Video Lecture

Limits to the use of Debt

Advanced Financial Management

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Overview

Additional Imperfections:

- Direct bankruptcy costs
- Conflicts of Interest

Direct Bankruptcy Costs

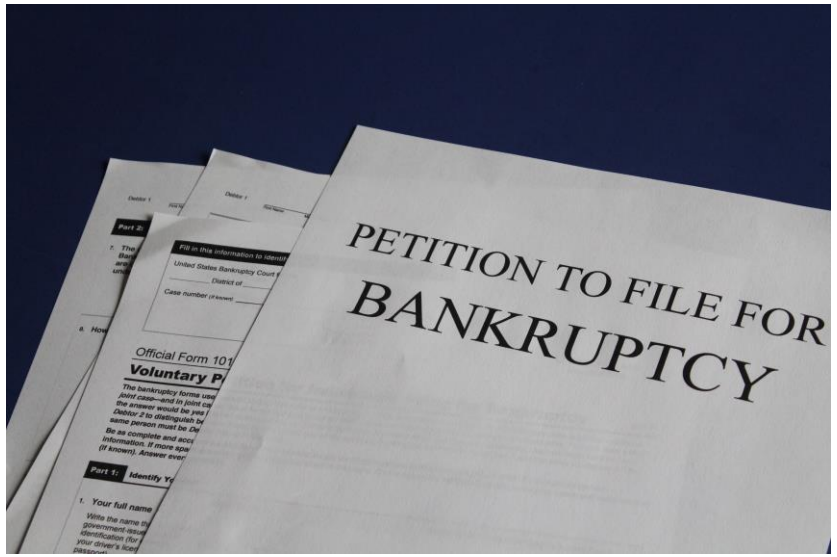
What is the optimal amount of Debt?

- From MM Proposition I, the conclusion seems to be that the optimum value for D/(D+E) is 100%.
- In practice, we observe a decline in the value of firms who allow their debt ratio to grow above a certain number.
- Therefore there are limits to the value created by debt. The firm can go bankrupt:
  - Direct bankruptcy costs
  - Indirect bankruptcy costs

Firms with debt can go bankrupt

- A firm is in financial distress when it is experiencing difficulty meeting its debt obligations (i.e. interest and/or principal).
- If the firm fails to make debt payments, it is in default or bankrupt or insolvent.
- Bankruptcy/Insolvency is the legal process by which control of a bankrupt firm's assets is handed over to its creditors.

Firms with debt can go bankrupt



"Debtholders take control of firm's assets" is a too general statement. Need to figure out:

1. What are the assets worth?
2. Who wants to buy the assets?
3. What fraction of the benefits of this sale must go to each debtholder: senior vs junior?

These questions are not easily answered, so one would expect the possibility of a bankruptcy and the resulting costly restructuring of the firm to destroy some value, i.e., it is a cost of debt!

- Thus, it is important to understand the trade-off between the tax benefit of debt and the bankruptcy costs of debt.

MM assumptions

One or more of these assumptions must be false for Capital Structure choice to add value.

1. Investment is held constant
2. No transactions costs
3. Efficient capital markets
4. Managers maximise shareholders' wealth
5. No taxes (or, no differential tax treatment between equity and debt holders)
6. No bankruptcy costs

Bankruptcy costs

Costs of Financial Distress

Costs of Financial Distress (CFD) are costs arising from bankruptcy or distorted business decisions before bankruptcy

- Direct - legal and administrative costs of bankruptcy
- Indirect - losses from customers/suppliers /employees abandoning firm, or poor investment/operating decisions, decisions prior to bankruptcy or while bankruptcy is being resolved

