Capital Structure Part 2: Capital Structure and Agency Problems

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Readings

- Main Readings
  - Harris and Raviv (1991), "The Theory of Capital Structure," The Journal of Finance, 46, 297-355
    - Survey paper that puts a lot of this together
  - Jensen and Meckling (1976) "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," Journal of Financial Economics, 3, 305-360
  - Jensen (1986) "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," AER, 76, 323-329
  - Stulz (1990), "Managerial Discretion and Optimal Financing Policies," Journal of Financial Economics 26, 3-27.
  - Hart, Moore (1995) "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management," AER, 85, 567-585

Where we are in the story ...

- Trade-off theory says that:
  - APV = V_U + PV[DTS] - PV[CFD]
  - Cost of financial distress includes both direct and indirect costs
- If this is all there is to it, we should now tell our manager: "Maximize APV, or you're fired!"
  - Unfortunately, the story isn't over yet

Agency problems and incentives

- In reality, managers often pursue their own interests rather than those of investors. The question is then, how can the incentives of investors and managers be aligned?
- If all decisions in the firm could be observed and verified, and if investors delegated decisions to managers, the problem would be trivial. The first-best solution would be to write a complete contract:
  - "Invest in all positive NPV projects and return all the earnings you don't need for new investments to the shareholders."
  - But it is never that easy!

The economic theory of incentives

- Principal-Agent Theory (e.g., Holmstrom (1979))
  - Moral hazard: idea that a party protected from risk will act differently than if they didn't have that protection (insurance).
  - Agent takes an action (i.e. effort) that is not freely observable, and some outcome (profit, cash flow, etc.) based on the action can be used in an incentive contract.
- Incomplete Contracts (e.g. Hart and Moore (1995))
  - Contracts are inherently incomplete, some variables are ex-post freely observable but are not verifiable by courts, and thus cannot be used in contracts.
    - A non-verifiable variable – The principal cannot provide documentation before the court that there has been a contract breach.
    - But debt can affect manager's ability to raise capital and thus prevent self-interested mangers from investing in bad projects.
- In either case managers have some *residual control rights*. They will have leeway for opportunistic behavior.

Examples of agency problems

1) Direct stealing or diverting profits
   - "tunneling" - transfer of assets/profits out of cash-rich firms into private companies owned by the same management
     - countries with weak investor protection and incompetent financial authorities (Russia, Czech Republic)
2) Perks: jets, apartments, excessive compensation
   - Examples: Worldcom, Tyco, and RJR Nabisco
3) Empire building
   - Example: conglomerate mergers in the 80's
   - Compensation is also often tied to the size of the firm
4) Providing too little "effort"
   - Slacking off (playing golf, coming in late, etc.)
5) Excessive risk aversion
   - May lose control after poor performance or default, so play it safe
   - CEO vega (sensitivity of wealth to stock volatility)
6) Managerial entrenchment to resist takeovers
   - Evidence from CEO death event studies – stock price rises if CEO is entrenched

Ways to mitigate problem

- Corporate governance mechanisms include:
  - The legal system (fraud penalties, rights to foreclose on collateral, etc.)
  - Monitoring (i.e. by board of directors, banks, or large shareholders)
  - Market for corporate control (takeovers to replace manager)
  - Incentive contracts (pay for performance, including delta and vega)
  - **Capital structure**

Models of Debt

- Most financing is through debt contracts (either bank loans or public debt).
- Why is financing structured through debt contracts?
  - Costs and benefits
  - Enormous literature with explanations of it.
  - Fundamental question in financial economics.
- Much of it is based on agency problems between managers and outside investors.
  - In contrast to models discussed in the previous section, in which the agency problem was with stockholders and bondholders.
- This section will survey principal-agent models.
- There are also models of security design, including:
  - Costly state verification
  - Incomplete contracting.

