Economics 4650 - John L. Turner

Homework 3 Answers.

1. a. 7,500

b. $P_B(x) = x + 500$

c. Consumers with $x \geq 7{,}000$ will buy, so the consumers buying have claims that are uniformly distributed between 7,000 and 10,000. Hence, the average claim is 8,500.

d. The insurance company must charge at least as much as the average claim. In part c), the person with expected claim 7,000 is the cutoff buyer, and the average was

$$\frac{7{,}000 + 10{,}000}{2} = 8{,}500.$$

For a general cutoff buyer *x*, the average is then

$$\frac{x + 10{,}000}{2},$$

and the insurance company must charge at least this. In the book, this is referred to as $P_S(x)$.

e. If it charges 7,500 for insurance, then its average claim is 8,500, so it loses 1,000 on average.

f. Set

$$P_B(x) = P_S(x)$$

and solve for *x*. We have

$$x + 500 = \frac{x + 10{,}000}{2}.$$

This yields *x* = 9,000.

g. Having an administrative cost *c* changes $P_S(x)$, multiplying it by (1+*c*), to yield

$$\left(\frac{x + 10{,}000}{2}\right)(1 + c).$$

In order for it to be impossible to find a price such that the company breaks even and some consumers are willing to buy, it must be impossible to insure only the highest claim (10,000) buyer. This occurs when

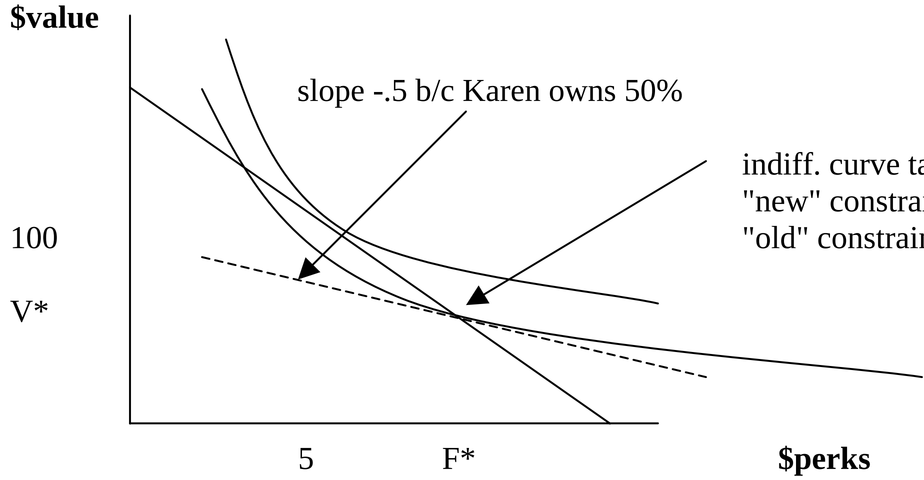
$$P_B(10{,}000) < P_S(10{,}000)\,.$$

We have

$$10{,}500 < 10{,}000(1+c)\,.$$

Solving this, we find $c > .05$.

2. Here is what your diagram should look like.



After the sale, firm value V* is lower than 100, perks F* are higher than 5. The reason that the point (F*,V*) must lie on the "old" and "new" constraints is that the sale price (from Karen to Gates) must be one that they are both willing to agree to. Since Gates knows Karen's preferences, and that she will consume more perks, he is unwilling to pay 50 for the shares, and pays .5V* instead. Karen, after the sale, chooses the optimal level of perks, so (F*,V*) must also satisfy a tangency condition with her indifference curves and her "new" constraint.

3. Gamble A returns expected utility of

$$1 - e^{-.00002(550{,}000)} = .9999832$$

Gamble B returns expected utility of

$$E(U \mid B) = .8U(600{,}000) + .2U(500{,}000)$$
$$= .8(1 - e^{-.00002(600{,}000)}) + .2(1 - e^{-.00002(500{,}000)})$$
$$= .9999860$$

Gamble C returns expected utility of

$$E(U \mid C) = .7U(700{,}000) + .3U(500{,}000)$$
$$= .7(1 - e^{-.00002(700{,}000)}) + .3(1 - e^{-.00002(500{,}000)})$$
$$= .9999858$$

Comparing the numbers, we see that Gamble B is preferred.

b. This is actually very easy. The expected utility of Gamble B is .9999860, and this must be exceeded by the certain utility of Gamble Z. Namely, we have

$$1 - e^{-.00002(500{,}000 + Z)} \geq .9999860 .$$

Solving for a bound on Z involves first moving the 1 to the RHS, then eliminating the negative signs (flipping the inequality)

$$- e^{-.00002(500{,}000 + Z)} \geq -.000014$$
$$.000014 \geq e^{-.00002(500{,}000 + Z)} .$$

Next, we take natural logs

$$\ln(.000014) \geq -.00002(500{,}000 + Z) .$$

From here, it is straightforward to work out using a calculator. We have

$$-11.1765 \geq -10 - .00002Z ,$$

or

$$.00002Z \geq 1.1765 .$$

Thus,

$$Z \geq \$58{,}825 \text{ (approximately)}$$

Note that I did not ask you to compute risk premia or certainty equivalents in this problem, but solving for Gamble Z essentially gives you those for Gamble B. The expected wealth earned through Gamble B is .8(100,000) +.2(0) = 80,000. To find the risk premium, we just subtract 58,825 from this, to get 21,175. The certainty equivalent is just 58,825 itself.