Corporate Issuers

Capital Structure

Exam Focus

- Weighted average cost of capital (WACC)
  - Calculate and interpret
- Factors affecting capital structure and WACC
  - Internal and external
- Modigliani-Miller (MM) propositions on capital structure
  - MM 1 and 2 with and without taxes
- Optimal and target capital structures
  - Static trade-off theory, pecking order theory, free cash flow hypothesis

Cost of Capital

A company's cost of capital (required rate of return) includes:

Cost of debt (r_d)

- Debt is less risky as it is a priority fixed claim and often secured with collateral so r_d is lower
- Starting point for estimating r_d is existing or recent borrowing rates of peer companies

Cost of equity (r_e)

- Equity is more risky as it is a permanent residual claim so r_e is higher

Weighted Average Cost of Capital (WACC)

WACC combines the cost of debt and cost of equity into one blended rate for the purposes of NPV and IRR computations:

WACC: (cost of debt × debt weighting) + (cost of equity × equity weighting)

- Use after-tax debt cost (need tax rate) and market value weights for debt and equity
- Other financing sources (e.g., preferred shares) could be added to the above calculation
- When choosing between capital structures, choose the one that minimizes WACC (and if possible, matches the liquidity or time horizon of the capital investment)

WACC Calculation 1: Example

A company's capital structure is 30% debt and 70% equity. The jurisdiction allows a tax deduction for interest expense. Debt investors require a before-tax return of 6% and the equity investors' required return is 12%.

Calculate the change in WACC if the marginal corporate tax rate rises from 20% to 25%.

Solution:

WACC at a 20% tax rate =

WACC at a 25% tax rate =

WACC the increase in the tax rate causes the after-tax cost of debt to

WACC Calculation 2: Example

A company's balance sheet shows $400,000 in bonds and $600,000 in common shares (40,000 shares). Total liabilities and equity are $1,000,000. Current stock price is $20 per share, the required before-tax return on debt is 5%, and the required return on equity is 10%.

Calculate the WACC if the stock price rises to $25 and the relevant tax rate is 20%.

Book value weights: debt = 0.40, equity = 0.6

market value of equity shares =

Total capital is

Market value weights: debt , equity

WACC =

Financing Required

WACC calculation weightings refer to the amount of financing and type of financing (debt or equity) required. They are dependent on the business model and position in the corporate life cycle.

Capital-intensive business (e.g., bank, public utilities)

- Borrow cash to buy assets or lease assets to try to reduce cost of capital
- Use the asset as collateral (as long as it has value to the lender) so as to lower the debt cost
- Governments may regulate certain companies to maintain at least a minimum amount of equity in their capital structures, thereby increasing WACC

Capital-light business (e.g., technology, service)

- Low capital needs and/or short cash conversion cycle so little or no need for external financing, thereby decreasing WACC

Corporate Life Cycle

A company's capital structure does not tend to be static and tends to evolve over time.

Early stage or start-up: zero or low sales; negative free cash flow; high business risk, so financing is largely equity from founders, employees, and venture capitalists; possible financing through leases and convertible debt

Growth: greater product demand and revenue growth, so medium business risk and increasing free cash flow; some use of secured debt, but still mainly equity financing

Mature: revenue growth slows but is stable, so low business risk and relatively high and consistent free cash flow; more use of unsecured debt that is often cheaper than equity

Life Cycle: Example

Match each of the following phases of the company life cycle with the debt type:

Phase of Life Cycle	Likely Debt Type
Start-up	Unsecured
Growth	Convertible
Maturity	Secured

Top-Down Factors Affecting Cost of Capital

Financial market conditions

- Cost of debt includes a spread to cover issuer-specific risks
- Increases in interest rates and/or recession/default risk increase cost of debt
- Higher stock prices decrease cost of equity and encourage equity issuances

Industry conditions

- The nature of the products or services sold by the company sells (e.g., low oil prices are bad for oil producers and increase cost of capital, but good for airlines and decrease cost of capital)

