

Lecture 20: Finance Part II

Corporate Finance

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Roadmap

- 1 Introduction
- 2 Benchmark: Modigliani & Miller Theorem
- 3 Debt Tax Shields
- 4 Bankruptcy Costs
- 5 Imperfect Capital Markets
- 6 Agency Costs of Leverage
- 7 Agency Benefits of Leverage
- 8 Information Asymmetry
- 9 Conclusion

Central Question of Corporate Finance

- Say a firm wants to adopt a new project.
- What is the best **financial structure** to choose in order to finance a **new project**?
- External or internal financing?
- If external financing is needed, issue **debt or equity**?
- **Equity**: hand over funds in exchange shares in the company. Receive dividends from cash flows; subject to limited liability.
- **Debt**: hand over funds in exchange for a promise to repay given face value. Can be risky or riskless.

Answer to Central Question

- It depends on **financial frictions**.
- Investopedia: frictions are the “stickiness” involved in making transactions; the total process including time, effort, money, and tax effects of gathering information and making a transaction such as buying a stock or borrowing money.

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MM Theorem (1958)

- “The total value of the securities issued by a firm is independent of the firm’s choice of capital structure. The firm’s value is determined by its real assets and growth opportunities, not by the types of securities it issues”.
- Holds only under certain conditions
 - Perfect and complete capital markets.
 - No taxes.
 - Bankruptcy is not costly.
 - Capital structure doesn’t affect investment decisions and cash flows.
 - Symmetric information between insiders and outsiders.

MM Theorem (1958) Intuition: Short Selling

- Short-selling is used to take advantage of arbitrage opportunities.
- We've already implicitly talked about this when looking at our Euler equations.
- The act of short-selling involves borrowing an asset from another person, (for a fee), selling that asset immediately and then returning that same asset to the lender in the future.
- You'd do this in the hope that the value of the asset will fall in the future to net a profit.
- A speculative transaction.

MM Theorem (1958) Intuition: Short Selling

- Consider a two period model with $t \in \{0, 1\}$.
- Say there are two assets — Assets A and B — that each pay dividends next period equal to d_1 .
- Assume that the price of Asset A is p_0^A and that for Asset B is p_0^B .
- If $p_0^A > p_0^B$, then you would short Asset A and purchase (take a long position), in Asset B.
- You'd net an immediate profit of $p_0^A - p_0^B > 0$.
- You'd get the same dividend from Asset B as you'd need to repay from Asset A.
- Net profit for period $t = 0$ is positive and that for $t = 1$ is zero. \$\$\$ winning.

MM Theorem (1958) Intuition

- If you take two firms with different capital structures but same underlying cash flows, no arbitrage arguments dictate that the firm values must be the same.
- E.g. say there are two firms with the same cash flows. Call them Firm Levered and Firm Unlevered.
- Firm Levered has some debt and Firm Unlevered is 100% equity.
- If there are no frictions and $V_{Unlevered} > V_{Levered}$ then you could short-sell the shares of Firm Unlevered and long a portfolio of Firm Levered's debt and equity to generate an instant profit.
- Can close the short position using the cash flows from the long position given that they are the same.

Departing From the Benchmark

- What happens when we relax the assumptions of the theorem?
- Does one type of financing start to do better than the other?
- Can we make money by issuing debt to finance or new project or using equity? Or vice-versa?
- This is the study of corporate finance.

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Taxes

- What happens if there are corporate taxes present?
- Tax deductions of interest payments can serve to make debt look more attractive!
- The more you borrow, they lower your tax burden on corporate profits will be.
- Assume a corporate tax rate given by τ^C .

Benefit of Debt: Tax Deductibility of Interest

- What if a firm takes-out some debt worth D at an interest rate of r_D in perpetuity?
- You'll receive interest tax reductions of $\tau^C r_D D$ every period.
- What is the present value of these cash flows? How should we discount them?
- Typically assume that investors are **risk neutral** in finance.
- Only need to account for the time value of money.
- Present value of “debt tax shields” given by

$$\begin{aligned} PV(DTS) &= \sum_{t=1}^{\infty} \beta^t \tau^C r_D D \\ &= \frac{\tau^C r_D D}{1 - \beta} \end{aligned}$$

Debt v.s. Equity

- Consider two firms — Firm U and Firm L.
- Firm L has D worth of debt in perpetuity with interest rate of r_D .
- Firm U is 100% equity-financed.
- Assume the two firms receive pre-tax earnings of C every period from $t = 1$ on forever.

Debt v.s. Equity

- Compare the present value of Firm U's cash flows V_U with that of Firm L V_L .
- See that for Firm U

$$\begin{aligned}V_U &= \sum_{t=1}^{\infty} \beta^t (1 - \tau^C) C \\ &= \frac{(1 - \tau^C) C}{1 - \beta}\end{aligned}$$

- Then for Firm L

$$\begin{aligned}V_L &= \sum_{t=1}^{\infty} \beta^t [(1 - \tau^C) C + r_D \tau^C D] \\ &= \frac{(1 - \tau^C) C}{1 - \beta} + \frac{\tau^C r_D D}{1 - \beta} \\ &= V_U + PV(DTS)\end{aligned}$$

Debt v.s. Equity

- We're reducing the Firm L's taxable income by $r_D D$ forever relative to Firm U.
- So when we relax this one friction, **debt is better than equity financing.**
- Borrow as much as you can!

