Theory of Corporate Finance
Introduction

Shiming Fu

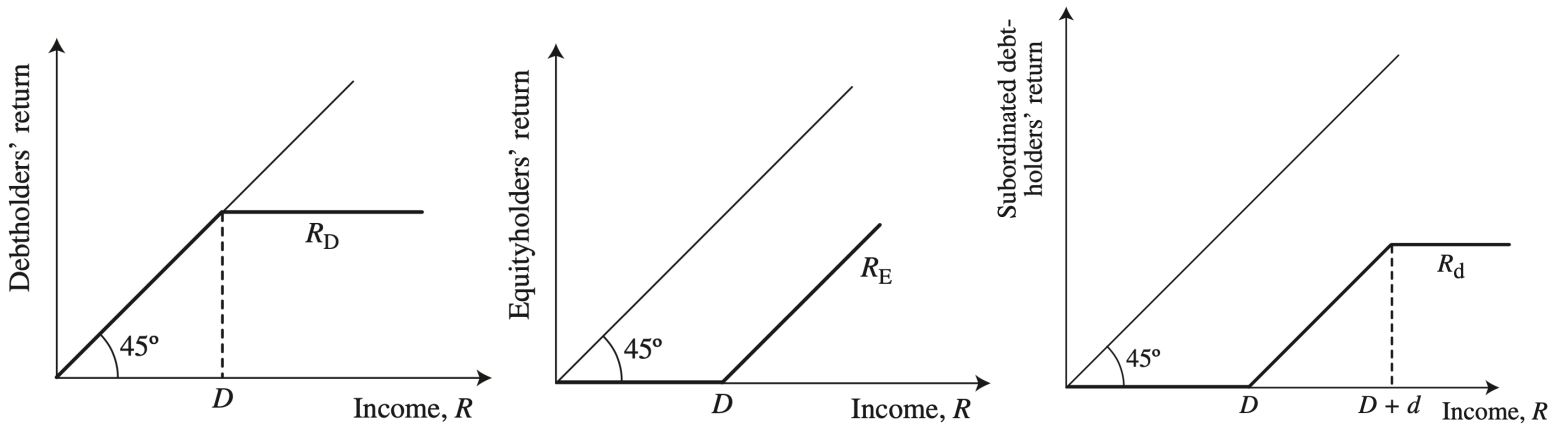
Shanghai University of Finance and Economics

What is Corporate Finance?

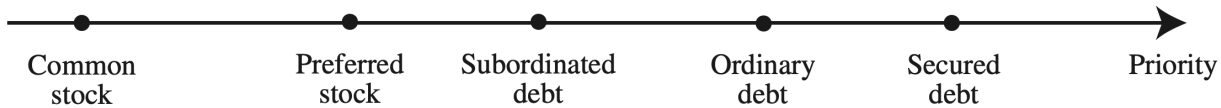
- How do/should firms finance real activities (investment, mergers & acquisitions...)?
- In what way financial policies affect firm valuations and real decisions?
  - capital structure: debt vs. equity, or more than that...;
  - investment (capital budgeting) and payout;
  - corporate governance and market for corporate control;
  - asset pricing implications of corporate decisions.

Financial Securities

- These is a wide range of standard financial claims:
  - cash flow rights, voting rights



  - seniority or priority



- Nonstandard claims: e.g. convertible bond

Corporate Financing Patterns

- Average financing of nonfinancial enterprises, as a percentage of total financing sources, 1970–1985. Source: Mayer (1990).

	Canada	Finland	France	Germany	Italy	Japan	U.K.	U.S.
Retentions	54.2	42.1	44.1	55.2	38.5	33.7	72.0	66.9
Capital transfers	0.0	0.1	1.4	6.7	5.7	0.0	2.9	0.0
Short-term securities	1.4	2.5	0.0	0.0	0.1	n.a.	2.3	1.4
Loans	12.8	27.2	41.5	21.1	38.6	40.7	21.4	23.1
Trade credit	8.6	17.2	4.7	2.2	0.0	18.3	2.8	8.4
Bonds	6.1	1.8	2.3	0.7	2.4	3.1	0.8	9.7
Shares	11.9	5.6	10.6	2.1	10.8	3.5	4.9	0.8
Other	4.1	6.9	0.0	11.9	1.6	0.7	2.2	−6.1
Statistical adjustment	0.8	−3.5	−4.7	0.0	2.3	n.a.	−9.4	−4.1

