

# Lesson 16 -1 – Depreciation

# Depreciation

- In an economic context:
  - Definition: depreciation is a decrease in value
    - Market value
    - Value to the owner
- In an accounting context:
  - Definition: depreciation is a systematic allocation of the cost of an asset over its depreciable life.
    - Deterioration
    - Obsolescence - When it is no longer useful or needed

# Causes of Depreciation

<b><i>Reason</i></b>	<b><i>Example</i></b>
Use-related physical loss— deterioration	car; light bulb
Time-related loss— even if the asset is not used	machinery and equipment
Functional loss— the asset is less able to meet expectations	calculators and computers

# Depreciation and Expenses

- Expenses are consumed over the normal course of business and over a short period of time.
  - Labour, materials, insurance, etc.
- In contrast, capital assets are not costed when they occur.
- Instead capital costs are depreciated – they are spread out over the useful life of the asset
- Depreciation is subtracted from business revenues over time as the value of the asset declines, as if it was an expense.
  - Decrease in the value of buildings, large machines, vehicles, computers, etc.

# Depreciation and Expenses - Example

- Invest \$5 million into capital improvements to net a \$1 million per year savings for 20 years. 15% MARR
- 1 - \$5 million up front, with 20 years savings:  
NPV = \$1.26 million
  - $NPV = \$1M(P/A, 15\%, 20) - \$5M$
- 2 – Depreciate \$5 million evenly over 20 years  
NPV = \$4.69 million
  - $NPV = (\$1,000,000 - \$250,000) * (P/A, 15\%, 20)$

# Effect of Depreciation on Taxes

- Generally speaking, legitimate business expenses are not taxed.
- Capital expenditures are legitimate business expenses, but they typically provide a benefit over a period of time.
- For tax purposes, the government requires capital expenditures to be 'spread out' over a period of time to reflect this.
- Also comes into play in accounting – businesses depreciate the 'book value' of their assets, reducing their asset base and improving the Return on Assets

# Effect of Depreciation on Taxes

- Depreciable lifetime — the period over which an asset is depreciated; the Capital Recovery Period.
- Depreciation:
  - is a non-cash expense, ie. no cash actually flows as capital is recovered (i.e. a Book cost)
  - is used to allocate an asset's loss of value over time
  - is treated as an expense that is deducted from revenue and thus reduces the taxable income of a business
  - does generate a cash flow — a reduction in taxes, known as a tax shield.

# Types of Property

- Tangible Property - Can be seen, touched, and felt
  - Real Property - Land, buildings, and all things growing on, built upon, constructed on, or attached to the land
  - Personal Property - Equipment, furnishings, vehicles
- Intangible Property - Value to the owner but cannot be seen or touched
  - Patents, copyrights, trademarks, trade names, and franchises
  - Goodwill
  - Brand loyalty, customer loyalty



# Depreciable Property

- Depreciable property
  - is primarily hard assets that are used for business purposes in the production of income
  - has a useful lifetime that can be determined, and the useful lifetime is usually longer than one year
  - decays, is used up, wears out, becomes obsolete, or loses value from natural causes
- Exceptions to depreciation (not depreciable):
  - Land is never depreciated (never wears out)
  - Leased property
  - Factory inventory

