Corporate Financial Management

Formula Reference Sheet

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2025-01-01

Investment Appraisal Methods

Net Present Value (NPV)

Formula:

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

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)

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:

$$\text{IRR} = r_1 + \frac{\text{NPV}_1}{\text{NPV}_1 - \text{NPV}_2} \times (r_2 - r_1)$$

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 > Cost of Capital

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

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 (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:

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

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:

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

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)

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):

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

Dividend Policy Ratios

Dividend Payout Ratio:

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

Dividend Yield:

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

Retention Ratio:

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

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!

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:

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

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 ÷ Market price
   - Debt: Yield to maturity × (1 - 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
NPV	$\Sigma[CF_t/(1+r)\hat{}t]$	Accept if NPV > 0
IRR	NPV $= 0$	Accept if IRR $>$ cost of capital
CAPM	$r_f + (r_m - r_f)$	Higher = higher required return
WACC	$(E/V)\times r_e + (D/V)\times r_d \times (1-T)$	Use market values
Dividend Model	$D/P + g$	Use ex-dividend price
Gearing	Debt/(Debt + 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

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.