Debt Instruments

- Debt instruments differ in several dimensions:
  - security, maturity, liquidity, covenants, etc.
  - collateral and covenants are designed to protect creditors.
- Banks and institutions vs. investors in public markets.
  - Institutional investors receive more information and access to management (with screening and monitoring).
  - Bank loans and privately placed debts are more illiquid.
  - While it's common for bank and nonbank private debts to have affirmative and negative covenants, public debts have very few.
  - Public debts are rarely defaulted, but bank loans and privately placed debts do default with nonnegligible probability.
  - Firms raise more money in IPO when they have bank loans.
- High-quality vs. low-quality borrowers
  - High-quality borrowers manage liquidity needs through long-term debt, and public debts.
  - High-quality borrowers suffer little and hardly reduce investments during credit crunch.

Equity Instruments

- Venture capital
  - finance early stage or start-up;
  - monitor, and bring expertise, industry contacts, and reputational capital;
  - receive control rights contingent on financial and nonfinancial performance.
- IPO
  - underpricing: shares are traded on the secondary market shortly after the IPO at a premium of 15-20%;
  - enable new sources of financing;
  - help discipline managers through takeovers.
- SPO
  - average permanent fall in stock price of about 3% in the week of seasoned equity issuance announcement.
  - issurances are more frequent in upswings of business cycles, and negative stock price reaction is smaller.

Dividend Policy Patterns

- Payout policy survey by Allen and Michaely (2003):
  - "during the entire 1972–1998 period, aggregate dividends fell only twice (in 1992 and in 1998), and then only by very small amounts. On the other hand, aggregate earnings fell five times during the same time period and the drop was larger".
  - "Table 3 shows the number of dividend increases and decreases for over 13000 publicly held issues, for the years 1971 to 2001. In each year, the number of dividend cuts is much smaller than the number of dividend increases."
- CFO survety by Brav et al. (2005)..
  - Financial executives target to remain consistent with historical dividend policy and take lagged dividends as a benchmark when choosing the current dividend policy.

MM Theorem

In a perfect capital market, financial policies are irrelevant for firm valuations and real economic activities.

- What defines a *perfect capital market*? MM assumptions:
  - No taxes, no bankruptcy costs, no transaction and securities issuance costs, no information and agency problems.
  - Financial policies do not create real value.
- Obviously, MM cannot hold in the real world. It is a benchmark for economic analysis (similar flavor as the First Welfare Theorem).

Capital Structure Irrelevance

- A firm with assets-in-place that generates a stream of random cash flows $\{x_0, x_1, ...\}$, with mean $\mathbb{E}[x]$.
- Unlevered (all-equity) firm value:

$$V_U = E = \frac{\mathbb{E}[x]}{r_A}$$

  where r_A is an asset-specific discount rate (cost of capital) that reflects the underlying risk of the firm's assets.
- Consider a levered firm with the same assets. Suppose the debt is perpetual with coupon c.
- Debt holders are promised c per period. equity holders are residual claimants and is entitled to $x_t - c$.

Capital Structure Irrelevance

- If cash flow is low, c is not paid, equity holders will need to inject additional capital.
  - Say by issuing new equity. Anyway equity absorbs the loss $x_t - c$.
- Levered firm value $V_L = E_L + D$, where levered equity $E_L = \frac{\mathbb{E}[x]-c}{r_E}$ and $D = \frac{c}{r_D}$ with r_E = cost of equity and r_D = cost of debt.
- MM Proposition 1: Under MM assumptions, firm value is independent of capital structure: $V_U = V_L$.
- Pizza View: debt and equity only determine how cash flows are allocated to investors.

Proof: No-arbitrage Argument

- Suppose not, $V_U > V_L$. What do you do? Buy low and sell high: buy a fraction α of $(E_L + D)$, then short sell a fraction α of V_U
  - Today ($t = 0$), profit is $\alpha(V_U - V_L) > 0$.
  - Every period in the future (all $t \geq 1$). Since you shorted the unlevered firm, need to repay αx_t per period. But as you bought the levered firm's stock and bond, you receive dividend $\alpha(x_t - c)$ and coupon αc.
- The arbitrage strategy is feasible in a perfect capital market. Earn positive profit now and no cash in or out in the future.
- Impossible, so $V_U \leq V_L$. Similarly, $V_U \geq V_L$ gives arbitrage opportunity. Hence $V_U = V_L$.
- Intuition: two firms with identical assets generate the same cash flows in total to investors, their values must be the same.

