# Why firms do not borrow as much as taxes say they should

Corporate Finance, Part II · Session 1 · Berk and DeMarzo ch. 16

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# Today’s goals

By the end of today you can:

1. Show why default alone does not destroy value, and what does
2. Value a firm, its debt and its shares when distress is costly, and say who pays
3. Use the trade-off to advise a firm on its debt, including the incentive and information problems debt creates

# From last time

Answer on your own first, then compare with a neighbour

1. In a perfect market, does borrowing change the total value of the firm?
2. Why does a levered firm's cost of equity rise with its debt?

# Five rules for using AI in this course

The same rules in every part of the course

1. **Try first yourself:** write down what the step should do (which cash flow, which rate, why)
2. **Use AI to explain, check or suggest an alternative**, not to build the model or write your page
3. **Test** what it gives you on a case where you know the answer: the book, or the course workbook
4. **Explain** every number, and which assumption drives it
5. **Own the result:** mark cells that came from AI with a comment “AI:”; you answer for all of them

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**The same rules as in Part I; the exam is taken without AI**

# Key terms for today

- **Economic distress:** the firm's assets fall in value
- **Financial distress:** the firm cannot pay its lenders; default
- **Distress costs:** value lost because of default: lawyers and courts (direct); lost customers, suppliers and staff, fire sales (indirect)
- **Interest tax shield (ITS):** tax saved because interest is deductible; with permanent debt $D$, $PV(\text{ITS}) = \tau_c D$ (Swedish $\tau_c = 20.6$ per cent)
- **Agency costs:** value lost when managers or shareholders act against the firm's total value

# Does default destroy value?

- SOLID AB launches a new product. In one year its assets are worth **165** MSEK (success, probability 0.6) or **85** (failure)
- 10 million shares; risk-free rate 5 per cent; the payoff is uncorrelated with the market, so we discount at the risk-free rate
- Option: borrow so that **100** MSEK is due in one year

**SOLID AB** Our firm for today: the same assets, financed three ways.

**If the product fails, a levered SOLID defaults. Is that a loss of value?**

# Step 1: unlevered, the shareholders own everything

$$V_U = \frac{0.6 \times 165 + 0.4 \times 85}{1.05} = 126.67 \text{ MSEK}$$

$$\text{Share price} = 126.67/10 = 12.67 \text{ SEK}$$

# Step 2: levered in a perfect market, the same total

**Debt** gets $\min(\text{assets}, 100)$:

$$D = \frac{0.6 \times 100 + 0.4 \times 85}{1.05} = 89.52$$

**Equity** gets the rest:

$$E = \frac{0.6 \times 65 + 0.4 \times 0}{1.05} = 37.14$$

$$V_L = 89.52 + 37.14 = 126.67 = V_U$$

**Default only moves the assets from the shareholders to the lenders. No value is lost: MM still holds.**

# Now default costs 30 MSEK in lawyers, lost customers and a fire sale. Who pays?

Your bet first: hands up. The answer is on the next slide.

A. The lenders: they get less when SOLID defaults
B. The shareholders: they pay before anything goes wrong
C. Nobody: it only happens if the product fails

# The shareholders pay, the day the debt is issued

- On failure the lenders get $85 - 30 = 55$, so the debt is worth 78.10 (not 89.52)
- They see it coming: the promised yield rises from 11.7 to 28.0 per cent (promised yield $= 100/D - 1$)
- $V_L = 78.10 + 37.14 = 115.24$, down by exactly $PV(\text{distress costs}) = 0.4 \times 30/1.05 = 11.43$
- Share price falls from 12.67 to 11.52 SEK

**Lenders price expected distress costs in, so the shareholders bear them up front, through a lower share price.**

# Check your understanding

Answer on your own first, then compare with a neighbour

A CFO says: “Distress costs are the lenders’ problem; they only bite if we default.” What is wrong with the argument?

# Add taxes: interest is paid before tax

- Permanent debt of 100 MSEK at $r_D = 5$ per cent: interest 5.00 a year

# How much debt? Weigh the tax gain against the costs

$$V_L = V_U + PV(\text{ITS}) - PV(\text{distress costs}) \\ - PV(\text{agency costs}) + PV(\text{agency benefits})$$

- Taxes: each krona of permanent debt saves $\tau_c$ in present value
- Distress costs: rise with debt, faster as default becomes likely; the warning sign is falling interest coverage (EBIT / interest)
- Agency costs: debt changes what shareholders want (next section)
- Agency benefits: debt also disciplines managers

# A firm worth 100 unlevered: where is value highest?

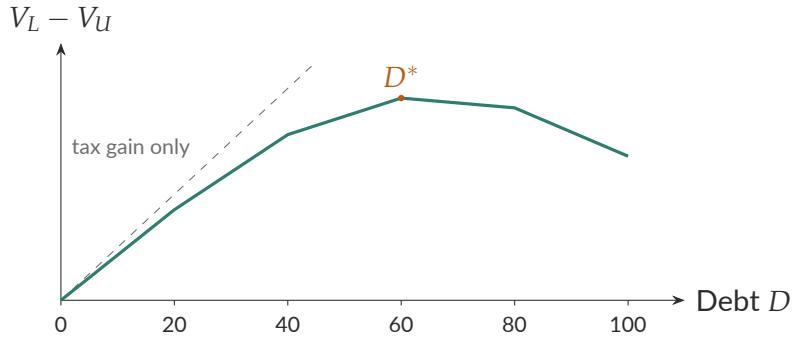
| Debt $D$ | P(distress), % | $PV(\text{ITS})$ | PV(distress costs) | $V_L$ |
|---|---|---|---|---|
| 0 | 0 | 0.00 | 0.00 | 100.00 |
| 20 | 2 | 4.12 | 0.60 | 103.52 |
| 40 | 6 | 8.24 | 1.80 | 106.44 |
| 60 | 15 | 12.36 | 4.50 | 107.86 |
| 80 | 30 | 16.48 | 9.00 | 107.48 |
| 100 | 50 | 20.60 | 15.00 | 105.60 |

