# Lecture 9: Capital Structure

# Outline

0. Motivation

1. Tradeoff Theory
   - Taxes
   - Distress Costs
     - Direct
     - Indirect
   - Optimal Capital Structure

# 0. Motivation

*1. What's the Question?*

*2. Who cares?*

*3. Why don't we already know the answer?*

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*1. What's the Question?*

How do I determine the optimal capital structure for my company? More precisely, how do I decide what ratio of debt-to-equity is best?

Examples:

- If structuring a large merger, how much of the money used to purchase a target should be raised using bonds vs. stocks?

- If starting your own company, how much money should you raise from banks vs. venture capitalists vs. friends/family/yourself?

# 0. Motivation

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*2. Who cares?*

When running a business, it's not just maximizing the productivity of assets that matters; one also needs to make sure that capital can be obtained as "cheaply" as possible in order to sustain the operations of the firm.

- explicit concern for CEO's/CFO's, investors, entrepreneurs, banks
- implicit concern for consultants, production managers

# 0. Motivation

*1. What's the Question?*

*2. Who cares?*

*3. Why don't we already know the answer?*

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*3. Why don't we already know the answer?*

Our first approach to answering this question is to use our INTUITION. Easy to think of qualitative factors: cost of getting money, control over the funds, and repayment obligations, but…

There are pros and cons of relying on intuition, however.

Pros: - can potentially incorporate many factors that are important but hard to quantify; "business savvy" can be sufficient

Cons: - can be difficult to justify to others, especially if they have different viewpoints.

- can be imprecise

- sometimes intuition is unreliable and inconsistent!

# 1. Approach: Tradeoff Theory

Intuitively, and as you probably learned in previous classes, there are a number of factors that affect a firm's choice of leverage.

In practice, two of the most common, easy-to-quantify factors that managers focus on are the tax benefits of debt financing and the costs of financial distress.

These factors are the center pieces of the "tradeoff theory" of capital structure. According to this theory, managers should choose a ratio of debt-to-equity that maximizes equity value (i.e., a leverage ratio that optimally trades off the tax benefits of debt with the costs of financial distress).

In the many cases, the maximization of equity value implies the maximization of firm value, and vice versa.

- There are special cases, however, where there are important differences between the two objectives (we will study these cases later in this lecture).

# Taxes

- Under the typical corporate tax code there is an important difference in the way in which interest and dividends are treated:
  - Historically, interest is regarded as a cost of doing business and as a result is tax deductible.
  - By contrast, dividends are treated as a return to the firm's owners and are therefore not tax deductible.
- This difference creates a bias towards debt finance. Holding before-tax cash flows fixed, debt finance reduces a firm's taxable income, resulting in higher after-tax cash flows.

- Example 3-1: Firms U and L are identical in almost all respects. They both have a corporate tax rate of 30% and an operating income of $100 per year forever with certainty. The only difference is that firm U has no debt while firm L has issued $200 in perpetual debt at the risk-free rate of 10%.

  What are the market values of firm U and L?

- Income statements (numbers per year forever):

| | Firm U | Firm L |
|---|---|---|
| Operating income | | |
| Interest | | |
| Pre-tax income | | |
| Taxes | | |
| Net income (goes to shareholders) | | |
| MV equity | | |
| MV debt | | |
| MV firm | | |

- Firm L's annual tax bill is $6 less than firm U's. These tax savings constitute a "tax shield" like the one we know from depreciation. The present value of the annual tax shields is 6/0.1 = 60, which is the difference in market values between firms U and L. Taking into account the tax benefits of debt (only), We thus have:

Value of levered firm = Value of unlevered firm + PV tax shields

- Example 3-2: Technotronics Inc. has 100 shares outstanding. The firm has no debt, a corporate tax rate of 34%, and its operating income is $758 per year forever with certainty. The risk-free interest rate is 10%.

  What is the firm's market value? Its stock price?

- Suppose Technotronics does a leveraged recapitalization, and issues perpetual debt with an annual coupon payment of $100 and uses the proceeds to buy back equity.

  What is the firm's market value and stock price now?

# Costs of Financial Distress

- If we only consider the tax advantage of debt finance, firms should be levered up to the hilt. However, debt ratios in reality are rather low, between 30% and 40% on average. To explain such low debt ratios there must exist substantial costs of debt finance. The tradeoff theory proposes bankruptcy costs, and more generally, costs of financial distress as the main costs of debt finance.

