ECB 201: Principles of Microeconomics, Midterm Exam 3

December 18, 2023

Name and section: _____

Instructions: There are three sections to this exam worth 70 points in total:

- 9 multiple choice questions, (20 points)
- 5 True/false questions, (10 points)
- 8 short answer questions, (40 points)

Clearly mark your answers in the exam book. For True/False questions, if the answer if false, briefly explain why. You may use a calculator but no other resources are permitted.

Help Received:

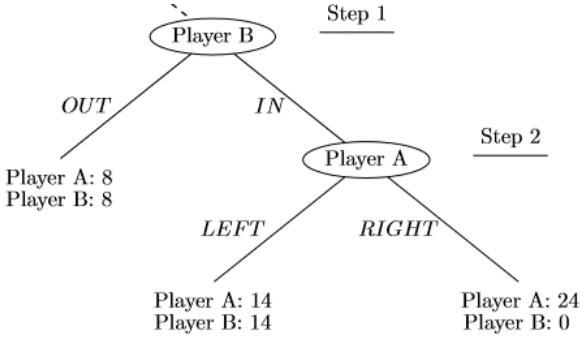
"A Cadet will not lie, cheat, steal, nor tolerate those who do."

Multiple choice section: Clearly circle the most correct answer for each question.

1. In the Bertrand model of oligopolistic competition, firms compete with each other on:
    A. Quality
    B. Quantity
    C. **Price**
    D. Marketing
    E. None of the above

2. In the market for health insurance, those most likely to require a lot of costly medical procedures are more likely to buy insurance, resulting in insurers needing to charge higher premiums to cover the costs. This is an example of:
    A. Excess Uncertainty
    B. **Adverse Selection**
    C. Systemic Risk
    D. Moral Hazard
    E. Negative Externalities

3. Use backward induction to predict the outcome of the game below, assuming all players are self-interested nad rational.



    A. **Player B: Out, Player A, Right**
    B. Player B: Out, Player A, Left
    C. Player B: In, Player A, Right
    D. Player B: In, Player A, Left
    E. Not enough information

4. Ideally, a tax imposed to minimize the dead-weight loss caused by a negative externality should be equal to:
    A. Marginal Private Cost
    B. Marginal Social Cost
    C. **Marginal Damage Cost**
    D. Average total cost
    E. Marginal Social Benefit

5. A restaurant sells a monthly membership where buyers can pay a fixed price to have unlimited free meals for 30 days. After running the promotion for a while, the owner finds that those who bought the membership are visiting far more often than they did before. This change in behavior is an example of:
    A. Excess Uncertainty
    B. Adverse Selection
    C. Systemic Risk
    D. **Moral Hazard**
    E. Negative Externalities

6. If there is a negative externaltiy in a market, then there will likely be:
    A. Dead-weight loss due to under production.
    B. **Dead-weight loss due to over production.**
    C. Dead-weight loss due to a shortage.
    D. Dead-weight loss due to a surplus.
    E. No dead-weight loss and overall welfare will be maximized.

7. In the Cournot model of oligopoly competition, firms compete on:
    A. Quality
    B. **Quantity**
    C. Price
    D. Marketing
    E. None of the above

8. A seafood cannery emits pollution, damaging forests in the area used as an input for a paper mill, resulting in lost profits to the paper mill. According to the Coase Theorem, this problem may be solved by:
    A. The fishery owning the property rights to the forest
    B. The paper mill owning the property rights to the forest
    C. **Either the paper mill or the seafood cannery having clear property rights to the forest**
    D. Legislation banning all pollution form the seafood cannery
    E. None of the above

9. If a good has positive externalities associated with its consumption, then there will likely be:
    A. **Dead-weight loss due to under production**
    B. Dead-weight loss due to over production
    C. Dead-weight loss due to a shortage
    D. Dead-weight loss due to a surplus
    E. No dead-weight loss and overall welfare will be maximized.

True or False section. For each question, indicate whether the statement is true or false; if false, briefly explain why.

1. In the price-leader model of Oligopolistic competition, the large firm does not need to consider the impact of the smaller firms on the market price.

   False, although the smaller firms have no market power on their own, they will affect the market price in aggregate

2. If a set of strategies is a Nash equilibrium for a game, then the outcome is the best possible outcome for all players

   False, if a set of strategies is a Nash equilibrium, then no individual can change their strategy on their own and improve their own payoff. It does not need to be the best possible outcome.

3. A game does not have a Nash equilibrium if the players do not have dominant strategies

   False, player do not need to have dominant strategies for there to be a Nash equilibrium

4. A store announces that they will have a 50% off sale next month. This will cause demand for their product in the current month to decrease.

   True. Buying a good in the next month acts like a substitute for buying a good this month.

5. Under certain competition structures, oligopolies maximize their profits by setting their price equal to their marginal cost.

   True, this is the outcome predicted in the Bertrand model.

