

# Rules of the Game: Taxes, Depreciation, & Regulation

*Toward More Sustainable Infrastructure:  
Project Evaluation for Planners and Engineers*

Chapter 10

# ***A VERY* General Perspective**

Gross Income

minus Expenses

minus Depreciation

= Taxable Income

minus Income Tax

= Net Income After Taxes

ROI = Net Income After Tax/(Net Investment)

# What is Depreciation?

- A concept:
  - Depreciation is a non-cash expense that reflects the loss of value of a capital asset as it deteriorates over time
  - The initial investment is not treated as an expense (because the investment created an asset)
- An accounting mechanism
  - An explicit rule or equation that calculates the annual amount of depreciation

# Possible Ways to View Depreciation

- A realistic engineering-based estimate of the decline in capability or loss of value of an asset over time
- An accounting convention that translates investment into annual expenses that approximate the actual deterioration over the life of an asset
- An arbitrary accounting rule that
  - Simplifies accounting for depreciation
  - Promotes private investment in projects of public interest
  - Gives big tax breaks to corporations

# What is an Expense?

- An amount that can be deducted from revenues when calculating profit
- Wages, material costs, sub-contracts, fuel and most cash expenditures are expenses
- However, investments are NOT expenses
- Depreciation is an expense, even though it is not a cash expenditure

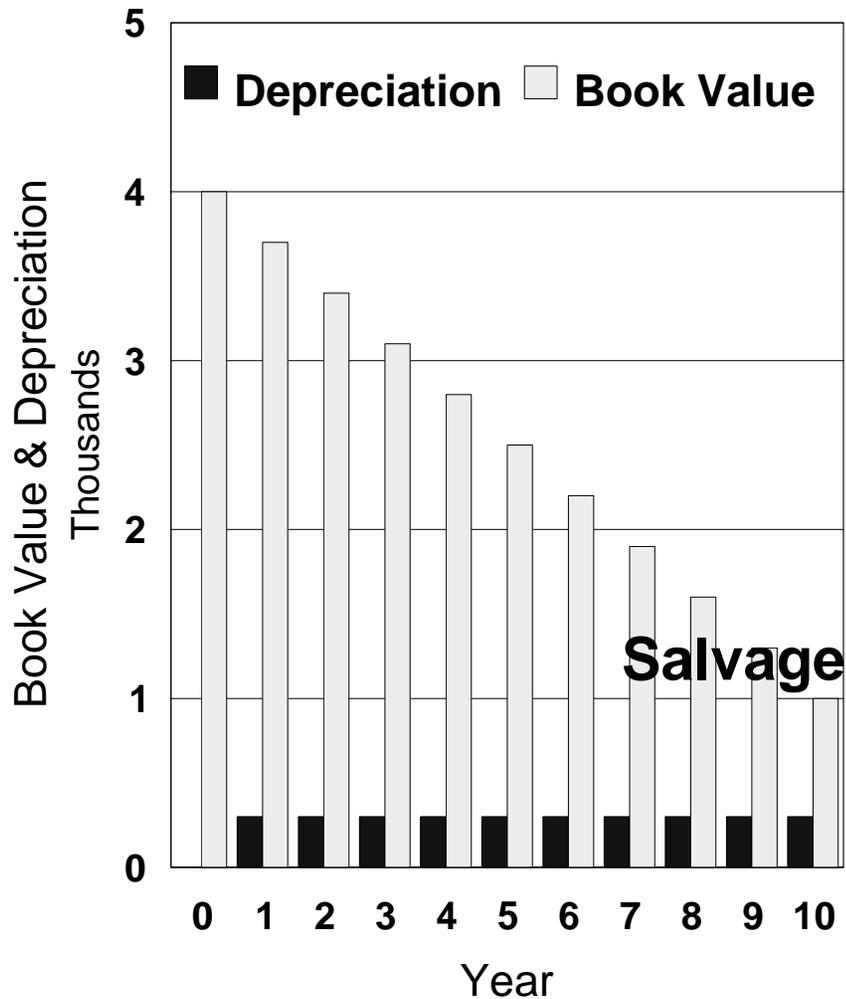
# Why Worry About Taxes & Depreciation?

