Cost of Capital

Day 2 - Afternoon Session

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Introduction to Cost of Capital

Every investment undertaken by a company requires financing that is either sourced by debt or equity. Each source has a cost.
The cost of capital needs to be considered from two perspectives:

- **Investor Perspective**: Cost of capital is the “opportunity cost” - the return that could be gained by investing funds in an alternative investment with similar risk characteristics.
- **Company Perspective**: The “cost of capital” is the minimum return a company must provide to investors to ensure they continue to provide finance for investment and/or additional finance for future projects.

> **Important**
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> The return from a project should at least cover a company's current cost of finance. Therefore, establishing the cost of capital is vital in the evaluation and selection of projects.

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Forms of Long-term Capital

There are four major forms of external long-term capital:

- Ordinary shares
- Preference shares
- Loan capital
- Redeemable debentures

In addition, an important form of internal long-term capital is retained earnings.

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Cost of Capital Framework

The cost of capital serves as the discount rate for investment appraisal and is calculated as the Weighted Average Cost of Capital (WACC), which combines:

- Cost of debt
- Cost of equity

The framework involves calculating each component separately:

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Cost of Debt

Two main products of debt: - Bank loans - Redeemable debt

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Cost of Equity

Two models to calculate the cost of equity (Ke): 1. Dividend growth model 2. Capital Asset Pricing Model (CAPM)

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The Cost of Equity

Equity represents the owners' investment in a company. This includes:

- Issued share capital (shown in financial statements)
- Retained earnings (often incorrectly viewed as a "free" source of finance)

> **Note**
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> Retained Earnings have an opportunity cost equal to the cost of equity (without issue costs). The market value of equity shares reflects the value placed on retained earnings by equity holders.

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Market Value of Equity (P_0)

A company's equity should be valued as though it were being sourced from the markets today. This means:

- Market price should not include premium to reflect a declared dividend payment
- Price should be reduced to reflect the costs associated with issuing shares

The market value of equity (MV) is calculated as:
MV = Share issue price × Number of shares currently in issue
Where 'share issue price' is the current long-run market price for each equity share (ex-dividend) less issue costs.

> **Tip**
>
> **Ex-dividend vs Cum-dividend**
> - **Cum-dividend**: Share price includes a premium for an upcoming dividend

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payment - **Ex-dividend**: Price after the dividend has been paid, without the dividend premium

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Example: Calculating Market Value of Equity

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Example 1

Invierno plc has two million issued equity shares. The current market price (cum dividend) is 240p per share. The accrued dividend is 22p per share.
Required: Calculate the market value of Invierno plc's shares for WACC calculation.
Solution:
Ex-div share price = £2.40 - £0.22 = £2.18
Market value = ex-div share price × number of shares = £2.18 × 2,000,000 = £4,360,000

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Example 2

Alberta has 3 million shares in issue. The ordinary shares currently have a market value of £1.30 per share. Dividend of 5p per share has just been paid.

Solution:

MV = ex-div price × no of shares = 3,000,000 × £1.30 = £3,900,000

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Example 3

Beta has 1 million shares in issue. The ordinary shares have a market value of £1.25 per share. Dividend of 3p per share was just announced and will be paid in a month.

Solution:

ex-div price = £1.25 - £0.03 = £1.22

MV = £1.22 × 1,000,000 = £1,220,000:

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Calculating the Cost of Equity (Ke)

The cost of equity is generally calculated using one of two methods:

1. **Dividend Models**: Focus on the returns received by investors
2. **Capital Asset Pricing Model (CAPM)**: Focus on the returns required to compensate for risk, relative to other investments

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Dividend Valuation Model (No Growth)

This model is used to calculate the cost of preference shares which typically maintain a constant dividend.

$$K_e = \frac{D_1}{P_0}$$

Where: - P_0 is the market value of equity (ex-dividend) - D_1 is the annual dividend (assuming no growth in dividend payout) - Ke is the equity holders' required return (company's cost of equity)

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Example: Dividend Valuation Model (No Growth)

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Example 1

Febrero PLC pays an annual dividend of 16p per share. The preference shares are currently trading at 188p. An interim dividend of 8p is about to be paid.
Required: Calculate the cost of equity capital for Febrero PLC.
Solution:
Annual dividend = £0.16
Ex-div = £1.88 - £0.08 = £1.80
Using dividend valuation model, Ke = £0.16/£1.80 = 8.89%

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Example 2

Hugo Plc pays an annual dividend of 24p per share. The shares are currently trading at £2.3 per share. Annual dividend has just been paid.