Trade-off Theory

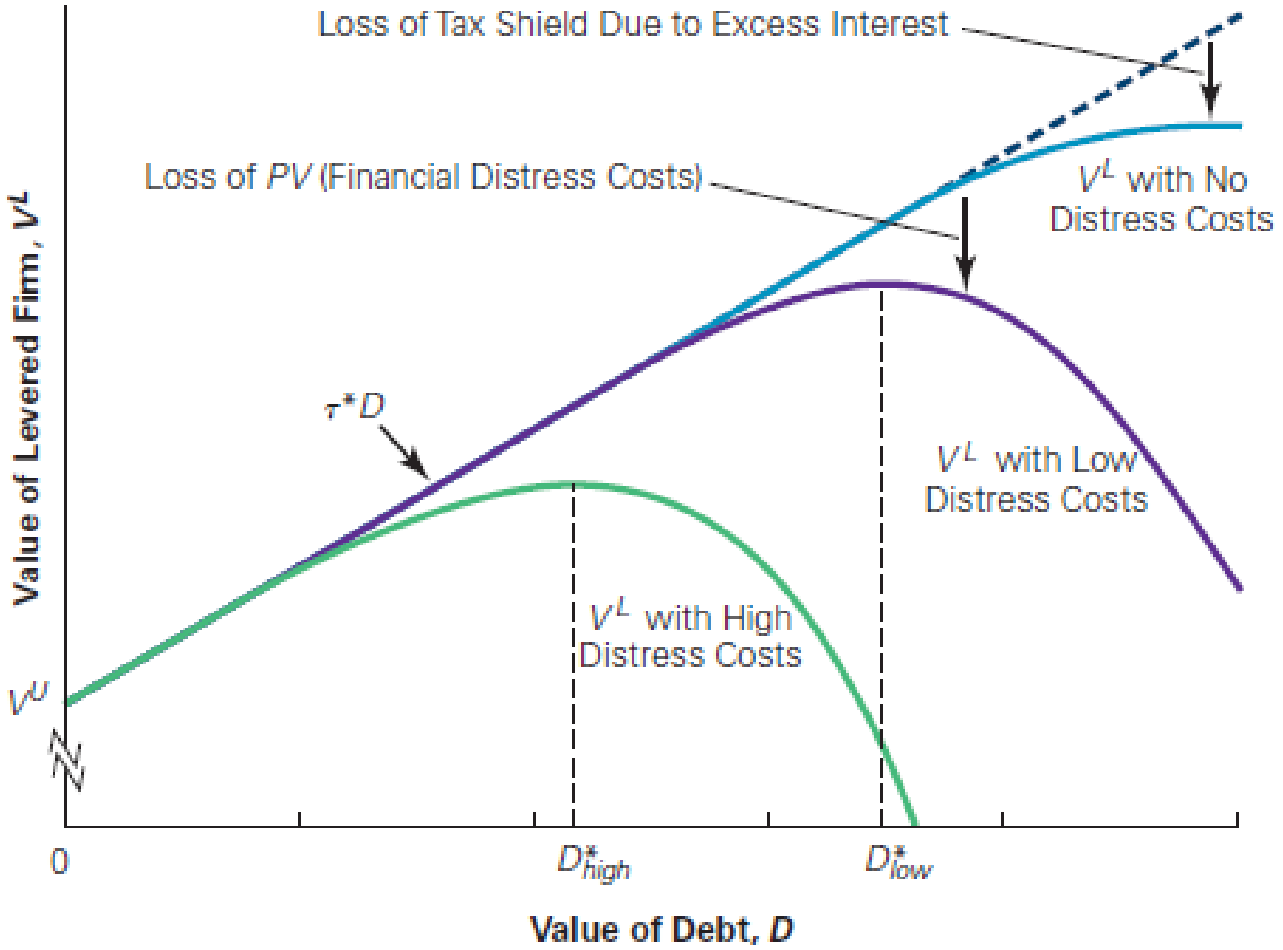
How to account for CFD in valuation?

$$V_L = V_U + PV(ITS) - PV(CFD)$$

Trade-off theory:

Optimal capital structure is based on a trade-off between tax savings and the distress costs of debt

Trade-off Theory



Direct bankruptcy costs

- Direct bankruptcy costs:
  - Litigation and renegotiation costs (court, lawyers)
  - Managers' time and effort
  - E.g., from 2003 to 2005 United Airlines paid $8.6M per month for legal advice on its reorganization after bankruptcy

- Direct bankruptcy costs are small:
  - on average 3 – 4% of firm's total market value.

- Direct bankruptcy costs seem second order compared with the tax shield benefit

Impact of Direct Bankruptcy costs

Example

The firm has only one project that requires an investment of €60 and will generate an uncertain cashflow of €60 or €100 (equally likely) in one year. Assume no taxes.

- Market price of risk = 8.4%
- Risk-free rate = 6.6%
- Beta of the assets = 1

1. What is the required return on assets?

$$r_A = r_f + \beta_A(E(r_M) - r_f)$$

$$r_A = 6.6\% + 1 \times 8.4\% = 15\%$$

2. What is the value of the firm unlevered?

$$NPV = -60 + \frac{0.5 \times 60 + 0.5 \times 100}{1.15} = 9.57 \quad \text{and} \quad V = PV(FCF) = \frac{0.5 \times 60 + 0.5 \times 100}{1.15} = 69.57$$

Default without Bankruptcy costs

Example

The finances the investment with debt: issues debt with a value of €60 today and which has a FV=68. Assume $\beta_D = 0$ and so $r_D = 6.6\%$. There are **no bankruptcy costs.**

- What is the required return on equity?

