FIN 325 Corporate Finance

L8 (Theory): Bankruptcy Costs and Tradeoff Theory

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Motivation

- Recall the Modigliani & Miller theorem said that capital structure was **irrelevant** under certain conditions.

- **Last time** we relaxed the assumption of no taxes.
  - Debt then comes at an advantage to equity due to tax shields.
  - But then firms will opt to **borrow as much as possible**.
  - We don't see firms with 99% debt in reality. What's the issue?

- Today we'll add in **costly bankruptcy**, which will lead to a **tradeoff**.
  - Increase in leverage will bring about tax shields.
  - More leverage means higher chance of bankruptcy.
  - Higher expected cost of financial distress.
  - No longer an incentive to max-out on borrowing.

Economic vs financial distress

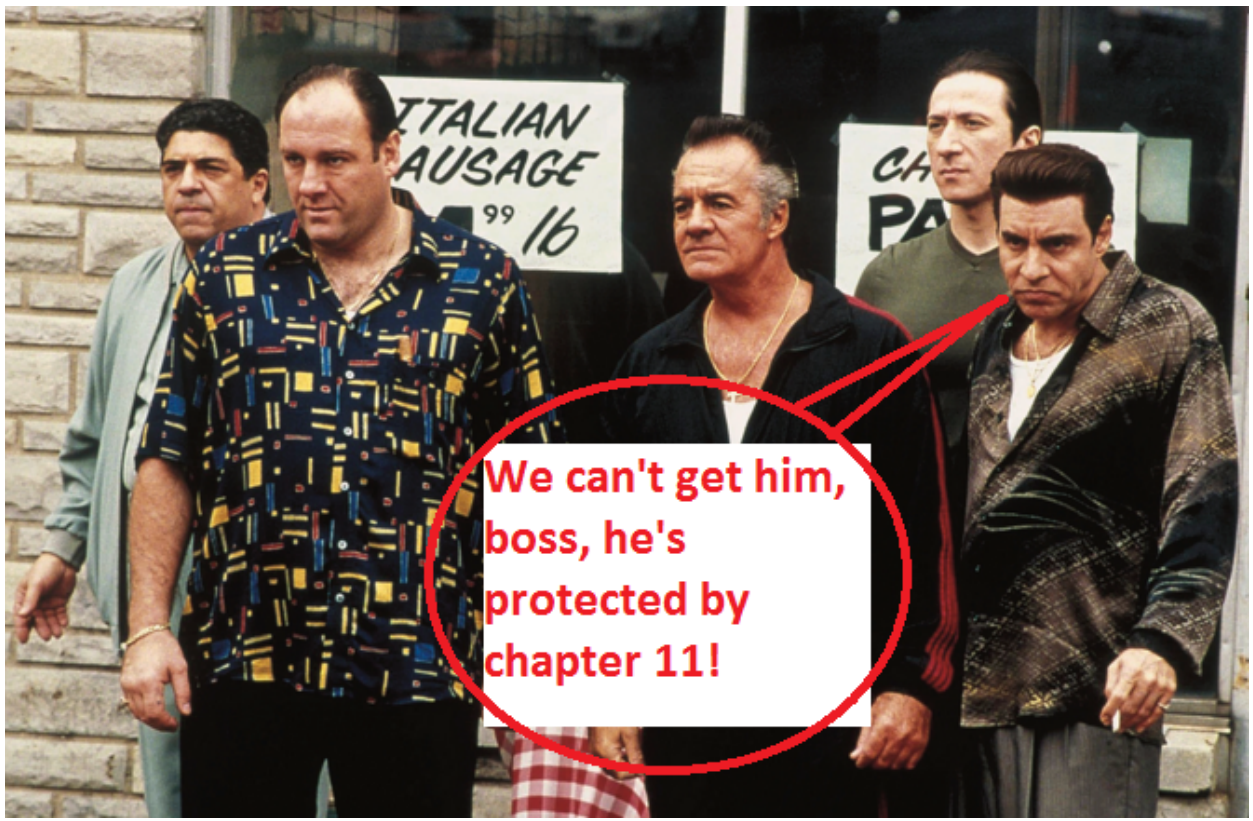
- There are two types of distress that a firm can face.
- **Economic distress**: when the operations of a distressed firm are performing poorly.
  - Loss of customers.
  - Low profits.
  - Low sales.
- **Financial distress**: when we're unable to meet our debt obligations. Additional costs can come with this type of distress.
  - Creditors demand concessions.
  - Lack of access to credit markets.
  - Lack of access to trade credit.
  - Costs of financial distress (CFD).

