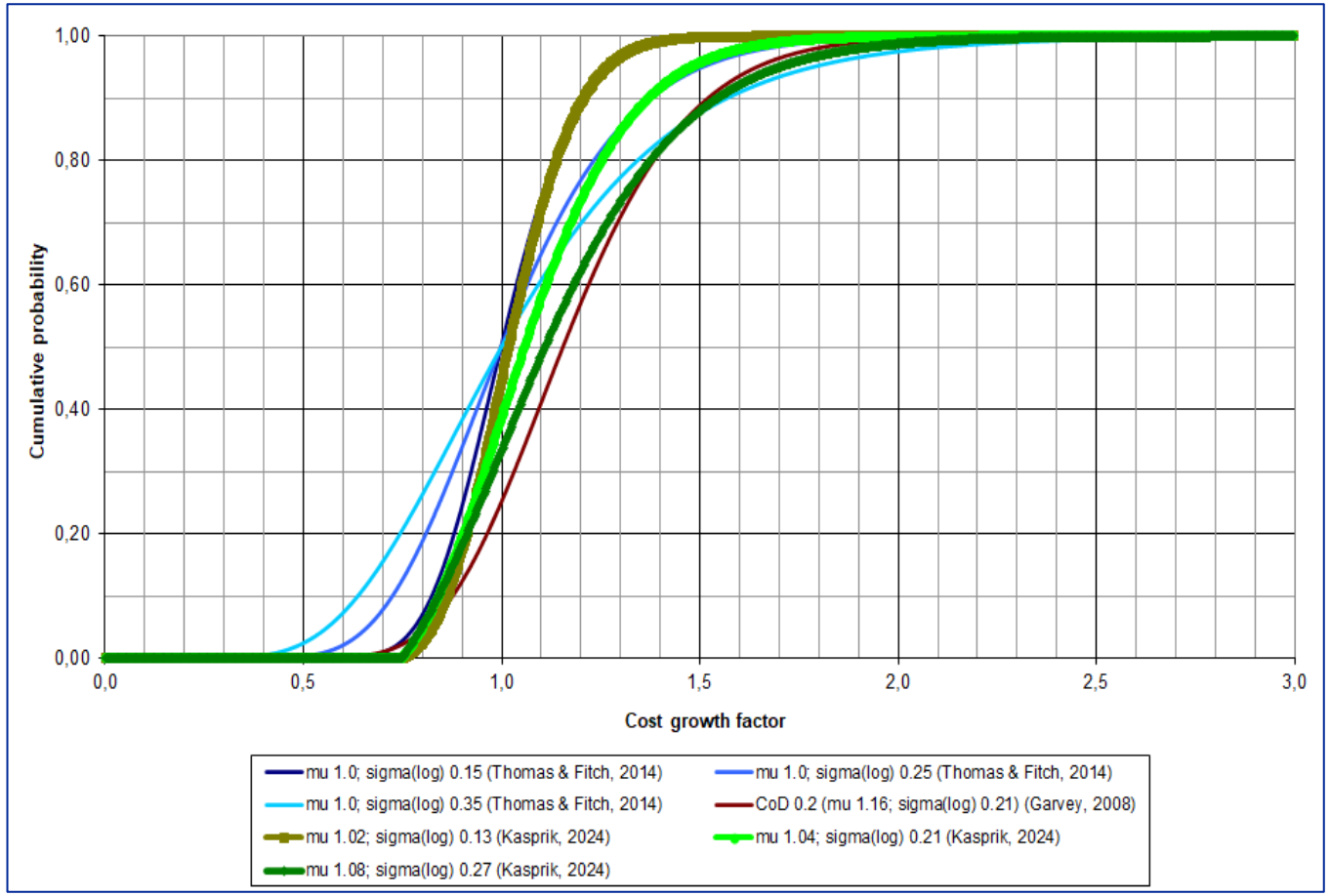


3 PROPOSED COST GROWTH FACTOR PROBABILITY DISTRIBUTIONS

Modelling

- Three states of uncertainty are defined following Thomas & Fitch (2014, 32).
- Each state of uncertainty displays a different cost variance.