Solution:

Annual div = £0.24

Ex-div price = £2.3

Ke = £0.24/£2.30 = 10.43%

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Dividend Growth Model

When a growth rate is estimated, this is factored into the dividend valuation model to provide a cost of equity that takes future dividend increases into consideration:

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

Where: - g is the growth rate - D_0 is the dividend that has just been paid - P_0 is the market value of equity (ex-dividend) - D_1 is the next expected dividend - Ke is the cost of equity capital

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Calculating Dividend Growth Rate

The formula for calculating historical dividend growth rate:

$$g = \sqrt[y]{\frac{D_{t0}}{D_{t0-y}}} - 1$$

Where: - g is the growth rate - D_{t0} is the dividend just paid - D_{t0-y} is the dividend paid “y” years ago

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Example: Dividend Growth Model

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Example 1

Junio PLC had the following dividends over the past 5 years:

Year	Dividends £
2011	195,000
2012	249,600
2013	267,800
2014	318,500
2015	341,055

Required: Calculate the growth in Junio PLC's dividends.

Solution: There are 5 years of dividends provided which means 4 years of dividend growth:

$341{,}055 = 195{,}000(1+g)^4$

$1.749 = (1+g)^4$

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$(1.749)^{0.25} = 1+g$

$g = (1.749)^{0.25} - 1 = 15\%$

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Example 2

Febrero PLC pays an annual dividend of 16p per share. The shares are currently trading at 188p. The annual dividend has just been paid.
Required: Calculate the cost of equity capital for Febrero PLC. Assume a growth rate of 7%.
Solution: Ex-div P_0 = £1.88
g = 7%
D_0 = £0.16
$D_1 = D_0(1+g)$ = £0.16 × 1.07 = £0.1712
$Ke = (D_1/P_0) + g$ = (£0.1712/£1.88) + 7% = 9.11% + 7% = 16.11%

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Example 3

Whiskey Plc just paid out a total of £300,000 as dividend. The shares are currently trading at £2.33 per share, and there are a total of 3 million shares. Assume there is a growth rate of 5%.

Solution: P_0 = £2.33

D_0 = £300,000/3,000,000 = £0.10 per share

$D_1 = D_0(1+g)$ = £0.10 × 1.05 = £0.105

$Ke = (D_1/P_0) + g$ = (£0.105/2.33) + 5% = 4.5% + 5% = 9.5%

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Limitations of the Dividend Valuation Model

- Assumes dividends grow smoothly, but this may not reflect reality
- Some companies pay zero dividends and reinvest 100% of earnings
- Assumes dividends continue to grow at historic rates
- Ignores that shareholders also receive returns in the form of capital gains
- Results are very sensitive to values of g and P_0

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Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model evaluates the risks associated with investing in a company relative to other capital market investments.

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Risk Classification

- **Unsystematic (unique/business) risk**: Specific to a company/industry (e.g., strike action, merger)
- **Systematic (market) risk**: Affects the whole market (e.g., inflation, interest rates, GDP movements)

> **Important**
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> Portfolio theory suggests that an investor can diversify away unsystematic risk by holding a well-diversified portfolio. The larger the number of differing types of shares held, the more likely that unsystematic risk will be reduced.

It is generally thought that holding eight to ten carefully chosen shares is sufficient to diversify away unsystematic risk.

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Beta and Systematic Risk

Beta (β) is a measure of the systematic risk of an individual equity share relative to the systematic risk experienced by the market.

