

Chapter 16

Financing Decisions

Road Map

Part A Introduction to finance.

Part B Valuation of assets, given discount rates.

Part C Determination of discount rates.

Part D Introduction to corporate finance.

- Efficient Market Hypothesis (EMH).
- Capital investment decisions (Capital budgeting).
- Financing decisions.

Main Issues

- Capital Structure without Taxes
- Effect of Taxes
- Costs of Financial Distress
- “Optimal” Capital Structure

1 Introduction

Main Question: How should a firm finance its operations?

- Is a firm's value dependent on its financing?
- If so, how?

Definition: How a firm's operations are financed is referred to as its capital structure.

With only debt and equity financing, a firm's capital structure is given by its debt to equity ratio.

Our Objective: Given a firm's assets and investment strategy, find a capital structure that increases its value.

Balance Sheet (in market value)	
Assets	Debt (D)
Growth opportunities	Equity (E)
Firm Value	Firm Value (V)

Find the debt/equity ratio, D/E , that maximizes V .

Capital Structure: Some Examples

(Source: Grinblatt and Titman)

Company	Debt	Debt
	Debt + Mkt Equity	Total Book Assets
AT&T	20%	29%
Boeing	15%	13%
Boston Edison	49%	42%
John Deer	40%	37%
Delta Air Lines	53%	32%
Disney	9%	20%
GM	61%	37%
HP	13%	17%
McDonald's	15%	31%
3M	6%	12%
Philip Morris	27%	35%
Raytheon	9%	12%
Safeway Stores	55%	53%
Texaco	27%	26%
Wal-Mart	14%	36%

Major factors that might affect target capital structure:

1. Trade-off between risk and return of financing instruments
 - Equity
 - Debt
 - etc.
2. Taxes
3. Costs of financial distress
4. Management incentives
5. Information problems.

For most of this lecture, we consider factor 1-3 and assume:

1. Financial market is perfect.
2. A firm's investment decisions have been made.
 - They are independent of its financing decisions.
3. Investments are financed by debt and equity.
 - No other financial instruments are used.

Main Conclusions (A Preview):

1. In absence of taxes, a firm's value is independent of its capital structure.
 - Financing decisions are irrelevant.
2. In the presence of taxes, when interest-expenses on debt are tax deductible, a firm's value increases with its debt/equity ratio.
 - It is better to have more debt financing.
3. When there are costs of financial distress, there is an optimal Capital Structure.

2 Capital Structure without Taxes

Consider two firms, U and L, with identical assets. Suppose that

- Firm U is financed by 100% equity (unlevered)
- Firm L is financed by 50% equity and 50% debt (levered).

Which firm is more valuable?

Example. Let the future asset payoffs look as follows:

	Firm U	Firm L
Payoff in good state	160	160
Payoff in bad state	50	50

Claim: The value of the two firms must be the same.

- Firm U is financed by equity only, which gets all cash flows.
- Firm L is financed by debt and equity and its cash flows are divided between these two classes of claims.
- The sum of payoffs to Firm L's equity and debt is identical to the payoffs to Firm U's equity.
- Thus the total value of Firm L's debt and equity must equal the value of Firm U's equity.

- For simplicity, let us assume
 - Firm L's debt promises \$60 and has market value of \$50
 - Firm L's equity has market value of \$50
- The value of Firm L is

$$V_L = D_L + E_L = 50 + 50 = 100.$$
- Suppose that the value of Firm U is different from 100, say, 105. Do the following:
 - Sell (short) Firm U at 105
 - Buy Firm L's equity at 50
 - Buy Firm L's bond at 50.

- The resulting cash flows look as follows:

(a) Current cash flow is $105 - 50 - 50 = 5$

(b) Future cash flow is

	Good state	Bad state
Long Firm L's equity	100	0
Long Firm L's bond	60	50
Short Firm U's equity	-160	-50
Net	0	0

- This is an arbitrage. In absence of arbitrage, we must have

$$V_L = V_U = 100.$$

- Thus, a firm's value is independent of its capital structure.

Observation: In absence of taxes

- Investment decisions fully determine a firm's cash flows
- Financing decisions do not alter a firm's cash flows
- Sum of the values of claims on the firm must equal the value of its cash flows
- A firm's value is independent of how its cash flows are "sliced" with different financing methods.

Modigliani-Miller Proposition I without taxes

- The values of two firms in the same risk class must be equal, independent of how they are financed:

$$V_L = V_U.$$

- There is no "optimal" capital structure.
- Financing does not matter.

MM provides a benchmark:

- It tells us what does not matter.
- It may tell us what does matter.