- Private sector:
  - Income taxes are large cash flows that cannot be ignored
  - Depreciation is a non-cash expense that results in reduced tax payments
  - After-tax results are most meaningful to companies and investors
- Public sector
  - Tax credits and depreciation rules can be used to encourage investments

# Depreciation Rules

- What can be depreciated?
  - Tangible or intangible assets that
    - Are used to produce income
    - Have a finite determinable life > 1 year
    - Deteriorate from use, natural causes or obsolescence
  - Land cannot be depreciated
- How quickly can something be depreciated?
- What kinds of records must be maintained?

# Straight Line Depreciation



Given:

Initial Basis  $B$

Salvage Value  $S$

Life  $N$

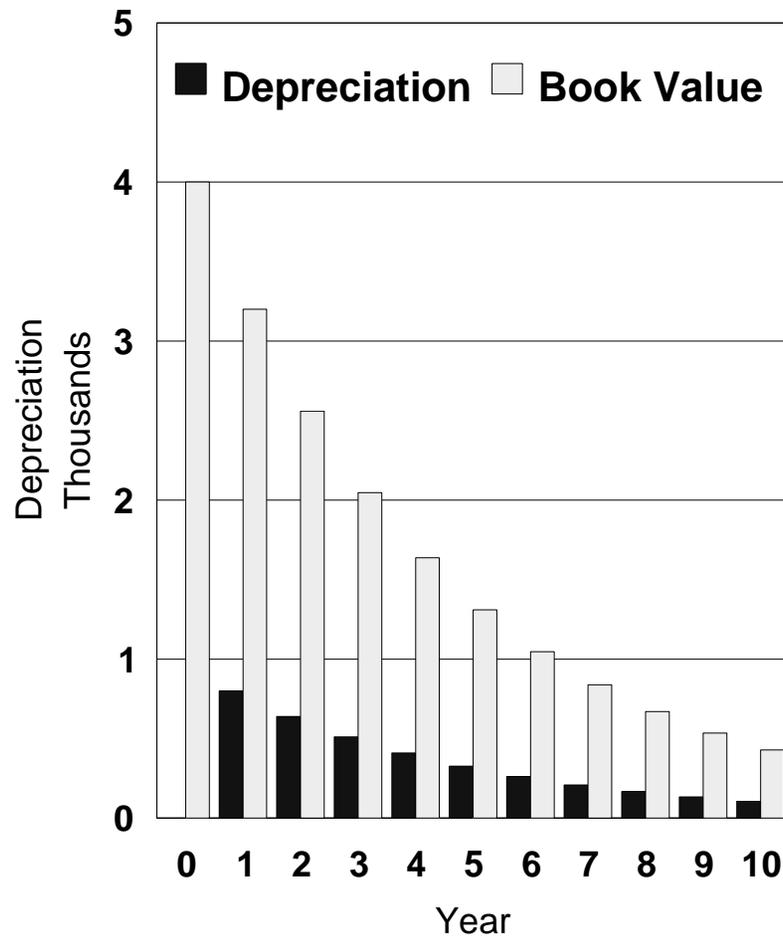
Annual depreciation  
 $= (B-S)/N$

Book value end of year  $k$   
 $= k(B-S)/N$

# Methods of Depreciation: Considerations

- **Simplicity vs. Realism**
  - Engineering formulations likely to be too complicated, even if feasible
  - Tax collectors and tax payers prefer simplicity to realism
- **Accurate Accounting vs. Policy Advocacy**
  - Shorter lives and accelerated depreciation can be used to promote
    - Any kind of investment
    - Specified kinds of investment

# Double Declining Balance



Given:

Basis  $B$

Life  $N$

Depreciation Year 1

$$= B \cdot (2/N)$$

Cost basis start of year 2

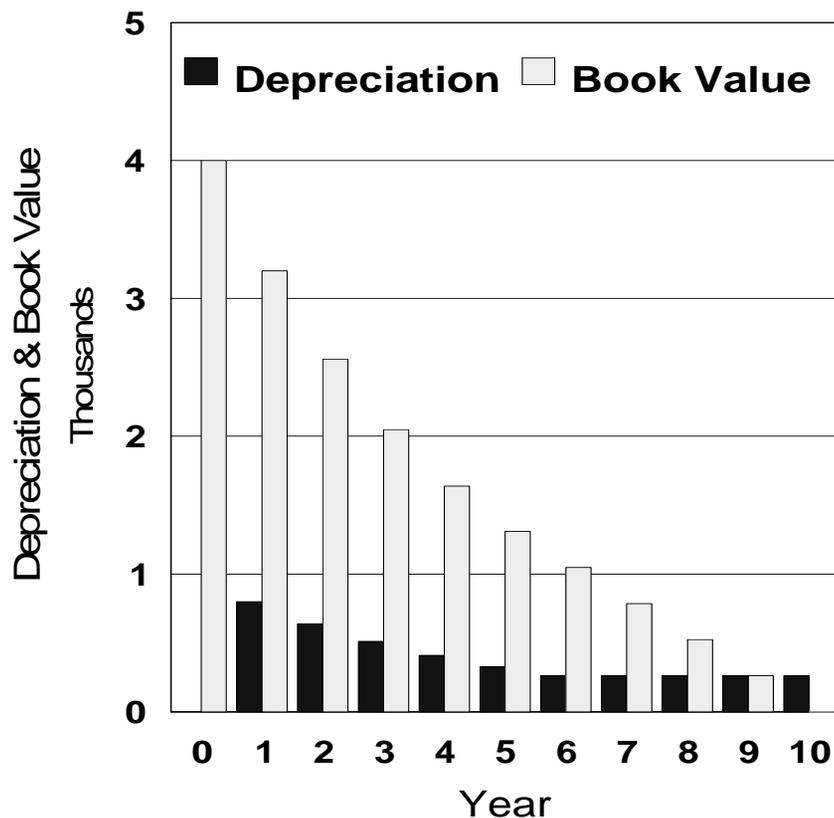
$$= B - B(2/N) = B(1 - 2/N)$$

Depreciation Year  $k$

$$= B(1 - 2/N)^{k-1} (2/N)$$

Salvage value is not a factor

# Double Declining Balance Switching to Straight Line after 6 Years



- Start with double declining
- Compare annual depreciation to straight line for remaining balance
- Switch when SL gives more depreciation

# Comparing Three Depreciation Methods

	Straight Line		Double Declining Balance		Double Declining Balance Reverting to Straight Line	
Year	Book Value Beginning of Year	Depreciation	Book Value Beginning of Year	Depreciation	Book Value Beginning of Year	Depreciation
1	\$4.000	\$0.300	\$4.000	\$0.800	\$4.000	\$0.800
2	\$3.700	\$0.300	\$3.200	\$0.640	\$3.200	\$0.640
3	\$3.400	\$0.300	\$2.560	\$0.512	\$2.560	\$0.512
4	\$3.100	\$0.300	\$2.048	\$0.410	\$2.048	\$0.410
5	\$2.800	\$0.300	\$1.638	\$0.328	\$1.638	\$0.328
6	\$2.500	\$0.300	\$1.311	\$0.262	\$1.311	\$0.2621
7	\$2.200	\$0.300	\$1.049	\$0.210	\$1.049	\$0.2621
8	\$1.900	\$0.300	\$0.839	\$0.168	\$0.786	\$0.2621
9	\$1.600	\$0.300	\$0.671	\$0.134	\$0.524	\$0.2621
10	\$1.300	\$0.300	\$0.537	\$0.107	\$0.262	\$0.2621
	\$1.000		\$0.429		\$0.000	