# Depreciation Models

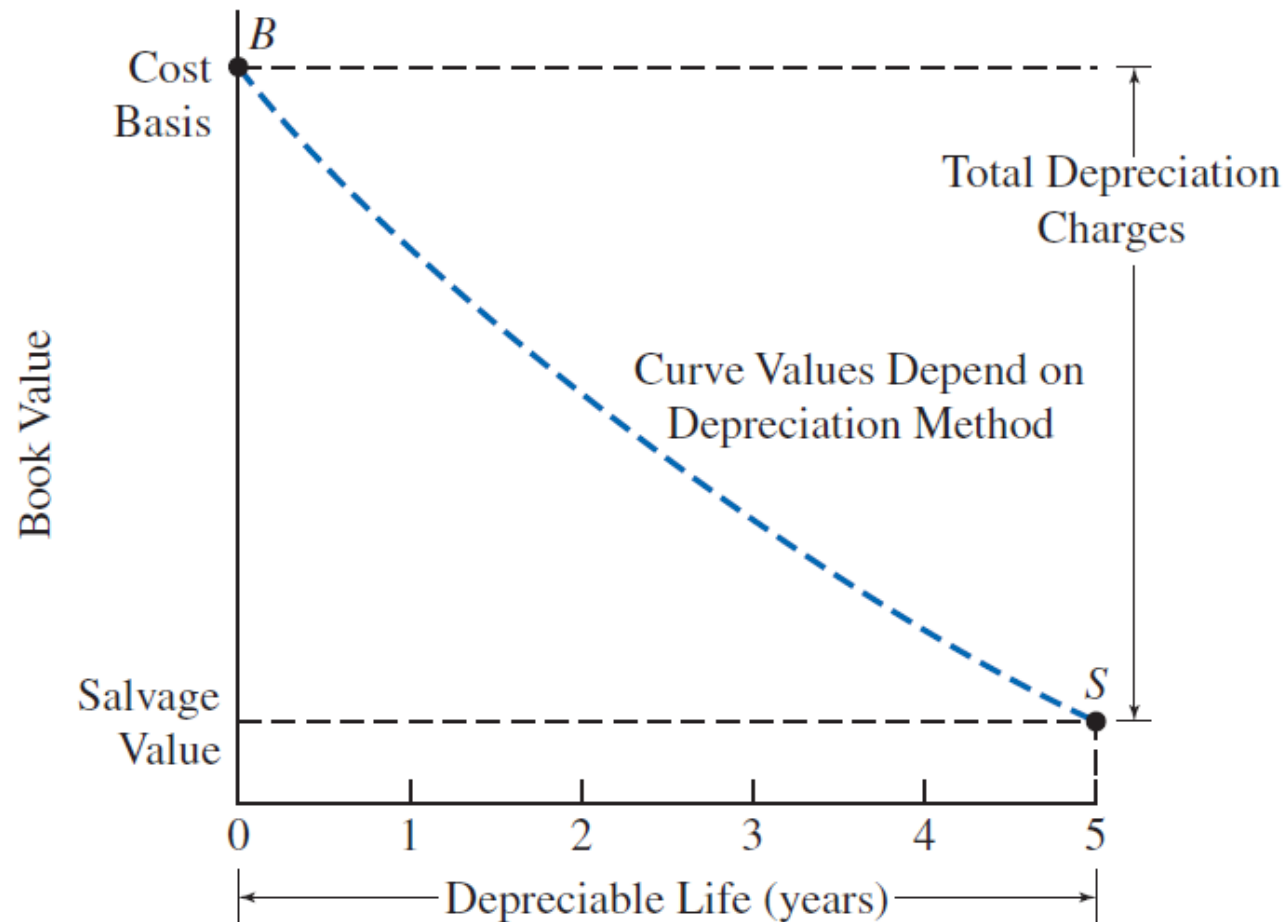
- A reliable model of depreciation:
  - establishes the value of owned assets accurately and realistically for making decisions
  - supports planning, e.g. indicates when to keep or sell an asset
  - determines the cost of current production as accurately as possible
  - reflects taxes payable and profits as accurately as possible

# General Depreciation Guidelines

- Depreciate an asset as rapidly as is legally possible to derive the largest benefit from tax shields as early as possible in an asset's life.
- Depreciation has an indirect effect on cash flows and a direct effect on net income.
- Initial capital cost — is the total cost of acquiring an asset and putting it into service.
  - This is the cost basis for depreciation of the asset.
- Book value = initial capital cost –  $\Sigma$ (depreciation expenses)
  - This value declines as the asset ages.

# Fundamentals of Depreciation Calculation

**Book Value = Cost basis – Sum of Depreciation charges to date**



# Depreciation Methods

- Historical methods of depreciation:
  1. Straight-line
  2. Sum-of-years-digits
  3. Declining balance
- Tax reporting depreciation methods:
  4. Canada— Capital Cost Allowance (CCA)
  5. United States – Modified accelerated cost recovery system