Beta and leverage

For a levered firm, its asset and equity have different risks.

Its asset can be viewed as a portfolio of debt and equity

$$A = D + E.$$

Thus we have

$$\bar{r}_A = \frac{D}{D + E} \bar{r}_D + \frac{E}{D + E} \bar{r}_E.$$

By CAPM:

$$\beta_A = \frac{D}{D + E} \beta_D + \frac{E}{D + E} \beta_E.$$

Example. Consider a company with leverage:

- $D/V = 0.4$, $\beta_D = 0.2$, $\beta_E = 1.2$.
- $r_F = 5\%$, $\bar{r}_M = 8\%$.

Thus,

$$\beta_A = (0.4)(0.2) + (0.6)(1.2) = 0.8 < \beta_E$$

$$\bar{r}_A = 0.05 + (0.8)(0.08) = 11.4\%.$$

\bar{r}_A is a weighted average cost of capital (WACC).

3 Capital Structure and Corporate Taxes

- Managers pay great attention to the tax implications of their financial decisions.
- Financial transactions are taxed (e.g. taxes on capital gains, dividends, etc.)
- Different financial transactions are taxed differently:
 - Interest payments are tax exempt for the firm
 - Dividends are not
 - etc.
- An important way in which financing decisions might matter is through their impact on the firm's tax bill.
- Other things equal, the firm's financing decision might aim at minimizing its tax burden.

With this perspective, we revisit Capital Structure.

3.1 Debt Tax Shield

The MM Proposition changes once taxes are taken into account.

At the corporate level:

- Interest payments are tax deductible
- Dividends and retained earnings are not.

Note:

- Given the firm's existing assets and investment strategies, only *pre-tax* cash flows are fixed.
- When interest payments on debt are tax-deductible, the PV of the government's claim on pre-tax income can be reduced by issuing debt.

Claim: Issuing debt saves taxes and increases a firm's value.

Example. Consider a firm that pays an expected annual income of \$1 forever. The annual income for stakeholders in the case of 100% debt-financing and 100% equity-financing are as follows:

	100% Debt	100% Equity
	Interest Income	Equity Income
Income before tax	\$1.00	\$1.00
Corporate tax at $\tau_c = 0.35$	0	-0.35
Income after corporate tax	1.00	0.65

More generally, consider the following:

- Two firms, U and L, with identical, pre-tax, perpetual, expected annual cash flow of \bar{X} .
- Firm U is 100% equity financed and has a required rate of return denoted by r_A .
- Firm L maintains a debt level D and pays perpetual expected interest rate r_D on the debt.
- The corporate tax is τ_c .
- Ignore personal taxes (for now).

The expected after-tax cash flows of the two firms are

- Firm U:

$$CF_U = (1 - \tau_c)\bar{X}$$

- Firm L:

$$\begin{aligned} CF_L &= (1 - \tau_c)(\bar{X} - r_D D) + r_D D \\ &= (1 - \tau_c)\bar{X} + \tau_c(r_D D) \end{aligned}$$

The cash flows of Firm U and L differ by the “tax shield” created by the tax-deductibility of interest expenses.

The value of each of these firms is:

$$V_U = \frac{(1 - \tau_c)\bar{X}}{r_A}$$
$$V_L = \frac{(1 - \tau_c)\bar{X}}{r_A} + \frac{\tau_c(r_D D)}{r_D}$$
$$= V_U + \tau_c D$$

Note:

- The risk of the first part of the cash flow of Firm L is identical to that of Firm U, thus the same discount rate, r_A , applies.
- The discount rate for the cash flows to the debt holders is the same as the required rate of return on debt, r_D .

Modigliani-Miller Proposition I with Taxes

- The values of two firms in the same risk class will differ by the present value of their tax shield.

$$V_L = V_U + PV(\text{debt tax-shield}).$$

Intuition: In effect, the government pays a fraction τ_c of the interest expense. Investors cannot get an equivalent tax break on homemade leverage. Hence, they are willing to pay extra for levered firms.

3.2 Implication of MM-I with Corporate Taxes.

- The tax effect is likely to be substantial.

Example. A firm has a constant safe cash flow of 100M. Compare its value with 100% debt to that with no debt.

$$\frac{V(\text{no debt})}{V(\text{100\% debt})} = 1 - \tau_c.$$

The magnitude is 65% for $\tau_c = 35\%$.

- To increase a firm's value, the firm should use as much debt as possible: the optimal capital structure is 100% debt!

It is hard to believe that 100% debt is optimal.