U.S. corporate bankruptcy code (1)

- Two types of bankruptcy from the perspective of the law.
- The **legal terms** for the two types are chapter 7 and chapter 11 bankruptcy.
- **Chapter 7: liquidation**
  - Trustee appointed sells the assets of the firm.
  - Cash flows are paid out to stakeholders in a particular order.
  - Secured claims (debt backed by an asset), wages, taxes, general unsecured claims (in order of seniority), equity.
  - Note that each of stakeholder needs to be paid out **in full** before moving down to the next in line.
  - Very rare that the equityholders will get anything, (otherwise the firm wouldn't have defaulted in the first place).

U.S. corporate bankruptcy code (2)

- **Chapter 11: reorganisation**
  - Debtor presents the reorganisation plan in debtor court.
  - If the plan is accepted, then the debtor retains assets and operations continue.
  - Debtor is **protected** from the creditors.



Direct and indirect CFD

- In the case of default, the firm can incur both direct and indirect CFD.
- **Direct costs**: incurred due to **default eventuating**.
  - Legal and administrative costs.
  - Cost of fire sales (low asset price due to speedy sales).
  - Loss of human capital or branding.
- **Indirect costs**: incurred due to **potential future** distress.
  - Loss of customers due to concerns about default.
  - Loss of suppliers due to fear they won't be paid.
  - Loss of employees.
  - Loss of receivables.
  - Inefficient liquidation.
  - Costs to creditors.

Largest public company bankruptcy filings (1980 - present)

Company	Date	Description	Assets*
Lehman Brothers Holdings Inc.	09/15/2008	Investment Bank	$691,063
Washington Mutual, Inc.	09/26/2008	Savings & Loan Holding Co.	327,913
WorldCom, Inc.	07/21/2002	Telecommunications	103,914
General Motors Corporation	06/01/2009	Manufactures & Sells Cars	91,047
CIT Group Inc.	11/01/2009	Bank Holding Company	80,449
Enron Corp.	12/02/2001	Energy Trading / Gas	65,503
Conseco, Inc.	12/17/2002	Financial Services Holding Co.	61,392
Energy Future Holdings Corp.	04/29/2014	Electric Utility Company	40,970
MF Global Holdings Ltd.	10/31/2011	Commodities & Derivatives Broker	40,542
Chrysler LLC	04/30/2009	Manufactures & Sells Cars	39,300
Thornburg Mortgage, Inc.	05/01/2009	Residential Mortgage Lending Company	36,521
Pacific Gas and Electric Company	04/06/2001	Electricity & Natural Gas	36,152
Texaco, Inc.	04/12/1987	Petroleum & Petrochemicals	34,940
Financial Corp. of America	09/09/1988	Financial Services and Savings and Loans	33,864
Refco Inc.	10/17/2005	Brokerage Services	33,333
IndyMac Bancorp, Inc.	07/31/2008	Bank Holding Company	32,734
Global Crossing, Ltd.	01/28/2002	Global Telecommunications Carrier	30,185
Bank of New England Corp.	01/07/1991	Interstate Bank Holding Company	29,773
General Growth Properties, Inc.	04/16/2009	Real Estate Investment Company	29,557
Lyondell Chemical Company	01/06/2009	Global Manufacturer of Chemicals	27,392

Figure 1: Assets are in millions of USD

How large are **direct** costs of distress?