Model I: Jensen/Meckling (1976)

- Jensen and Meckling (1976) is one of the earliest agency-based papers in corporate finance (and in the economics of the firm). It shows that agency problems are a key ingredient for understanding ownership, capital structure, and the theory of the firm.
- In this paper, the agency problem of outside equity is inefficient "perk" consumption.
  - Compares behavior of manager who owns 100% of firm's equity with manager who sells portion of equity to outsiders
- The benefit of debt is that it reduces the value of equity and allows the manager to own a greater fraction of the firm.
  - Debt helps align the interests of managers and shareholders.
- Here, the cost of debt is asset substitution or risk shifting (but any other CFD works for this argument).
  - i.e., overinvestment in risky projects

Jensen/Meckling (1976)

- Jensen and Meckling identify two separate conflicts:
- (1) Conflicts between shareholders and managers arise because managers hold <100% of the residual claim. Consequently, they do not capture the entire gain from their effort, but they do bear the entire cost of these activities. This leads managers to overindulge in perks, relative to level that maximizes firm value.
- (2) Conflicts between debtholders and equityholders arise because debt gives equityholders an incentive to overinvest in risky projects, i.e. the debt contract provides that if an investment yields large returns, equityholders capture most of the gain. If, however, the investment fails, because of limited liability, debtholders bear the consequences. As a result, equityholders may benefit from "going for broke," i.e., investing in very risky projects, even if they are value-decreasing.
  - "Asset Substitution" or Overinvestment Problem

JM: Risk Shifting Example

- Example: Baxter executives are considering a new strategy that seemed promising but appears risky after closer analysis. The new strategy requires no upfront investment, but it has only a 50% chance of success. If it succeeds it will increase firm value to $1.3 million, but if it fails the value of assets will be $0.3 million. The expected value of Baxter under the new strategy is $0.8 million, versus a certain $0.9 million under the old strategy. Baxter has $1 million of debt outstanding.

Example continued

- Comparing the alternatives

TABLE 16.3 **Outcomes for Baxter's Debt and Equity Under Each Strategy ($ thousand)**

	Old Strategy	New Risky Strategy		
		Success	Failure	Expected
Value of assets	**900**	1300	300	**800**
Debt	**900**	1000	300	**650**
Equity	**0**	300	0	**150**

Summary of Jensen/Meckling (1976)

- The benefit of debt is that for a given level of managerial wealth, more debt allows higher ownership α.
  - Minimizes agency costs of equity
- The cost of debt is asset substitution.
  - Now we have agency costs of debt
- The trade-off between these two effects determines the optimal capital structure.
- Intuition: when a manager has a greater fraction of equity, incentives are more aligned, and the manager internalizes more of the cost of consuming perks.
- In this model, debt is only valuable in that it helps align managers' incentives with those of equity holders.

Model II: The Principal-Agent Problem

- In the P-A problem we speak of "moral hazard" when:
  - The agent makes a decision ("action") that affects both his utility and the principal's utility.
  - The agent's action is unobservable, and the principal only observes the "outcome," which is an imperfect signal of the action.
  - The action that the agent would spontaneously choose is not optimal.
- The problem is to design the best contract to elicit the optimal "effort" from the agent.

A simple principal-agent model of debt

- Simplistic model, based on assuming that the manager is risk neutral and willing to bear all of the firm's risk. The problem is that he can't "afford" to buy the whole firm (investor is also risk neutral).
- There is limited liability (can't demand a payment from the manager for bad future performance), also motivated by "the manager can't afford it."
- Manager's action (or "effort") is unobserved, future cash flow depends on both action and luck, but *the cash flow is fully observed and verifiable*.

A simple principal-agent model of debt

- Manager has a project that requires effort, e
  - At t = 0: Invests I in project
  - At t = 1: Manager chooses high effort (e=1) or low effort (e=0). High effort costs C, low effort is free.
  - At t = 2: Cash flow of X_H or X_L is realized. $X_H > X_L > 0$
  - $Prob(X_H \mid e = 1) = P$; $Prob(X_H \mid e = 0) = p$;
    - $\Delta p = P - p > 0$
    - High effort leads to a greater probability of a better cash flow.
  - Effort is efficient, $\Delta p * (X_H - X_L) \geq C$
- With high effort, the project has positive NPV:
  - $NPV = P X_H + (1 - P) X_L - I - C \geq 0$

