# Chapter 7
# Lecture # 3-3

- **Inflation**
- **Depreciation**
- **Taxation, Cash Flow, and Profit.**

# Inflation

Purchase power of cash drops with time due to the effect of inflation.

$$CEPCI(j+n) = (1+f)^n \, CEPCI(j)$$

$n$ = time span in years

$f$ = Average inflation rate over the time span

j = arbitrary year

# Inflation

## Example 7.18

What was the average rate of inflation for the costs associated with building a chemical plant over the following periods:

a)1986-1992

b)1992-1998

# Inflation

## Solution

Table 5.4

CEPCI (1986) = 318

CEPCI (1992) = 358

CEPCI (1998) = 390

a) $358 = 318*(1+f)^6 \longleftrightarrow f = 0.02$ (2.0 % p.a.)

b) $390 = 358*(1+f)^6 \longleftrightarrow f = 0.014$ (1.4 % p.a.)

# Inflation

Inflation has a negative effect on F.

$$F' = F/(1+f)^n$$

$$i' \cong i - f = \frac{i - f}{i + f}$$

Resolve all the previous example considering the inflation.

# Depreciation

- Total Capital Investment = Fixed Capital + Working Capital
  - Fixed Capital – All costs associated with new construction, but Land cannot be depreciated
  - Working Capital – Float of money to start operations

$$TCI = FCI_L + Land + WC$$

# Depreciation

- Salvage Value
  - Value of $FCI_L$ at end of project
  - Often = 0
- Life of Equipment
  - *n* – Set by IRS
    - Not related to actual equipment life
- Total Capital for Depreciation
  - $FCI_L$ - $S$

# Depreciation

## 3 Basic Methods for Depreciation

- Straight Line (SL)
- Sum of the Years Digits (SOYD)
- Double Declining Balance (DDB)

# Depreciation

## Straight Line

$$d_k^{SL} = \left( \frac{FCI_L - S}{n} \right)$$

$n$ = # of years

# Depreciation

## Sum of the Years Digits (SOYD)

$$d_k^{SOYD} = \frac{\left[(n+1-k)(FCI_L - S)\right]}{\frac{1}{2}n(n+1)}$$

# Depreciation

## Double Declining Balance (DDB)

$$d_k^{DDB} = \frac{2}{n}\left[ FCI_L - \sum_{j=0}^{k-1} d_j \right]$$

# Depreciation

**Example 7.21**

The fixed capital investment (excluding the cost of land) of a new project is estimated to be $150.0 million, and the salvage value of the plant is $10.0 million. Assuming a seven-year equipment life, estimate the yearly depreciation allowances using:

- **a.** The straight line method
- **b.** The sum of the years digits method
- **c.** The double declining balance method.

# Depreciation

$$FCI_L = \$150 \times 10^6$$

$$S = \$10 \times 10^6$$

$$n = 7$$

$1^{st}$ *Year*

$$d_{SL} = \frac{150 - 10}{7} = 20$$

# Depreciation

$$d_{SOYD_1} = \frac{(7+1-1)}{\frac{1}{2}(7)(8)}[150-10] = \frac{7}{28}[150-10] = 35$$

$$d_{SOYD_2} = \frac{(7+1-2)}{\frac{1}{2}(7)(8)}[150-10] = \frac{6}{28}[150-10] = 30$$

$$d_{DDB_1} = \frac{2}{7}(150) = 42.9$$

$$d_{DDB_2} = \frac{2}{7}(150-42.9) = 30.6$$

# Depreciation

**Table E7.21 Calculations and Results for Example 7.21: The Depreciation of Capital Investment for a New Chemical Plant (all values in $10^7$).**

| Year ($k$) | $d_k^{SL}$ | $d_k^{SOYD}$ | $d_k^{DDB}$ | Book Value $FCI_L - Sd_k^{DDB}$ |
|---|---|---|---|---|
| 0 | | | | $(15 - 0) = 15$ |
| 1 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-1)(15-1)}{28^a} = 3.5$ | $\frac{(2)(15)}{7} = 4.29$ | $(15 - 4.29) = 10.71$ |
| 2 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-2)(15-1)}{28^a} = 3.0$ | $\frac{(2)(10.71)}{7} = 3.06$ | $(10.71 - 3.06) = 7.65$ |
| 3 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-3)(15-1)}{28^a} = 2.5$ | $\frac{(2)(7.65)}{7} = 2.19$ | $(7.65 - 2.19) = 5.46$ |
| 4 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-4)(15-1)}{28^a} = 2.0$ | $\frac{(2)(5.46)}{7} = 1.56$ | $(5.46 - 1.56) = 3.90$ |
| 5 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-5)(15-1)}{28^a} = 1.5$ | $\frac{(2)(3.90)}{7} = 1.11$ | $(3.90 - 1.11) = 2.79$ |
| 6 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-6)(15-1)}{28^a} = 1.0$ | $\frac{(2)(2.79)}{7} = 0.80$ | $(2.79 - 0.80) = 1.99$ |
| 7 | $\frac{(15-1)}{7} = 2$ | $\frac{(7+1-7)(15-1)}{28^a} = 0.5$ | $1.99 - 1.0 = 0.99^b$ | $(1.99 - 0.99) = 1.00$ |
| Tot. | 14.0 | 14.0 | 14.0 | 1.0 = Salvage Value[b] |

# Taxation, Cash Flow, and Profit

- Tables 7.3 – 7.4
- Expenses = $COM_d + d_k$
- Income Tax = $(R - COM_d - d_k)t$
- After Tax (net)Profit =
  $(R - COM_d - d_k)(1 - t)$
- After Tax Cash Flow =
  $(R - COM_d - d_k)(1 - t) + d_k$