MM: Summary

- Miller (1988): Showing what *doesn't* matter can show, by implication, what *does*.
  - "While the Modigliani–Miller theorem does not provide a realistic description of how firms finance their operations, it provides a means of finding reasons why financing may matter."
- MM implies: the starting point for corporate finance is certain types of frictions that makes financial policies relevant.
- Tax and trade-off theory.
- Agency based theories.

Trade-off Theory

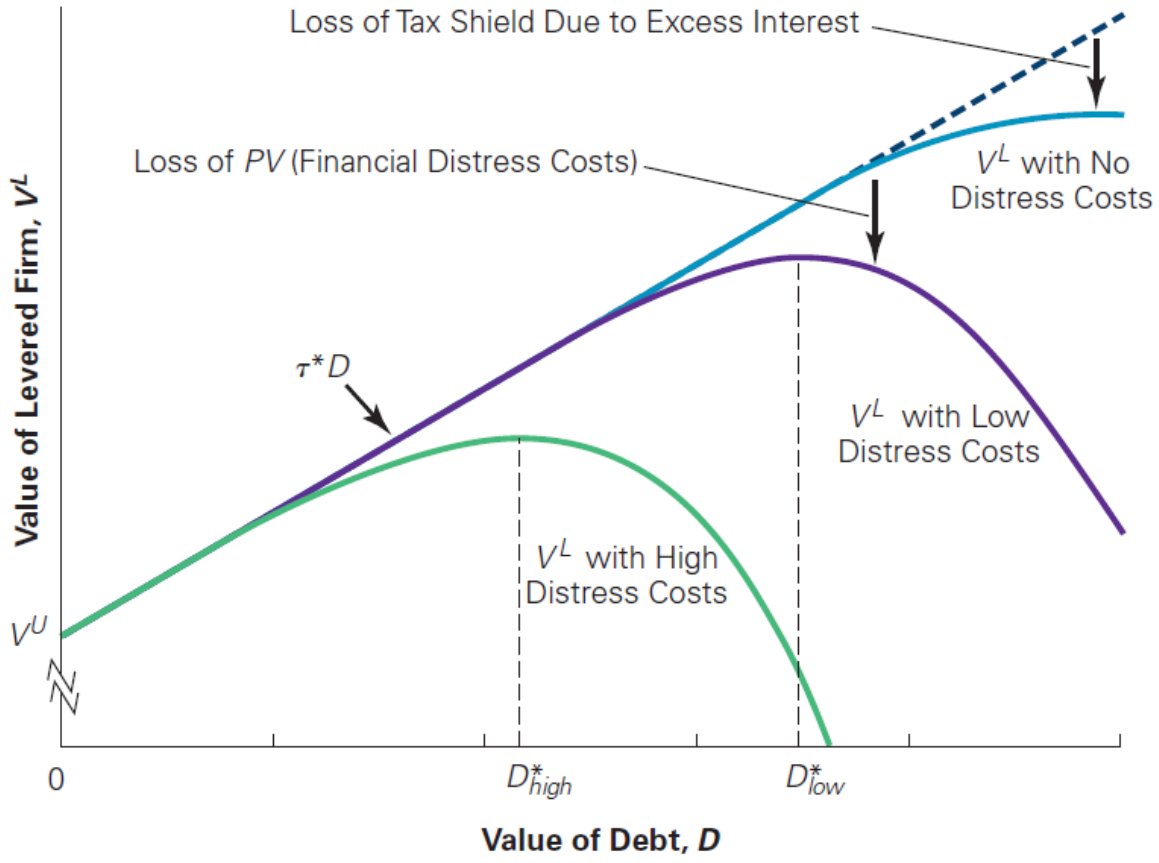
- In US and many other countries, corporate interest payments are tax-deductible: they are deducted before calculating corporate taxable income
  - Corporate tax rate τ_c (In US, $\tau_c = 35\%$).

$$\begin{aligned} \text{EBIT: } x_t &= (1-\tau_c)(x_t - C) + C + \tau_c(x_t - C) \\ &= \underbrace{(1-\tau_c)x_t + \tau_c C}_{\text{dist. to all investors}} + \underbrace{\tau_c(x_t - C)}_{\text{gov't}} \end{aligned}$$

  - With perpetual debt, $PV(\text{Tax Shield}) = \tau_c D$
- But more debt implies higher probabilities of default and bankruptcy or financial distress is costly.
  - Direct cost: legal expenses, accounting fees, costs paid to experts: consultants, appraisers, auctioneers etc; time spent bargaining with creditors...
  - Indirect cost: scare off customers and suppliers (reputation loss), loss of market share and employees, fire sales of assets...