- Beta = 1: Company has the same risk as the market average
- Beta > 1: More risky than the market (e.g., β=2 means twice as risky)
- Beta < 1: Less risky than the market

A company's beta is obtained by plotting the returns of the company against the returns of the market over time, creating a "securities market line."

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The CAPM Formula

The CAPM captures the gradient of the securities market line:

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

Where: - r_j is the return expected from company j (same as Ke) - r_f is the risk-free rate of return - β is the level of systematic risk - $(r_m - r_f)$ is the market risk premium

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Example: CAPM Calculations

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Example 1

M plc has a beta factor of 1.2. The yield on government bonds is 3% and the return on the market is 8%.

Required: Calculate M plc's equity cost of capital using CAPM.

Solution: $r_f = 3\%$

$r_m = 8\%$

$\beta = 1.2$

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

$r_j = 3\% + 1.2(8\% - 3\%)$

$r_j = 3\% + 1.2(5\%)$

$r_j = 3\% + 6\%$

$r_j = 9\%$

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Example 2

L plc has a beta factor of 1.5. The risk-free yield is 5%, and the market premium is 8%.

Required: Calculate L plc's Ke using CAPM.

Solution: $r_f = 5\%$

Market premium = $(r_m - r_f) = 8\%$

$\beta = 1.5$

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

$r_j = 5\% + 1.5(8\%)$

$r_j = 5\% + 12\%$

$r_j = 17\%$

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Example 3

N plc is considered to be twice as sensitive to market change. Government bonds currently have a 5% coupon rate, and the average market return is 15%.
Required: Calculate N plc's Ke using CAPM.
Solution: $r_f = 5\%$

$r_m = 15\%$

$\beta = 2$ (twice as sensitive)

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

$r_j = 5\% + 2(15\% - 5\%)$

$r_j = 5\% + 20\%$

$r_j = 25\%$ :::

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CAPM vs Dividend Growth Model

CAPM	Dividend Growth Model
Takes into account risk	Does not explicitly account for risk
Assumes no taxation or transaction costs	Incorporates actual market prices
Assumes investors can diversify away unsystematic risk	Requires historical dividend data
Can be applied to all	Cannot be used for companies without dividend history

CAPM	Dividend Growth Model
listed companies	
Assumes investors can borrow/lend at risk-free rate	Based on actual dividend payments

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The Cost of Debt

There are two main types of debt financing:

1. **Untraded Debt**: Bank loans
2. **Traded Debt**: Redeemable bonds

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Untraded Debt (Bank Loans)

When long-term debt is untraded, such as a bank loan: - The market value equates to the book value - The cost of capital is the post-tax interest rate charged on that debt

$$K_{dt} = i(1 - t)$$

Where: - K_{dt} is the cost of debt after taxation - i is the interest rate - t is the taxation rate

Example: Cost of Bank Loan

If a company has a bank loan of £1m with an interest rate of 8% and corporate tax is 30%:

K_d = 8% × (1-30%) = 5.6%

The market value of this loan is £1m, same as the book value.

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Traded Debt (Redeemable Bonds)

Traded debt usually takes the form of bonds that can be traded on stock markets:

- In the UK, bonds have a nominal value of £100
- The most common type is a “plain vanilla bond” with a fixed annual interest rate
- Traders value bonds based on their coupon (interest) compared to returns from similar investments
- Interest payments on debt are tax-deductible

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Market Value of Redeemable Bonds

The market value of bonds should be the cash flows expected by a company on a new issue:
Quoted market value – Ex-interest – Ex-issue costs
Redeemable bonds are valued at the present value of: - Future stream of income (coupon) for a set period (annuity), plus - Final redemption payment
Both discounted at the required rate of return.