# 1. Straight-Line Depreciation

Constant Annual Depreciation

$$= d_i = \frac{(B - S)}{N}$$

B = initial capital  
cost

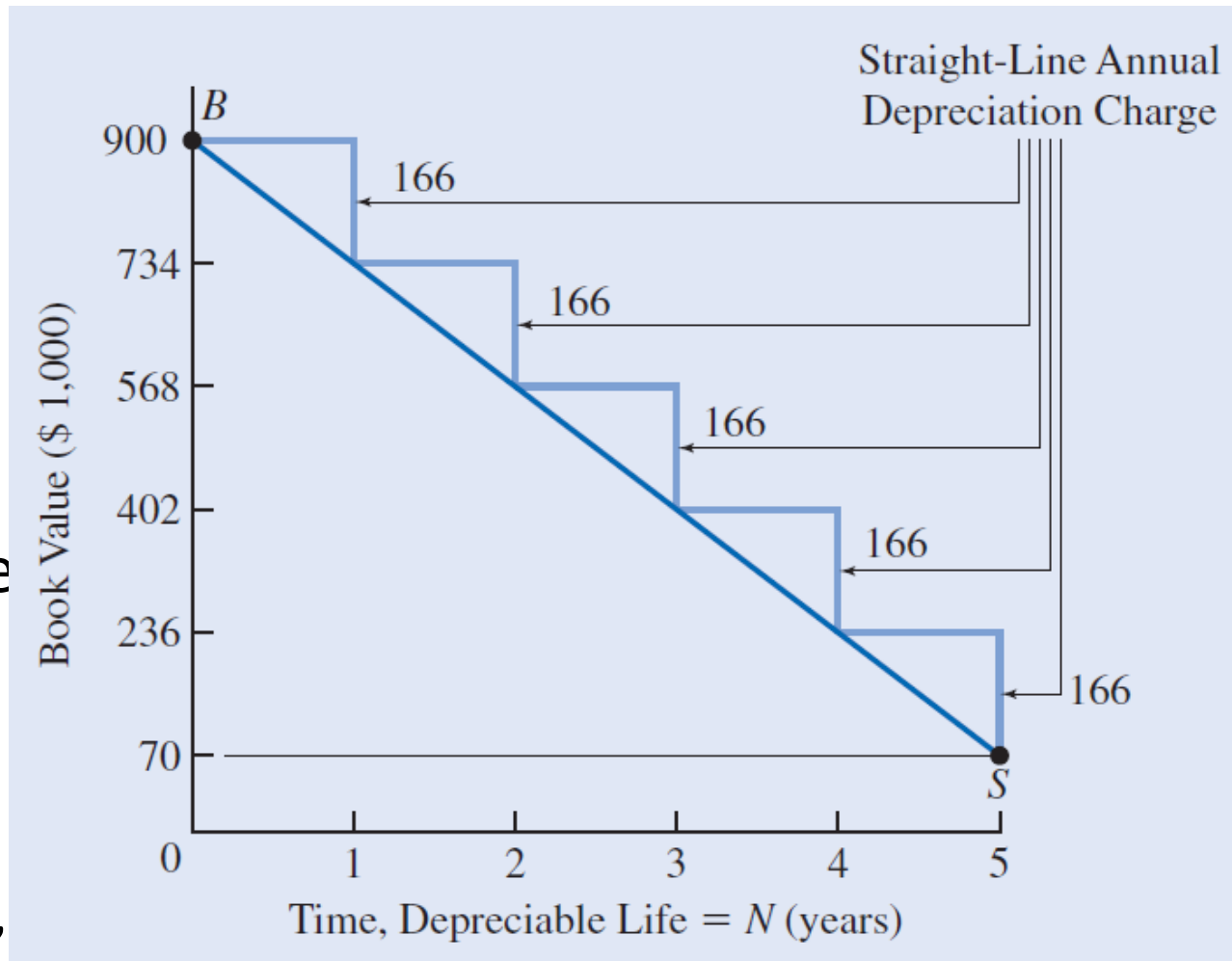
S = salvage value

N = depreciable life

$d_i$  is constant – the same  
every period

Book value at the end  
of period  $t$  is:

$BV_t = B - td_i$  where  $t = 1,$   
...  $N$



## Straight-Line Depreciation: Problem

A tech company just purchased a new rack of database servers for \$550,000. The installation cost was \$40,000. The life expectancy is 6 years with a salvage value of \$60,000. Using straight-line depreciation, determine the first cost, the annual depreciation amounts, and the book value after 4 years.

## Straight-Line Depreciation: Solution

$$\text{First Cost} = \$550,000 + \$40,000 = \$590,000$$

$$\begin{aligned}\text{Depreciation} &= d_i = \frac{(B-S)}{N} = (\$590,000 - \$60,000)/6 \\ &= \$88,333.33/\text{year}\end{aligned}$$

$$\begin{aligned}\text{Book Value at year 4} &= BV_4 = B - td_i \\ &= \$590,000 - (4)(\$88,333.33) \\ &= \$236,666.67\end{aligned}$$



