Limits to the use of Debt

Advanced Financial Management

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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.**

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

Asset substitution/ risk-shifting

Consider a value destroying project:

- 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

Take the firm from the previous example. Consider a government-sponsored project that guarantees \$350 in one period if firm invests \$300 today. Also assume r=10%. 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!

CFD summary

- What are the costs of financial distress (CFD)?
  - Direct costs (lawyer's fees, court fees) are small
  - Indirect costs can be large and can arise before bankruptcy

- Indirect costs also vary across firms/industries and the type of company's assets:
  - e.g. Much lower if they are, for instance, real estate or tangible assets. Higher if assets are intangible.
  - Industries in which firms can more easily increase risk (e.g. growth firms) may face higher indirect costs from risk-shifting behaviour

Exercise 1

Gladstone Corporation is about to launch a new product. Depending on the success of the new product, Gladstone may have one of four values next year: $150 million, $135 million, $90 million, or $80 million. These outcomes are all equally likely. Suppose the opportunity cost of capital for assets, debt and equity is 5% and that there are no bankruptcy costs. (Ignore all other market imperfections, such as taxes.)

a.   What is the initial value of Gladstone's equity without leverage?

Now suppose Gladstone has zero-coupon debt with a $100 million face value due next year.

b.   What is the initial value of Gladstone's debt?

c.   What is the value of Gladstone's levered equity? What is Gladstone's total value with leverage?

d.   What happens to the value of debt, equity and the value of the levered firm if 25% of the value of Gladstone's assets will be lost to bankruptcy costs.

Exercise 2

Consider the case of Henrietta Ketchup, a budding entrepreneur with two possible investment projects that offer the following payoffs (assuming zero discount rate):

- Project 1: Investment now: 12. Payoff one year from now: 15 with probability 1.
- Project 2: Investment now: 12. Payoff one year from now: 24 with probability 0.4 and 0 with probability 0.6.

a. Calculate the expected payoffs to the bank and Ms. Ketchup if the bank lends the present value of $10. Which project would Ms. Ketchup undertake? What agency problem leads to the decision?

b. What is the maximum amount the bank could lend that would induce Ms. Ketchup to take project 1?

Exercise 3

Firm U wants to start a project with cash flows, after one year, equal to 400, 105, 20 with equal probability, and an initial investment of 100. The outcome of the project does not depend on the state of the economy and the risk-free rate is 5%. The firm will suffer a financial distress cost of 20 if it cannot honor completely the payment to the lender. Firm U asks for a loan to pay the initial investment.

a) What is the probability that the firm enters into default (Hint: think that debt must have a PV equal to 100)

b) What is the interest rate of the loan

c) What is the value of Firm U if this is the only project of the Firm and faces a corporate tax of 30%

d) What is the proportion of the initial investment financed through debt that maximizes firm value.