- Warner (1977) study of railroads.
  - Direct costs average 5.3% of market value.
  - Smaller for big railroads.
  - Less than 1% compared to the value 7 years prior to bankruptcy.
- Weiss (1990) studied NYSE firms for 1979 – 1986.
  - Direct costs were around 3.1% of assets.
  - Probability of bankruptcy was 0.7% per year.
- Chen (2008), Almeida & Phillipon (2007) found costs as high as 4% of assets.
- These direct costs are quite small relative to the tax benefits of debt.
- Must be the indirect costs that are important.

How large are **indirect** costs of distress?

- Indirect costs are hard to quantify.
- Need to firstly find the economic distress incurred by the **unlevered firm**.
- Then find the incremental losses **beyond** economic distress for the **levered firm**.
- Estimates over the range of 10% – 20%.

Example I (1)

- Empire Promotions faces an uncertain future.
- The firm launches a new product that has a 50% chance of success.
  - Success yields a cash flow of $150m.
  - Failure only yields $80m.
- Assume for now that there is no discounting, upfront cost of investment or taxes.
- Is it better to use debt or equity financing under the MM assumptions?
- How about in the face of a CFD.

Example I (2)

- In the case of **all equity** financing:
  - Success: $E = 150$.
  - Failure: $E = 80$.
- Let's first think about the MM world example, where there is no CFD.
- Say instead that the firm has \$100m worth of **debt due next year**, (when the project cash flow is realised).
  - Success: $E = 50$ and $D = 100$.
  - Failure: $E = 0$ and $D = 80$.
- The failure scenario represents **economic distress** in both scenarios.
- It's also **financial distress** in the case with debt.

Example I (3)

- The value of the firm can be found by taking the **expected** value from the viewpoint of $t = 0$.
- All equity firm
  - $E = 0.5(150) + 0.5(80) = 115$.
  - $A = E$.
- Firm with debt and equity
  - $E = 0.5(50) + 0.5(0) = 25$.
  - $D = 0.5(100) + 0.5(80) = 90$.
  - $A = 25 + 90 = 115$.
- In this case with no CFD, the two capital structures generate the **same value**.

Example I (4)

- Now let's introduce **CDF**.
- Say that in the failure state, bankruptcy necessitates the payment of \$20m in lawyers' fees.
- Again let's compare the two financing structures — all equity and debt with value of \$100m due next year.
- All equity financing
  - $E = 0.5(150) + 0.5(80) = 115$.
  - $A = E$.
- With debt and equity
  - $E = 0.5(50) + 0.5(0) = 25$.
  - $D = 0.5(100) + 0.5(80 - 20) = 80$.
  - $A = 25 + 80 = 105$.
- Now the firm with all equity is worth more!
- The value of the levered firm falls by exactly the present value of the CFD! (0.5*20 = 10).

Who pays the CFD?

- Example I looked at a situation whereby **debt's face value was already fixed**.
    - The \$100m of debt was already on the firm's balance sheet and there was no upfront cost of the investment.
- Let's now assume that the project has an **upfront cost** of investment of \$80m.
- If raising the funds through debt, the creditors will **account for the potential CFD when deciding on the face value**.
- The creditors will only **lend an amount that they will receive in expectation at** $t = 1$.

Example I (5)

- Now let's come back to the example and assume that the project instead costs \$80m at $t = 0$.
  - In this case, we have some old shareholders but the firm has no value unless we undertake the project.
  - Pay the upfront cost and then get the project with success or failure possibilities.
- Again let's compare the two cases both **with** and **without** a CFD of \$20m in the bankruptcy state.
  - We'll compare debt issuance in each case with the all equity firm.
- In the case **without CFD**, the creditors will lend $0.5(100) + 0.5(80) = 90$ of cash for debt with \$100m face value.
  - Assume they pay-out a dividend with the extra \$10m.
- In the case **with CFD** of \$20m in the failure state, the creditors will lend $0.5(100) + 0.5(80 - 20) = 80$ of cash for debt with \$100m face value.
- In the case of all equity financing, they will issue shares to pay for the upfront cost.