The Optimal Contract

- A contract consists of returns (R_H, R_L). The investor receives R_H if $X=X_H$, and R_L if $X=X_L$
  - Remember only the outcome, not the effort is contractible
- The optimal contract maximizes the investor's expected profits. It solves: max $PR_H+(1-P)R_L$
- But, this maximization is subject to constraints:
  - (IR) Individual rationality: $P(X_H-R_H) + (1-P)(X_L-R_L) - C \geq 0$
  - (LL) Manager limited liability: $X_H \geq R_H$ and $X_L \geq R_L$
  - (IC) Manager incentive compatibility: $\Delta p * [(X_H - R_H) - (X_L - R_L)] \geq C$

Features of the optimal contract

- Optimal contract sets $R_L = X_L$ (investor receives all the cash flows in the bad state) and (IC) is binding.
- Intuition: Manager's incentives depend on difference in income from high vs. low outcomes. Minimizing income in the low state ($X_L - R_L$) improves the incentives, which benefits the investor.
- So, we want to give just enough to satisfy (IC), and hence manager incentive compatibility:
  - $\Delta p * (X_H - R_H) = C$ thus $R_H = X_H – [C / \Delta p]$
- Note, debt has $R_L = X_L$ (unlike equity) and debt provides better incentives than equity.
  - Same result as Jensen/Meckling – debt helps to align interests – but different economic model.

Comments on P-A Models

- Effort should be interpreted broadly, i.e., it may be perk consumption, or abstaining from pursuing pet projects.
  - Also, cost of effort can be interpreted as foregone private benefit of low effort.
- The basic intuition in both J-M and the moral hazard models is that debt aligns interests and improves manager's incentives.
  - But, there may be easier ways to do this. Options or pay for performance could provide incentives without bankruptcy risk.
- Rich variety of P-A models in economic theory. Variations in information, agents' types, dynamics, multi-tasking, risk aversion, etc.
  - Books by Tirole (2006), and Bolton/Dewatripont (2005) introduce contract theory and give applications to corporate finance.

Model III: Jensen's (1986) Free Cash Flow Theory

- Free cash flow: cash flow in excess of that required to fund all positive NPV projects.
- Agency problem of overinvestment: managers tend to invest current FCF in unprofitable projects.
  - Growth increases managers' power by increasing the resources under their control.
  - Growth is also associated with increases in compensation.
- This FCF problem is greater in mature companies with high FCF and few investment opportunities.
  - Classical example is oil industry in 80's
- Debt forces managers to pay out future FCF.
  - Bonding mechanism
  - Threat of bankruptcy serves as an effective motivating force to make organization more efficient.
  - Stulz (1990) has a model.

Stulz (1990)

- The paper presents a simple tradeoff associated with debt financing:
- On the positive side, debt payments prevent managers from taking bad projects for their private benefits (e.g., empire building).
- On the negative side, debt payments prevent firms from taking good projects when they come along.
- Optimal capital structure finds optimal balance between these forces.

Model IV: Free *Future* Cash Flow Problem (Hart, Moore (1995))

- Also an agency model of overinvestment.
  - Unlike Stulz, debt doesn't prevent overinvestment by reducing FCFs but instead, senior debt constrains the amount of external funds that can be raised.
- The firm has some assets in place, and it can invest I in the future in a new project that returns r.
- All interest rates are zero, everyone is risk neutral, and *the manager will always invest no matter what incentive contract he or she is given, even if* r < I.
  - Similar to Stulz (1990). Reason for preference not modeled, but...
  - Managers generally prefer larger firms.
    - Pay correlated with firm size.
    - Improve human capital ("resume building") by undertaking "initiatives"
    - More resources under control

Hart and Moore (1995)

- Timing of model:
  - T = 0: Optimal debt structure chosen: d1 and d2 are face values of debt due at time 1 and 2, respectively. Firm has old assets in place.
  - T = 1: Old assets yield y1. Investment in project costs I. Liquidation value of old assets is L (but no renegotiation) .
  - T = 2: Old assets yield y2. Project yields r (if we invested in it).
- If firm defaults on debt at T=1 ($y_1 < d_1$), must liquidate for L.
- (y_1, y_2, L, I, r) are random variables at T = 0, and are realized and common knowledge at T = 1.