# Tax Benefits of Depreciation

	Straight Line		Double Declining Balance		Double Declining Balance Reverting to Straight Line	
Year	Depreciation	Tax Benefit	Depreciation	Tax Benefit	Depreciation	Tax Benefit
1	\$0.3 million	\$0.120	\$0.800	\$0.320	\$0.800	\$0.320
2	\$0.3 million	\$0.120	\$0.640	\$0.256	\$0.640	\$0.256
3	\$0.3 million	\$0.120	\$0.512	\$0.205	\$0.512	\$0.205
4	\$0.3 million	\$0.120	\$0.410	\$0.164	\$0.410	\$0.164
5	\$0.3 million	\$0.120	\$0.328	\$0.131	\$0.328	\$0.131
6	\$0.3 million	\$0.120	\$0.262	\$0.105	\$0.2621	\$0.105
7	\$0.3 million	\$0.120	\$0.210	\$0.084	\$0.2621	\$0.105
8	\$0.3 million	\$0.120	\$0.168	\$0.067	\$0.2621	\$0.105
9	\$0.3 million	\$0.120	\$0.134	\$0.054	\$0.2621	\$0.105
10	\$0.3 million	\$0.120	\$0.107	\$0.043	\$0.2621	\$0.105
Total		\$1.200	\$0.086	\$1.428		\$1.600
NPV		\$0.737		\$1.023		\$1.096

# Conventions to Simplify and Unify Depreciation: MACRS

- Modified Accelerated Cost Recovery System introduced by Tax Reform Act of 1986
- Salvage Value assumed to be 0
  - ▶ More depreciation, less record-keeping
- Useful life specified by tax code - one of six categories
  - ▶ Shorter lives, fewer categories, & specified annual percentages OR
  - ▶ ADS (alternative depreciation system), which is straight-line and used for some assets
- First and last year assumed to be exactly 6 months
  - ▶ Don't bother with actual dates

# Conventions to Simplify and Unify Depreciation

- Modified Accelerated Cost Recovery System (MACRS, introduced in Tax Reform Act of 1986)
- Salvage value assumed to be zero
- Useful (shorter) lives specified for six categories covering most types of assets
- Straight line alternative still used for some assets
- First and last year assumed to be exactly 6 months

Result: More rapid depreciation, less record-keeping

# Depreciation & Taxes: Summary

- Depreciation and taxes are important because they affect cash flows
- Depreciation is based upon accounting rules – not actual physical deterioration or change in value
- Accelerated depreciation reduces profit and taxes in early years, but actually increases cash flow

# Taxes

Before Tax Cash Flow

plus Tax Credits

minus State and Federal Income Tax

equals After Tax Cash Flow

Tax credits directly offset tax payments

Income tax is proportional to income

Federal Rate (FR): typically 34% for large corporations

State Rate (SR): typically 6-12% and deductible from federal tax

# After Tax MARR

Effective income tax rate =  $SR + FR(1-SR)$

After tax MARR =  $MARR (1-\text{eff income tax rate})$

Example:

If  $FR = 34\%$

and  $SR = 10\%$

Then Effective income tax rate =  $0.10 + (1-.1)*0.34 = 0.406$

And After tax MARR =  $MARR (0.594)$

# Other Rules of the Game

- Land use regulation (zoning)
  - Type of uses allowed
  - Set-backs required
  - Height restrictions
  - Floor area ratio
  - Architectural standards
- Building codes
  - Structural requirements
  - Fire
  - Access
- Environmental regulations
- Labor regulations
  - Local labor on public projects
  - Payment of prevailing wage
  - Union contracts and work rules
  - Collective bargaining



# Worldwide Plaza, Manhattan

- Height and size of towers limited by FAR
- Greater setbacks required at upper levels
- NYC encourages new buildings to connect to subways
  
- Note: the tallest tower is the inspiration for the “Skyscraper Assignment”



