The Value of New Information - Remote Sensing to Improve Adaptation Planning and Investment

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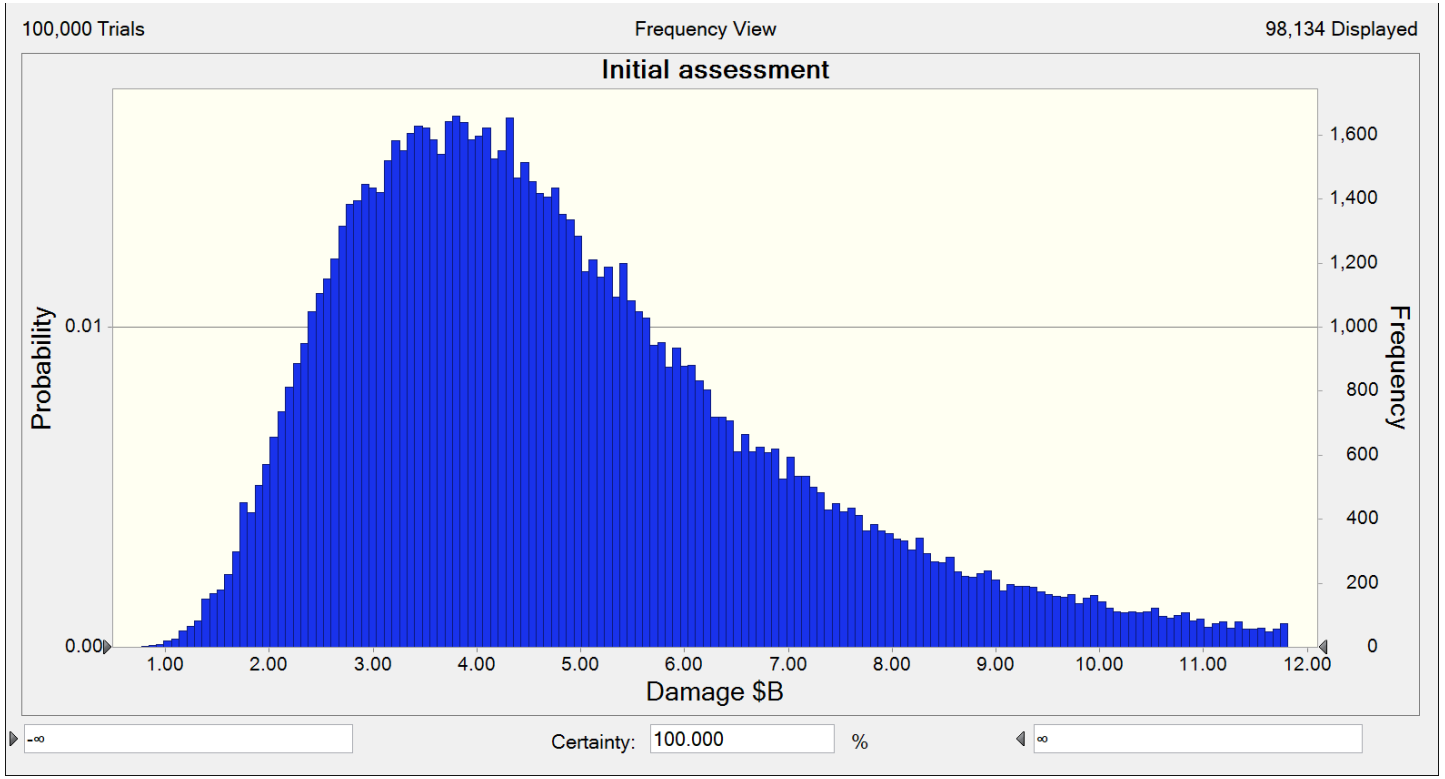
Adaptation as an Investment Strategy

- Investment under uncertainty
- Benefit cost analysis vs. cost-effectiveness analysis
- Robust decision making
- Real options analysis;
- Foster-Hart risk metrics to choose between RDM and ROA
  - Use RDM If a country or region can not afford irreversible damage from climate change.
    - Prevention of catastrophic events or adaptation to catastrophic events like imminent floods or droughts.
- In all other cases ROA is a preferable instrument

Potential damage given climate and climate policy uncertainty



- **Sources of uncertainty:**
  - The global GHG emissions;
  - Response of the climatic system to GHG accumulation in the atmosphere(unknown climate sensitivity);
  - Regional specifics of climatic events;
  - Vulnerability and resilience;
- **Wide range of outcomes ➔ high degree of uncertainty**
- **Higher uncertainty ➔ higher risk of adaptation investment and lower willingness to invest in adaptation**

Reduction of uncertainty increases investment in adaptation

What is ROA and how to use ROA in context of climate change?

