E: Option value and irreversibility

Key use of option value:

- Analyzing **irreversible** or difficult to reverse decisions:
  - Building a dam
  - Changing land use
  - Building a power plant or other long-lived capital
  - Adopting a technology

Example: land use change

- A city has open land with two alternative uses:

  Current: Public green space (park)

  Proposed: Developer wants to convert it to an industrial area

- Two periods:

  Now (0)

  Future (1)

  Many years apart; use interest rate = 25%

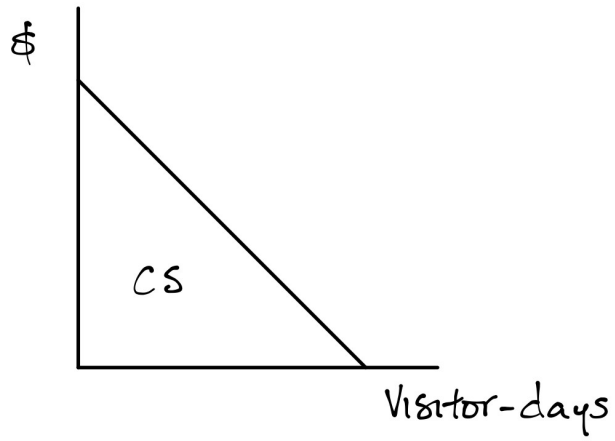
- Developer's WTP for the land:

  $4 million in either period (only pays once)

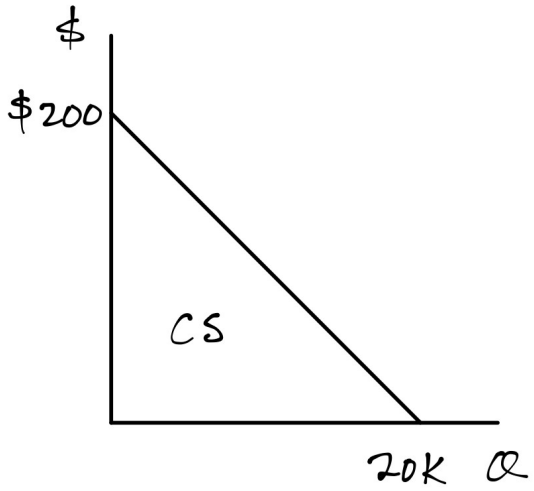
- Park value in **period 0**?

  Entrance price = $0

  Total benefit = CS generated



Example:



Value = 0.5*20,000*200 = 2,000,000

Aside:

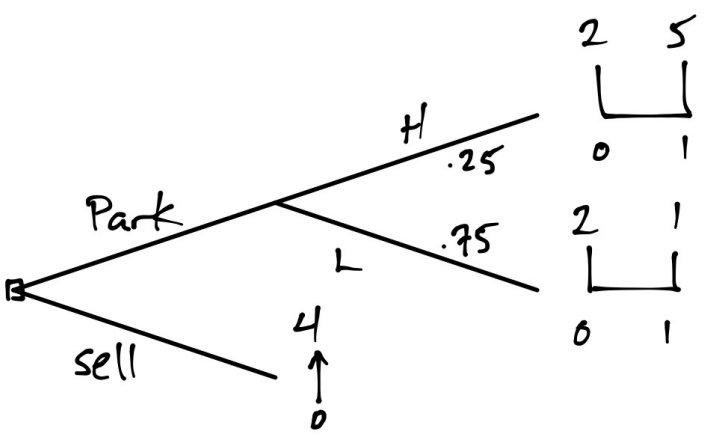
Typically estimate WTP from cost of traveling to the park

- Park **value in 1** is uncertain:

In this case, two possibilities depending on changes in WTP:

State	Probability	Value
Low (L) - WTP shifts inward	75%	$1 M
High (H) - WTP shifts outward	25%	$5 M

- Suppose city had to make a **once and for all** decision at **0**:
  Sell at 0 or keep as a park permanently



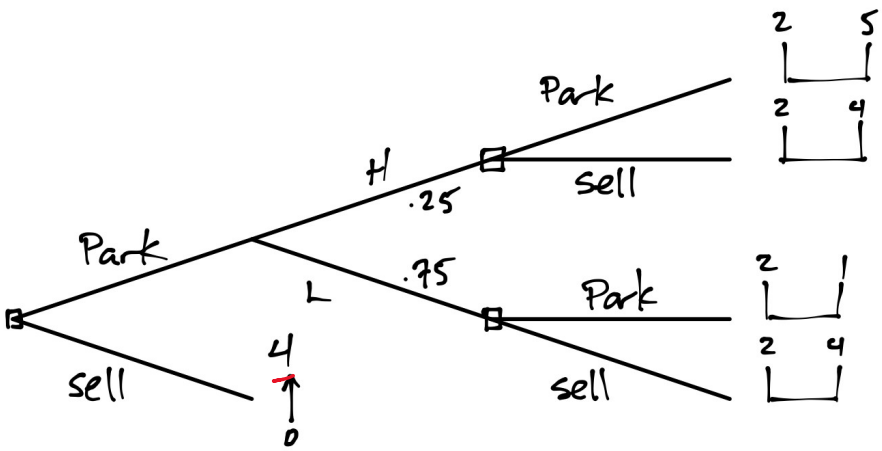
PV = 2+5/1.25
PV = 6

PV = 2 + 1/1.25
PV = 2.8

EV = 0.25*6 + 0.75*2.8 = 3.6

Decision: would sell

- However, **true decision tree** is different:
  - If kept as a park at 0, **could decide to sell in 1**
  - Park at 0 **preserves option** to sell at 1



PV = 6

PV = 2+4/1.25
PV = 5.2

PV = 2.8

PV = 5.2

EV = 0.25*6 + 0.75*5.2 = 5.4

Decision: would preserve

- Option value of preserving?

Sell if L:	Gain = 5.2 - 2.8 = 2.4
Probability of selling:	0.75
Expected gain:	0.75*2.4 = 1.8
Option value:	1.8

- Value of preserving at 0:

3.6	EV of park under once-and-for-all decision
1.8	Option to sell later
5.4	Total value of park at 0

Exercise on GC