

BA 210

Dr. Jon Burke

Exam 2 Version A

This is practice for your Exam 2. Exam 2 is a 100-minute exam (1hr. 40 min.). There are 5 questions (20 minutes per question). The exam begins exactly at the normal time that class starts. To avoid the temptation to cheat, you cannot take this exam if you arrive more than 10 minutes late, and you cannot (without permission) leave the room and re-enter during the exam.

Exam Grading

Each individual question on the following exam is graded on this 4-point scale:
4 points if all is correct --- or there is only a small error.
3 points for missing or doing wrong part of a problem, but the rest is correct.
2 points for a reasonable and substantive attempt.
1 point if there is at least something of value in the attempt.

After all individual questions are graded, I sum the individual scores, and then compute that total as a percentage of the total of all points possible.

I then apply a standard grading scale to determine your letter grade:

90-100% A; 80-89% B; 70-79% C; 60-70% D; 0-59% F

Finally, curving points may be added to letter grades for the entire class (at my discretion), and the resulting curved letter grade will be recorded on a standard 4-point numerical scale:

A = 4; A- = 3.7; B+ = 3.3; B = 3.0; B- = 2.7; C+ = 2.3; C = 2.0; C- = 1.7; D+ = 1.3; D = 1.0; F = 0

Tip: Pace yourself. When there is only ½ hour left, spend at least 5 minutes outlining an answer to each remaining question.

Question 1: Consider negotiations over wages for adjunct Management Science Professors at the Business Administration Division of Seaver College of Pepperdine University. Pepperdine seeks a professor for the next 3 semesters. The only candidate is willing to work for \$10,000 per semester and Pepperdine is willing to pay up to \$30,000 per semester. Before the first semester, the candidate confronts Pepperdine over wages. The candidate presents his demand. Pepperdine either accepts it or rejects it and returns the next semester with a counteroffer. Offers alternate thereafter. Employment only occurs in those semesters after an agreement is reached.



What wage per semester should the candidate demand? Should Pepperdine accept that initial demand?

Compute how the candidate's wage demand changes if the candidate finds an alternative employment offer by UCLA for \$15,000 for each of the same 3 semesters. Suppose the candidate cannot accept the job at both UCLA and Pepperdine University.

Answer to Question 1:

Question 2: You are a manager of Kleenex and you compete directly with Puffs selling facial tissues in America. Consumers find the two products to be indistinguishable. You have a decision to make about competing with Puffs in New Zealand, where the inverse market demand for facial tissues is $P = 12 - Q$ (in dollars), and each firm selects quantity of 2 or 3 or 4. You must choose the option that is best for Kleenex.



Option A. Puffs sets up its factories and distribution networks now, and you set up later. Puffs produces at a unit cost of \$2.00 but your unit costs are only \$1.50, resulting in the profit table:

		Kleenex		
		2	3	4
Puffs	2	12,13	10,16.5	8,18
	3	15,11	12,13.5	9,14
	4	16,9	12,10.5	8,10

Option B. You hurry set up your factories and distribution networks now, and Puffs sets up later. Your hurry means your unit costs increase to \$2.00, while Puffs' unit costs remain \$2.00, resulting in the profit table:

		Puffs		
		2	3	4
Kleenex	2	12,12	10,15	8,16
	3	15,10	12,12	9,12
	4	16,8	12,9	8,8

Answer to Question 2:

Question 3: Sam's Club and Costco both sell emergency food supplies in a weather-proof bucket that provides 275 delicious easy-to-prepare meals, including potato soup and corn chowder. The unit cost to both retailers is \$75. The retailers compete on price: the low-price retailer gets all the market and they split the market if they have equal prices. Suppose they consider prices \$75, \$76, \$80, \$85, and \$95, and suppose profits at those prices are given in the following payoff table:



		Costco				
		75	76	80	85	95
Sam's	75	0,0	0,0	0,0	0,0	0,0
	76	0,0	248,248	496,0	496,0	496,0
	80	0,0	0,496	300,300	600,0	600,0
	85	0,0	0,496	0,600	500,500	1000,0
	95	0,0	0,496	0,600	0,1000	800,800

If they choose prices simultaneously, what price should Sam's charge? what price should Costco charge?

Answer to Question 3:

Question 4: Wii video game consoles are made by Nintendo, and some games are produced by third parties, including Sega. The unit cost of a console to Nintendo is \$40, and of a game to Sega is \$10. Suppose, Nintendo considers prices \$240 and \$340 for consoles, and simultaneously Sega considers \$50 and \$60 for games. If they choose prices \$240 and \$50 for consoles and games, then demands are 2 and 4 (in millions); if \$240 and \$60, then 1.5 and 3 (in millions); if \$340 and \$50, then 1.5 and 3 (in millions); and if \$340 and \$60, then 1 and 2.5 (in millions).



How are the two goods related? Explain.

