Risk vs. Uncertainty

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One Brick Higher

- In 1894, after a building was destroyed by fire, Purdue President James Smart promised that the building would be rebuilt and that the tower on the new building would be "one brick higher"
- Since then, it has become a motto for the University to indicate resilience and continual improvement
- This presentation is in that spirit in that it is not a criticism of the good work that has been done so far; rather, it is an attempt to make the future work a little bit better

Risk & Uncertainty

- These terms have different meanings to different people
  - Academics have focused on the distinction of whether we can measure the odds of something happening (risk) or not (uncertainty)
  - Often the academics find ways of being simultaneously correct and useless

Risk & Uncertainty*

- Risk – the possibility of suffering harm or loss
- Uncertainty – the condition of being in doubt

*The American Heritage Dictionary

Similar but not Identical

- There is a tendency to use the terms interchangeably but they are not always the same
  - If I buy a lottery ticket, the uncertainty could be in the millions of dollars, but the risk is limited to the price of the ticket

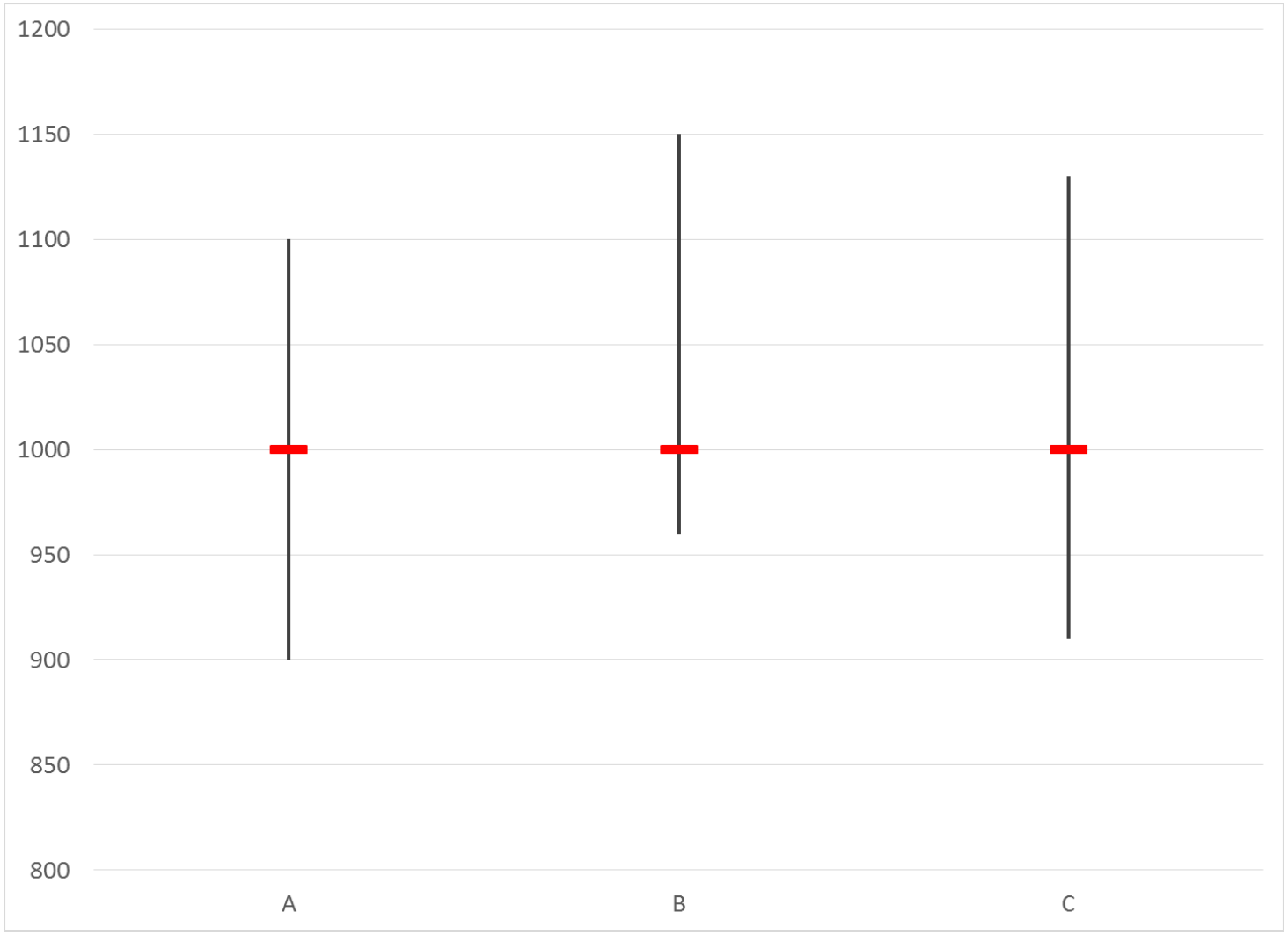
Risk Analysis Approaches

- One approach is to run scenarios or sensitivities from the base case and measure the spread between the extreme low and high results
- Another is to run different combinations of inputs to get a distribution of outcomes (mean and variance)