Issuer-Specific Factors Affecting Cost of Capital

- **Sales risks**
- **Profitability risks (operating leverage)**
- **Financial leverage and interest coverage**
- **Collateral/type of assets owned**

Issuer Specific: Example

The cost of debt and equity is likely to be higher for a firm with:

A. stable revenue growth.

B. high operating leverage.

C. high interest coverage.

Operating Leverage: Example

Two companies are 100% equity financed. Each company has revenue of 100 and expenses of 70 for the year. Company 1 has fixed costs (FC) of 50 and variable costs (VC) of 20. Company 2 has FC of 20 and VC of 50. Equity is 100 for both companies. As a result, ignoring taxes, both companies have profit of 30 and ROE of 30%.

What is the impact on ROE for both companies of a 25% sales increase and of a 25% sales decrease?

Which company is likely to have a lower cost of debt?

Operating Leverage: Example

Company 1	Base Case	25% Decline	25% Increase
Revenue	100		
Variable costs	(20)		
Contribution	80		
Fixed costs	(50)	(50)	(50)
Profit	30		
Total equity	100	100	100
ROE	30%		

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Operating Leverage: Example

Company 2	Base Case	25% Decline	25% Increase
Revenue	100		
Variable costs	(50)		
Contribution	50		
Fixed costs	(20)	(20)	(20)
Profit	30		
Total equity	100	100	100
ROE	30%		

Company would likely have a lower cost of debt.

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Financial Leverage: Example

Two companies both have assets of 100%. Firm A is financed with 80 in equity and 20 in debt while Firm B is financed with 40 in equity and 60 in debt. Each company has sales of 100 and non-interest expenses of 70 for the year. Firm A has interest expense of 2 and Firm C has interest expense of 9. Ignore income taxes.

What is the interest coverage and ROE for both companies?

What is the impact on ROE for both companies of a 25% sales increase and of a 25% sales decrease?

Which company is likely to have a lower cost of capital?

Financial Leverage: Example

Firm A	Base Case	25% Decline	25% Increase
Operating income	30	22.5	37.5
Interest expense	(2)	(2)	(2)
Profit	28	20.5	35.5
Interest coverage			
Total equity	80	80	80
ROE			

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Financial Leverage: Example

Firm B	Base Case	25% Decline	25% Increase
Operating income	30	22.5	37.5
Interest expense	(9)	(9)	(9)
Profit	21	13.5	28.5
Interest coverage			
Total equity	40	40	40
ROE			

Firm B:

Firm A:

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Modigliani-Miller (MM) Propositions

MM I: value of a firm is unaffected by its capital structure

MM II: WACC is unaffected by capital structure

Assumptions

- **No taxes**, transaction costs, bankruptcy costs
- Homogeneous expectations
- Borrowing and lending at risk-free rate
- No agency costs
- Investment decisions unaffected by financing decisions

Capital Structure Irrelevance

MM Proposition I without taxes: changing the capital structure does not affect firm value

- Value of levered company (V_L) = value of unlevered company (V_U)
- Company value is determined solely on expected future cash flows
- Total cash flows to debtholders and equity holders are the same for leveraged and unleveraged firms
- Investors can choose the level of leverage by borrowing and lending at the risk-free rate (homemade leverage)