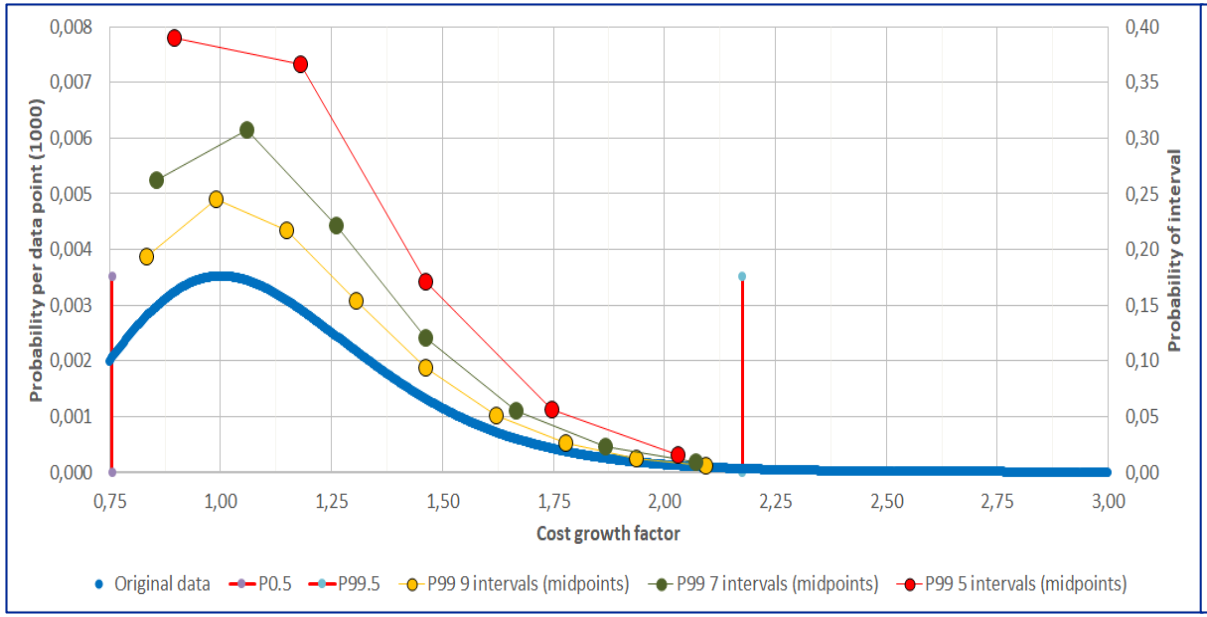
- Solution is gained by a systematic and iterative variation of mu and sigma.
- Target variable: VaR80 and VaR90.
- Method of Moments-Matching by minimizing the absolute deviation.