- Example 3-3: The Boxer Company's cash flows are either $100 or $200 per year forever. Both scenarios are equally likely. All uncertainty is resolved one year from now when the first cash flow is received. The company has no debt and the risk-free interest rate is 10%.

  What is the market value of the Boxer Company?

- Suppose the Boxer Company issues debt with annual coupon of $150 and uses this debt to repurchase equity. What is the value of the firm now? (Assume the tax rate is 0%).

- Suppose if the Boxer Company enters into bankruptcy it must pay a one-time cost of $11 out of its cash flows. Think of this cost as a lawyer's fee or administrative costs to be paid in bankruptcy. The annual coupon payment remains $150.

  Assuming debt holders pay a fair price for the debt, what are the proceeds from the debt issue now? What is the market value of the Boxer Company?

- The present value of expected bankruptcy costs in the example is 0.5 x -11/1.1 = 5, which explains the difference in market values between the levered and unlevered firms. Thus, only considering the distress costs of debt, we have:

Value of levered firm = Value of unlevered firm – PV expected costs of financial distress

- In Example 4-3 the Boxer Company incurs legal fees and administrative costs when it enters into bankruptcy. These are examples of **direct costs of financial distress**.

- Empirical studies suggest that direct costs of financial distress are rather small, between 1% and 5% of firms' value prior to bankruptcy. Given that the likelihood of going bankrupt for a typical large U.S. firm is less than 1%, this implies that **expected** direct costs of financial distress are less than 0.05% of firms' value prior to bankruptcy.

- Hence, direct costs of financial distress alone cannot explain the low debt ratios of 30% to 40% observed in practice.

- While direct costs of financial distress are likely to be small, there are potentially large **indirect costs of financial distress**:
  - Firms may have to sell assets in fire sales.
  - Firms may lose flexibility if they must continually obtain permission from the bankruptcy court for any important decision or if debt holders try to steer the firm towards investing in relatively safe but possibly less profitable projects.
  - Firms may lose customers who think the firm might go out of business ("endgame problem"). Likewise, suppliers may be reluctant to continue supplies and less willing to grant trade credit.

– “Agency conflicts” between debt holders and management (who represents equity holders’ interests) become amplified when firms enter into in financial distress:

  - Management may invest in risky projects even if these have a negative NPV (“overinvestment”).
  - Management may be unable to raise new capital for positive-NPV projects when the firm’s existing debt holders have a senior claim to the proceeds (“underinvestment”).
  - Management may pay out large dividends to shareholders even if it’s costly to do so (“cash outs”).

# Agency Cost: Overinvestment

- Example 3-4: Bumber-Tifflin, a well-known supplier of paper products, is facing financial distress. It currently has a loan outstanding of $1 Million due at the end of the year, however, at that time, the market value of its assets will only be $900,000.

  To salvage the firm, Bumber-Tifflin's managers are considering going into the lemonade business for a year. This venture has no upfront costs, and with 50% probability the market value of Bumber-Tifflin's assets will be $1.3 Million (otherwise the assets will be worth only $300,000).

  Should management pursue the new strategy?

- End of year balance sheet (in market values):

| | Existing Business | New Strategy |
|---|---|---|
| Assets | | |
| Debt | | |
| Equity | | |

- This example shows that shareholders can gain at the expense of debt-holders by engaging in risky strategies when firms are close to financial distress.

- This phenomena is sometimes called the asset-substitution problem.
  - Especially relevant in today's economic environment

# Agency Cost: Underinvestment

- Example 3-5: Suppose that instead of entering the lemonade business, Bumber-Tifflin considers hiring a recent graduate of LSE to steer the company into the origami paper business. For an initial investment of $100,000, the firm will realize a risk-free return of 50% at the end of the year. Assume a risk free rate of 5%.

  Could Bumber-Tifflin raise $100,000 by issuing new equity?

- End of year balance sheet (in market values):

| | Existing Business | New Strategy |
|---|---|---|
| Assets | | |
| Debt | | |
| Equity | | |

- This example shows that when facing financial distress, some firms may choose not to finance positive NPV projects.