$E = V_L - D = 9.57 \quad \Rightarrow \quad r_E = r_A + \frac{D}{E}(r_A - r_D) = 0.15 + \frac{60}{9.57}(0.15 - 0.066) = 67.66\%$

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Firm	$\frac{80}{1.15} = 69.57$	60	100	0.5x60 + 0.5x100 = 80
Debt	$\frac{64}{1.066} = 60$	60	68	0.5x60 + 0.5x68 = 64
Equity	$\frac{16}{1.6766} = 9.57$	0	100 – 68 = 32	0.5x0 + 0.5x32 = 16

Default WITH Bankruptcy costs

Example

Now assume that if bankruptcy occurs, the firm must pay 7% to lawyers (**direct bankruptcy costs**).

- This implies that in the bad state the asset cash flow is equal to €55.8 (= 0.93 x 60) instead of €60.

What is the value of the firm? $V_L = \frac{0.5 \times 55.8 + 0.5 \times 100}{1.15} = 67.74$

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Firm	$\frac{77.9}{1.15} = 67.74$	55.8	100	0.5x55.8 + 0.5x100 = 77.9
Debt				
Equity				

Default WITH Bankruptcy costs

Example

Notice that the value of debt still needs to be 60 today. Why? Because this is the value of investment required to do the project.

- This implies that $E(V_1)$ of debt needs to be 64.

What is the FV of debt in this case? $64 = 0.5 \times FV + 0.5 \times 55.8 \Leftrightarrow FV = 72.2$

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Firm	$\frac{77.9}{1.15} = 67.74$	55.8	100	0.5x55.8 + 0.5x100 = 77.9
Debt	60	55.8	72.2	0.5x55.8 + 0.5x72.2 = 64
Equity				

Default WITH Bankruptcy costs

Example

What is the value of equity today?

$E = V_L - D = 7.74$

And this implies $\Rightarrow \quad r_E = r_A + \frac{D}{E}(r_A - r_D) = 0.15 + \frac{60}{7.74}(0.15 - 0.066) = 80.12\%$

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Firm	$\frac{67.74}{1.15} = 67.74$	55.8	100	0.5x55.8 + 0.5x100 = 77.9
Debt	60	55.8	72.2	0.5x55.8 + 0.5x72.2 = 64
Equity	$\frac{13.9}{1.8012} = 7.74$	0	100–72.2 = 27.8	0.5x0 + 0.5x27.8 = 13.9

Impact of Direct Bankruptcy costs – Summary

- Firm value decreased 1.83 (=69.57-67.74)
  - The decline is equal to the PV of bankruptcy costs

$$PV(BC) = \frac{0.5 \times (60 - 55.8)}{1.15} = 1.83$$

- Value of debt remained the same at 60
- Value of equity declined by the same amount as firm value:

9.57 - 7.74 = 1.83

1. Bankruptcy costs are paid by shareholders
   - Debtholders know they will get less if the firm defaults.
   - So they demand more (a larger face value) in the event that the firm does not default (otherwise, no lending).
   - This leaves less money for shareholders ⇒ value of equity decreases

2. Direct Bankruptcy costs are relatively small
   - In the example, the expected bankruptcy costs reduce firm value by only 2.6% (=1.83/69.57). Why is it lower than 7%?
     - Bankruptcy is not certain and occurs in the future

Conflicts of Interest

Indirect bankruptcy costs

Indirect bankruptcy costs can be considerably larger than the direct costs. Indirect costs include:

- Deterioration of business environment in expectation of bankruptcy:
  - Poorer prices for products
  - Poorer prices from suppliers (no trade credit)
  - Problems hiring and retaining employees
- Fire sale of assets
- Poor investment decisions arising from conflicts of interest between stakeholders of the firm (i.e., between debtholders and equityholders)
  - Asset substitution/risk-shifting
  - Debt overhang

Just the threat of bankruptcy can generate these indirect costs

MM assumptions

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Conflicts of interest

Agency costs: costs arising from conflicts of interest between *stakeholders* in a firm.

In firms with leverage, conflicts of interest can emerge between shareholders and debtholders when projects have different consequences for their respective payoffs.

Debtholders

Prefer safer projects:

- They have priority in cash flow.
- They only care about the first X dollars

Equityholders

Prefer risky projects:

- They are a residual claimant with limited liability.
- Potentially unlimited upside

The costs created by this conflict can be especially acute when a firm is already in or facing a high risk of financial distress.

Conflicts of interest

Due to the conflict of interest, there is no incentive to pick the best project.

- The negative effects can be big
- This is a real cost of financial distress

There are two well-known agency problems of debt:

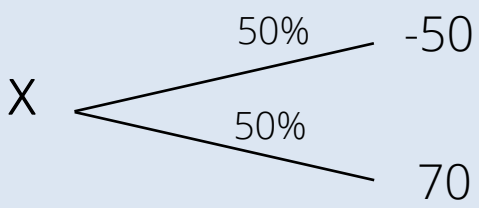
- Risk-shifting/Asset substitution/Overinvestment/: when debt is in place, equity has the incentive to take excessive and inefficient risks
- Debt overhang/Underinvestment: when debt is in place, equity has the incentive to refuse positive NPV projects

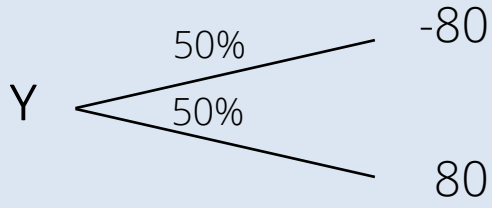
Risk-shifting / Asset substitution

Risk-shifting: shareholders of firms with lots of debt push management to take high risk, negative NPV projects to gamble for their own resurrection.

