DEALING WITH UNCERTAINTY

Yoshitsugu Kanemoto

BGVW, Ch.7 Dealing with uncertainty

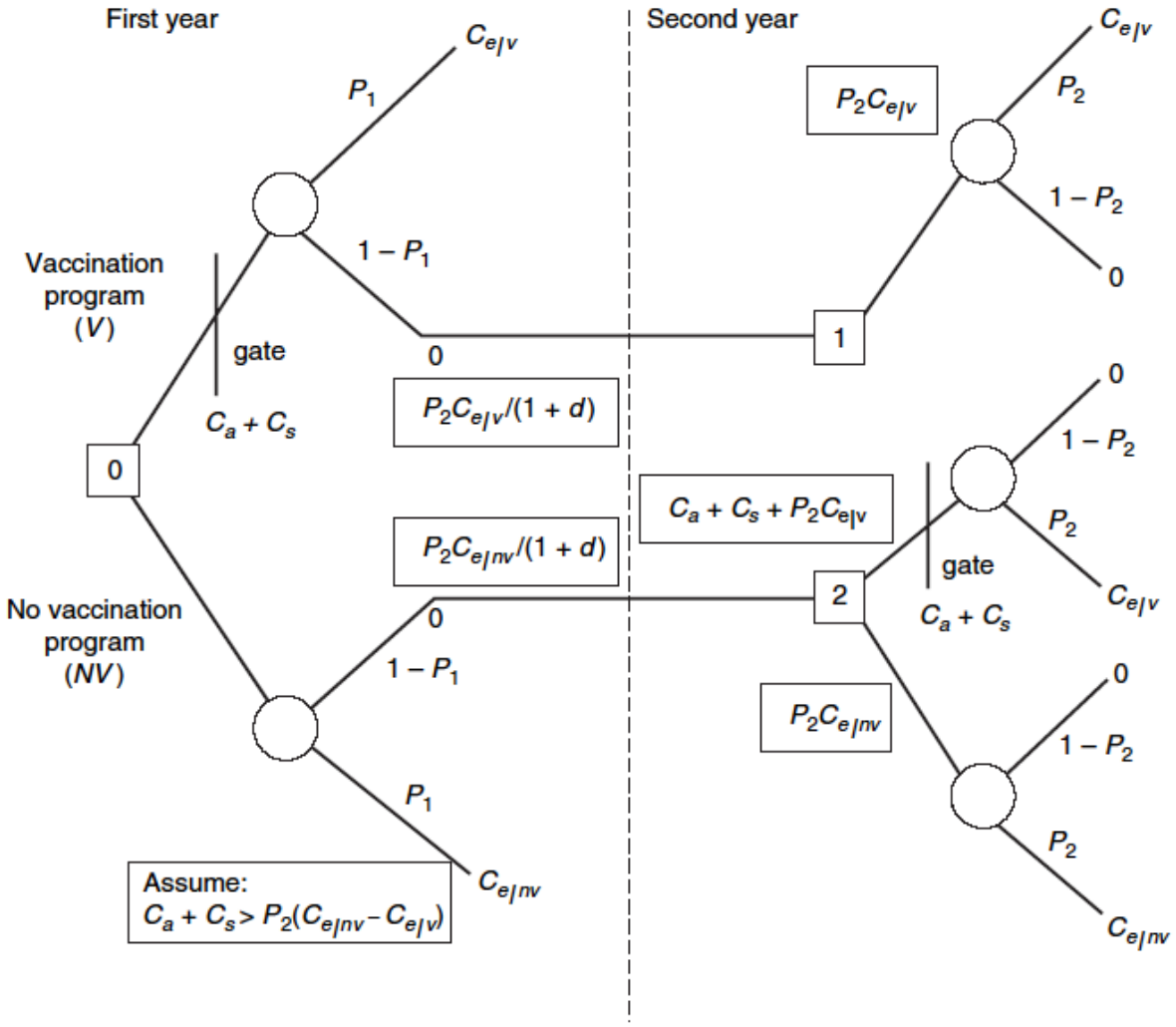
Expected Value Analysis

- Expected net benefit
  - E(NB) = Σ Pi (Bi - Ci)
    - E(NB): Expected net benefit
    - Pi: Probability of event i
    - Bi – Ci: Bet benefit in event i
  - Calculate the net benefits of each contingency and then multiply by that contingency's probability of occurrence
- Example:
  - E(Net benefit of a dam)
    = Probability of a flood x Net benefit of a dam with a flood + Probability of a flood not occuring x Net benefit of a dam when a flood does not occur
    = Probability of a flood x Reduction in damages due to a dam - Cost of a dam

Decision Trees and Expected Net Benefits

- Specifies the logical structure of the decision problem in terms of sequences of decisions and realizations of contingencies using a decision tree that links an initial decision to final outcomes.
- Works backwards from final outcomes to the initial decision, calculating expected values of net benefits across contingencies and pruning dominated branches
- Vaccine Example:
  - Present value of expected net benefits of the vaccination program: E(CNV) - E(CV)

Decision tree of the vaccination program



Sensitivity analysis

- Key ideas to sensitivity analysis:
  - We face uncertainty about the predicted impacts and the values assigned to them.
  - Most plausible estimates comprise the base case.
  - The purpose of sensitivity analysis is to show how sensitive predicted net benefits are to changes in assumptions.
  - Looking at all combinations of assumptions is infeasible.
- Three manageable approaches:
  - Partial sensitivity analysis: Asks, how do net benefits change as one assumption varies (holding other assumptions constant)? It should be used for the most important or uncertain assumptions.
  - Best/worst case analysis: Can be used to find worst and best case scenarios (subset of assumptions).
  - Monte Carlo sensitivity analysis: Creates a distribution of net benefits from drawing key assumptions from a probability distribution, with variance and mean drawn from information on the risk of the project.

Quasi-Option Value

- Quasi-option value: Expected value of information gained by delaying an irreversible decision.
- Exogenous learning: learning is revealed no matter what option is taken. After the first period we discover with a certainty which of the two contingencies will occur. Quasi-option value is the difference in expected net benefits between the learning and no learning case.
- Endogenous learning: information is generated only through the activity itself.
- This leads Exogenous learning to give large no activity results (i.e., hold off decision) and endogenous learning to give large limited activity results (i.e., limited program).