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More Debt, More Problems...

- Borrowing can also create issues with regard to bankruptcy costs.
- If you borrow so much that you can't repay your debts for the period, you go bankrupt.
- Say that in the event of bankruptcy, $\Omega \in [0, 1]$ is a fraction of the firm that will be written-off as a deadweight cost.
- In the event of firm bankruptcy, we'll assume that the creditors (lenders) seize the assets of the firm.
- Also assume just one period loans are made and there is only one potential creditor.

More Debt, More Problems...

- When the creditors lend the money at time t , they know that there is some possibility of default at time $t + 1$.
- Set the interest rate $r_{D,t+1}$ such that

$$D_{t+1} = \beta \mathbb{E}_t [(1 + r_{D,t+1}) D_{t+1} \mathbb{1}_{\text{No default}} + V_{t+1}(1 - \Omega) \mathbb{1}_{\text{Default}}] \quad (1)$$

where V_{t+1} is the value of the firm next period, meaning that $V_{t+1}(1 - \Omega)$ is the value after the deadweight costs are paid.

- The $\mathbb{1}_{\text{Default}}$ is an indicator function that equals one when the firm defaults at $t + 1$ (and vice versa for the other).
- This equation is known as a “breakeven” or zero profit condition for the creditor.

More Debt, More Problems...

- (1) says that the amount of cash the creditor is prepared to lend (left side) equals what they expect to receive back next period (after discounting).
- If the firm defaults, they seize their cash flows (net of the bankruptcy cost).
- If the firm doesn't default, they get their cash back with interest.
- As Ω gets larger, the creditors recover less in the event of default.
- They charge a higher interest rate $r_{D,t+1}$ to **compensate**.

Tradeoff Theory of Corporate Finance

- Recall that without bankruptcy costs, in the presence of interest tax deductions, firms should borrow as much as possible.
- If they borrow too much now though, they reduce the recovery value of the firm by **too much as well**.
- Yields an interior solution for debt.
- Tradeoff: more debt means more tax shields but also more deadweight losses in default.
- Back to Firm L (with debt) and Firm U (with no debt) see that

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

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Imperfect Markets

- Means that there are some barriers that prevent trades from happening.
- Messes with our argument regarding arbitrage for the Theorem to hold.
- May not be able to short-sell to cause the values to be the same regardless of capital structure.

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Conflicts in Decision Making

- Recall that the firm's objective was always to **maximise the value to equity holders**.
- This can lead to conflicts in the interests of shareholders and creditors.

Debt Overhang

- Say that a firm has a crippling-amount of debt it needs to repay.
- They may end up foregoing profitable projects because the equityholders won't receive any of the benefits.
- Any extra profits a firm might generate would go into the pockets of the creditors.
- We've missed-out on a profitable project!

Risk Shifting

- Recall that equityholders have limited liability, (you can't force them to put more money into the firm if they don't want to).
- Again say a firm has a crippling amount of debt to repay.
- It might make sense for the firm to accept really risky projects with high rewards.
- If the project succeeds, equity holders get more cash.
- If the project fails, who cares? The equityholders weren't going to get much anyway because of all the debt to be repaid.
- Hurts the creditors.

Agency Conflicts

- Again come-back to the Firm U (with no debt) and Firm L (with some debt).
- See now that

$$V_L = V_U + PV(DTS) - PV(CFD) - PV(\text{Cost of Agency Conflicts})$$

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More Debt Less Problems....????

- But debt is not always our enemy when it comes to agency issues.
- What if the firm's manager likes wasting money on pet projects, (e.g. building a flying car).
- This might not be a profitable project for the firm.

Free Cash flow Hypothesis (Jensen, 1986)

- Wasteful spending by managers is likely to take place when there is an abundance of cash flow.
- More debt means **more of this excess cash** that needs to be used for debt repayments and interest.
- Means less cash lying around for the manager to waste on that flying car.
- See now that

$$V_L = V_U + PV(DTS) - PV(CFD) - PV(\text{Cost of Agency Conflicts}) + PV(\text{Benefit of Agency Conflicts})$$

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Securities

- If outside investors, (who the firm wants cash from), know less about the firm's activities/profitability than insiders, then this can be a problem.
- The beliefs of the outside investors matter a lot here.
- E.g. if the market believes Company PathETech is worthless, (even if it's not), new equity issuances that take place by PathETech will raise no cash!

Securities

- In highly asymmetric environments with regard to information, it might make more sense to use retained earnings.

Pecking-Order Theory

- Says that firms will first turn to issuing securities that are less sensitive to asymmetric information and then work their way down to more sensitive securities.
- Rough pecking order
 - Retained earnings,
 - Short-term bank debt,
 - Public debt,
 - Equity.

Pecking-Order Theory

- See now that

$$\begin{aligned}V_L = & V_U + PV(DTS) - PV(CFD) - PV(\text{Cost of Agency Conflicts}) \\ & + PV(\text{Benefit of Agency Conflicts}) \\ & + PV(\text{Effects of Information Asymmetry})\end{aligned}$$

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Takeaways

- We started with a benchmark where capital structure didn't matter.
- When you relax all of the theory's assumptions, you introduce financial frictions.
- These frictions work in both directions: some make equity financing better and some make debt better.
- Their overall impact depends on their relative sizes.