Example

- We have three portfolios that all have the same NPVRR for the base case (1000) but have different spreads
  - A = 200
  - B = 180
  - C = 240
- Rank the uncertainty from lowest to highest
- Rank the risk from lowest to highest

Example Spreads



Direction of Uncertainty Matters

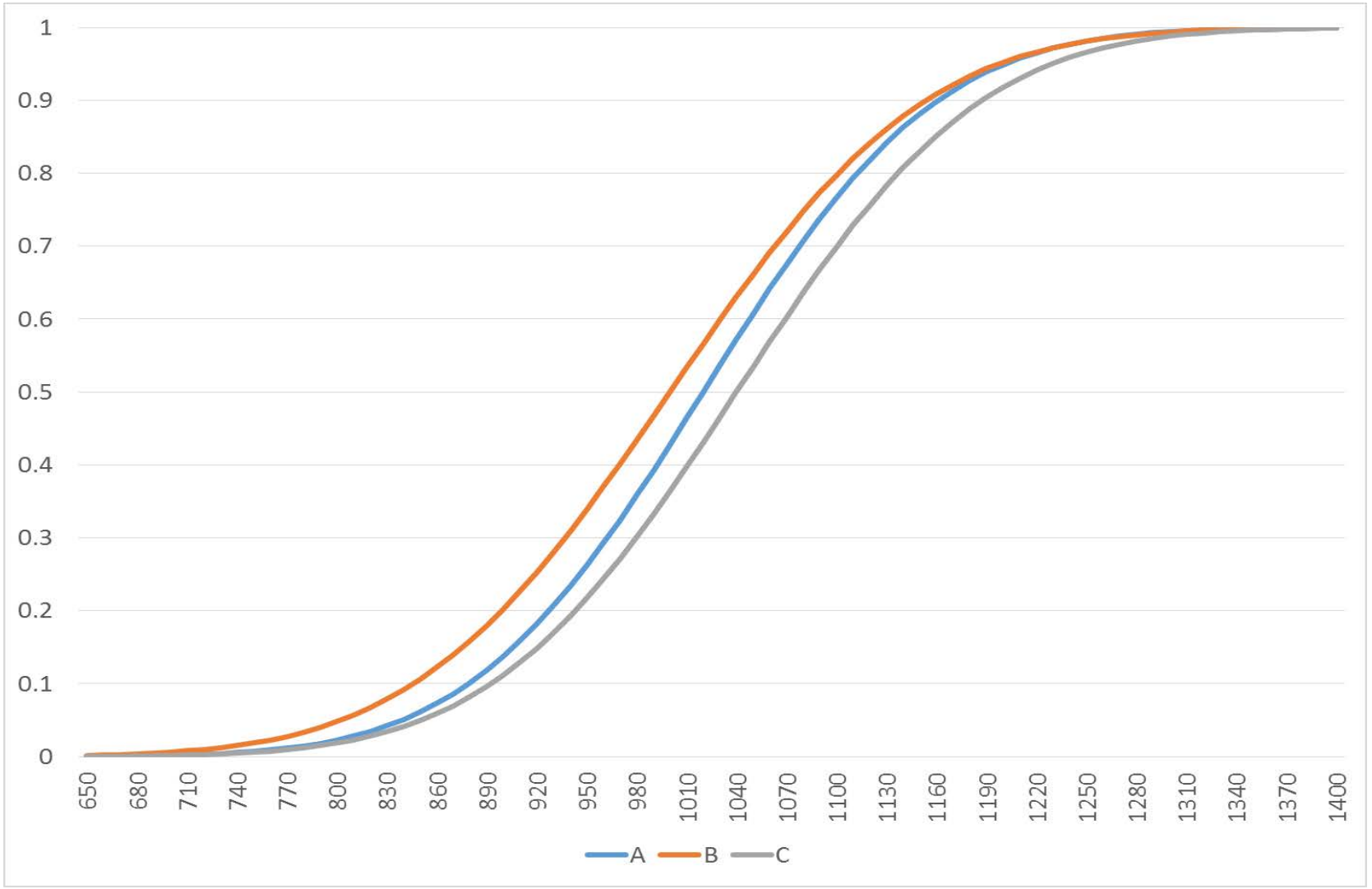
- If we base our analysis on uncertainty, we can mistake positive uncertainty (the chance that it will work out better than we expect) for risk

Another Example

- Three candidate portfolios have these expected NPVRR and associated standard deviations
  - Rank the uncertainty from lowest to highest
  - Rank the risk from lowest to highest

	Mean	Std Dev
A	1020	110
B	1000	120
C	1040	115

Cumulative Distributions



Context Matters

- The variance should be considered in the context of the magnitude of the mean
  - A portfolio with a higher variance could be less risky if the expected cost is low enough

What Happened to the Tower?

- It was actually built nine bricks higher