Topic 7 : Convexity, Excessive Risk and Bank Regulation

EE431/438

Peter D. Spencer, Chapter 9
(available at the reserve section of the library, HG173 .S637)

November 2012

Outline

- Introduction
- Agency Cost of Debt Finance : Conflict between a firm's bondholders and stockholders
- Asset Substitutions
- How to solve asset substitution problem?
  - Moral Hazard, Bond Covenants, and the Accounting System
  - Bank Loans
  - Public Debt Instruments
  - Banks

Introduction

- Topic 6 : Theory of Financial Intermediation
  - Bank help resolve asymmetric information problem : confidentiality and bank relationship, economies of scale and diversification
  - Economies of scale: the model shows that monitoring cost is lower for intermediated finance because of economies of scale. The bank is always able to pay its depositors back because of diversification.
- In fact, it is possible for a bank to default.
- Banks are highly financial leverage. They have high debts. Most of their assets are loans which are risky assets. Banks are very risky.
- Followings will be discussed,
  - Debt financing encourages excessive risk-taking.
  - The firm has an incentive to take higher risk after debt incurred.
  - As the debt level increases, the firm has more incentive to take higher risk.
  - If the firm takes higher risk, the shareholders will gain while the bondholders will lose. (conflict of interest)
  - How the bondholders can protect themselves?

The Agency Cost of Debt Finance

- Financial theory of agency analyzes the impact of the conflict between managers and a firm's claimholders, conflict between claimholders on issues related to optimal levels of investment and risk bearking by the firm and capital structure
- Here, the focus is on the conflict between claimholders (bondholders(creditors) and shareholders(owners)) on issues related to risk bearing by the firm
- creditors are bondholders or lenders, shareholders are owners or borrowers
- Assumption
  - The borrower has no equity, needs to borrow principal amount I to finance his investment project
  - Project's yield is Y
  - The borrower are the owner of the project : residual income
  - The lender is the creditor of the project : fix payment (L) with a bankrupcy provision in case of default

- Borrower's payoff
  - If $Y > L$, the borrower will get .....
  - If $Y < L$, the borrower will get .....
  - If $Y = L$, the borrower will get .....
- Then, the borrower's payoff is $\gamma =$.....
- Lender's payoff
  - If $Y > L$, the borrower will get .....
  - If $Y < L$, the borrower will get .....
  - If $Y = L$, the borrower will get .....
- Then, the lender's payoff is $\alpha =$.....

- mean-preserving increase in spread
- Draw a diagram for the return to equity and debt in (Y, L) space.

- Suppose there are two investment projects to choose
  - Project A : “Safe” Project yields L for sure
  - Project B : “Risky” Project returns Y_1 and Y_2 each with equal probability
    - $\bar{Y} = \frac{Y_1 + Y_2}{2} = L$
    - $Y_1 < I < \bar{Y} < Y_2$
    - $\theta = Y_2 - Y_1$: “spread”

- Project A : Expected return on project $_A$ =.....
- Project B : Expected return on project$_B$ =.....
- Compare risk and returns between the two project
- Which one the borrower is prefer?
- Project A : Expected return to equity $_A$ =.....

- Project B : Expected return to equity$_B$ =.....

- θ becomes bigger, the riskiness of project B ..... and project B become ..... attractive from the borrower's point of view.
- The borrower tends to choose the investment project with the ..... risk.

- What's about the lender?
- Project A : Expected return to debt $_A$ =.....
- Project B : Expected return to debt$_B$ =.....
- θ becomes bigger, the riskiness of project B ..... and expected return to the lenders .....
- "conflict of interest" between the lenders and the borrowers.

- Summarize

	Project A	Project B
Return on Project		
Return to Equity		
Return to Debt		

Asset Substitution (or excessive risk-taking)

- The borrower will gain from taking higher risk while the lender will lose.
- The debt transfer value from debtholders to equityholders.
- Mathematically, this is because the expected value of a concave function of a random variable falls as the degree of risk increases.
- Return to debt : concave function
- Return to equity : convex function
- Note that return to equity has the same pattern as payoff of a call option. One important distinction is that the holder of a call option cannot influence the riskiness or variance of the underlying asset. The shareholders/ equity holders are in a position to influence the riskiness of the business.
- The borrower has an incentive to substitute high-risk projects for low-risk ones once a debt incurred.
- This is called “asset substitution”
- Convexity encourage managers/owners to undertake a risky projects which has negative social value.

Moral Hazard, Bond Covenants, and the Accounting System

There are various ways in which the lenders of the firm can protect themselves from moral hazard

- the issuance of convertible bonds (bonds with share purchase option)
- writing covenants that limit the scope for asset substitution
  - limit the issuance of new debt
  - dividend restriction
  - cashflow covenant : maintain minimum ratio of cashflow to debt, for example, EBIT/interest, EBITDA/debt, other debt service ratios
- loan collateral (most often used by banks)
- These covenants would be meaningless if the firm's account can be fudged
- Effective accounting system is necessary for preventing moral hazard problem

Bank Loans

- formal covenants are less common in the case of bank loans
  - Banks are given access to insight information
  - Banks can monitor the company effectively since they are bookkeepers (economies of scope)
- a bank usually ask the borrower for collateral
- a bank can punish its borrowers by not giving more loans
- long term relationship to the bank is important for businesses: esp. the case of high-growth companies with intangible assets

Public Debt Instruments

- Government bonds, sovereign debts are not considered to be risk-free asset in the internation bond market. How can public bondholders protect themselves from moral hazard problem?