Adverse Selection

"adverse selection" is the term the insurance industry uses for asymmetric information

adverse selection occurs if customers know their risk probabilities better than firms

so expected utility of a type–π person is

$$EU = (1 - \pi)u(W - p) + \pi u(W - L + B - p) \quad (1)$$

where

$u(\cdot)$ is a concave utility–of–wealth function

W is the customer's initial wealth

π is the probability of some accident

L is the loss which results from an accident

p is the premium paid for insurance

B is the payment received from the insurance company if there is a loss actuarially fair odds :

$$p = \pi B \tag{2}$$

full insurance :

$$B = L \tag{3}$$

if the probability π is known, then, under perfect competition, customers get full insurance at actuarially fair odds

so the outcome is efficient

insurance companies are assumed **risk neutral** here ; they maxmize expected profits $p - \pi B$

if no–one knows her true probability π of an accident [i.e. everyone is equally uninformed], then in equilibrium : full insurance at actuarially fair odds "on average"

p/B equals the population average of the probability of an accident

again efficient [in the "ex ante" sense : customers use the population average of π in calculating EU, since they have no idea of their own true π]

Asymmetric Information

order of play :

"nature" moves first, choosing customers' risk probabilities

customers know their own risk probabilities ; firms don't

(many) firms then move, choosing which insurance policies (p, B) to offer

firms have to make policies available to **all customers**, since they do not know which customers are high–risk

then each customer picks the policy which gives her the highest expected utility

Notation

(a little different than in *Jehle and Reny*)

two risk classes

π_L : probability of accident of low–risk type

π_H : probability of accident of high–risk type

(so $\pi_H > \pi_L$)

α : proportion of customers who are low–risk

$$\hat{\pi} \equiv \alpha\pi_L + (1-\alpha)\pi_H \tag{4}$$

Indifference Curves in p–B Space

a customer's expected utility from an insurance policy is $(1-\pi)u(W-p)+\pi u(W-L+B-p)$, so that her choice among different policies can be derived by looking at her indifference curves in a p–B diagram (as in *Jehle and Reny*)

with B on the horizontal, p on the vertical, indifference curves slope up

"better than" direction is southeast

slope can be derived by implicitly differentiating the equation

$$(1-\pi)u(W-p)+\pi u(W-L+B-p)=E\bar{U} \quad (5)$$

so that

$$\frac{\partial p}{\partial B}|_{E\bar{U}} = \frac{\pi u'(W - L + B - p)}{\pi u'(W - L + B - p) + (1 - \pi)u'(W - p)} \quad (6)$$

important : the higher is π, the **steeper** is the indifference curve

(proof : take derivative of (6) with respect to π)

No Pooling Equilibrium

a pooling equilibrium is an equilibrium in which a single insurance contract is offered to all customers

competition among insurance firms implies that any equilibrium contract must break even

so any pooling equilibrium must lie on the "pooling line" : the set of policies such that $p = \hat{\pi} B$

but if a policy (p, B) is on the pooling line, then there must exist some other policy (p', B').with $p' < p$, and $B' < B$, such that

i the low risk customers prefer (p', B') to (p, B)

ii the high risk customers prefer (p, B) to (p', B')

iii $p' > \pi_L B'$, so that the new policy (p', B') makes a profit when it is chosen only by low risk customers

Figure 8.16 in *Jehle and Reny* (or my figure 1) illustrates : the indifference curve of the high risk customers through any pooling contract must be steeper than the indifference curve of the low risk customers

so there must be some other contract (such as $*$ in my figure 1), to the southwest of the pooling contract, which is on a higher indifference curve for the low risk, and on a lower indifference curve for the high risk (proving points i and ii above)

if this new contract is close enough to the pooling contract, then it must be above the zero profit line for the low risk customers, proving point iii above

so that Theorem 8.4 holds : there can be no pooling equilibrium

Separating Equilibrium

the only possible equilibrium in this screening model is the **pair** of contracts depicted in figure 8.18 of *Jehle and Reny* (or my figure 2)

contract H offers full insurance (with $p = \pi_H B$), and is chosen by high risk customers

the high risk customers are indifferent between contract H, and contract L, which offers less than full insurance

contract L (which has $p = \pi_L B$) is chosen only by low risk customers, who prefer it strictly to contract H

No equilibrium?

but there may be no equilibrium at all in this screening model

if the pooling line $p = \hat{\pi}B$ cuts the indifference curve of the low risk customers through L, then they can be induced away from L by some pooling contract which they prefer

this new pooling contract will also attract the high risk customers, but if it is below the pooling line, then it can make a profit even when chosen by all customers

in this case, the separating equilibrium is upset by a pooling contract

but Theorem 8.4 still applies : some new separating contract would upset this pooling contract

so if the pooling line is very close to the zero profit line for the low risk customers i.e. if the proportion α of customers who are low risk is close enough to 1

then there is no equilibrium at all in this insurance market