CHAPTER 7

Net Present Value and Capital Budgeting

7.1 Incremental Cash Flows

- Cash flows matter—not accounting earnings.
- Sunk costs don’t matter.
- **Incremental** cash flows matter.
- Opportunity costs matter.
- Side effects like cannibalism and erosion matter.
- Taxes matter: we want incremental after-tax cash flows.
- Inflation matters.

7.2 The Baldwin Company: An Example

7.3 The Boeing 777: A Real-World Example

7.4 Inflation and Capital Budgeting

7.5 Investments of Unequal Lives: The Equivalent Annual Cost Method

7.6 Summary and Conclusions

Cash Flows—Not Accounting Earnings

- Consider depreciation expense.
- You never write a check made out to “depreciation”.
- Much of the work in evaluating a project lies in taking accounting numbers and generating cash flows.

Incremental Cash Flows

- Sunk costs are not relevant
  - Just because “we have come this far” does not mean that we should continue to throw good money after bad.
- Opportunity costs *do* matter. Just because a project has a positive NPV that does not mean that it should also have automatic acceptance. Specifically if another project with a higher NPV would have to be passed up we should not proceed.

Side effects matter.
- Erosion and cannibalism are both bad things. If our new product causes existing customers to demand less of current products, we need to recognize that.
7.3 Inflation and Capital Budgeting

- Inflation is an important fact of economic life and must be considered in capital budgeting.
- Consider the relationship between interest rates and inflation, often referred to as the Fisher relationship:
  \[(1 + \text{Nominal Rate}) = (1 + \text{Real Rate}) \times (1 + \text{Inflation Rate})\]
- For low rates of inflation, this is often approximated as
  \[\text{Real Rate} \approx \text{Nominal Rate} - \text{Inflation Rate}\]
- While the nominal rate in the U.S. has fluctuated with inflation, most of the time the real rate has exhibited far less variance than the nominal rate.
- When accounting for inflation in capital budgeting, one must compare real cash flows discounted at real rates or nominal cash flows discounted at nominal rates.

Example of Replacement Projects

Consider a Belgian Dentist’s office; he needs an autoclave to sterilize his instruments. He has an old one that is in use, but the maintenance costs are rising and so is considering replacing this indispensable piece of equipment.

New Autoclave
- Cost = $3,000 today,
- Maintenance cost = $20 per year
- Resale value after 6 years = $1,200
- \( NPV \) of new autoclave (at \( r = 10\% \)) is $2,409.74
  \[-2,409.74 = -3,000 \sum_{t=1}^{6} \frac{20}{(1.10)^t} - \frac{1,200}{(1.10)^6} \]
  \[EAC \text{ of new autoclave} = -553.29\]

Dorm Beds Example

Consider a project to supply the University of Missouri with 10,000 dormitory beds annually for each of the next 3 years.
Your firm has half of the woodworking equipment to get the project started; it was bought years ago for $200,000: is fully depreciated and has a market value of $60,000. The remaining $60,000 worth of equipment will have to be purchased.
The engineering department estimates you will need an initial net working capital investment of $10,000.
Dorm Beds Example

The project will last for 3 years. Annual fixed costs will be $25,000 and variable costs should be $90 per bed. The initial fixed investment will be depreciated straight line to zero over 3 years. It also estimates a (pre-tax) salvage value of $10,000 (for all of the equipment). The marketing department estimates that the selling price will be $200 per bed.
You require an 8% return and face a marginal tax rate of 34%.

Dorm Beds Example $OCF_0$

What is the OCF in year zero for this project?
Cost of New Equipment $60,000
Net Working Capital Investment $10,000
Opportunity Cost of Old Equipment $39,600 = $60,000 × (1-.34) = $109,600

Dorm Beds Example $OCF_{1,2}$

What is the OCF in years 1 and 2 for this project?
Revenue 10,000 × $200 = $2,000,000
Variable cost 10,000 × $90 = $900,000
Fixed cost $25,000
Depreciation $60,000 ÷ 3 = $20,000
EBIT $1,055,000
Tax (34%) $358,700
Net Income $696,300

$OCF_1 = NI + D$
$OCF_2 = NI + D$

Dorm Beds Example $OCF_3$

Revenue 10,000 × $200 = $2,000,000
Variable cost 10,000 × $90 = $900,000
Fixed cost $25,000
Depreciation $60,000 ÷ 3 = $20,000
EBIT 10,000 × $200 = $1,055,000
Tax $358,700
NI $696,300
OCF = NI + D
$OCF_3 = NI + D$

We get our $10,000 NWC back and sell the equipment. The after-tax salvage value is $6,600 = $10,000 × (1-.34)
Thus, $OCF_3 = $716,300 + $10,000 + $6,600 = $732,900

Dorm Beds Example NPV

First, set your calculator to 1 payment per year.
Then, use the cash flow menu:

| CF0 | $-109,600 |
| CF1 | $716,300 |
| F1  | $732,900 |
| F2  | $1,749,552.19 |

NPV $1,749,552.19$