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Example: Market Value of Redeemable Bonds

ABC PLC has £2,000,000 of 8% bonds due for redemption at par in 3 years.
The expected return for bondholders is 5%.
Required: Calculate the market value of the bond.
Solution: MV = £8/1.05 + £8/1.05^2 + £108/1.05^3 = £108.17
Since each bond has a par value of £100, the total market value would be:
(£108.17/£100) × £2,000,000 = £2,163,400

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Calculating the Cost of Redeemable Debt

The cost of redeemable debt is calculated using an IRR approach:

1. Determine the current market price of the bond
2. Identify the after-tax interest payments
3. Find the discount rate that makes the present value of future cash flows equal to the current market price

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Example: Cost of Redeemable Debt

Derry PLC has £5,000,000 8% debentures (2022 at Par) trading at £92. The interest payment has just been made. The company pays tax at 50%.
Required: Calculate the cost of Derry PLC's debentures.
Solution: After-tax interest = £8 × (1-50%) = £4 per £100 bond
Redemption time = 4 years
Redemption price = £100
Current market value = £92
Using IRR approach to find K_d: $92 = 4/(1+k_d) + 4/(1+k_d)^2 + 4/(1+k_d)^3 + 104/(1+k_d)^4$
Testing with 5%: NPV = 92 - 4×(3.546) - 100×(0.823) = -4.484
Testing with 15%: NPV = 92 - 4×(2.855) - 100×(0.572) = 23.38
K_d = 5% + (4.484/27.864)×(10%) = 6.61%

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Weighted Average Cost of Capital (WACC)

The weighted average cost of capital (WACC) is the overall cost of long-term funds invested in a company.

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Calculating WACC

The WACC formula:

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

Where: - E is the market value of equity - D is the current market value of debt - K_e is the cost of equity - K_d is the before-tax cost of debt - t is the current rate of tax

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Example: WACC Calculation

Primavero Plc has equity amounting to £2million and debt capital of £2million. The cost of equity is 16% and the cost of debt (before tax) is 12.5%. The current tax rate is 20%.
Required: a) What is the market value of Primavero Plc? b) What is Primavero Plc's WACC?
Solution: a) Market value = £2m + £2m = £4m

b. WACC = 0.5(16%) + 0.5(12.5%)(1-0.2) = 8% + 0.5(10%) = 8% + 5% = 13%

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Limitations of Using WACC for Investment Appraisal

The WACC is appropriate when: - The rate reflects the marginal cost of new capital - The company's capital structure is at its optimal level - The project being evaluated has the same business risk as the company - The finance raised is in similar proportions to the existing capital structure
Other limitations: - Some debt instruments are highly complicated and don't fit theoretical models - Companies may issue floating-rate debt capital - The WACC provides only a framework for estimation

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Capital Structure Theory

A company's Capital Structure is the mixture of long-term debt and equity used to finance projects and operations.
The value of a company is the market value of its capital structure: MV = D + E

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Capital Structure Objective

- Debt is generally cheaper than equity
- However, gearing impacts the required return by existing equity and debt holders due to financial risk
- A financial manager must find the level of debt and equity that minimizes WACC - the optimum capital structure

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Financial Risk

- Debt has a fixed yearly return that must be paid
- This creates a constant drain on liquidity and may increase bankruptcy risk
- Higher fixed costs (interest) increase sensitivity of income available for equity holders
- Financial risk is the additional sensitivity in returns to equity holders due to debt

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Modigliani and Miller Theory

The Modigliani and Miller theory suggests:

- Company value is not influenced by its capital structure
- Equity holders require a premium for increased financial risk that exactly offsets the benefit of cheaper debt
- Therefore, WACC remains constant regardless of capital structure
- Market value is determined solely by the quality of investments (operating profits/cash flows)

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Summary of Cost of Capital

The key components for calculating the cost of capital:

1. **Bank loans**: Cost and market value
2. **Redeemable debt**: Cost and market value
3. **Preference shares**: Cost and market value
4. **Ordinary shares**: Cost and market value
    - Two models to calculate cost:
        - Dividend growth model
        - CAPM
5. **WACC**: Weighted average combining debt and equity costs

These calculations help determine the appropriate discount rate for investment appraisal, ensuring projects generate sufficient returns to meet financing costs.

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