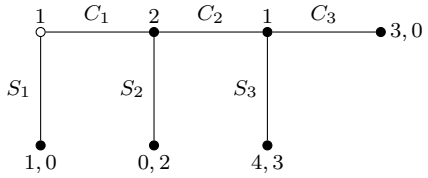
Short answer section. Briefly address each question; a sentence or two is sufficient

1. *Nash Equilibrium:* Find all Nash equilibria for the game below.

(row player, column player)	Left	Center	Right
Top	2,1	3,8	0,0
Middle	0,0	0,0	0,0
Bottom	0,0	0,0	20,20

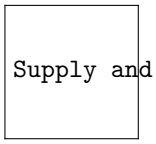
The Nash equilibria in this game are { *Top, Center* } *and* { *Bottom, Right* }

2. *Backwards Induction:* Use backward induction to predict the outcome of the game below, assuming that all players are rational and self-interested. Payoffs are given in the form (Player 1, Player 2)

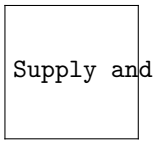


The outcome of this game will be { C_1, C_2, S_3 } *with the payoffs being (4,3)*

3. *Positive Externalites:* Draw an example marginal social benefit curve for this market if there is a positive externality associated with consumption of this good. Shade in the area representing the dead weight loss.



4. *Negative Externalites:* Draw an example marginal social cost curve for this market if there is a negative externality associated with the production of this good. Shade in the area representing the dead weight loss.



5. *Max-min strategy:* In contrast to our usual fully rational and self-interested agents, we can model extremely risk-averse players using 'maximum-minimum' strategies. If players play a 'maximum-minimum' strategy, they choose the action that gives them the best worst case outcome, ignoring their partners' incentives. What would the outcome of the game below be if both players use this kind of strategy to make their choices?

(row player, column player)	Left	Center	Right
Up	-1,-1	3,8	0,0
Down	-10,0	0,8	20,20

The max-min strategy equilibrium would be { Up, Center } with an outcome of (3,8). When making decisions in this way, players each essentially assume that the worse case outcome will happen for whatever action they choose and maximize their payoffs in that situation. Using the column player as the example, the worst case outcome if they choose Left is -1, 8 if they choose Center, and 0 if they choose Right. Thus, they would choose to play Center since it gives them the 'best worst case' payoff.

6. *Solving imperfect information*: Suppose that there is a market with imperfect information, known to sellers but not buyers. The seller wants to signal the information they have to the buyer. What conditions must a signal satisfy to be effective?

For a signal to be effective, it must be credible, meaning that telling the truth must allign with the sender's incentives. Otherwise, the recipient would not believe the signal as it is in the sender's best interest to lie.

7. *Sequential games:* Twitter is trying to negotiate a lower service fee to sell subscriptions for their app through the Apple App Store. They offer Apple an ultimatum: "Either give us a discounted service fee or we will remove our App from your platform."

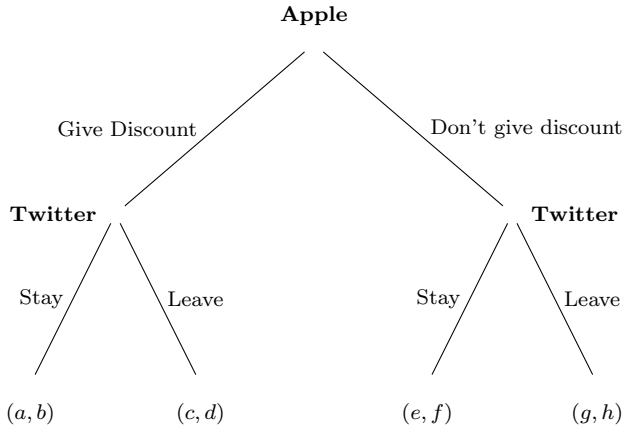
   Assume that Twitter would earn:

   - $10 million if they remain on the App store with no discount given
   - $12 million if they remain on the App store with a discount
   - $5 million if they leave the App store

   and that Apple would earn:

   - $3 million if Twitter stays on the platform and Apple gives no discount
   - $1 million if Twitter stays and Apple gives a discount
   - $0 if Twitter leaves

   Using these hypothetical numbers, assign a numerical payoff to each letter (a through h,) so that the game tree below models this interaction. Each payoff should be in the form (Apple's earnings, Twitter's earnings.)



Letter	Payoff amount, (million $)	Letter	Payoff amount, (million $)
a	1	**e**	3
b	12	**f**	10
c	0	**g**	0
d	5	**h**	5

8. *Analysing incentives::* Using the game tree from the previous question, is Twitter's threat to pull their app from the App Store credible? Why or why not?

Twitter's threat is not credible. Although it would be very costly to apple if they choose to leave, it would also be costly to Twitter. Regardless of Apple's decision, Twitter will be better off if they remain on the platform.