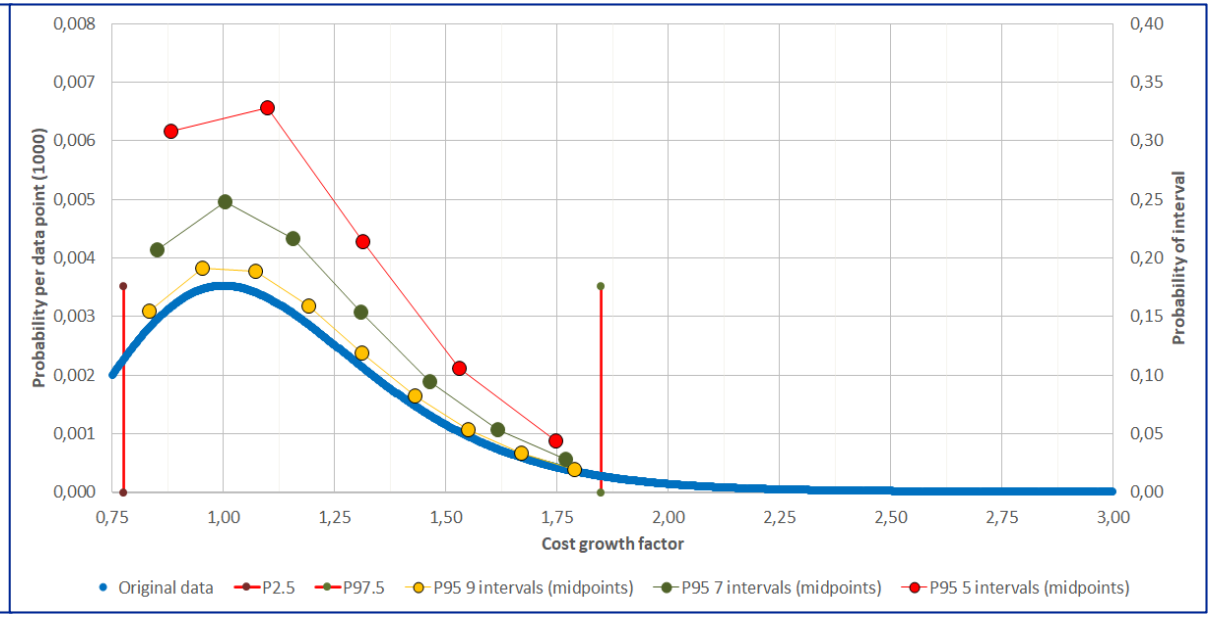


4 DATA POINTS FOR DISCRETIZATION

Results (high uncertainty)

- Acceptable goodness of fit values can be gained when truncating the presented lognormal CGF distribution function at fractile 