CHARTA LEARNING · LESSON NOTES

Capital structure: debt, equity and the best mix

CFA Level I · Corporate Issuers

You will learn: What drives a company's mix of debt and equity, how it changes through the company's life, what Modigliani and Miller showed with and without tax, and why real firms aim for a range around an optimum.

Running example: Examples use made-up figures: two identical firms with $1,000 of assets (Firm B borrows $500 at 6%), then a firm earning $100 a year forever, and a firm with an unlevered value of $1,200 and 25% tax.

1. Debt, equity and leverage

- Debt is borrowed money: the lender is promised fixed interest and the money back whatever happens. Equity is the owners' money: nothing is promised, and the owners keep what is left. The mix is the capital structure; a lot of debt is high leverage.
- Debt works like a lever. It magnifies the owners' gain in a good year and the pain in a bad year, so return on equity swings more with debt.
- Return on equity is the profit left for the owners divided by the owners' money.

FIRM A HAS NO DEBT; FIRM B HAS DEBT OF $500 AT 6% (INTEREST $30) AND OWNERS' MONEY OF $500

A, good year (profit $150)	150 ÷ 1,000	**15%**
B, good year	(150 − 30) ÷ 500	**24%**
A, bad year (profit $40)	40 ÷ 1,000	**4%**
B, bad year	(40 − 30) ÷ 500	**2%**
Gap between years	A: 15 − 4; B: 24 − 2	**11 points; 22 points**

2. The five forces on the mix

- Business risk is how uncertain operating profit is. Steady profits and tangible assets that lenders can seize make more debt safe; volatile profits and value in ideas or people mean less debt. Debt adds financial risk on top of business risk.
- Tax shield: interest is deductible and dividends are not, so the saving equals the tax rate times the interest paid. A higher tax rate means a bigger shield and more debt; a firm paying no tax gets little value from it.
- Financial distress costs: more debt makes trouble more likely. Direct costs are lawyers and administrators; indirect costs are often bigger (lost customers, tougher suppliers, lost staff, assets sold cheaply). They are worse for volatile, intangible firms.
- Agency costs: debt disciplines managers who might waste cash, but owners of a heavily indebted firm may gamble with the lenders' money, so lenders monitor and restrict, which costs money.
- Asymmetric information: managers know more than outsiders, so new shares signal a price that may be too high. The pecking order theory says retained profit first, then debt, then new equity as a last resort. It is an order of choices, not a target ratio.

TAX SHIELD: OPERATING PROFIT $200, TAX RATE 25%, INTEREST $40

Tax with no debt	25% × 200	**$50**
Tax with $40 of interest	25% × (200 − 40)	**$40**
Tax saved: the shield	50 − 40	**$10**
Check: rate × interest	25% × 40	**$10**

3. Capital structure through a company's life

- Start-up: equity only (founders and venture investors). Lenders gain nothing if the business does brilliantly and lose if it fails, so they need safety; a start-up has no profits or assets. Equity is costly because investors need a big upside.
- Growth: new shares and some loans against assets. As revenue becomes predictable and assets build, the cost of borrowing starts to fall.
- Maturity: stable cash flow makes debt cheapest and easiest, and debt use is highest. With few projects left, spare cash goes to owners, often funded by debt for dividends or buybacks.
- Decline: the same fixed interest sits on smaller profit, so risk rises even with no new borrowing. Lenders charge more or refuse, so the firm repays debt and sells assets. Stage suggests debt capacity, not a rule.

SAME DEBT, SHRINKING PROFIT: DEBT $400 AT 6% (INTEREST COVER = OPERATING PROFIT ÷ INTEREST)		
Interest bill each year	6% × 400	**$24**
Maturity: profit $100	100 ÷ 24	**4.17×**
Decline: profit $40	40 ÷ 24	**1.67×**
Break-even: profit $24	24 ÷ 24	**1.00×**

4. Modigliani and Miller with no taxes

- A company's value comes from the cash its business produces; how that cash is sliced between lenders and owners does not change the total (a pizza cut into four or eight slices).
- This holds in a perfect world: no taxes, no bankruptcy costs, no information gaps, and people borrow on the same terms as companies.
- Proposition I: levered and unlevered firms are worth the same. If the levered one were worth more, investors could buy the cheaper unlevered firm and borrow themselves (homemade leverage), pulling prices together.
- Proposition II: debt is cheaper than equity, but more debt makes equity riskier, so the cost of equity rises by exactly enough. The average cost of capital (WACC) stays flat. The premium is (r0 − rd) times debt-to-equity.