## 2. Sum-of-Years-Digits (SOYD) Depreciation

$$d_t = \frac{N - t + 1}{\text{SOYD}} (B - S)$$

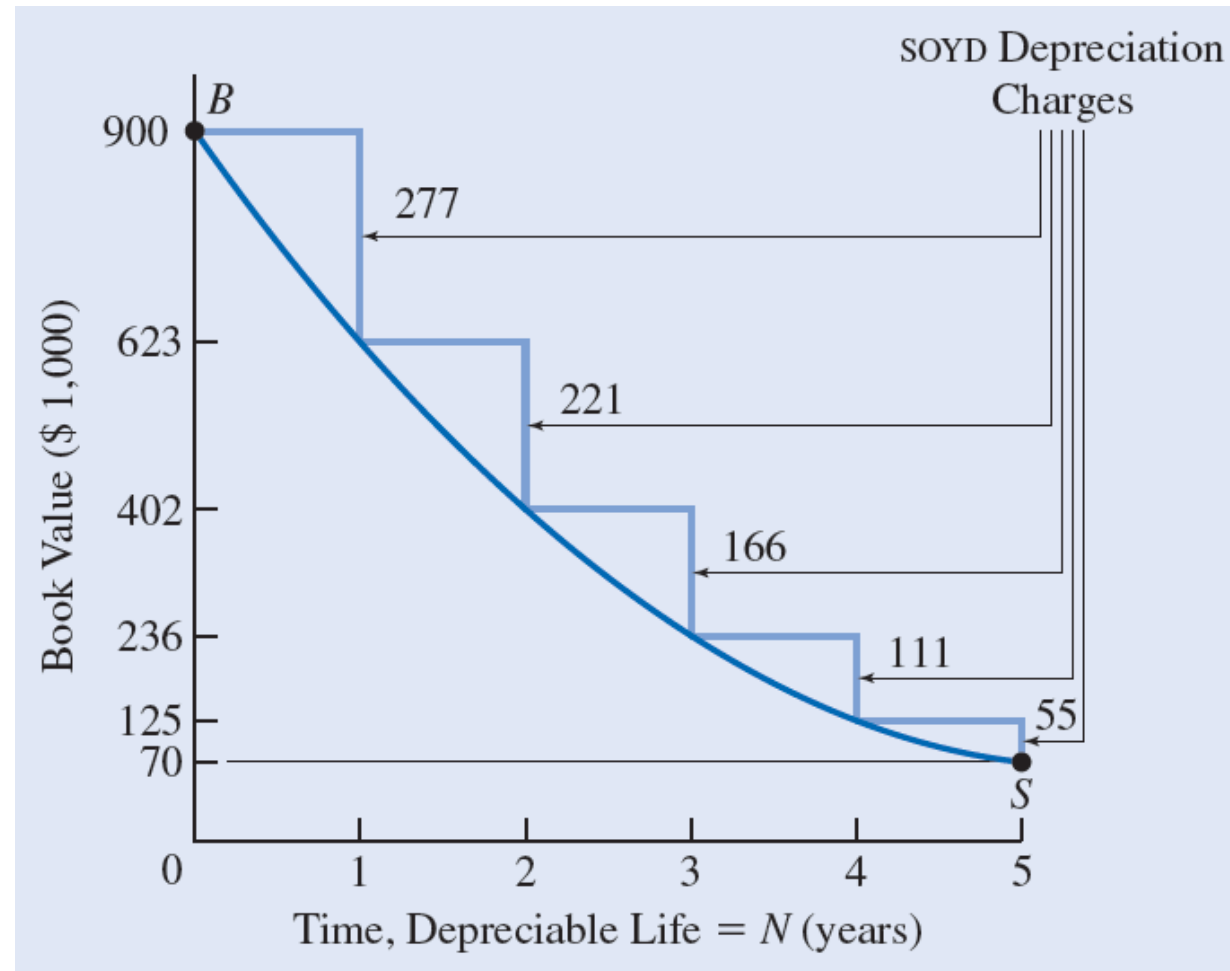
$d_t$  = depreciation value in any year  $t$

$N$  = number of years in depreciable life

SOYD = sum of years' digits, calculated as  $N(N+1)/2$

$B$  = cost basis

$S$  = salvage value



# Sum-of-Years-Digits Depreciation: Example

An asset costs \$12,000 and has a salvage value of \$2000 after 5 years. Find the book value at the end of Year 2.

