



Lecture 23. Sunk costs and Opportunity Costs

FOR 2022. Financial Analysis for Natural Resources.



School of Forest Resources



Partially completed projects

- In natural resource management, it is more common to acquire or take over projects sometime between initiation and completion.
- Few projects will be run from start to finish.
- Examples:
 - Public facilities like campgrounds, parks, trails, etc.
 - Timber and wildlifemanagement projects
 - Water conservation projects



Sunk costs

- Any cost that has occurred in the past.
 - Previous expenditures for capital and labor
 - Irretrievable because their value cannot be recovered
- Irrelevant to current and future decisions among alternatives.
- If a cost or revenue occurred in the past, it is NOT relevant to decisions yet to be made about a situation...



Example of sunk costs

- Bill bought a used sedan, a 1992 Chevy Caprice, last year for \$2100. He has spent an additional \$500 on some minor repairs and new tires for the car. After 12 months of great driving, Bill notices that the car's acceleration is getting poorer and the car blows smoke at startup and when accelerating. His mechanic tells him he needs new rings and valves, and that the engine rebuild will cost about \$1100. If Bill sells the car in its current condition, he will probably get about \$800 for it. With a rebuilt engine, the car is worth \$1800.
 - Which costs are SUNK costs here?
 - Which costs are relevant to Bill's decision?
 - Is there any other information that might be important to Bill?



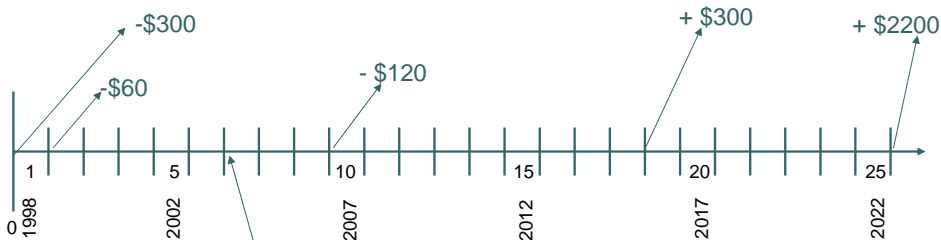
Example of sunk costs: valuing an existing stand of timber

| Date | Project Year(s) | Activity | Cash Flow |
|------|-----------------|-------------------------|-----------|
| 1998 | 0 | Site/prep and planting | (\$300) |
| 1998 | 1 | Release | (\$60) |
| 2006 | 9 | Pre commercial thinning | (\$120) |
| 2015 | 18 | Pulpwood thinning | \$300 |
| 2022 | 25 | Regeneration felling | \$2200 |


Costs and values for 2006-2022 are based on estimates given current stand conditions.



Timeline of situation



We are "here" in the beginning of 2004




Value of stand

$$V_{2004} = -\$120(1.08)^{-3} + \$300(1.08)^{-12} + \$2200(1.08)^{-19}$$

$$V_{2004} = \$534$$

[if analyzed from 1998, with all costs and returns,
the project has a per acre NPV of (\$19)]



From a buyer / seller perspective

- The owner started this plantation in 1998, and wanted an 8% return on his investment, so, in 2004, his asking price would be:
 - $\$300(1.08)^6 + \$60(1.08)^5 = \$564$
- But, if you are buying this plantation in 2004, based on expected future costs and returns, and desiring an 8% return on your investment, the most you will pay is \$534!
- The difference is “sunk costs.” The buyer wants you to consider them, but either he paid too much for the services, or they were performed inadequately, because they are not returning 8%!



Test your knowledge

- What would be your maximum bid price (COC = 8%) if you bought the stand in 2010?

$$V_{2010} = \$300(1.08)^{-6} + \$2200(1.08)^{-13}$$

$$V_{2010} = \$998$$



Opportunity costs

- The cost of actions NOT taken, of alternatives that are foregone by a particular action.
- Also important when valuing projects at intermediate stages.
- Let's look at calculating the NPV of activities planned for an existing stand...

Opportunity costs

- Let's say you have purchased 40 acres of forest land that has a fully stocked 20 year old pine plantation on it.
- The pine currently has a stumpage price of \$500 per acre.
- You propose the following activities over the next 15 years...

| Year(s) from present | Stand Age | Activity | Cash Flow |
|----------------------|-----------|---------------|-----------|
| 1 | 21 | Thinning | \$170 |
| 2 | 22 | Fertilization | (\$120) |
| 8 | 28 | Thinning | \$1000 |
| 9 | 29 | Fertilization | (\$120) |
| 15 | 35 | Final harvest | \$5500 |

What is the correct NPV at 8%?

NTLS

Opportunity costs

- We must consider the current value of the timber \$500 per acre as an opportunity cost!
- Why?
 - To obtain the future harvests we have planned, we have to "give up" cutting the trees today!
- Failure to include opportunity costs will inflate NPV, B/C ratio, and ROR calculations!

| Year(s) from present | Stand Age | Activity | Cash Flow | PV @ 8% |
|----------------------|-----------|------------------|-----------|---------|
| 0 | 20 | Opportunity cost | (\$500) | (\$500) |
| 1 | 21 | Thinning | \$170 | \$157 |
| 2 | 22 | Fertilization | (\$120) | (\$103) |
| 8 | 28 | Thinning | \$1000 | \$540 |
| 9 | 29 | Fertilization | (\$120) | (\$60) |
| 15 | 35 | Final harvest | \$5500 | 1734 |

NPV = \$1768

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Sensitivity analysis