Cost of Capital

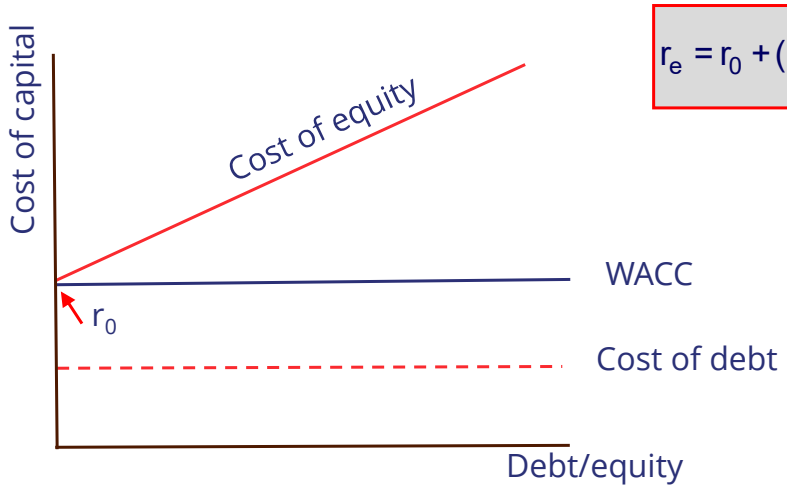
MM Proposition II without taxes: greater financial leverage increases the cost of equity

- Adding debt to a company's capital structure increases risk of bankruptcy, so equity investors will require a higher return on equity as a result
- Linear relationship between the cost of equity (r_e) and D/E:

$$r_e = r_0 + (r_0 - r_d)\frac{D}{E}$$

  where r_0 = cost of equity for a 100% equity-financed firm
- No impact on WACC as any decrease by adding lower-cost debt capital is exactly offset by increased cost of equity; no impact on company value

MM With No Taxes



$$r_e = r_0 + (r_0 - r_d)\left(\frac{D}{E}\right)$$

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MM With No Taxes: Example

Assume that Gerhardt Corporation has an all-equity capital structure. Gerhardt has expected annual cash flows (or CF_e) of €5,000 and a cost of equity of 10%, which is also its WACC since equity is the firm's only source of capital. For simplicity, we assume that all cash flows are perpetual. Therefore, Gerhardt's value is equal to:

$$\text{Value of firm} = \frac{€5{,}000}{0.1} = €50{,}000$$

Now suppose that Gerhardt plans to issue €15,000 in debt at a cost of 5% and use the proceeds to buy back and reduce its outstanding equity by €15,000. This action leaves total invested capital unchanged at €50,000.

Compute the cost of equity, WACC, and firm value.

MM With No Taxes: Example

Cost of equity:

r_e = =

WACC:

r_{WACC} = + =

-2

MM With No Taxes: Example

Firm value

Cash flow to debtholders = €15,000 × 0.05 = €750

Cash flow to equity holders = residual = €5,000 – €750 = €4,250

Value of debt =

Value of equity =

Value of firm = =

=

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Firm Value With Taxes

MM Proposition I with taxes: tax shield increases value of company

- Ignoring bankruptcy costs, company value increases with more debt; cost of debt is lowered by the amount of the tax benefit
- $V_L = V_U + tD$
- tD is the present value of the debt tax shield based on the marginal corporate tax rate, so a higher tax rate provides a greater benefit
- Tax shield means that the leveraged firm can distribute greater cash flows than the unleveraged firm

Cost of Capital

MM Proposition II with taxes: tax shield increases value of company

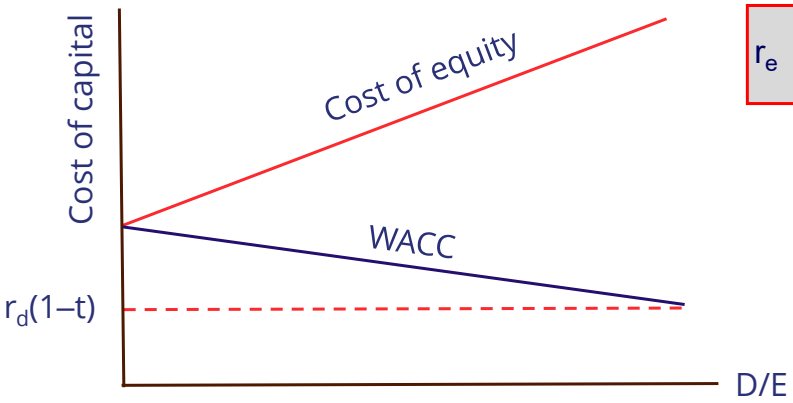
- With taxes and assuming no bankruptcy costs, the even-lower cost of debt outweighs the increase in cost of equity and WACC is reduced:

$$r_e = r_0 + (r_0 - r_d)(1 - t)\frac{D}{E}$$

- The r_e still rises with increases in debt in the capital structure, but the increase is at a slower rate (compared to MM Proposition II without taxes)

