Chapter 8: Adverse Selection

Financial Microeconomics

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Asymmetric Information

- A situation in which one party has more information than the other
  - Managers compared to investors regarding future cash flows
- In this chapter
  - Ex-ante asymmetric information and adverse selection
  - A model: market breakdown and cross-subsidisation
  - Applications: Market timing and the pecking order hypothesis

Adverse Selection problem (Akerlof, 1970)

- Large number of firms: value of future cash flows: $V \sim U[0, 100]$
- Investors risk neutral and can't observe value of individual firm $\rightarrow$ maximum willingness to pay: 50 (average value)
- But, at this price, only owners of firms with $V < 50$ willing to sell
- Firms offered on the market no longer a "random selection":
  - Investors revise beliefs about V of firms on the market
  - At $p = 50$, distribution of firms offered is $U[0, 50]$
  - Investors willing to pay at most 25 for firms ("average").
- But, given this price, only owners of firms with $V < 25$ will sell
  - Consumers revise their beliefs again and the process continues
- In equilibrium, only the worst firms will be traded on the market
- Market breakdown! Solutions?

Model

- Same model as in previous chapter (with $A = 0$):
  - Project yields R in case of success 0 in failure
  - Everyone is risk neutral, limited liability, no discount
  - Cost of the project: I
- ... but now borrower can be of two types:
  - Good with prob. of success p or bad with prob. q, $p > q$
  - Assume $pR > I$ (NPV good>0) but either (i) $qR > I$ or (ii) $qR < I$
  - Type is "privately" (to borrower himself) but not publicly known
  - Market puts probabilities: α and $1 - \alpha$ of being of good and bad
  - Denote as m "prior" probability of success: $m = \alpha p + (1 - \alpha) q$
- ...and no effort needed (or costless: $B = 0$, $\overline{A} < 0$). No moral hazard

Full information benchmark

- Good entrepreneur would get financed (Why?) and
  - would keep max payoff R_b^G (in success) s.t. investors break even:

$$p\left(R - R_b^G\right) = I$$

- Bad one gets financed if (i) $qR > I$ but not if (ii) $qR < I$ (Why?) and
  - in (i), she would again keep max share (R_b^B) s.t.:

$$q\left(R - R_b^B\right) = I$$

- Clearly

$$R_b^B < R_b^G$$

Asymmetric information and market break down

- Bad borrowers would want to get qR_b^G instead of qR_b^B
- Suppose not possible to distinguish them ("pooling contract" R_b)
- Investors' expected profits are then

$$[\alpha p + (1-\alpha)q](R - R_b) - I = m(R - R_b) - I$$

- Lending not possible if $mR - I < 0$ (even with max pleadgeable)
  - Note that this can only happen if (ii) $qR < I$
  - It happens iff (ii.a) $\alpha < \alpha^*$ (probability of good is low) where

$$[\alpha^* p + (1-\alpha^*)q] R - I = 0$$

- Market break down!!
  - Underinvestment: good borrowers not financed (despite NPV>0)
  - Good borrower hurt by the potential presence of bad borrowers!

Asymmetric information and cross-subsidisation

- Suppose now that lending is possible, i.e. $mR - I > 0$ (i.e. either (i) $qR > I$ or (ii.b) $qR < I$ and $\alpha > \alpha^*$)
  - Then R_b is s.t. investors break even *on average*

$$m(R - R_b) = I$$

  - Investors make money on the good types and lose on the bad:

$$p(R - R_b) > I \text{ and } q(R - R_b) < I$$

- Cross-subsidisation and potential overinvestment:
  - Good borrowers are again hurt by the presence of bad borrowers:

$$R_b < R_b^G$$

  - If (ii.b) projects with NPV<0 are financed ($qR < I$)!

A measure of adverse selection

- $mR > I$ can be rewritten as

$$\left[1 - (1 - \alpha)\frac{(p - q)}{p}\right] pR > I$$

which can be rewritten as $(1 - \chi)\, pR > I$ where

$$\chi \equiv (1 - \alpha)\frac{(p - q)}{p}.$$

- χ: measure of adverse selection (discount from existence of bad types)

Application 1: (A type of) market timing

- Suppose that we add τ to the probability of success (p and q)
- Financing condition is now

$$[\alpha(p+\tau) + (1-\alpha)(q+\tau)]\, R = (m+\tau)R > I$$

- In booms (τ large):
  - More likely to obtain financing
  - Adverse selection less important w.r.t. intrinsic value ($m/p \uparrow$)
  - Difference between types relatively lower and $\chi \downarrow$

Application 2: the pecking order hypothesis

Myers (1984) and Myers and Majluf (1984)

- How much value of a financing source depends on manager info?
- Financing sources can be ordered according to their *info intensity*
  - (1, lowest): internal finance (cash, retained earnings)
  - (2) debt
  - (3) junior debt, convertibles
  - (4, highest) equity
- Firm should prefer to use sources with less info intensity because of investors concern about the value of the claims bought

Model

- Same model as before but with "salvage value" of assets (R^F)
  - Equity not equivalent to debt (different from previous chapter)
  - Profits in success: $R^S = R + R^F$ and in failure $R^F > 0$
  - R is still the increment
- Assume cross-subsidisation but not market break down:

$$mR^S + (1 - m)R^F > I$$

- Denote **"pooling"** rewards in success or failure as R_b^S and R_b^F

The optimal contract

- Good borrower maximises her payoff $pR_b^S + (1-p)R_b^F$. s.t. (IR):

$$m(R^S - R_b^S) + (1-m)(R^F - R_b^F) > I$$

- Financing condition binding (Why?). Substituting into objective:

$$pR^S + (1-p)R^F - I - (1-\alpha)(p-q)\left[(R^S - R_b^S) - (R^F - R_b^F)\right]$$

- Objective: minimise adverse selection discount (s.t. IR)
  - Discount $\uparrow$ with R_b^F and $\downarrow$ with R_b^S $\rightarrow$ set $R_b^F = 0$ and R_b^S in (IR)

$$R_b^S = R - \frac{I - R^F}{m}$$

  - Payment to investor: $R^F + (I - R^F)/m$ (success) and R^F (failure)

How to achieve the optimal contract?

- Implementation:
  - Issue safe debt with $D \equiv R^F$ (paid in both success and failure)
  - Issue equity which pays the rest: fraction $\beta \equiv \left[(I - R^F)/m\right]/R$

    More equity the more acute the adverse selection (the lower m)

    In expected terms, outside equity pays

$$\beta \left[m \left(R + R^F - D \right) + (1 - m) \left(R^F - D \right) \right] = I - R^F$$

- Intuition:
  - Issue first the claim least exposed to adverse selection (safe-debt)
  - Thus, minimising cross-subsidisation with the bad borrower
  - More sensitivity to the private info, more return will be asked

Conclusion

- Securities are issued under asymmetric information:
  - Investors have less information than borrowers
  - Firms issue equity when undervalued
  - Market anticipates and NPV$>$0 projects might not be funded
- Adverse selection model:
  - If prob that agent is good low: market breaks down
  - If prob is high: cross-subsidisation and overinvestment
- In order to minimise the adverse selection problem:
  - Firms tend to issue shares in good economic times (high stock prices)
  - Firm prefer to use sources with less info intensity