What price should Nintendo choose in this pricing game?
Are there mutual gains from cooperation? If so, can Nintendo trust Sega to cooperate? and can Sega trust Nintendo to cooperate?

Answer to Question 4:

Question 5: Consider 2 bars (A and B) suffering from a serious drunkenness problem that detracts customers because of the violence and smell. It costs \$192 yearly in foregone profit for each bar to enforce moderation by stopping service to customers before they become drunk. For each bar that enforces moderation during the year, both bars will have a \$100 increase in profit. Suppose the yearly interest rate is 10%.



What strategies (A_{One}, B_{One}) should each player choose if they expect this game to last only one time period? Are there mutual gains from cooperative strategies (A_{Coop}, B_{Coop}) rather than (A_{One}, B_{One}) ? If they expect this game to repeat indefinitely, would Player A cooperate each period and choose A_{Coop} if Player B followed the Grim Strategy of punishing non-cooperation? and would B cooperate each period and choose B_{Coop} if A followed the Grim Strategy of punishing non-cooperation?

Answer to Question 5:

Answers to Exam 2 Version A (remember to try each problem before looking at these answers)

Answer to Question 1:

To consider all possible wage offers (offers by Pepperdine to buy labor by the candidate to sell labor), consider another bargaining payoff table. The game ends if an offer is accepted or if the three semesters end without an accepted offer, and gains are measured as a percentage of the gain from accepting Pepperdine's offer before the first semester.

Rounds to End of Game	Offer by	Total Gain to Divide	Pepperdine's Gain Offered	Candidate's Gain Offered
1	Candidate	33 1/3	0	33 1/3
2	Pepperdine	66 2/3	33 1/3	33 1/3
3	Candidate	100	33 1/3	66 2/3

Without the alternative offer, the candidate's opportunity cost of Pepperdine employment is \$10,000 per semester, and so the gain from Pepperdine employment is \$20,000=\$30,000-\$10,000 per semester. For the candidate to receive 66 2/3% of those gains, the candidate should demand \$13,333 gain per semester, or **wages \$23,333 per semester, or \$70,000 for all three semesters.** And Pepperdine should accept that initial demand.

With the alternative offer, the candidate's opportunity cost of Pepperdine employment is \$15,000 per semester, and so the gain from Pepperdine employment is \$15,000=\$30,000-\$15,000 per semester. For the candidate to receive 66 2/3% of those gains, the candidate should demand \$10,000 gain per semester, or **wages \$25,000 per semester, or \$75,000 for all three semesters.** And Pepperdine should accept that initial demand.

Comment: Finding alternative employment raised the candidate's Pepperdine wages.

Answer to Question 2:

In Option A, you are the follower in a Stackelberg Duopoly. Puffs anticipates your reactions below, and so chooses to produce 4, you react with 3 and so you earn 10.5.

		Kleenex		
		2	3	4
Puffs	2	12,13	10,16.5	8,18
	3	15,11	12,13.5	9,14
	4	16,9	12,10.5	8,10

In Option B, you are the leader in a Stackelberg Duopoly. You anticipate Puffs' reactions below, and so choose to produce 4, Puffs reacts with 3 and so you earn 12.

		Puffs		
		2	3	4
Kleenex	2	12,12	10,15	8,16
	3	15,10	12,12	9,12
	4	16,8	12,9	8,8

Option B is thus best for Kleenex since Kleenex profits (as a follower) are 10.5 in Option A, while Kleenex profits (as the leader) are 12 in Option B.

Answer to Question 3:

Step 1: For each firm, \$75 is weakly dominated by any other strategy, and \$95 is weakly dominated by \$85. Hence, eliminate \$75 and \$95 and reduce the game.

		Costco				
		75	76	80	85	95
Sam's	75	0,0	0,0	0,0	0,0	0,0
	76	0,0	248,248	496,0	496,0	496,0
	80	0,0	0,496	300,300	600,0	600,0
	85	0,0	0,496	0,600	500,500	1000,0
	95	0,0	0,496	0,600	0,1000	800,800

Step 2: For each firm, \$85 is now weakly dominated by \$80. Hence, eliminate \$85 and further reduce the game.

		Costco				
		75	76	80	85	95
Sam's	75	0,0	0,0	0,0	0,0	0,0
	76	0,0	248,248	496,0	496,0	496,0
	80	0,0	0,496	300,300	600,0	600,0
	85	0,0	0,496	0,600	500,500	1000,0
	95	0,0	0,496	0,600	0,1000	800,800

Step 3: For each firm, \$80 is now strictly dominated by \$76. Hence, eliminate \$80 and further reduce the game to its single solution of prices \$76 for each firm.

Answer to Question 4:

Goods are gross complements because a higher price for one means lower demand for the other.