MM With Taxes

Debt financing creates a **tax shield** that increases company value (WACC falls with more debt)



$$r_e = r_0 + \left(\frac{D}{E}\right)(r_0 - r_d)(1 - t)$$

Cost of capital minimized and value of the firm maximized at 100% debt

MM With Taxes: Example

Recall from the previous example that annual cash flows to Gerhardt shareholders were €5,000 and the cost of equity (and WACC) was 10%. As before, Gerhardt is planning to issue €15,000 of 5% debt to buy back an equivalent amount of equity. Now, however, assume that Gerhardt pays corporate taxes at a rate of 25%.

Value of firm prior to buy back:

After tax cash flow = €5,000 × (1 – 0.25) = €3,750

Firm value = $\frac{€3,750}{0.1} = €37,500$

Compute the cost of equity, WACC, and firm value.

MM With Taxes: Example

Firm value:

$V_L = V_U + (t \times D)$

V_L = €37,500 + =

Value of equity – €15,000 =

Cost of equity:

r_e = =

WACC:

r_{WACC} = =

-4

MM With Taxes: Example

$V_L = V_U + (t \times D)$

V_L = €37,500 + (0.25 × €15,000) = €41,250

Proof:

V_L = =

Value of debt = €15,000

Value of equity = =

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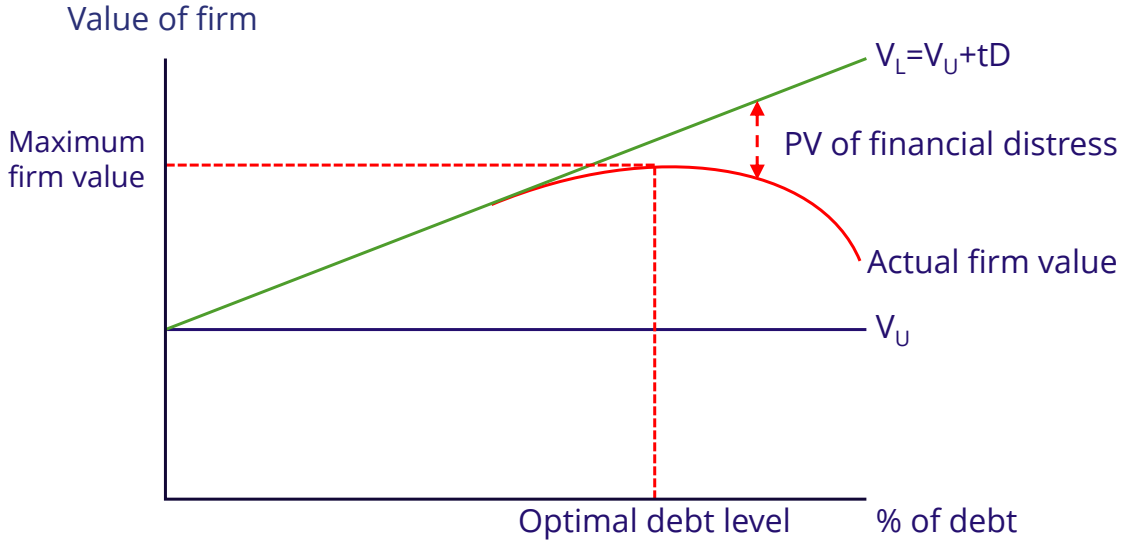
Static Trade-Off Theory