In symbols

$V_L(D) = V_U + \tau_c D - p(D) \times 30,$ distress costs of 30 MSEK with probability $p(D)$

**Value peaks at $D = 60$: beyond it, the extra tax saved is smaller than the extra distress cost.**

# The same table as a picture




**Firms with high distress costs (intangible assets, volatile cash flows) choose less debt.**

# When debt is risky, shareholders and lenders pull apart

- **Excessive risk-taking (asset substitution):** near default, shareholders gain from gambles; the lenders bear the downside
- **Debt overhang (under-investment):** shareholders refuse good projects whose gains go mostly to the lenders
- **Cashing out:** paying out cash just before default

**These are costs of debt too, and lenders price them in, so the shareholders pay again.**

# Debt overhang: Vätternfrakt AB

Owes 20 MSEK in one year. Assets will be worth 30 or 6 (50/50). A project costs **10** today, paid by the shareholders, and adds a safe **12** next year.

- NPV $= 12/1.05 - 10 = 1.43$: a good project
- Shareholders: equity 4.76 without, 10.48 with; gain 5.71 for an outlay of 10
- Lenders: debt 12.38 without, 18.10 with; gain 5.71, for nothing

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**The shareholders pay 10 to gain 5.71: they say no to a positive-NPV project.**

# Exercise in pairs: Mälarbygg AB (20 minutes)

Open `s1_workbook.xlsx`, sheet **Exercise**. Mälarbygg owes 25 in one year; assets 40 or 10 (50/50). A project costs 8 today and adds a safe 10 next year.

1. What is the project's NPV?
2. What do the shareholders gain from it? Do they invest?
3. The lenders offer to pay part of the 8. What is the smallest contribution that makes the shareholders invest, and the largest the lenders would give?
4. Name two other ways to get the project done.

**Formulas in the yellow cells, as in the Debt overhang sheet. We go through it at minute 75.**

# Exercise: answers

- NPV $= 10/1.05 - 8 = 1.52$

# Debt also disciplines managers

- Managers may pursue size rather than value: empire building, perks, projects that entrench them
- Interest payments take free cash flow out of their hands
- Lenders monitor, and a default threat punishes waste

**Empire building** US multinationals that stopped reporting earnings by region grew abroad faster, at lower margins and lower firm value (Hope and Thomas, 2008, *JAR* 46(3)).

**A cash-rich firm with few good projects can gain from debt's discipline.**

# What a financing choice tells investors

- Managers know more than investors about the firm's prospects
- **Lemons:** a firm that sells shares may be selling because it thinks they are overpriced; investors know this, so the price falls on the announcement
- **Signalling with debt:** only a firm confident in its cash flows can promise large interest payments
- **Pecking order:** retained earnings first, then debt, equity last

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**The financing choice is itself information, so it moves the share price.**

# Check your understanding

Answer on your own first, then compare with a neighbour

A mature Swedish firm announces a large share issue to fund an ordinary expansion. Its share price falls on the day. Give one explanation from today's lecture.

# Summary

1. Default alone moves value between investors; **distress costs** destroy it
2. Lenders price those costs in, so shareholders pay them up front (SOLID: 12.67 to 11.52 SEK)
3. The trade-off sets debt where the tax gain stops paying; incentive and information problems push the answer down or up

**Before next time:** read ch. 17 and do MyLab ch. 17, due 10:00 on Tue 8 Dec.

# Test yourself before next time

Without AI: this is the exam competence

1. Why is $V_L = V_U$ for SOLID in a perfect market, even though it defaults on failure?
2. Recompute SOLID's share price with distress costs of 20 instead of 30
3. In the trade-off table, what happens to $D^*$ if distress costs double? Explain without computing
4. Why might shareholders turn down a project with positive NPV?

# The AI-project case: part of the assignment (A001)

- In pairs: is an AI investment profitable, when should it start, does it cut jobs?
- Today: case and data on the course site; pairs and pair numbers on the board
- **Mon 7 Dec, 23:59:** one page and up to three slides, under your pair number
- **Wed 9 Dec:** every pair ready to present; five pairs are picked

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**magnuslodefalk.com/na434a/case.html**

# Appendix

# Research on distress, monitoring and leverage

- Frydman and Hilt (2017, *AER* 107(7)): after a 1914 US law removed underwriters from railroad boards, railroads with strong underwriter ties invested less, lost value, carried less debt and paid more for outside funds: monitoring matters
- Korteweg (2010, *JF* 65(6)): in US data 1994 to 2004 the median firm gains up to 5.5 per cent of firm value from leverage; firms are slightly underlevered on average, mainly because of firms with no debt