- Option is a right but not an obligation to buy (take possession of) the asset in question.
- ROA is used to estimate the opportunity cost of premature investment decisions or measure the value of flexibility;
- In the case of climate change ROA is used to estimate the cost of inaction (irreversible damage from the release of CO2 into the atmosphere);
- In case of adaptation ROA could be used to:
  - Optimize time of investment in adaptation;
  - Assess the value of information;

Valuation using ROA

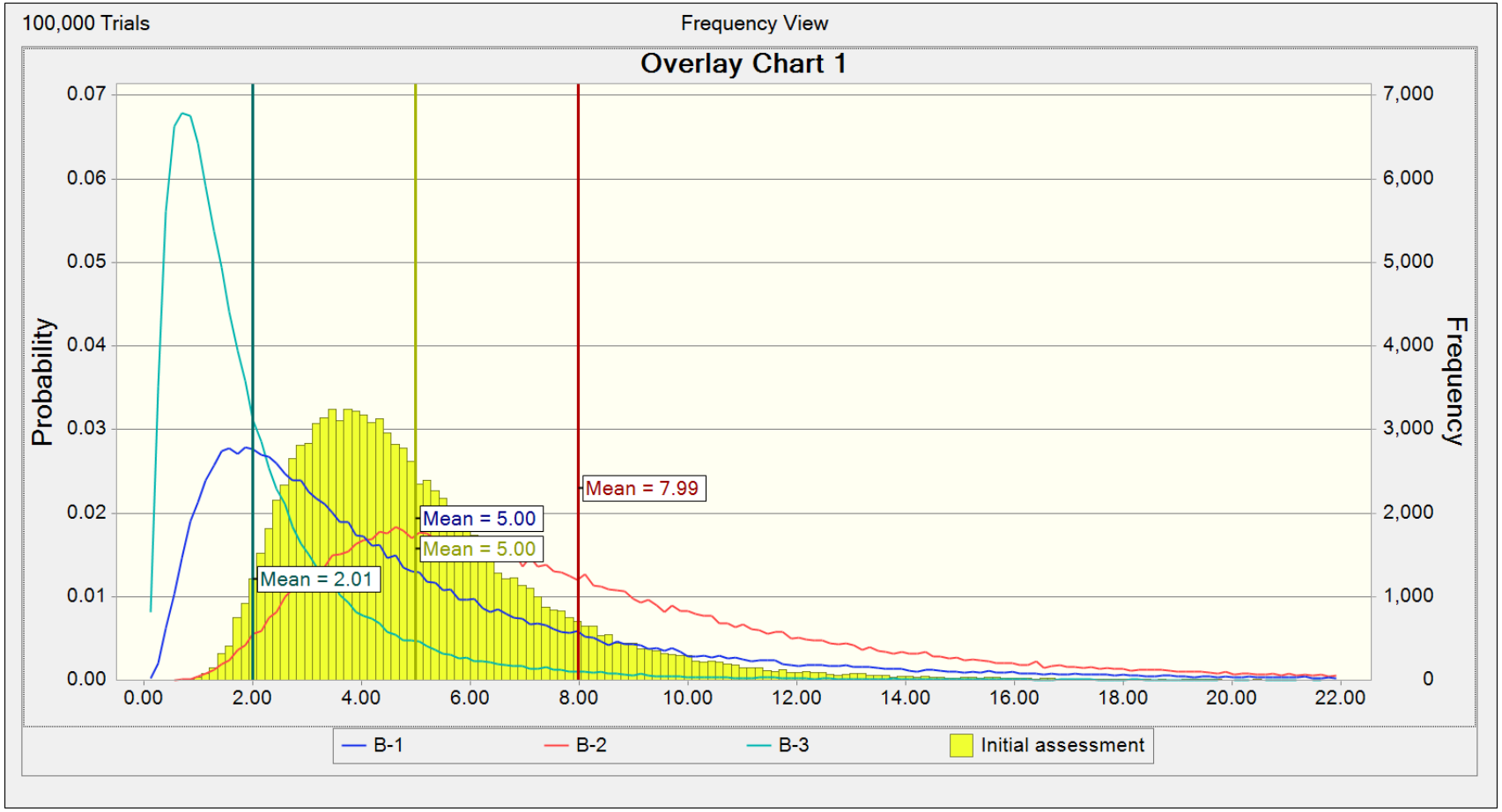
Value of Earth Observing Systems (EOS): the difference between a risk-adjusted value of the investment in adaptation planned with and without the new information.

We use the real options valuation methodology to quantify the risk-adjusted value of the investment in adaptation.

Reduction of investment risk is essential to mobilize private capital.

EOS information reduces risk and therefore cost of capital.

What is behind initial distribution?