- Must balance the benefit of the tax shield due to additional leverage with the present value of the probability-weighted costs of financial distress
  - $V_L = V_U + tD$ – PV(costs of financial distress)
- With low amounts of debt, there is likely a net increase in company value with the debt tax shield being greater than increased potential bankruptcy costs
- At higher levels of debt, the potential bankruptcy costs increase significantly; there exists a point of optimal debt (optimal capital structure) whereby the PV(tax shield on debt) = PV(financial distress costs)

Static Trade-Off Theory



Target Capital Structure

Actual capital structure may not be the same as target capital structure

- Potential exploitation of short-term opportunities in issuing debt or equity
- Changing market values of debt and equity
- Transaction costs and minimum deal sizes may be too high to justify frequent rebalancing

Determining target capital structure

- Is often set as a range of values rather than a specific value
- Usually computed using book (not market) values of debt and equity given potential significant fluctuations in market values and much focus by third parties on book value
- Examine trends or use averages of comparable companies' capital structures

Pecking Order Theory

Asymmetric information occurs when the company has more information about its business than is publicly disclosed.

- Debt and equity investors require a greater return premium when greater information asymmetry exists.
- Because signals by company management are carefully monitored by investors, there may be a "pecking order" for financing sources.

Pecking Order Theory

Pecking order theory implies that managers will first use internally generated funds due to low information content and use public equity offerings last due to high information content.

- Within external financing, in order of preference: (1) private debt, (2) public debt, (3) equity
- Stock issuance viewed as a negative signal; share repurchase viewed as a positive signal
- Debt issuance viewed as a positive signal

Agency Costs

Using more debt in the capital structure could result in avoiding the agency costs of equity.

Free cash flow hypothesis suggests that the more constrained a company is with debt, the more likely managers will spend funds wisely to meet periodic interest and principal payments.

Asymmetric Information, Signaling: Example

CLP AG (CLP) is a small public pharmaceutical company. It has a drug that is already approved for treating an autoimmune disorder but it is conducting a clinical trial for a new application of treating a viral infection.

In July, management is told that the clinical trials look promising. Thinking they may need to start production soon, CLP is approved for and discloses a major increase in its credit line.

In August, CLP publicly announces successful test results and its share price rises 35%.

- There is asymmetric information since management knew about the positive trial result in July prior to the public announcement in August.
- Signaling occurred with the announcement in July of the increase in the credit line; a signal that trial results were positive and production capacity will need to be expanded.

Solutions

WACC Calculation 1: Example

A company's capital structure is 30% debt and 70% equity. The jurisdiction allows a tax deduction for interest expense. Debt investors require a before-tax return of 6% and the equity investors' required return is 12%.

Calculate the change in WACC if the marginal corporate tax rate rises from 20% to 25%.

Solution:

WACC at a 20% tax rate = (0.30 × 6%)(1 – 20%) + (0.70 × 12%) = 9.84%

WACC at a 25% tax rate = (0.30 × 6%)(1 – 25%) + (0.70 × 12%) = 9.75%

WACC **declines by 0.09%**; the increase in the tax rate causes the after-tax cost of debt to decline.

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WACC Calculation 2: Example

A company's balance sheet shows $400,000 in bonds and $600,000 in common shares (40,000 shares). Total liabilities and equity are $1,000,000. Current stock price is $20 per share, the required before-tax return on debt is 5%, and the required return on equity is 10%.

Calculate the WACC if the stock price rises to $25 and the relevant tax rate is 20%.

Book value weights: debt = 0.40, equity = 0.6

market value of equity = $25 × 40,000 shares = $1,000,000.

Total capital is $1,400,000.

Market value weights: debt $0.29 = \frac{400,000}{1,400,000}$, equity $0.71 = \frac{1,000,000}{1,400,000}$

WACC = (0.29)(5%)(1 – 20%) + (0.71)(10%) = 8.26%.

