Module 6: Measuring Benefits

- "Non-market valuation": to back out WTP
- WTP is a welfare measure (Total Benefits)
- Alternative measure: WTA
- WTP < WTA (income effects, behavioral abnormalies, etc.)

- Total Value = use value + option value + non-use value
- Method to evaluate benefits:
  - stated preference methods
  - Revealed preference methods

- Stated preference
  - Measures all three types of values, but suffer from potential biases
  - Contingent valuation
  - Choice experiments
- Revealed preference
  - Only measures use value, but are more accurate
  - Hedonic property price model
  - Hedonic wage model (VSL)

VSL

- The economic value of risk taken by one individual, not actual human life
- Should be decided by each individual, not by the govt
- VSL = wage differential / risk (1)
- Total WTP = VSL * risk * No. people affected (2)

Hedonic property method

- Measures environmental benefits through housing markets
- Total WTP = price diff * No houses affected (3)

Module 7: Measuring Costs

- Engineering costs vs. opportunity costs
- Env regulation is not a job killer
  - Job loss mainly due to automation/globalization
- Green jobs are not equal to net jobs
  - Need to calculate the opportunity cost of investment

- Pollution haven hypothesis
  - Firms move to places with lax regulation
  - Mixed evidence

Module 8: Benefit Cost Analysis

- Benefit-cost analysis provides a normative criteria to evaluate public policy decisions
  - Normative
  - Public policy
  - Decisions
- Decision rule: B - C > 0 (4)

- Inter-temporal decisions making:
  - Decision rule: PVNB > 0 (5)
  - Discounting

The discounting equation:

$$PV = \frac{CV}{(1+r)^t}$$

PV of an infinite stream of payoff = $\frac{\text{CV of each year's payoff}}{r}$

- Larger discount rate: values the current more
- How is discount rate determined:
  - Ramsey equation: discount rate = time preference + weighted growth rate
  - Public discount rate < private discount rate
- Decision making under uncertainty
  - Compare E(PVNB)

Module 9: Non-renewable Resources

- Difference between "economic scarcity" and "physical scarcity"
  - R/P does not capture the economy-wide feedbacks
- Higher market price induces:
  - New discoveries
  - Development of new technologies
  - Development of substitutes
- Why price of a resource does not increase over time?

Solving the two-period problem

- DEA rule: PVMNB should be equal between two periods (8)
  - The simultaneous equation
- Solution: Price = scarcity rent + MC (9)

Solving the N-period problem

- Hotelling's rule: royalty increases at the rate of r

$$SR_t = SR_0 * (1 + r)^t$$

(10)

- Backstop prices for the substitute

Other implications

- Larger r, faster extraction, faster price increase
- Larger reserve, lower prices + more extraction
- Sustainability rule: weak, strong and environmental
- Hartwick's rule
  - DEA could align with the weak sustainability goal

Module 10: Water

- Consumptive vs. non-consumptive use
- Water rights in the US:
  - Riparian rights
  - Prior appropriation rights

- Efficient allocation of water
  - MB for water is equalized for all users
  - Be able to apply this rule to determine who gets (how much) water
- Problems with PA doctrine
  - Not an efficient/fair allocation
  - High transaction cost prohibits water trades