Trade-off Theory: Levered Firm Value

$$V_L = V_U + PV(\text{Tax Shield}) - PV(\text{Bankruptcy Cost})$$



- Trade-off theory: optimal capital structure balances the benefits of tax shield and financial distress cost at the margin

How Important are Tax Benefit and Bankruptcy Cost?

- How big are tax benefits of debt? Seems large with $\tau_C = 35\%$
- Graham (JF2001): "How Big Are the Tax Benefits of Debt?" ... the capitalized debt tax shield accounts for 9.7% of firm value.
- What about bankruptcy cost?
  - Warner (1977), in a sample of 11 railroad companies, the average ex-post direct cost is 5.3% of firm market value.
  - *Expected* direct costs of bankruptcy is about 1% of firm value.
- Miller (1977): "trade-off between tax gains and bankruptcy cost looks suspiciously like the horse-and-rabbit stew"
  - U.S. corporate tax rate was around 48% at 70s.
  - Taxes are large and they are sure, while bankruptcy is rare and, and it has low dead-weight costs
  - If the trade-off theory were true, then firms ought to have much higher debt levels than we observe in reality.

Agency Theory of Capital Structure

Two types of agency problems (conflicts of interests):

- Conflicts between equity and debt holders:
  - Debt overhang: under-investment in positive NPV projects.
  - Asset substitution: over-investment in inefficient risky projects (excessive risk-taking).
- Conflicts between investors and managers:
  - Moral hazard, managerial private information, empire-building etc...
  - We deal with this later.
- This breaks the MM result that cash flows and investment policy are independent of financial policy

Myers (1977): Debt Overhang

Myers (JFE1977): "Determinants of Corporate Borrowing"

- Debt overhang leads to under-investment, that is, the firm may forgo projects with positive NPV.
- Simple model: one period with $t = 0, 1$ and assume interest rate is 0.
- A firm with **assets-in-place** that generates cash flows $\tilde{x} = x_g, x_b$ with euqal probability at $t = 1$. That is, the states can either be good or bad with $x_g > x_b$.
- The firm has an *existing* risky debt with face value $F > x_b$. The debt matures at $t = 1$.
- The market values are
  - Equity $E_0 = \mathbb{E}[\max\{\tilde{x} - F, 0\}] = \frac{1}{2}(x_g - F)$
  - Debt $D_0 = \mathbb{E}[\min\{F, \tilde{x}\}] = \frac{1}{2}F + \frac{1}{2}x_b$
  - Firm value $V_0 = E_0 + D_0 = \frac{1}{2}x_g + \frac{1}{2}x_b = \mathbb{E}[\tilde{x}]$

Myers (1977): Debt Overhang

- A project (growth option) that requires costs I at $t = 0$ with a sure return of R at $t = 1$. Assume $R > I$ so efficient to invest, but $R < \min\{F - x_b, 2I\}$.
- Suppose the firm invests. What happens to the cash flows allocation at $t = 1$?

	Total	Debt	Equity
Good State	$x_g + R$	F	$x_g + R - F$
Bad State	$x_b + R$	$x_b + R$	0

- The market values when equity contributes the investment
  - Debt value increases $D_I = \frac{1}{2}F + \frac{1}{2}(x_b + R) > D_0$
  - Equity value $E_I = \frac{1}{2}(x_g + R - F) - I < E_0$, because $\frac{1}{2}R < I$
- Equity holders pays I (through cash or new equity injection) but only receive half of the return R due to potential default!
- Under-invest in positive NPV projects ...

The Idea behind Debt Overhang

- With existing risky debt, default is a possibility.
- But debt is **senior**, in the default state (bad state), return of the project goes to the debt. Yet equity bear the full investment cost.
- As the debt distorts investment decisions, it reduces the firm value
  - Without debt, project is taken. The firm worth $\mathbb{E}[\tilde{x}] + R - I$.
  - With the risky debt, the firm does not invest and value is $\mathbb{E}[\tilde{x}]$.
- If debt is not risky, say $x_b > F$, equity will be able to capture the full return and invest efficiently.
  - When a firm faces financial distress, it may choose not to finance new, positive NPV projects.
- Testable implication: firms with more growth options (e.g. R&D firms) use less debt.