V(levered) = V(unlevered); re = r0 + (r0 − rd) × (D/E)

CASH FLOW $100 A YEAR FOREVER, R0 = 10%, BORROW $400 AT 6%		
Value with no debt	100 ÷ 10%	**$1,000**
Value with the debt; equity left	same; 1,000 − 400	**$1,000; $600**
Owners' return	(100 − 24) ÷ 600 = 76 ÷ 600	**12.67%**
Cost of equity by formula	10 + 4 × 400/600	**12.67%**
Average cost (WACC)	0.6 × 12.67 + 0.4 × 6	**10.00%**

Watch out: Saying debt is cheaper so more debt always lowers the average cost: that holds only with tax.

5. Modigliani and Miller with taxes

- With corporate tax, interest is deductible, so borrowing creates a tax shield and debt matters. The levered value equals the unlevered value plus the tax rate times the debt (the present value of the shields, assuming permanent debt). The shield is the rate times the debt, not times the interest.
- The cost of equity rises more slowly because of the (1 − t) bracket. The average cost of capital now falls steadily as debt rises. Taken literally, a company should be almost all debt: that is the puzzle.

V(levered) = V(unlevered) + t × D; re = r0 + (r0 − rd) × (1 − t) × (D/E)

PROFIT $160 BEFORE TAX, TAX 25%, R0 = 10%, BORROW $400 AT 6%		
After-tax profit; unlevered value	160 × (1 − 25%); 120 ÷ 10%	**$120; $1,200**
Tax shield; levered value	25% × 400; 1,200 + 100	**$100; $1,300**
Equity	1,300 − 400	**$900**
Cost of equity	10 + 4 × 0.75 × 400/900	**11.33%**
Average cost (WACC)	120 ÷ 1,300	**9.23%**
Shield as perpetuity	interest 24; tax saved 25% × 24 = 6; 6 ÷ 6%	**$100 = 25% × 400**

Watch out: Forgetting that the shield formula assumes permanent debt.

6. The trade-off and the target mix

- Real firms are not all debt because distress is costly. Static trade-off theory: levered value equals unlevered value plus the present value of the tax shield minus the present value of distress costs.
- The optimum is where the extra tax benefit of one more dollar of debt equals the extra expected distress cost.
- The top of the curve is the optimal capital structure: the highest firm value and lowest average cost of capital. Beyond it distress costs grow faster than the shield.
- The target capital structure is the mix management actually aims for over time (debt ÷ total capital), a practical plan. Near the top the curve is flat, so a sensible target is a range.
- The range moves: a lower tax rate shrinks the shield, a riskier business raises distress costs sooner, and actual weights drift as prices move. Outside analysts often use current market weights or peers.

> **V(levered) = V(unlevered) + PV(tax shield) − PV(distress costs)**

VALUE = 1,200 + SHIELD − DISTRESS COSTS

Debt $0	no shield, no distress	**$1,200**
Debt $200	shield 50, distress 4	**$1,246**
Debt $400	shield 100, distress 32	**$1,268 (highest, about 32% debt)**
Debt $600	shield 150, distress 108	**$1,242**
Debt $800	shield 200, distress 256	**$1,144**

Key takeaways

- Debt magnifies owners' gains and losses: the return on equity swings more with leverage.
- Five forces shape the mix: business risk, tax shield, distress costs, agency costs and information (pecking order).
- Debt capacity is nil at the start-up, peaks at maturity and is cut back in decline.
- With no taxes the mix does not matter: cost of equity rises to offset cheaper debt and WACC is flat.
- With taxes, levered value = unlevered value + t × D (permanent debt); the shield is rate × debt.
- Firms balance shield against distress costs and aim at a target range around the optimum.

Quick check

1. All-equity value $2,000, tax rate 30%, permanent debt of $500. Levered value?
   Answer: $2,150 = 2,000 + 30% × 500
2. No taxes: the firm borrows more. Cost of equity and average cost?
   Answer: Equity cost rises; average cost unchanged.
3. An extra $1 of debt adds 40c of shield and 60c of distress cost. Do what?
   Answer: Borrow less: the cost beats the benefit.