0.005 and 0.995 or fractile 0.025 and 0.975.
- The minimum number of intervals is seven.





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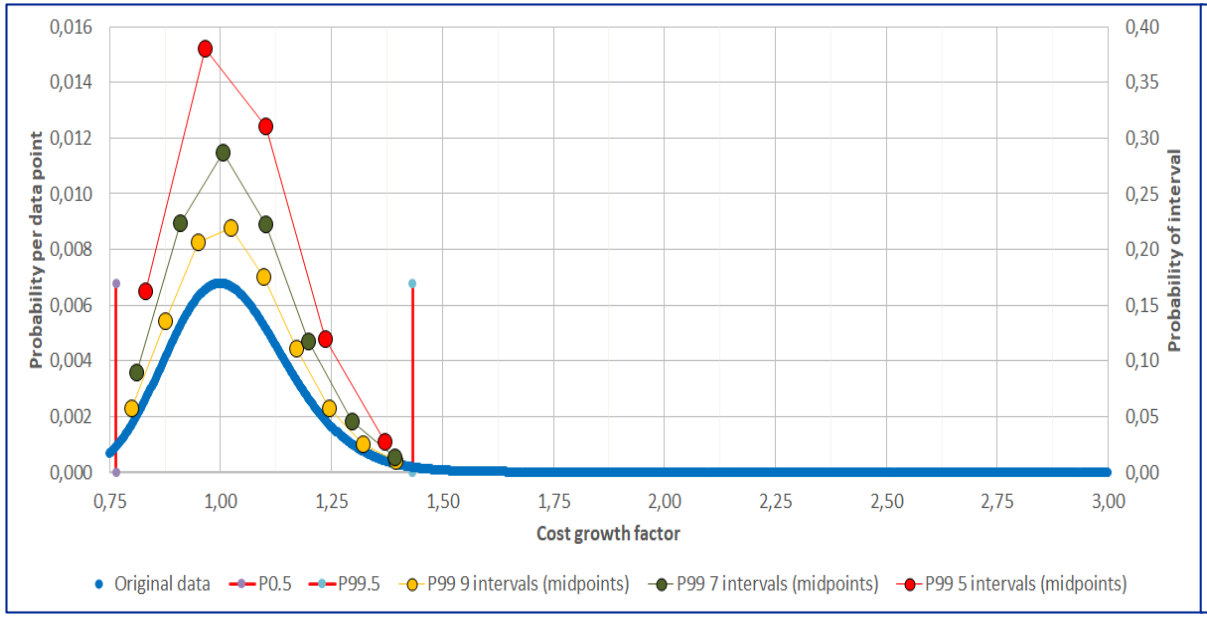
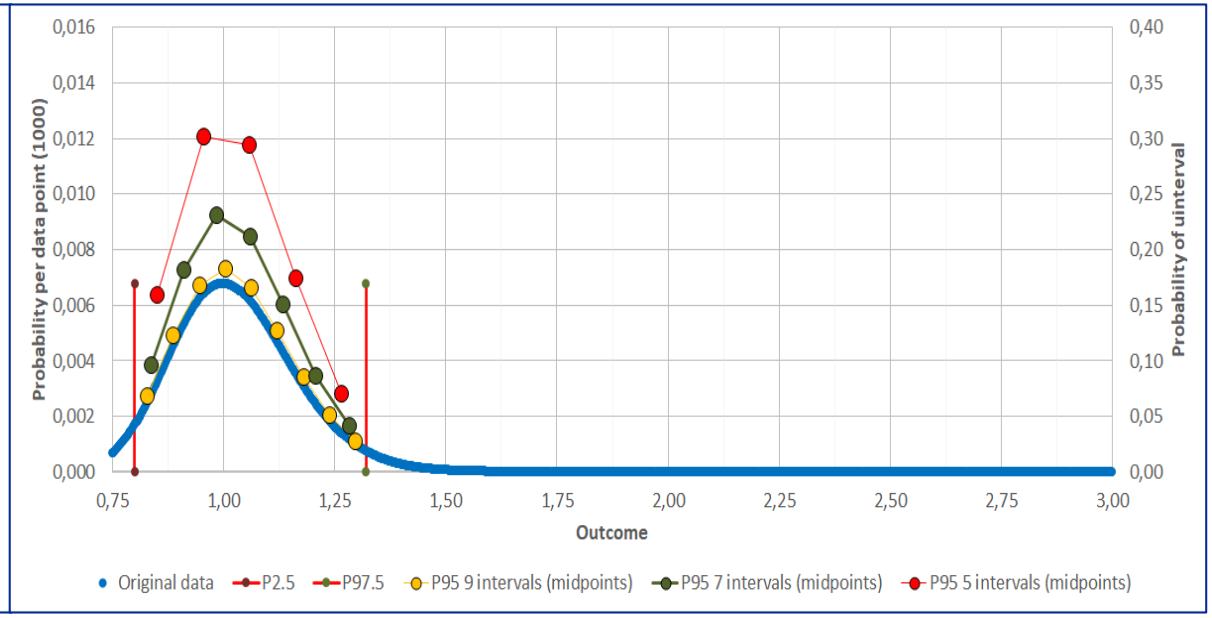