Solution:

$$B = \$12,000 \quad S = \$2000 \quad N = 5 \text{ Years}$$

$$\text{SOYD} = (5)(5 + 1) / 2 = 15$$

$$\begin{aligned} \text{Depreciation in Year 1} &= (5/15)(12,000 - 2000) \\ &= \$3333 \end{aligned}$$

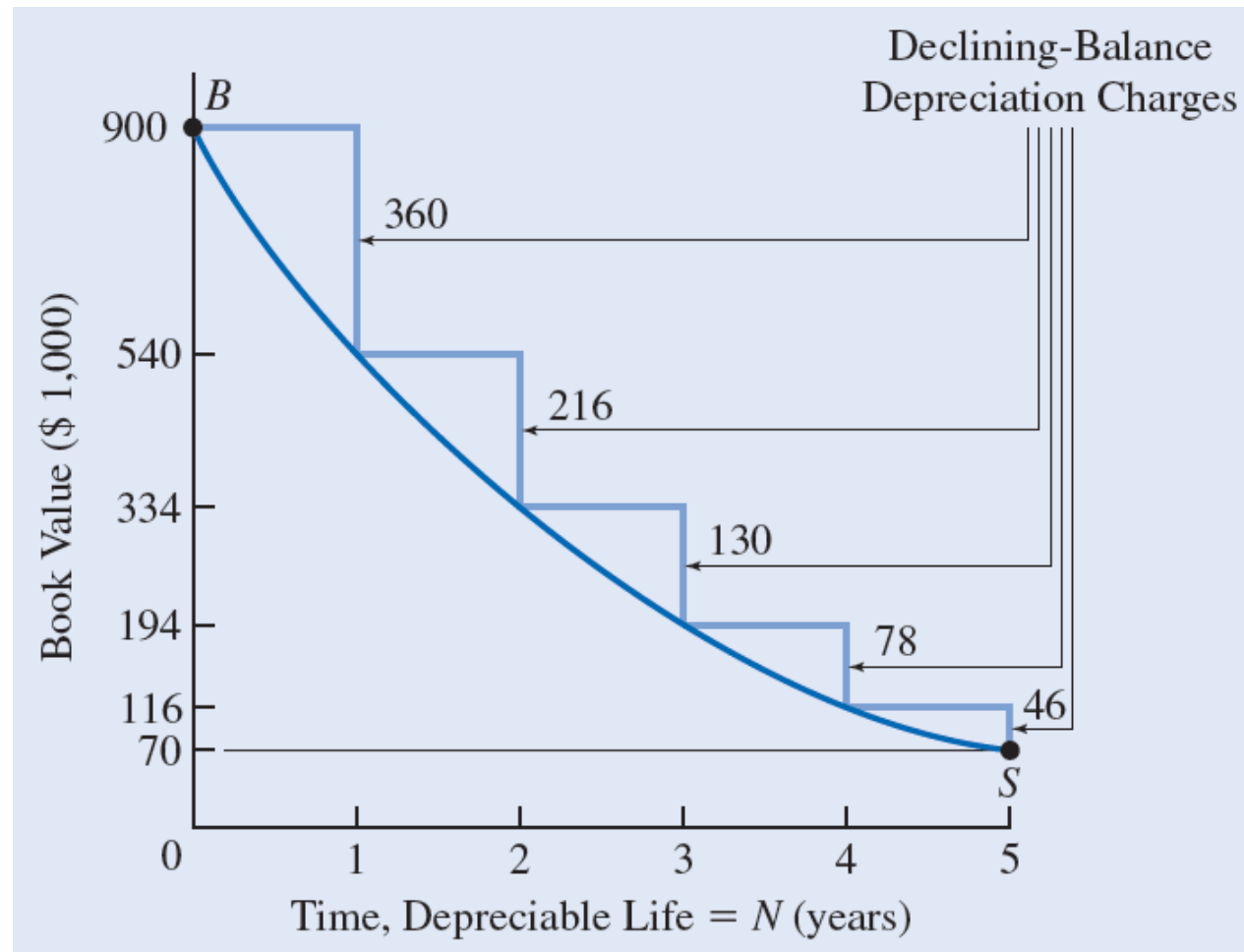
$$\begin{aligned} \text{Depreciation in Year 2} &= (4/15)(12,000 - 2000) \\ &= \$2667 \end{aligned}$$

$$\text{Book Value at EOY2} = \$12000 - \$3333 - \$2667 = \$6000$$

### 3. Declining-Balance (DB) Depreciation

Declining-Balance depreciation applies a constant depreciation rate ( $D$ ).

$$\begin{aligned}d_n &= D * B * (1 - D)^{n-1} \\ &= D * BV_{n-1}\end{aligned}$$



# Overview of Depreciation Methods

- The DB method depreciates an asset more rapidly than the SL method, similar to the SOYD method, i.e. larger  $d_n$  values occur earlier in the asset's life.
- The DB method may be preferred because:
  1. it is the required method for corporate business tax purposes and
  2. it can provide the greatest present value of depreciation tax shields