- This phenomena is sometimes called the debt overhang problem.
  - Also very relevant in today's economic environment

# Agency Cost: Fire Sales / Cash outs

- Example 3-6: Suppose that instead of entering new lines of business, Bumber-Tifflin considers selling some of its machinery and equipment for $25,000 at the beginning of the year, the proceeds of which will be distributed as dividends to equity holders. The only problem is that upon selling the machinery and equipment, the value of the firm's assets at the end of the year will only be $800,000.

  Does management have any incentive to execute this transaction?

- The previous three examples of agency costs illustrate various incentive problems that can arise when firms face financial distress.

- There are several ways that stakeholders can mitigate these costs:
  - Debt Maturity
  - Debt Covenants

- Indirect costs of financial distress are potentially very important. The only problem is that they are extremely difficult to measure. Direct costs of financial distress, on the other hand, are likely to be negligible. For this reason, costs of financial distress are often left out in valuation exercises.

# Optimal Capital Structure

- According to the tradeoff theory, debt finance has both benefits (tax shields) and costs (expected costs of financial distress). Combining these benefits and costs we have:

Value of levered firm = Value of unlevered firm + PV tax shields – PV expected costs of financial distress

- How precisely does the value of the firm depend on leverage?
  - Starting out from a situation where the firm is unlevered, a small increase in leverage has benefits (tax shields) but virtually no costs as the probability of financial distress remains negligible.
  - As leverage increases beyond the point where financial distress is negligible, the probability of financial distress, and thus the expected costs associated with it, becomes more and more important. At some point, the expected costs of financial distress become some large that the firm value decreases if leverage is increased any further. At this point, the firm has reached its **optimal capital structure**.

# Example: IBM's Stock Repurchase



## MOVING THE MARKET

# *IBM to Spend $15 Billion In Expanded Stock Buyback*

### *Plan Involves New Debt, But Rating Is Seen Safe; Dividend Gets a Big Lift*

By WILLIAM M. BULKELEY

**International Business Machines** Corp. expanded its long-running stock-buyback program, saying it will borrow funds and spend $15 billion to retire shares, potentially reducing shares outstanding by about 10%.

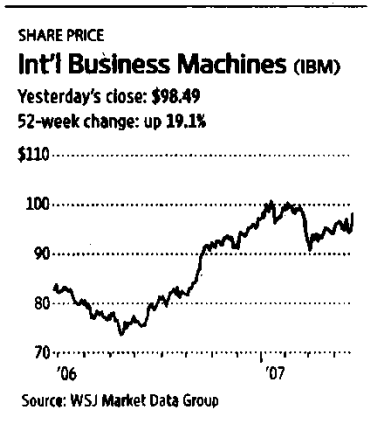
IBM said the action will increase its forecast of growth in earnings per share by between one and three percentage points, resulting in an expected gain of between 12% and 14% for the current year. IBM also boosted its quarterly dividend by 10 cents to 40 cents a share, payable June 9, to holders of shares of record May 10.

IBM shares rose $3.28, or 3.5%, to $98.49 in 4 p.m. composite trading on the New York Stock Exchange.

In an interview, Treasurer Jesse Greene said IBM has been "very underleveraged," considering its size and strong cash flow. He said IBM has about $700 million in "core" debt, excluding borrowing related to its financing business. It had $10.8 billion in cash at the end of the first quarter. He said IBM isn't ready to discuss precisely how much new debt it will take on to fund the buyback. Mr. Greene said IBM's borrowing ability has been enhanced by a reduction in cash-flow volatility from the sale of its personal-computer business in 2005.

Rating agencies Moody's and Standard & Poor's each said that IBM's plan wouldn't cause a downgrade in its debt ratings.

At the annual shareholders meeting, in Knoxville, Tenn., IBM Chairman Samuel J. Palmisano said the decision to shed the PC business has sharply improved IBM's bottom line. He said: "In the seven quarters since ... we acquired 19 software companies, our stock price has gone from 75 [dollars] to where it is today." He also cited gains since the PC-unit sale in gross profit margin, up to 40.2% from 36%, and in IBM's pretax income margin, up to 11.7% from 8.8%.




At the meeting, shareholders approved by 51% a proposal that was opposed by management to require that directors receive a majority of all votes cast, even if votes are withheld from certain directors, which has become an increasingly popular form of shareholder protest. The proposal is nonbinding.

- What does IBM do?
- What enables them to do this?
- What is the effect of their actions?