

# Corporate Financial Management

## Formula Reference Sheet

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### Investment Appraisal Methods

#### Net Present Value (NPV)

**Formula:**

$$NPV = \sum_{t=0}^n \frac{\text{Cash Flow}_t}{(1+r)^t}$$

**Where:** -  $CF_t$  = Cash flow in period  $t$  -  $r$  = Discount rate (cost of capital) -  $t$  = Time period -  $n$  = Project life

**Decision Rule:** Accept if  $NPV > 0$

**Key Points:** - Use incremental cash flows only - Include working capital investment and recovery - Consider opportunity costs (e.g., foregone rental income)

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#### Internal Rate of Return (IRR)

**Definition:** The discount rate that makes  $NPV = 0$

**Formula:** Find  $r$  where:

$$\sum_{t=0}^n \frac{\text{Cash Flow}_t}{(1+r)^t} = 0$$

**Interpolation Formula:**

$$IRR = r_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (r_2 - r_1)$$

**Where:** -  $r_1$  = Lower discount rate (giving positive NPV) -  $r_2$  = Higher discount rate (giving negative NPV) -  $NPV_1$  = NPV at  $r_1$  -  $NPV_2$  = NPV at  $r_2$

**Decision Rule:** Accept if  $IRR > \text{Cost of Capital}$

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#### Payback Period

**Simple Payback:**

$$\text{Payback Period} = \text{Time until } \sum_{t=1}^n \text{Cash Flow}_t = \text{Initial Investment}$$

**Discounted Payback:**

$$\text{Discounted Payback} = \text{Time until } \sum_{t=1}^n \frac{\text{Cash Flow}_t}{(1+r)^t} = \text{Initial Investment}$$

**Decision Rule:** Accept if payback period < maximum acceptable period

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**Accounting Rate of Return (ARR)**

**Formula:**

$$\text{ARR} = \frac{\text{Average Annual Profit}}{\text{Average Investment}} \times 100\%$$

**Where:** - Average Annual Profit = Total profit over project life ÷ Number of years - Average Investment = (Initial Investment + Residual Value) ÷ 2

**Decision Rule:** Accept if ARR > minimum required return

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**Cost of Capital Calculations****Capital Asset Pricing Model (CAPM)**

**Formula:**

$$r_e = r_f + \beta(r_m - r_f)$$

**Where:** -  $r_e$  = Required return on equity (cost of equity) -  $r_f$  = Risk-free rate of return -  $\beta$  = Beta (systematic risk measure) -  $r_m$  = Expected market return -  $(r_m - r_f)$  = Market risk premium

**Key Points:** - Beta = 1: Same risk as market - Beta > 1: Higher risk than market - Beta < 1: Lower risk than market

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**Dividend Valuation Model**

**No Growth Model:**

$$K_e = \frac{D}{P_0}$$

**Constant Growth Model:**

$$K_e = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

**Where:** -  $K_e$  = Cost of equity - D = Annual dividend -  $D_0$  = Current dividend -  $D_1$  = Next year's expected dividend -  $P_0$  = Current share price (ex-dividend) - g = Growth rate

**Growth Rate Calculation:**

$$g = \sqrt[n]{\frac{D_{\text{current}}}{D_{n \text{ years ago}}}} - 1$$


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## Cost of Debt

**Bank Loans (Untraded Debt):**

$$K_d = i(1 - T)$$

**Where:** -  $K_d$  = After-tax cost of debt -  $i$  = Interest rate -  $T$  = Tax rate

**Redeemable Bonds (Traded Debt):** Find the IRR where:

$$\text{Current Market Price} = \sum_{t=1}^n \frac{\text{Interest}(1 - T)}{(1 + K_d)^t} + \frac{\text{Redemption Value}}{(1 + K_d)^n}$$


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## Weighted Average Cost of Capital (WACC)

**Formula:**

$$\text{WACC} = \frac{E}{V} \times K_e + \frac{D}{V} \times K_d \times (1 - T)$$

**Where:** -  $E$  = Market value of equity -  $D$  = Market value of debt -  $V = E + D$  (total market value) -  $K_e$  = Cost of equity -  $K_d$  = Before-tax cost of debt -  $T$  = Tax rate

**Key Points:** - Use market values, not book values - Tax shield applies to debt only - Include all sources of finance (ordinary shares, preference shares, all debt)

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## Financial Ratios and Metrics