Example

Firm faces two alternative projects that cost 0 and assume r=0:





$$E(Project_X) = 0.5(-50) + 0.5(70) = 10$$

$$E(Project_Y) = 0.5(-80) + 0.5(80) = 0$$

The firm as a whole will prefer the low risk, high expected value project X!

Will shareholders also always prefer project X? Let's compare two firms with enterprise value of 100 but either low debt (20%) or high debt (50%).

Asset substitution/ risk-shifting

Low debt company A: V = 100, **D = 20**, E = 80

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Project X				
Firm	110	100-50=50	100+70=170	0.5(50)+0.5(170)=110
Debt	20	20	20	20
Equity	**90**	50-20=30	170-20=150	0.5(30)+0.5(150)=**90**
Project Y				
Firm	100	100-80=20	100+80=180	0.5(20)+0.5(180)=100
Debt	20	20	20	20
Equity	**80**	0	160	**80**

Shareholders choose project X

- Low debt firm does not go bankrupt with either project.
- The project that maximizes the firm's value is also the project that maximizes shareholder value. There is **no risk-shifting**.

Asset substitution/ risk-shifting

High debt company B: V = 100, **D = 50**, E = 50

	t = 0	t = 1		
	$E(V_0)$	Bad state	Good State	$E(V_1)$
Project X				
Firm	110	100-50=50	100+70=170	0.5(50)+0.5(170)=110
Debt	50	50	50	50
Equity	**60**	50-50=0	170-50=120	0.5(0)+0.5(120)=**60**
Project Y				
Firm	100	100-80=20	100+80=180	0.5(20)+0.5(180)=100
Debt	35	20	50	35
Equity	**65**	0	130	**65**

The firm is in financial distress

- Shareholders of the high debt firm prefer the lower NPV, high risk project because they have limited downside risk.
- Capital structure may create the wrong incentives for equity, leading debtholders to demand protection in the form of covenants and higher interest rates.

Shareholders choose project Y

Asset substitution/ risk-shifting

The conclusion holds for value destroying projects.

- Consider a firm that has Assets in cash worth \$200 and Debt worth \$200 (the actual Face Value is \$300). Equity is currently worth 0 (Assume r=0.)
- Shareholders are offered a gamble at a price of \$200: with 10% they win \$1,000 and with 90% win nothing. Will shareholders take the bet?

$$NPV = -200 + [1000 \times 0.1 + 0 \times 0.9] = -100 < 0$$

	t = 0	t = 1		
	$E(V_0)$	Good State	Bad State	$E(V_1)$
Firm	100	1000	0	0.1(1000)+0.9(0) = 100
Equity	70	1000 – 300 = 700	0	70
Debt	30	300	0	30

Shareholders take the gamble:

- It destroys 100 in firm value
- But it gives them the possibility of getting 700 with some probability

Debt overhang/underinvestment

Debt overhang: shareholders of firms with lots of debt push management to pass up positive NPV projects, as the projects only benefit debtholders

Example

Take the firm from the previous example. Consider a government-sponsored project that guarantees $350 in one period.

- Cost of investment is $300 (the firm only has $200 in cash now) so the stockholders will have to supply an additional $100 to finance the project.
- The appropriate discount rate for the project is 10%.

$$NPV = -300 + \frac{350}{1.1} = 18.18 > 0$$

This investment will increase the value of the firm, but will shareholders want to undertake it?

Debt overhang/underinvestment

The payoffs for Equity and Debt are shown below:

	t = 0	t = 1	
	$E(V_0)$	Good state	$E(V_1)$
Firm	318.18	350	350
Equity	45.45	50	50
Debt	272.73	300	300

This is >0 **but** shareholders have to invest $100 of their own money.

Since the shareholders have to invest 100 their NPV of this project is:

$$NPV = -100 + \frac{50}{1.1} = -54.55 < 0$$

- Thus, stockholders will decide not to take the project even though it has a positive net present value to the firm as a whole!

Key takeaways

01 **Understand what is the Trade-off Theory and be able to distinguish between direct bankruptcy costs and indirect bankruptcy costs.**

02 **Understand how to incorporate direct and indirect bankruptcy costs in the firm's valuation.**

03 **Recognize the different types of conflicts of interest: risk-shifting and debt overhang.**