Economics 101 | Winter 2012
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Answer Key - Problem Set #5

Part I. Look over all the problems at the end of Chapters 12 and 13 of Baye. Write up and turn in your solutions to the following problems.

Chapter 12: problems 12, 18.

Problem 12

Your expected inverse demand is E(P) = .5(200,000 – 250Q) + .5(400,000 – 250Q) = 300,000 – 250Q. Therefore, your expected marginal revenue is E(MR) = 300,000 – 500Q. Your marginal cost is MC = $200,000. Setting E(MR) = MC and solving, Q = 200. The price you expect is thus E(P) = 300,000 – 250(200) = $250,000. Your expected profits are thus ($250,000 -$200,000)(200) - $110,000 = $9,890,000.

Problem 18

Offer two plans for customers with more than $1 million in assets. One plan (perhaps called the "Free Trade" Account) has an annual maintenance fee of $10,000 good for up to 400 "free" transactions (computed as $10,000/$25) per year (each additional transaction is priced at $25 each). The other plan (perhaps called the "Free Service" Account) has no annual maintenance fee but charges $100 per transaction. Given these two options, investors will sort themselves into the plans based on their individual characteristics.

Chapter 13: problems 3, 7.

Problem 3

a. The simultaneous-move equilibrium is (Yes, Yes), and Player 1 earns $200 in this equilibrium. By going first player 1's best strategy is to commit to "No." Player 2's best response would be "No", and thus Player 1 would earn $350 by going first. The maximum amount Player 1 should pay for going first is this $150 (or perhaps $149.99). Importantly, this assumes Player 1's move is observed by Player 2 before Player 2 makes her decision.
b. Player 2 gets $200 when Player 1 goes first, compared to $225 when they move at the same time. Thus, player 2 would be willing to pay up to $25 to keep player 1 from moving first.

Problem 7

a. Since last year's market price was $8, it follows that Firm 1 produced 1 million units last year (since P = 10 – 2Q = 8 implies Q = 1 million). For this to be the profit-maximizing price (MR = MC), it follows that 10 – 4Q = MC. Since Q = 1, Firm 1's marginal cost was $6 last year – the same as Firm 2's marginal cost this year. Thus, it would appear that Firm 1's marginal cost has declined over time due perhaps to learning curve effects.
b. At the current market price of $8, total market output is 1 million. Thus, each firm sells 0.5 million units. Each firm's fixed costs are $1 million.

Firm 1's profits are thus (\$8 - \$2)(.5) - \$1 = \$2 million and Firm 2's profits are (\$8 - \$6)(.5) - \$1 = \$0 million.

c. Firm 1's profits would increase to (\$6 - \$2)(2) - \$1 = \$7 million and Firm 2's profits would fall to -\$1 million.
d. No; \$6 is the monopoly price.
e. No; it is not pricing below its own marginal cost.

Part II. Answer the following questions. Where insufficient information is provided, write down an explicit and reasonable assumption, and proceed.

1. Akbar (A) and Bill (B) have the same mean income $I_A = I_B = 100$ and face independent risks with standard deviation of 20. Their risk premiums can be approximated by $0.5\ r_iV_i$ where $r_A= 0.1$, $r_B= 0.2$ and $V_i = Var(I_i)$, I = A, B.

a. Compute the mean and standard deviation of their combined income $I_A + I_B$.

Mean = 200
Variance = 800

b. Compute the certainty equivalent (CE) income for each of them, and the sum of the two CE's.

$CE_A = 100 – (1/2)\ (1/10)\ 400$

$CE_B = 100 – (1/2)\ (1/5)\ 400$

$CE_A + CE_B=200-(1/2)(1200)(1/10)=140$

c. It is known that the sum of the CE's is maximized when the risks are shared in proportion to the risk tolerances $1/r_i$. Compute the gain in total CE for this form of risk sharing.

Therefore, the income for A will be 10/15 *200 and the income for B will be 5/15*200. In other words, A receives 2/3*100 and B 1/3*100

$CE_A = 2/3*200 – (1/2)\ (1/10)\ 800\ (2/3)$

$CE_B =1/3*200 – (1/2)\ (1/5)\ 800\ (1/3)$

$CE_A + CE_B= 147.67$

Hence, the benefit of risk sharing is 7.67.

2. A newly formed insurance company, Santa Cruz Health Inc (SCHI) is planning to sell policies in the local area. Of the 10,000 local households, 75% are low risk with average annual health costs of $2000. The other 25% are high risk with average annual health costs of $6000. SCHI is a for-profit company with negligible overhead costs.
   a. What annual premium would allow SCHI to break even if all households joined?

      *75%*2000+25%*6000 = 3000*

   b. At that premium, which households would find it worthwhile to join SCHI? What would SCHI's annual profit be if just those households joined?

      The low risk households have an expected loss of only $2000, so they would have to pay a $1000 risk premium to join. Probably they would rather not join. In this case, only high-risk households will join SCHI. Then the annual profit for SCHI per customer will be $3000 - $6000, or a loss of $3000 on each of 2500 customers, or an overall loss of $3000*2500 = $7,500,000.

   c. What advice can you offer SCHI to help them efficiently serve the local healthcare market?

      SCHI can design low-premium-high-deductible policy for the low-risk households; and high-premium-low-deductible policy for the high-risk households.

Part III. Find the theoretical bid functions and expected revenue for each period of the auctions run in class. Compare these theoretical forecasts to the outcomes of the auctions posted on the class website.

a. According to auction theory, with IPV (independent private values), the expected revenue is exactly the second highest valuation for English and 2nd Price auctions. Recall that the optimal bid (or dominant strategy) in such auctions is to bid your true value.
b. For 1st Price and Dutch Auctions with IPV, expected revenue will sometimes be higher and sometimes lower than the second highest valuation (depending on the luck of the draw for highest and second highest valuations) but on average will be the same as in 2nd price and English—this is the famous Revenue Equivalence result. See formula, Baye Ch.12 p. 460-465, for optimal bid (or more precisely, the Nash equilibrium bid) in1st Price and Dutch Auctions is V- (V-L)/n, where V= my value, L= lowest possible value of other bidders, and n=number of bidders. Make reasonable assumptions for # of bidders based on class attendance. If bidders are risk averse, the expected revenue is a bit higher in 1st Price and Dutch Auctions
c. In auction 8, the bag of coins has a common value. The average estimated value, and the true value, of the bag of coins is $11.27. The winning bid is $9.00. Thus the winner made a profit if $2.27.
d. The dollar auction has Nash equilibria involving randomized strategies (not covered in class) where the expected revenue is $1.00. But there is a curse here too, and bidding above $1.00 often occurs with inexperienced bidders! Lawsuits can be like that, with each side escalating the resources they put into lawyers, sometimes going beyond what the winner can hope to recover.