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Life Cycle: Example

Match each of the following phases of the company life cycle with the debt type:

Phase of life cycle	Likely debt type
Startup	Unsecured
Growth	Convertible
Maturity	Secured

-3

Issuer Specific: Example

The cost of debt and equity is likely to be higher for a firm with:

A. stable revenue growth.

B. high operating leverage.

C. high interest coverage.

Operating leverage is the firm's proportion of fixed costs to total costs and measures the stability of profits. Firms with high operating leverage experience a greater change in operating profits for a given change in revenues. Thus, firms with high operating leverage are riskier and likely to have higher debt and equity costs.

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Operating Leverage: Example

Company 1	Base Case	25% Decline	25% Increase
Revenue	100	75	125
Variable costs	(20)	(15)	(25)
Contribution	80	60	100
Fixed costs	(50)	(50)	(50)
Profit	30	10	50
Total equity	100	100	100
ROE	30%	10%	50%

Operating Leverage: Example

Company 2	Base Case	25% Decline	25% Increase
Revenue	100	75	125
Variable costs	(50)	(37.5)	(62.5)
Contribution	50	37.5	62.5
Fixed costs	(20)	(20)	(20)
Profit	30	17.5	42.5
Total Equity	100	100	100
ROE	30%	17.5%	42.5%

Company 2 would likely have a lower cost of debt.

Financial Leverage: Example

Firm A	Base Case	25% Decline	25% Increase
Operating income	30	22.5	37.5
Interest expense	(2)	(2)	(2)
Profit	28	20.5	35.5
Interest coverage	15	11.25	18.75
Total equity	80	80	80
ROE	35%	26%	44%

Financial Leverage: Example

Firm B	Base Case	25% Decline	25% Increase
Operating income	30	22.5	37.5
Interest expense	(9)	(9)	(9)
Profit	21	13.5	28.5
Interest coverage	3.3	2.5	4.2
Total equity	40	40	40
ROE	53%	34%	71%

Firm B: higher ROE due to greater debt finance but greater variability

Firm A: greater interest coverage

MM With No Taxes: Example

Cost of equity:

$$r_e = 0.1 + (0.1 - 0.05)\frac{€15,000}{€35,000} = 0.12143 \text{ or } 12.143\%$$

WACC:

$$r_{WACC} = \frac{€15,000}{€50,000} \times 0.05 + \frac{€35,000}{€50,000} \times 0.12143 = 0.1 \text{ or } 10\%$$

-2

MM With No Taxes: Example

Firm value

Cash flow to debtholders = €15,000 × 0.05 = €750

Cash flow to equity holders = residual = €5,000 – €750 = €4,250

$$\text{Value of debt} = \frac{€750}{0.05} = €15,000$$

$$\text{Value of equity} = \frac{\$4,250}{0.12143} = €35,000$$

Value of firm = €15,000 + €35,000 = €50,000

$$\frac{€750 + €4,250}{0.1} = €50,000$$

-4

MM With Taxes: Example

Firm value:

$V_L = V_U + (t \times D)$

V_L = €37,500 + (0.25 × €15,000) = €41,250

Value of equity = €41,250 – €15,000 = €26,250

Cost of equity:

$$r_e = 0.1 + (0.1 - 0.05)(1 - 0.25)\frac{€15,000}{€26,250} = 0.12143 \text{ or } 12.143\%$$

WACC:

$$r_{WACC} = \frac{€15,000}{€41,250} \times 0.05 \times (1 - 0.25)) + \frac{€26,250}{€41,250} \times 0.12143 = 0.09091 \text{ or } 9.091\%$$

-4

MM With Taxes: Example

$V_L = V_U + (t \times D)$

V_L = €37,500 + (0.25 × €15,000) = €41,250

Proof:

$$V_L = \frac{€3,750}{0.09091} = €41,250$$

Value of debt = €15,000

$$\text{Value of equity} = \frac{(€5,000 - €750)(1 - 0.25)}{0.12143} = €26,250$$

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