How to Finance the Project?

- How about raising new debt to finance the project?
- Say new debt has face value F_{new} and *equal seniority (pari-passu)* as the existing debt
- When will this work? If F_{new} is large enough.
  - Equity: gets $x_g + R - F - F_{new}$ in good state; and 0 in bad state.
  - Old debt: gets F in good state; and $(x_b + R) \times \frac{F}{F+F_{new}}$ in bad state.
- What is the F_{new} that makes new debt contributes I at the beginning?
- $$\frac{1}{2}F_{new} + \frac{1}{2}(x_b + R)\frac{F_{new}}{F + F_{new}} \geq I$$
- Let $\underline{F}$ be the threshold of F_{new} that satisfies "=".
- Problem solved if $\underline{F} \leq R$ holds. Why?

Other Ways to Reduce Debt Overhang?

- Renegotiation
  - Easier with a single creditor, say bank.
  - Coordination and free-riding problems appear with many creditors. Under-investment particularly severe with public debt.
- Maturity
  - With long-term debt, equity have more opportunities to profit before the debt matures.
- Debt Covenant
  - Limit the firm's ability to pay large dividends.
  - Limit the amount and senior debts the firm can take on.

Jensen-Meckling (1976): Asset Substitution

Jensen-Meckling (JFE1976): "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure"

- Equity has incentives to increase risk of the firm's operation.
- *Intuition*: equity is a call option with strike price of F. With limited liability, volatility $\uparrow \Rightarrow$ value of call option $\uparrow$, shifting risk to debt holders.
- Suppose a firm has an *existing* debt with face value F
- Two projects, no investment cost
  - Safe project: always yield $x > F$
  - Risky project: either x_g or x_b, equally likely.
- Assume $\frac{1}{2}x_g + \frac{1}{2}x_b = x$. So without debt, the firm is indifferent between the two
- When will the equity holders choose the risky project? Will do if

$$\frac{1}{2}(x_g - F) > x - F \Leftrightarrow F > R_b$$

- Suppose this is the case.

Jensen-Meckling (1976): Asset Substitution

- What about changes in values?
- If the firm invests in the safe project, market values are:
  - Equity $E_S = x - F$; bebt $D_S = F$; and firm value $V_S = x$.
- If the firm chooses the risky project, the values are:
  - Equity $E_R = \frac{1}{2}(x_g - F)$; debt $D_R = \frac{1}{2}F + \frac{1}{2}x_b$; and firm value $V_R = x$.
- Same pie, but equity transfers wealth from debt under risky project.
  - Equity value: $E_R - E_S = \frac{1}{2}(x_g - F) - (x - F) = \frac{1}{2}(F - x_b) > 0$
  - Debt value: $D_R - D_S = \frac{1}{2}F + \frac{1}{2}x_b - F = -\frac{1}{2}(F - x_b) < 0$

Jensen-Meckling (1976): Asset Substitution

- What really happens?
  - After debt issuance, equity holders only have incentives to maximize their value
  - Equity **cannot commit** to take a decision that does not hurt debt
- What will the debt holder do at issurance taken into accout equity hoders' incentive?
- What does this imply for the investment choice? Does it matter here for efficiency?
- Can you construt a case where debt financing hurts efficiency due to asset substitution?
- Biais-Casamatta (1999): Convertible debt can alleviate risk-shifting problem.

Comparing the Two Frictions

- Mayers (1977), Jensen-Meckling (1976) give two different conflicts of interests between equity and debt investors.
- They arise only when debt financing is risky, but hurt investment in different ways:
  - With cash deficit, equity holders need to inject additional capital $\Rightarrow$ under-investment.
  - With excess fund, chance of bankrupcy only hurts debt holders $\Rightarrow$ over-investment.
- While debt overhang more serious in high growth firms, asset substitution more serious in mature firms.
- The inefficiencies are referred to as **agency cost of debt.**

Taking Stock

- MM drives us to think about...
  - What are the relevant market frictions that shape a firm's investment and financial policy?
  - How real and financial decisions redistribute cash flows to different parties?
- The trade-off of debt financing?
  - Funding cost advantage of debt: tax shield.
  - Costs of excessive leverage: default, distress, underinvestment, and risk-shifting.
- A model is a mathematical formalization of a theory: Good models tell you a lot about a particular economic mechanism.