1. Most firms seem to avoid having a large amount of debt.
 - "What are the costs associated with debt?"
 - These costs should be substantial to offset the tax gains.
2. Using $\tau_c D$ as a measure of debt tax-shield can be inaccurate:
 - Non-tax paying firms.
 - Firms close to tax exhaustion
 - Negative or low earnings
 - Non-debt tax-shields (depreciation, R&D expenses ...)
 - Limited Tax Loss Carry Forwards ...
3. Personal taxes.

4 The Impact of Personal Taxes

So far, we considered only the effect of corporate taxes—which favor debt over equity. This suggested that the optimal capital structure should have 100% debt.

We now look at personal taxes: debt and equity face differential taxation at the personal level.

Classical Tax Systems. (e.g. U.S.)

- Interests and dividends are taxed as ordinary income
- Capital gains are taxed at a lower rate
- Capital gains can be deferred (\neq dividends and interests)
- Corporations: 70% dividend exclusion

Imputation Systems. (e.g. most of Europe)

- Tax credits for recipients of dividends (=fraction of corporate tax on dividends) reduce the double taxation of dividends.

For personal taxes, equity has an advantage over debt.

Below, we examine the impact of personal taxation on the tax-based trade-off between debt and equity.

Pre-Clinton

	Debt	Equity Deferred Capital Gains	Equity No Deferral
Corporate Level	100	100	100
Tax rate: 34%	0	34	34
Net	100	66	66
Personal Level			
Tax rate \simeq 31%	$(0.31)(1)$ $= 31\%$	0	$(0.31)(0.66)$ $= 20.46\%$
Bottom Line	69	66	45.54

Post-Clinton

	Debt	Equity Deferred Capital Gains	Equity No Deferral
Corporate Level	100	100	100
Tax rate: 35%	0	35	35
Net	100	65	65
Personal Level			
Tax rate \simeq 40%	$(0.40)(1)$ $= 40\%$	0	$(0.40)(0.65)$ $= 26\%$
Bottom Line	60	65	39

Bottom Line: Taxes favor debt for most firms, but beware of particular cases.

5 Optimal Capital Structure

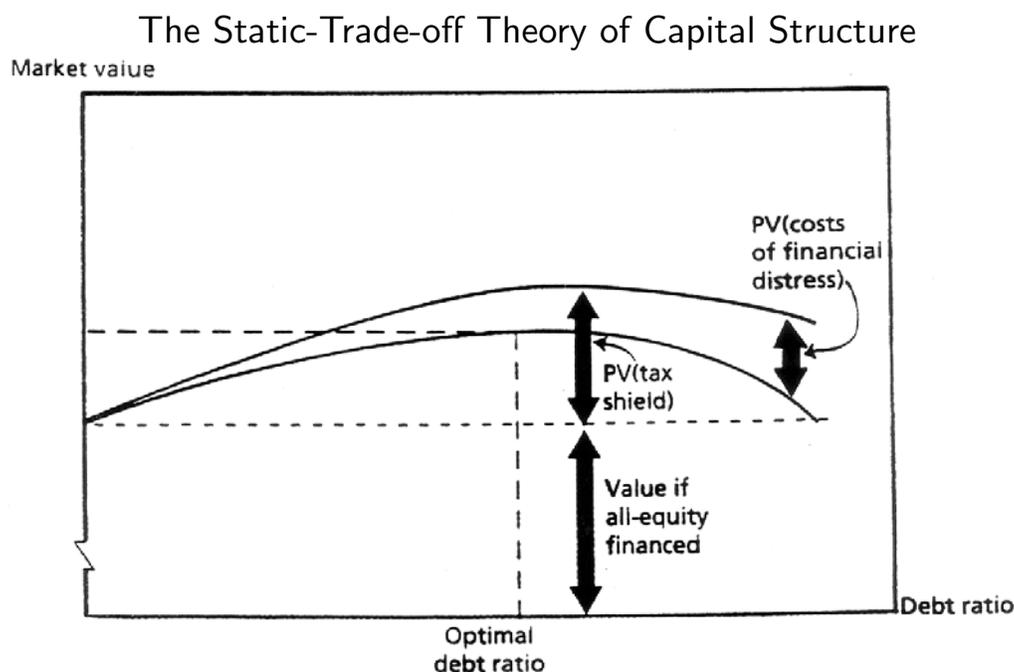
The tax benefit makes debt financing attractive. However, high debt level increases the chance of financial distress.