Fill out the normal form for this game of simultaneous moves. For example, at Nintendo price \$340 and Sega price \$50, Nintendo's demand is 1.5 and Sega's is 3, so Nintendo profits $$(350-30) \times 1.5 = \480 and Sega profits $$(40-10) \times 3 = \90 .

		Sega	
		\$50	\$60
Nintendo	\$240	400,160	300,150
	\$340	450,120	300,125

Nintendo should choose \$340 since it is the weakly-dominant strategy, Sega should choose \$60 since it is the dominant strategy after the removal of Nintendo's choice of \$240. Payoffs in that dominance solution are 300 and 125.

Mutual gains are possible by lowering prices to \$240 and \$50, but **Nintendo cannot be trusted**: Nintendo cooperating and choosing \$240 is not a best response to Sega cooperating and choosing \$50. It turns out **Sega can be trusted**: Sega cooperating and choosing \$50 is a best response to Nintendo cooperating and choosing \$240;

Answer to Question 5:

The essential data of the game are the interest rate between periods, $r = 10\%$ or $r = 0.10$ (as a fraction), and the payoffs each period defined by the normal form. For example, if Bar A does not enforce moderation during the period but Bar B does enforce moderation, then both bars will have a \$100 increase in profit but Bar B pays an extra \$192 cost, and so nets profit $\$100 - \$192 = -\$92$.

		Bar B	
		Enforce	Not En.
Bar A	Enforce	8,8	-92,100
	Not En.	100,-92	0,0

What strategies (A_{One}, B_{One}) should each player choose if they expect this game to last only one time period? In that one-shot game, each player should choose Not Enforce $(A_{One} = \text{Not Enforce}, B_{One} = \text{Not Enforce})$ since it is the dominate strategy for each player. Each player thus earns 0.

Are there mutual gains from cooperative strategies (A_{Coop}, B_{Coop}) rather than (A_{One}, B_{One}) ? Yes, if both players choose $(A_{Coop} = \text{Enforce}, B_{Coop} = \text{Enforce})$, then each player earns 8, rather than 0.

If players expect this game to repeat indefinitely, each should consider the Grim Strategy, which has two components.

- 1) The Cooperative choice for each player $(A_{Coop} = \text{Enforce}, B_{Coop} = \text{Enforce})$.
- 2) The Punishment choice for each player $(A_{Pun} = \text{Not Enforce}, B_{Pun} = \text{Not Enforce})$, which gives the other player the worst payoff after that player chooses his best response to his punishment.

The Grim Strategy is thus, in each period, Cooperate and choose $(A_{Coop} = \text{Enforce}, B_{Coop} = \text{Enforce})$, as long as the other player has Cooperated and chosen $(A_{Coop} = \text{Enforce}, B_{Coop} = \text{Enforce})$ in every previous period. But otherwise (if the other player has ever made a choice other than cooperation $(A_{Coop} = \text{Enforce}, B_{Coop} = \text{Enforce})$), then you punish by choosing $(A_{Pun} = \text{Not Enforce}, B_{Pun} = \text{Not Enforce})$ in the next period and in every period thereafter --- forever.

Suppose Bar B followed the Grim Strategy. Would Bar A cooperate each period and choose $A_{Coop} = \text{Enforce}$?

On the one hand, if Bar A cooperated each period and choose $A_{Coop} = \text{Enforce}$, then the Grim Strategy says Bar B will also cooperate each period and choose $B_{Coop} = \text{Enforce}$, and so Bar A earns 8 each period.

On the other hand, if Bar A cheated in any period, then consider the first period when he cheats.

In that first period, the Grim Strategy says Bar B will still cooperate and choose $B_{\text{Coop}} = \text{Enforce}$. Bar A's best response to cooperation is Not Enforce, which earns 100 in that period, rather than earning 8 if he had continued to cooperate. So **the one period gain from cheating is 92.**

But starting in the next period and continuing forever, the Grim Strategy says Bar B will punish by choosing $B_{\text{Pun}} = \text{Not Enforce}$. Bar A's best response to $B_{\text{Pun}} = \text{Not Enforce}$ is to Not Enforce, which earns 0 in each punishment period, rather than earning 8 if he had continued to cooperate. So **the eventual loss from cheating is 8.**

Summing up, if Player B followed the Grim Strategy, then Player A would cooperate and choose A_{Coop} each period exactly if the one period gain of from cheating of 92 does not compensate for the eventual losses of 8 starting the next period.

Use the formula that \$1 starting next month and continuing for each subsequent period is worth $\$(1/r)$ today. Since the interest rate $r = 10\%$ expressed as a fraction is $r = 0.10$, the eventual losses of 8 is the same as losing $8/0.10 = 80$ today.

Therefore, the one period gain of from cheating of 92 does compensate for the eventual losses of 8 starting the next period (since $92 > 80$), so Player A would not cooperate and, instead, would choose Not Enforce each period. Since the game is symmetric, Player B would likewise not cooperate if Player A followed the Grim Strategy.