More adverse selection

Lecture 8

November 20, 2015

Adverse selection

- There is a monopoly insurance company.
- Buyers of insurance can be either low, probability α, or high, prob. $1-\alpha$, risk types.
- The former have accident probability π_h and the latter $\pi_l < \pi_h$.
- The loss is of constant size L.
- Assume the insurance company offers two contracts (p_l, q_l) and (p_h, q_h).
- Its objective is

$$max_{p_l,q_l,p_h,q_h} \alpha\left[p_l - \pi_l q_l\right] + (1-\alpha)\left[p_h - \pi_h q_h\right]$$

subject to individual rationality constraints

$$\pi_i u(y - p_i - L + q_i) + (1-\pi_i)u(y - p_i) \geq \pi_i u(y - L) + (1-\pi_i)u(y)$$

and incentive compatibility constraints

$$\pi_i u(y - p_i - L + q_i) + (1-\pi_i)u(y - p_i) \geq$$

$$\pi_i u(y - p_j - L + q_j) + (1-\pi_i)u(y - p_j)$$

Adverse selection

- An agent who pays p for coverage q has utility $v(p,q) = \pi u(y-p-L+q) + (1-\pi)u(y-p)$.
- Marginal rate of substitution between price and coverage is $\frac{\partial v/\partial p}{\partial v/\partial q} = 1 + \frac{(1-\pi)u'(y-L)}{\pi u'(y-L+q)}$ is decreasing in π.
- This is the (Spence-Mirrlees) sorting condition which makes separation possible.

Adverse selection

- Let us think about the problem in (w_1, w_2)-space where the first coordinate is the insuree's wealth in no-accident state and the second his/her wealth when accident happens.

- The endowment is given by (e_1, e_2).

- The insurance company offers contracts $\left(w_1^h, w_2^h\right)$ and $\left(w_1^l, w_2^l\right)$.

- Notice that the insurance premium, or its price, is $p = e_1 - w_1$.

- The compensation in case of accident is given by $w_2 = e_2 - p + q$ from which we get $q - p = e_2 - w_2$.

Adverse selection

- The company's problem is

$$max_{w_1^h, w_2^h, w_1^l, w_2^l} \alpha \left[\pi_l \left(e_2 - w_2^l\right) + (1 - \pi_l) \left(e_1 - w_1^l\right)\right]$$

$$+(1 - \alpha) \left[\pi_h \left(e_2 - w_2^h\right) + (1 - \pi_h) \left(e_1 - w_1^h\right)\right]$$

subject to

$$\pi_l u \left(w_2^l\right) + (1 - \pi_l) u \left(w_1^l\right) \geq \pi_l u (e_2) + (1 - \pi_l) u (e_1)$$

$$\pi_h u \left(w_2^h\right) + (1 - \pi_h) u \left(w_1^h\right) \geq \pi_h u (e_2) + (1 - \pi_h) u (e_1)$$

$$\pi_l u \left(w_2^l\right) + (1 - \pi_l) u \left(w_1^l\right) \geq \pi_l u \left(w_2^h\right) + (1 - \pi_l) u \left(w_1^h\right)$$

$$\pi_h u \left(w_2^h\right) + (1 - \pi_h) u \left(w_1^h\right) \geq \pi_h u \left(w_2^l\right) + (1 - \pi_h) u \left(w_1^l\right)$$

Adverse selection

- These are individual rationality constraints (IR) and incentive compatibility constraints (IC).

- Remember from the last lecture that a low-risk type has a steeper indifference curve.

- Remember also that the slopes of the insurance company's isoprofit lines are given by $-\frac{1-\pi_l}{\pi_l}$ and $-\frac{1-\pi_h}{\pi_h}$ when it sells different contracts to different types of consumers.

Adverse selection

- Assume that the low-risk agents are not insured at all.
- Then high-risk agents get full insurance but are indifferent between getting the insurance and not.
- Then we show that $w_1^l \geq w_1^h$.
- The IC contraint for low-risk types requires that they are better of at (w_1^l, w_2^l) than at (w_1^h, w_2^h), and vice versa for the high-risk type.
- Thus, w_1^h must be to the left from w_1^l at the point (w_1^l, w_2^l) where the indifference curves intersect.

- Then we show that $w_1^l \leq e_1$.

- Assume to the contrary and consider a contract (w_1^l, w_2^l) where $w_1^l > e_1$ and $w_2^l < e_2$.

- Draw the low-risk agent's indifference curve through this point.

- Draw also the high-risk agent's indifference curve through the endowment point.

- Now the high-risk agent's IR constraint and the low-risk agent's IC constraint are satisfied only if the high-risk agent's contract is to the north-west of the intersection point.

Adverse selection

- If the low-risk type has higher utility than at the endowment point the company can reduce the compensation a little bit.

- If the low-risk agent has the same utility then the intersection point is at the endowment, and s/he can be offered more insurance.

- This increases the company's profits.

- Then we show that high-risk agent's IC constraint binds.

- Draw an indifference curve of the low-risk agent through his/her contract, and the indifference curve of the high-risk agent through the same contract.

- If the IC constraint of the high-risk agent does not bind s/he gets something between the indifference curves to the north-west of the intersection point.

- Then the company can increase profits by reducing the compensation of the high-risk agent a little.

Adverse selection

- Then we show that the IR constraint of the low-risk agent binds.

- Assume that the low-risk agent gets a strictly better contract than his/her endowment.

- Draw the indifference curves through this contract, endowment and high-risk agent's indifference curve at his/her contract; it has to go through low-risk agent's contract, too.

- It is immediate that the company can decrease both types of agents compensation, and still make them buy the new contracts.

Adverse selection

- We still have to show that the low-risk agent is not offered a contract that provides more than full insurance.
- Assume to the contrary and choose a contract on the low-risk agent's indifference curve through the endowment such that the contract gives more than full insurance.
- The high-risk agent gets a contract on the indifference curve that goes through the low-risk agent's contract.
- Any movement of the contract towards full insurance increases profit as the isoprofit-line is tangent at full insurance.

Adverse selection

- Finally, we show that the high-risk agent gets full insurance.
- Consider the high-risk agent's indifference curve through the endowment.
- Highest profit on this curve results from full insurance.
- But the same logic holds for all indifference curves that go through the contract that is given to the low-risk agent.

Adverse selection

- From the above analysis we conclude the following result.

Theorem

The high-risk agent gets full insurance, high-risk agent's IC constraint binds and low-risk agent's IR constraint binds.

- Notice that the high-risk agent may get informational rent in the equilibrium.