### Leverage Ratios

**Debt-to-Equity Ratio:**

$$\text{Debt-to-Equity} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

**Debt Ratio:**

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

**Equity Ratio:**

$$\text{Equity Ratio} = \frac{\text{Total Equity}}{\text{Total Assets}}$$

**Times Interest Earned (Interest Cover):**

$$\text{Times Interest Earned} = \frac{\text{EBIT}}{\text{Interest Expense}}$$


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### Dividend Policy Ratios

**Dividend Payout Ratio:**

$$\text{Dividend Payout Ratio} = \frac{\text{Dividends Paid}}{\text{Net Income}} \times 100\%$$

**Dividend Yield:**

$$\text{Dividend Yield} = \frac{\text{Annual Dividend per Share}}{\text{Market Price per Share}} \times 100\%$$


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**Retention Ratio:**

$$\text{Retention Ratio} = \frac{\text{Retained Earnings}}{\text{Net Income}} = 1 - \text{Dividend Payout Ratio}$$


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**Inflation Adjustments****Real vs Nominal Rates****Fisher Equation:**

$$\text{Nominal Rate} = (1 + \text{Real Rate}) \times (1 + \text{Inflation Rate}) - 1$$

**Approximation (for low rates):**

$$\text{Nominal Rate} \approx \text{Real Rate} + \text{Inflation Rate}$$

**Cash Flow Adjustments****Inflating Cash Flows:**

$$\text{Nominal Cash Flow}_t = \text{Real Cash Flow}_t \times (1 + \text{inflation rate})^t$$

**Deflating Cash Flows:**

$$\text{Real Cash Flow}_t = \frac{\text{Nominal Cash Flow}_t}{(1 + \text{inflation rate})^t}$$

**Key Principle:** Use real cash flows with real discount rates OR nominal cash flows with nominal discount rates - never mix!

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**Present Value Tables Usage****Present Value Factor****Single Cash Flow:**

$$\text{PV} = \text{Future Value} \times \frac{1}{(1 + r)^t}$$

**From tables:** Look up discount factor for given rate and period

**Annuity Present Value****For equal annual cash flows:**

$$\text{PV of Annuity} = \text{Annual Cash Flow} \times \text{Annuity Factor}$$

**Annuity Factor:**

$$\text{Annuity Factor} = \frac{1 - (1 + r)^{-n}}{r}$$


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## Common Calculations Checklist

### NPV Calculation Steps

1. Identify all relevant cash flows (incremental, future, after-tax)
2. Include initial investment and working capital
3. Consider opportunity costs and terminal values
4. Apply appropriate discount rate consistently
5. Sum all present values to get NPV
6. State decision clearly (Accept if  $NPV > 0$ )

### WACC Calculation Steps

1. Calculate market values for all capital sources
2. Determine cost of each component:
  - Equity: Use CAPM or dividend model
  - Preference shares: Dividend  $\div$  Market price
  - Debt: Yield to maturity  $\times (1 - \text{Tax rate})$
3. Calculate weights based on market values
4. Apply tax shield to debt costs only
5. Multiply costs by weights and sum

### Bond Valuation Steps

1. Identify annual coupon payments
2. Determine maturity date and redemption value
3. Apply appropriate discount rate
4. Calculate present value of coupon stream (annuity)
5. Calculate present value of redemption payment
6. Sum to get bond value

## Quick Reference Summary

Concept	Formula	Decision Rule
<b>NPV</b>	$\Sigma[CF_t / (1+r)^t]$	Accept if $NPV > 0$
<b>IRR</b>	$NPV = 0$	Accept if $IRR > \text{cost of capital}$
<b>CAPM</b>	$r_f + (r_m - r_f)$	Higher = higher required return
<b>WACC</b>	$(E/V) \times r_e + (D/V) \times r_d \times (1-T)$	Use market values
<b>Dividend Model</b>	$D/P + g$	Use ex-dividend price
<b>Gearing</b>	$\text{Debt} / (\text{Debt} + \text{Equity})$	Higher = more financial risk

## Important Reminders

### Common Mistakes to Avoid

- **Don't mix** real and nominal discount rates
- Use **market values** not book values for WACC

- **Include tax shields** on debt costs only
- **Remember working capital** investment and recovery
- **Consider opportunity costs** in NPV calculations
- Use **ex-dividend prices** for cost of equity calculations

### Professional Presentation

- **Show all workings** clearly and systematically
- **State assumptions** explicitly
- Use **appropriate units** (£'000s, percentages)
- **Provide clear decisions** with justification
- **Check reasonableness** of all answers

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**Note:** This reference sheet covers the core formulas and calculations for Corporate Financial Management. Always refer to specific question requirements and apply formulas in the appropriate context.