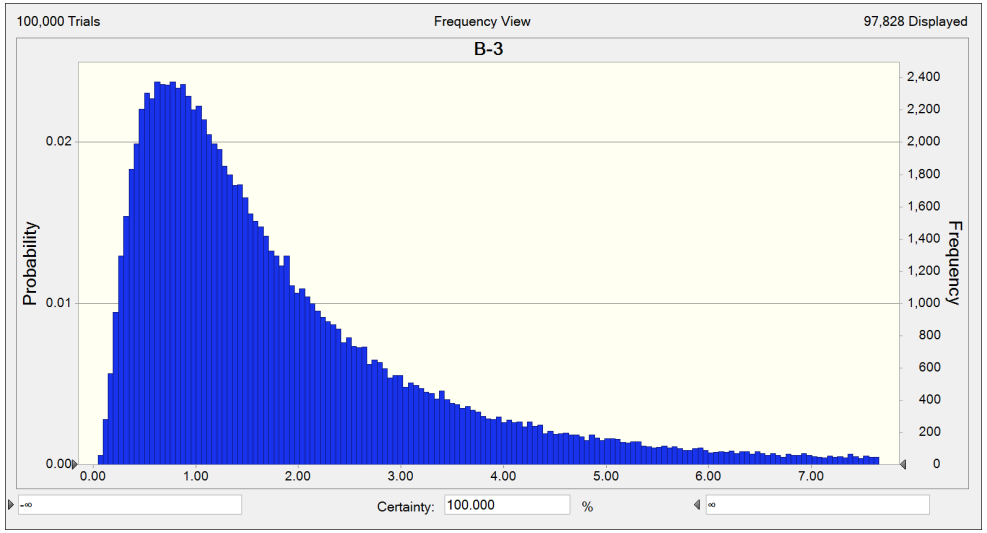


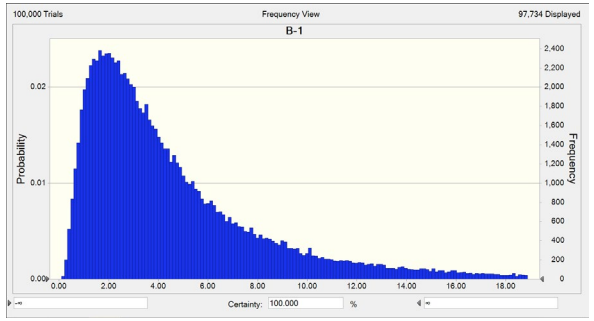
Initial distribution is a composition of different climate change scenarios

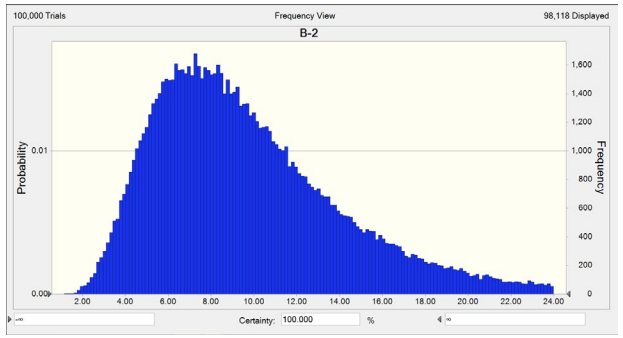
Example of calculation of breakeven investment

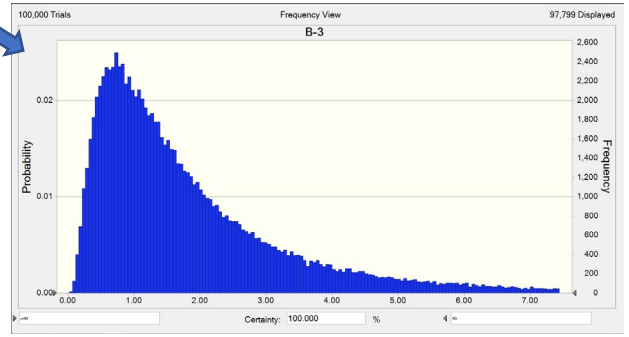
Parameters of Distribution ROV and Breakeven Investment	B-1	B-2	B-3	Initial assessment
Mean	5.00	7.99	2.01	5.00
Standard Deviation	4.94	5.00	2.02	2.43
Skewness	3.59	2.15	3.94	1.85
Kurtosis	27.92	12.26	36.88	9.93
ROV	1.97	2.00	0.81	0.97
Breakeven investment when damage is reversible	3.03	5.99	1.20	4.03
Breakeven investment when damage is irreversible	>6.98	>9.99	>2.81	>5.97

Learning narrows distribution reducing the value of the deferral option









The information reduces uncertainty and therefore reduces the deferral option value of the investment in adaptation. Premature investment decisions may be associated with significant losses in the future. The deferral option allows the estimation of the economic value of potential regrets.

Conclusions

EOS narrows uncertainty in anticipated avoided damage calculation therefore reducing investment risks and increasing investment in adaptation.

The Earth-observing remote sensing system provides a foundation for decision-making but does not improve this process automatically. Any information has value if this information is being used.

Proper integration of the new information is a necessary condition to benefit from this information.

ROA expresses both climate and investment risk in monetary terms and makes BCA possible.

EOS provides vital information to narrow uncertainty and improve adaptation investment decisions