- **ASSUMPTION 1**: $y_1 < I$ and $y_2 \geq L$
  - This essentially says that managers can never finance the new investment out of the time 1 earnings (there is no FCF) and it is not efficient to liquidate at time 1.

- The question is, what is the optimal choice of d_1 and d_2?

Investment behavior

- It is only ***efficient*** to invest in project when: r > I

- The investment is undertaken whenever it can be financed, i.e. when $y_1 + y_2 + r - d_1 - d_2 \geq I$ (1)
  - Uncertainty is resolved at time 1 so it is assumed to be ok to use time 2 cash flows for investment purposes.
  - Remember managers always want to invest even if r < I.

- Inefficient investments occur for two reasons:
  - When $y_1 + y_2$ is *large* relative to $d_1 + d_2$, manager will sometimes invest when r < I (FCF problem => overinvestment).
  - When y1 + y2 is *small* relative to d1 + d2, manager will sometimes not invest when r > I because they can't raise I (underinvestment).
  - The trade-off is that debt is good when r < I and y1 + y2 is high, but it is bad when r > I and y1 + y2 is low.

Investment behavior

- The investment is undertaken whenever it can be financed, i.e. when $y_1 + y_2 + r - d_1 - d_2 \geq I$. (1)
- If (1) is not satisfied, manager will maintain the firm as a going concern as long as either:
  - $y_1 \geq d_1$ OR $y_1 + y_2 \geq d_1 + d_2$ (3)
- If (3) but not (1) is satisfied, then R = y1 + y2.
  - Just get returns from old assets since can't invest.
- If neither (3) nor (1) is satisfied, firm is liquidated at date 1 and $R = y_1 + L$.

Optimal capital structure

- Optimal capital structure chooses debt to maximize value of firm: E(r - I | investment) * P(investment), subject to (1).
  - Essentially equation (6) of paper
- **Proposition 1: Given ASSUMPTION 1** ($y_2 \geq L$), the time 0 value of the firm is maximized by holding $d_1 = 0$.
  - Intuition: Since debt is not renegotiable, $d_1 > 0$ can only lead to inefficient liquidation, and liquidation is undesirable since total return R is higher when firm survives than when it is liquidated.
- But what is the optimal amount of long-term debt (d_2)?
  - Benefit of high d2 is that returns from old assets are mortgaged, which stops management from using them in bad projects.
  - Cost is debt overhang – sometimes good projects can't be undertaken because we can't raise the investment.

Optimal capital structure

- **Proposition 2: Cases in which first best is possible**
  - (i) If r is always greater than I, the first-best solution is achieved by setting $d_2 = 0$ (all equity financing)
  - (ii) If r is less than I, the first-best solution sets d_2 very large
  - (iii) When $y_1 + y_2$ equals some constant c, first-best is $d_2 = c$
  - (iv)…can again disentangle returns from existing assets from returns from new investment
- But in general, first best can't be achieved.
- For second best, the FOC is: $E[r- I \mid y_1+y_2+ r – I = d_2] = 0$
  - Set d_2 to level such that marginal investment just breaks even.

Comments on Hart, Moore (1995)

- The benefit of debt is that debt overhang prevents managers from funding bad projects. The cost is that debt overhang prevents managers from funding good projects.
- Paper argues that long-term debt solves agency problems that incentive compensation can't. Companies with high (widely-held) debt will find it hard to raise capital, since new security holders will have low priority relative to existing creditors; the opposite holds for companies with low debt.
- There is an optimal D/E ratio AND mix of senior and junior debt if management undertakes unprofitable as well as profitable investments.

Comments on Free Cash Flow Problem

- Two key assumptions for FCF problem are:
  - Managers invest in unprofitable projects (empire-building or overconfidence) .
  - They use the firm's current free cash flow.
- Hart, Moore (1995) also considers future free cash flow and shows that long-term debt is required to restrict managers from borrowing against the future free cash flows to fund bad investments today.
- Empirically, FCF does seem to play an important role for mergers, LBO activity, and payout policies.