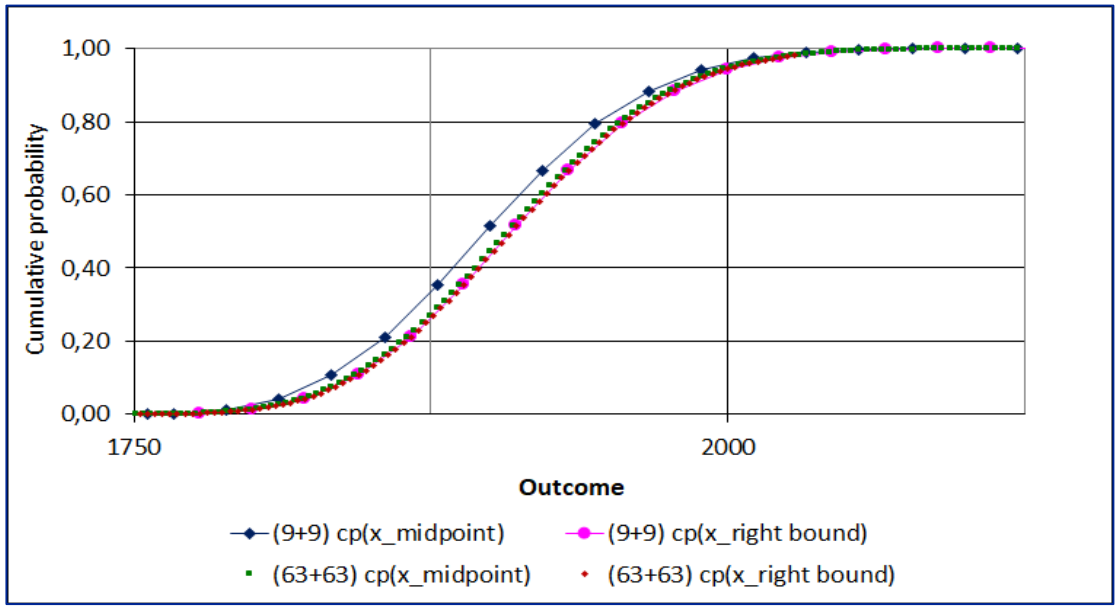
5 FURTHER CRITERIA FOR CHOOSING THE RIGHT NUMBER OF INTERVALS

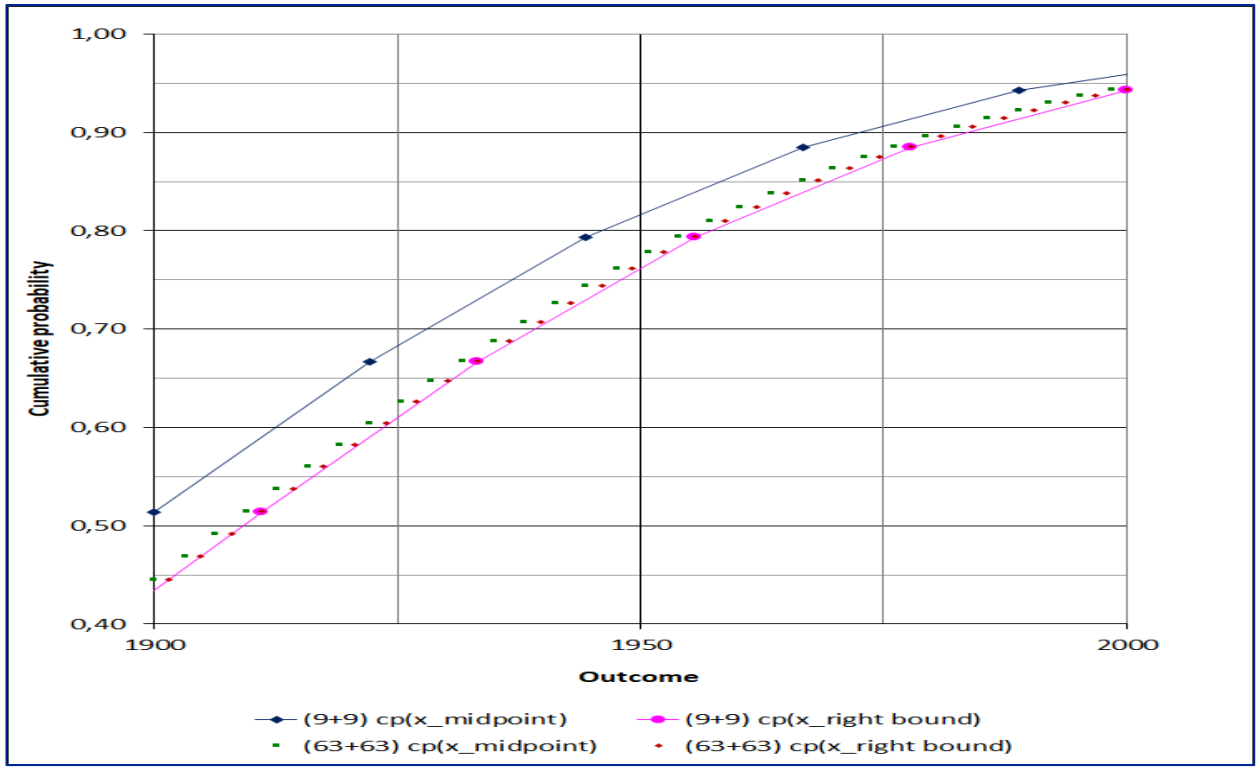
> The midpoint of the modal interval should be close to the true mode.
- The midpoint of the mode interval
- influences the resulting joint distribution
- more than other data points.

> The intervals of the joint distribution data points should be interpretable.
- When additively convoluting PDFs,
- each joint distribution data point represents the midpoint of an interval
- bounded by the sum of all lower
- respective of all upper bounds of the PDF intervals integrated.

6 INTERPRETATION OF NOT-DEFINED AREAS ON THE JOINT CDF

Possible solution for interpreting not-defined areas (case: additive convolution)





The linear interpolation of the right bounds of the CDF joint intervals of two additively folded granular distributions (each discretized into nine intervals) comes close to the highly discretized (true) joint CDF (63 intervals).

7 LESSONS LEARNED

(1) Test the maximum number of combinations that a risk management software can calculate if you plan to deploy a full enumeration of all combinations (preferable).

(2) Choose equal interval widths per PDF.

(3) Start the decision process on the number of intervals by looking at the resulting interval width of the joint distribution data points.

(4) Choose an identical interval width for each PDF.

(5) Make the midpoint of the discretized mode interval get close to the true mode of the PDF by shifting the relevant bandwidth.

(6) In the case of the lognormal CGF distributions presented: the minimum number of equal width intervals is seven if truncated.

(7) Interpret the joint CDF of additively convoluted PDFs as follows: Assess the distance of the joint distribution data points and shift the CDF half the distance to the right.

THANK YOU FOR YOUR ATTENTION!

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