5.1 Costs of Financial Distress

- In a perfect world, financial distress is costless:
 - no frictions
 - no asymmetric information among different parties
 - no incentive problems
 - perfect contracts
- In an imperfect world, financial distress is costly:
 - (a) Direct Costs of Financial Distress:
 - Administrative expenses
 - Disruption of operations
 - Loss of customer confidence . . .
 - (b) Indirect Costs of Financial Distress:
 - Conflicts between different stakeholders
 - Negative perception by financial markets
 - Weakened position against competitors
 - Costs incurred to mitigate the above . . .

5.2 Static Trade-off Theory

1. There are tax advantages to debt
 - Firms paying taxes at full marginal rate should use debt
 - Firms facing low marginal tax rates, or unable to use interest shields should borrow less, or become net lenders.
2. There are costs of financial distress to debt
 - Probability of financial distress depends on asset risk
 - It is not just the probability of financial distress but the cost if distress occurs.
3. The optimal capital structure equates the marginal cost of debt-financing and the marginal tax-benefit of debt-financing.



Practical implications of the static-trade-off theory

1. Firms with low distress costs should load up on debt to get the tax shield (these are firms with mostly tangible assets; Example: airlines, real estate holding companies).
2. Firms with high distress costs (firms with mostly intangible assets) should follow more conservative debt financing policies; Example: high-tech companies).
3. Firms with a high probability of financial distress should go for capital structures that minimize the costs of financial distress:
 - Avoid too much debt
 - If need debt, go for an easy-to-reorganize debt structure:
 - Banks rather than many bondholders
 - Few rather than many banks
 - Few rather than many classes of debt.

Checklist of factors against debt

- Volatile cash flows (e.g. exposure to macro shocks...)
- Need to raise more external finance in the future
- Financially strong competitors
- Customers and suppliers care about the firm's financial position (e.g. because of implicit warranties).

Problems with the static trade-off theory

1. Ignores potential gains from market imperfections
 - Opportunities to issue securities on favorable terms (e.g., government guarantees)
 - Demand for certain securities that are not available in the market.
2. Ignores information problems
3. Ignores incentive effects of leverage — LBO example
4. Firms do not seem to have well-defined debt ratios.

5.3 Other Theories of Capital Structure

- Pecking Order Theory based on Information Asymmetry
 - Internal Funds
 - Debt
 - Equity.
- Free Cash Flow Theory: Debt is a way to “pump out” cash from cash-rich firms, whose managers may be tempted to retain it for poor investment opportunities.

5.4 Some Facts about Capital Structure

- Firms that produce steady cash flows (e.g. utilities), and have easily redeployable assets that they can use as collateral (e.g. aircrafts or real estate) have high debt ratios.
- Risky firms, with little current cash flows, and firms with intangible assets (e.g. with high R&D and advertising) tend to have low leverage.
- Companies whose value consists largely of intangible growth options (high market-to-book ratios and heavy R&D spending) have lower leverage ratios.
- Most profitable companies tend not to borrow as much: they rely on internally generated funds.

6 Summary

1. In absence of taxes and information/incentive problems, a firm's value is independent of its capital structure and financing decisions are irrelevant.
2. In the presence of corporate taxes, with interest expenses being tax deductible, a firm's value increases with its debt/equity ratio.
3. Personal taxes favors equity over debt.
4. When there are costs to financial distress, there may exist an optimal capital structure with a mixture of debt and equity.
5. Information/incentive problems can be important factors in determining capital structure.

7 Appendix A: Empirical Evidence on Corporate Debt and Equity

Measures of corporate net worth by industry in the US–1985

Source: White (1991)

Industry	Ratio of Net Worth to Total Assets	Ratio of Debt to Equity
All industries	0.32	2.11
Mining	0.45	1.21
Manufacturing	0.45	1.20
Transportation and Public Utilities	0.40	1.50
Agriculture, forestry, fishing	0.32	2.12
Services	0.31	2.25
Wholesale and retail trade	0.29	2.49
Construction	0.28	2.52
Finance, insurance, real estate	0.26	2.90
Commercial banks	0.08	11.00
Savings and Loans	0.04	28.00

Sources of Funds: International Comparison Average Financing of Non-Financial Firms, in % of total sources (1970-1985)

((Source: Mayer (1990))

	Canada	France	Germany	Italy	Japan	UK	US
Retentions	54.2	42.1	55.2	38.5	33.7	72.0	66.9
Capital Transfers	0.0	0.1	6.7	5.7	0.0	2.9	0.0
Short-Term Securities	1.4	2.5	0.0	0.1	N.A.	2.3	1.4
Loans	12.8	27.2	21.1	38.6	40.7	21.4	23.1
Trade Credit	8.6	17.2	2.2	0.0	18.3	2.8	8.4
Bonds	6.1	1.8	0.7	2.4	3.1	0.8	9.7
Shares	11.9	5.6	2.1	10.8	3.5	4.9	0.8

7.1 Debt Financing

Firms issue bonds to raise long-term capital.