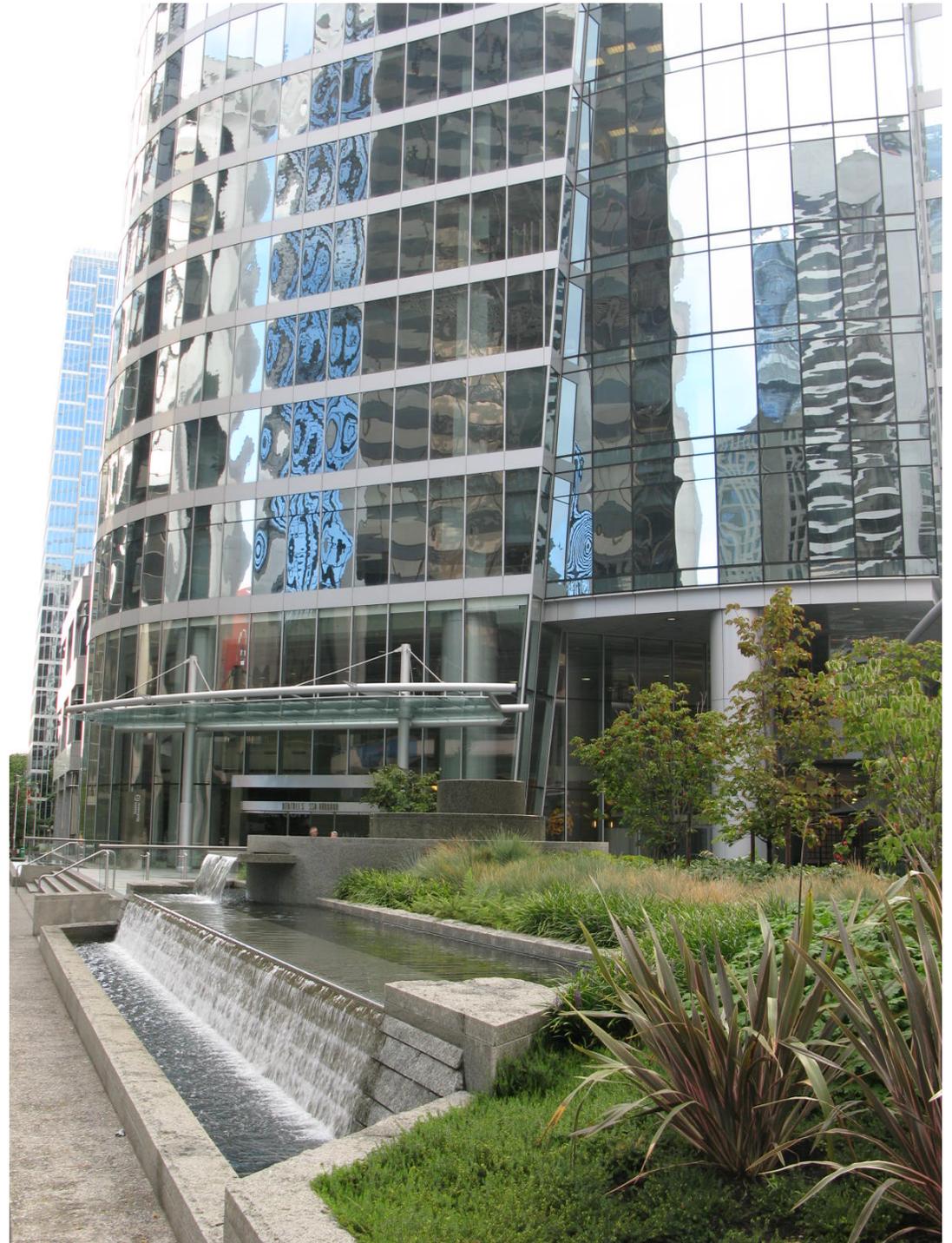
# Can the Rules be Changed?

- Consider:
  - Changing zoning to allow high-rise buildings
  - Changing land use from residential to commercial
  - Changing state law to allow gambling
  - Eliminating environmental restrictions to allow construction in wetlands or nearer to rivers

*Such changes mean big money to someone – and there is a risk of corruption if processes are not subject to public scrutiny and broad public approval.*

# Vancouver, BC

- Micro-parks
- Pedestrian friendly
- High-rise buildings



# Can the Rules be Changed?

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# San Antonio River Walk







# Rules of the Game

They may or may not seem sensible, they may in fact be quite arbitrary, but they are important. You will have to understand how the rules of the game limit what you can do, affect the cash flows of your various options, and influence which projects and which designs will be best to pursue.

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