

ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT (HUM 3151)

Discrete Compounding Formulas with Discrete Payments:

Single Payment Series	Compound Amount, $(F/P, i, n)$	$F = P(1+i)^n$
	Present Worth, $(P/F, i, n)$	$P = F(1+i)^{-n}$
Equal Payment Series	Compound Amount, $(F/A, i, n)$	$F = A \left[\frac{(1+i)^n - 1}{i} \right]$
	Sinking Fund, $(A/F, i, n)$	$A = F \left[\frac{i}{(1+i)^n - 1} \right]$
	Present Worth, $(P/A, i, n)$	$P = A \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right]$
	Capital Recovery, $(A/P, i, n)$	$A = P \left[\frac{i(1+i)^n}{(1+i)^n - 1} \right]$
Gradient Series	Conversion factor, $(A/G, i, n)$	$A = G \left[\frac{(1+i)^n - in - 1}{i(1+i)^n - i} \right]$

Nominal and Effective Interest Rates:

Effective interest rate per period $i = \frac{r}{m}$	m = Number of compounding periods per year r = Interest rate
Effective annual interest rate $i_{eff} = (1 + \frac{r}{m})^c - 1$	m = Number of compounding periods per year c = Number of compounding period per payment period r = Interest rate
Capitalized Cost (CC) $CC = \frac{A}{I}$	A = Annual worth I = interest rate

<p>Capital Recovery (CR)</p> $CR = (I - S) \times \left(\frac{A}{P}, i, n \right) + S * i$	<p>I = Purchase price of the machine</p> <p>S = Salvage value of the machine at the end of machine life</p> <p>n = Life of the machine in years, and</p> <p>i = Interest rate, compounded annually</p>
Economic Life of an Asset	Capital Recovery expenses + EUAC of operating and maintenance expenses

Depreciation	
<p>i. Straight Line Depreciation</p> <p>Annual Depreciation = $D_n = \frac{\text{Purchase Price} - \text{Salvage Value}}{\text{Years of useful life}}$</p> <p>Book Value = $I - (n * D_n)$</p>	<p>D_n = Annual depreciation amount</p> <p>I = Purchase price of the equipment</p> <p>n = Number of Years</p>
<p>ii. Decline Balance Method (DBM) Depreciation</p> <p>The depreciation rate (α) is given by</p> $\alpha = 1 - \left(\frac{B_n}{I} \right)^{\frac{1}{n}}$ <p>The depreciation charge for any year 'n' is given by,</p> $D_n = \alpha I (1 - \alpha)^{n-1}.$ <p>The book value is given by,</p> $B_n = I (1 - \alpha)^n.$	<p>α = Annual rate of Depreciation (%)</p> <p>B_n = Book value of the equipment</p> <p>I = Purchase price of the equipment</p> <p>n = Number of Years</p> <p>D_n = Depreciation charge for any year "n".</p>
<p>iii. Double Decline Balance Depreciation</p> <p>Annual rate of depreciation is, $\alpha = 2 / \text{years of useful life}$ or $\alpha = \frac{2}{n}$</p>	<p>α = Annual rate of Depreciation (%)</p> <p>n = Number of Years</p>

Ratio Analysis

Types of Financial Ratios

I. Liquidity Ratios

Current Ratio

Current Ratio = Current assets / current liabilities

Acid test ratio (quick ratio)

Acid test ratio (quick ratio) = (current assets – inventories) / liabilities

II. Financial Leverage Ratio

Structural Ratio

Debt to equity ratios

Debt to equity ratios = total debt or long term debt / shareholder's equity

Debt to total asset

Debt to total asset = total debt / total asset

Coverage ratio

Interest coverage ratio

Interest coverage ratio = Earnings before Interest & Taxes / Interest Expense

III. Turnover Ratios

1. Inventory turnover

Inventory turnover = Cost of goods sold / Average inventory

Costs of goods sold = Opening stock + Manufacturing cost including purchases – Closing stock

Or cost of goods sold = (100 - %gross profit) sales

Avg. Inventory = Avg. of monthly inventory for calendar year considered

= (opening stock + closing stock) / 2

In the absence of data, inventory turnover = Sales / Closing Inventory

2. Debtor's turnover ratio

Debtors turnover = Net Credit sales / (Avg. accounts receivable (or avg. debtors)

Average debtors = (opening balance debtors + closing balance debtors) / 2

Closing balance = Current assets – Inventories – Cash

In the absence of data, Debtors turnover = Total sales / (debtors + bills receivable)

Average collection period

Another method of measuring liquidity of firm's debtors is **average collection period**.

Avg. accounts receivable/avg. daily credit sales

OR (Avg. debtor's /credit sales) x 360 days

SIMILARLY, THERE IS CREDITORS TURNOVER RATIO

3. *Asset Turnover*

Fixed Asset Turnover = costs of goods sold/ avg. fixed assets

Total Asset Turnover = costs of goods sold/ avg. total assets

IV. Profitability Ratios

Profit margin ratio

- ▣ Indication of relationship between profits and sales.

Two types,

1. Gross profit margin = (gross profit /sales) x100
2. Net profit margin
 - a. Net profit margin (before tax) = (EBIT /Sales)
 - b. Net profit margin (after tax) = EAT/ Sales

Return on Investment

- Profits of firm to its investment

Return on Assets

Return on Assets = Net profit after tax/Avg. total assets

= (EAT + Interest - Tax Advantage on Interest)/ Assets

Return on equity

Return on equity = Net profit after tax/ avg. total shareholders' equity