Corporate debt:

- corporate bonds (approx. 40%)
- bank loans (approx. 25%)
- commercial paper (approx. 25%)
- others (notes, international bonds, asset-backed securities, ...)

7.2 Equity Financing

- Equity issues are infrequent
- Small Role of Equity Financing
 - Firms finance a large part of their investments with internally generated funds
 - For external funds, debt dominates equity
 - In US, average over 1970-85: equity issues represent only 0.8% of the sources of funds of non-financial corporations
 - In the 80s, firms have actually retired equity \Rightarrow “negative fraction”

	1980	1990
Internally generated funds	64%	81.5%
Debt + trade credit	33%	31.5%
Equity issues	3%	-13%

In most countries, internally generated funds dominate and equity is minimal ($\leq 12\%$ in G7 average over 1970-85).

- Price Reactions to Seasoned-Securities Issues:
 - Non-positive stock price reaction to the announcement of a Seasoned Equity Offering (SEO).
 - The more “equity-like” the security, the more negative the share price reaction:
 - * Debt issue: little or no effect
 - * Convertible Debt: $\simeq -2\%$ ($\simeq 9\%$ of proceeds)
 - * Equity: $\simeq -3\%$ ($\simeq 25\%$ of proceeds)
 - Positive (negative) stock price reaction at announcement of transactions decreasing (increasing) the amount of equity
 - * Positive reaction at announcement of debt for equity exchanges, preferred stock for equity exchanges, cancellations of equity offers.
 - * Negative reaction at announcement of equity for debt exchanges, equity for preferred stock exchanges.

8 Appendix B: Effect of Personal Taxes

At the personal level:

- Tax rate on debt: τ_{pd}
- Tax rate on equity (dividend + capital gains): τ_{pe}

Each period, the cash flow after corporate and personal taxes is

$$\underbrace{(1 - \tau_{pe})(1 - \tau_c)(X - r_D D)}_{\text{to equity holders}} + \underbrace{(1 - \tau_{pd})r_D D}_{\text{to debt holders}}$$

which can be rewritten as

$$\underbrace{(1 - \tau_{pe})(1 - \tau_c)X}_{\text{all equity firm}} + \underbrace{\left[(1 - \tau_{pd}) - (1 - \tau_{pe})(1 - \tau_c) \right] r_D D}_{\text{tax impact of debt}}.$$

We can discount the after tax cashflows at the appropriate rates to find the value of the firm:

- For debt, the discount rate should be $(1 - \tau_{pd})r_D$
- For an all-equity firm, use the corresponding discount rate.

The value of the firm is then:

MM Proposition-I with Corporate and Personal Taxes:

$$V_{\text{withdebt}} = V_{\text{all-equity}} + \left[1 - \frac{(1 - \tau_c)(1 - \tau_{pe})}{(1 - \tau_{pd})} \right] D.$$

Thus, to evaluate the impact of personal taxes, we need to compare taxes on dividends and capital gains. From the expression:

$$V_{\text{withdebt}} = V_{\text{all-equity}} + \left[1 - \frac{(1 - \tau_c)(1 - \tau_{pe})}{(1 - \tau_{pd})} \right] D.$$

we see that this comparison is determined by

$$\frac{(1 - \tau_c)(1 - \tau_{pe})}{1 - \tau_{pd}}.$$

1. If equity pays large dividends and $\tau_{pd} \simeq \tau_{pe}$:

- Then, we can ignore personal taxes:

$$V_{\text{with debt}} = V_{\text{all-equity}} + \tau_c D.$$

- Debt, in this case, has a strong advantage over equity.

2. If equity can avoid large dividends, it does not look as bad

- If, $\tau_{pe} < \tau_{pd}$, the tax shield of debt is smaller than $\tau_c D$

3. In the extreme, if equityholders can avoid capital gains taxation sufficiently (by delaying payment of taxes long enough), equity might even dominate debt

- If $\tau_{pe} = 0$, $\frac{(1 - \tau_c)(1 - \tau_{pe})}{1 - \tau_{pd}} > 1$ because $\tau_c < \tau_{pd}$.
- In this case, debt can have a negative overall tax shield.

9 Homework

Readings:

- BM Chapter 17, 18.