Example I (6)

- **All equity financing**.
- Issue \$80m worth of new shares to pay the upfront cost.
- Value of the firm (equity) will be \$115m.
  - Value of new equity is now \$80m.
  - Value of old equity is \$35m.
  - New equityholders must get a share that has the same value as the cash they handed-over to fund the project.

Example I (7)

- **Debt issuance without CFD**.
- The debt will have face value of \$100m; the market value will be \$90m.
- Invest \$80m and pay a dividend of \$10m.
- Payoff to the **existing equityholders** will be \$35m.
  - \$10m of dividend they receive from the cash raised.
  - \$25m of expected value in the firm, (\$50 in success state, \$0 in failure).

Example I (8)

- **Debt issuance with CFD**.
- Now the firm can only raise \$80m of cash for the debt with \$100m face value.
- Value to existing equity is \$25m
  - \$50m in success state and \$0 in failure.
  - No longer receive a dividend!
- Notice that the existing equityholders **are paying** the present value of the CFD ($0.5 \times \$20m = \$10m$) when we compare the case **without CFD** against the case **with CFD**.
  - Equityholders prefer the scenario **without** the CFD as they receive the extra dividend!
- The new debtholders are **indifferent** between the cases with and without CFD.
  - They only hand-over as much cash as they will receive in expected value when the state of the project is revealed.

Ex ante v.s. ex post (1)

- **Ex ante**: based on forecasts rather than actual results (think before).
- **Ex post**: based on actual results rather than forecasts (think after).
- Ex post: bankruptcy is **costly for the new investors/debtholders**.
- Ex ante: the new debtholders **take account** of the fact that bankruptcy will cost them. So they hand-over less cash before the state of the project is realised.

Ex ante v.s. ex post (2)

- In Example I, see that when CFD = \$0, then the capital structure was irrelevant.
    - Old equityholders received \$35 regardless of whether there was debt or equity used for the new project.
- When CFD =\$20m in the failure state, then the cost is borne entirely by the existing shareholders.
    - In that sense, the old equityholders would prefer to issue new equity rather than using debt financing.

Ex ante CFD

- In general, when we have a multiperiod model with discounting, we can represent the present value of CFD using

$$PV(CFD) = \sum_{t=1}^{\infty} \frac{\mathbb{E}[CFD_t]}{(1+r)^t}$$

  where $\mathbb{E}[CFD_t] = \text{Prob(Bankruptcy at t)} \times (CFD_t | \text{bankruptcy at t})$.

- In the case of Example I, we didn't have to worry about discounting as we assumed $r = 0$.

- What discount rate to use in reality?
  - Usually would think that $COV(\text{bankruptcy}, r_m) < 0$.
  - That is — the number of firm bankruptcies should fall when the market is doing well.
  - CAPM means that $r_{CFD} = r_f + \beta_{CFD}(\mathbb{E}_t[r_m] - r_f) < r_f$ where r_{CFD} is what we use to discount CFD.

Tradeoff theory of capital structure

- Combine the debt tax shields benefit and CFD ideas into a theory of capital structure.
- Using the adjusted present value method, the two effects can be summarised by

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

- Higher leverage yields tax shield benefits.
- Higher leverage also increases CFD.
- Two effects are balanced.

Summary

- No CFD in MM model.
  - There is CFD in the real world and firms don't take high enough leverage to ignore it.

  With CFD the existing shareholders bear the ex ante distress cost.

- Only financial distress should affect capital structure decisions, not economic distress.
- There exist direct and indirect CFD.
- Tradeoff theory incorporates tax benefits and CFD of debt financing.