

January Examination Period 2025

ECN361: Advanced Microeconomics

Duration: 2 hours

**YOU ARE NOT PERMITTED TO READ THE CONTENTS OF THIS QUESTION PAPER
UNTIL INSTRUCTED TO DO SO BY AN INVIGILATOR**

Answer ALL questions

Cross out any answers that you do not wish to be marked

Calculators are permitted in this examination. Please state on your answer book the name and type of machine used. Complete all rough workings in the answer book and cross through any work that is not to be assessed.

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Examiner: Jan Knoepfle

Question 1**[30 marks]**

Give *concise* answers to the following questions and justify your answers.

- (a) [15 marks] The following stage game is repeated infinitely often. Players discount future payoffs with factor $\delta \in (0, 1)$.

		Player 2		
		<i>L</i>	<i>C</i>	<i>R</i>
Player 1	<i>T</i>	3,1	1,1	x,y
	<i>B</i>	1,2	1,1	6,6

Consider the limit as $\delta \nearrow 1$, i.e. players become patient.

- (i) Suppose $x = 2$ and $y = 2$. Draw the set of **feasible average payoff profiles** in a diagram with player 1's payoffs on the horizontal axis and Player 2's payoffs on the vertical axis.
 - (ii) Suppose y increases slightly while $x = 2$ remains unchanged. Does the set of average payoff profiles that can be attained in a **subgame perfect equilibrium** grow, shrink, or stay unchanged? Briefly explain your answer.
 - (iii) Suppose x increases slightly while $y = 2$ remains unchanged. Does the set of average payoff profiles that can be attained in a **subgame perfect equilibrium** grow, shrink, or stay unchanged? Briefly explain your answer.
- (b) [15 marks] The recently established country 'Republic of Mile End' considers introducing, for the first time, an unemployment insurance programme. According to the current proposal, each citizen of the Republic of Mile End can decide whether to purchase insurance at a fixed fair price. If a citizen purchases the unemployment insurance and later loses their job, then the Republic of Mile End will pay them the wage they earned in that job until they find a new job. You are the economic advisor to the chancellor.

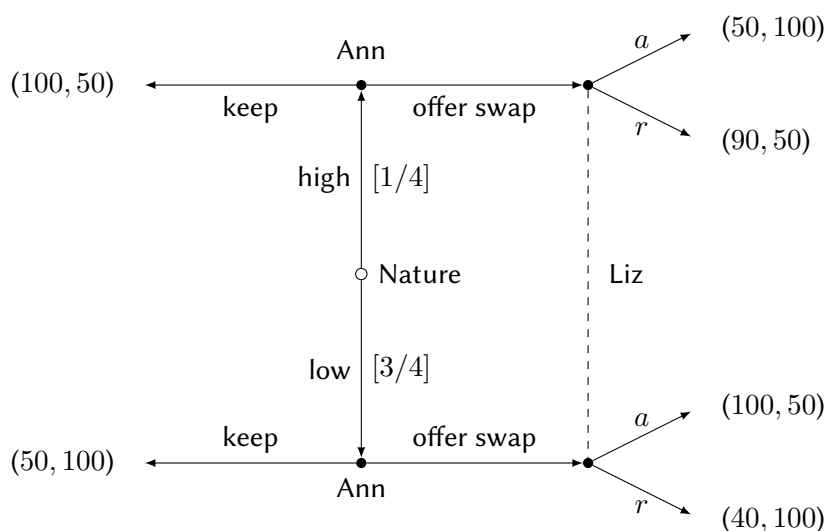
Answer (i) and (ii) below and make sure to indicate clearly which parts of your answer belong to (i) and (ii), respectively.

- (i) Describe a potential way in which **adverse selection** could cause a problem for this insurance programme and propose a remedy to alleviate the problem you described.
- (ii) Describe a potential way in which **moral hazard** could cause a problem for this insurance programme and propose a remedy to alleviate the problem you described.

Question 2

[32 marks]

Consider the following signalling game. There are two envelopes. One envelope contains GBP 100, and the other one contains GBP 50. Ann and Liz receive one envelope each. With probability $1/4$, Ann gets the high amount (GBP 100) and with probability $3/4$ Ann gets the low amount (GBP 50). Ann gets to open her envelope, observe whether she got the high or low amount, and decides whether she keeps her envelope or offers Liz to swap envelopes. If Ann decides to keep, she gets the amount in her envelope and Liz the amount in the other envelope. If Ann offers to swap, Liz can either accept (a) or reject (r). Liz cannot open any envelope before she decides. If Liz accepts, each gets the amount in the other's original envelope. If Liz rejects, each gets the amount in their original envelope, but Ann also suffers a disutility from being rejected equal to GBP 10.



- (a) [8 marks] Suppose for part (a) that Ann plays the strategy $\beta_h = 1/4$ and $\beta_\ell = 1/3$, where β_h is the probability with which Ann decides to **keep** her envelope after observing the high amount and β_ℓ is the probability with which Ann decides to **keep** her envelope after observing the low amount. What is Liz' belief μ that Ann's envelope is high if she observes that Ann offers to swap?
- (b) [6 marks] For which values of μ would Liz accept the offer to swap?
- (c) [6 marks] Let α denote the probability with which Liz accepts the offer to swap. Suppose Ann observes the low amount in her envelope. Under what condition on α is it optimal for Ann to offer to swap after observing the low amount?
- (d) [6 marks] Is there any PBE in which Ann ever offers to swap with positive probability? If yes, specify one. If no, explain why not.
- (e) [6 marks] Specify the set of **all** pooling PBE in which Ann keeps her envelope in both cases.

Question 3

[38 marks]

Pam makes a take-it-or-leave-it offer to hire Jim to work on a project. The project can be a success or a failure. The success probability depends on Jim's effort level $e \in \{e^L, e^H\}$. If Jim exerts low effort e^L , then the project succeeds with probability $1/4$. If Jim exerts high effort e^H , then the project succeeds with probability $2/3$. Pam offers Jim a fixed salary $s \geq 0$ which he receives if he accepts the contract, independent of the success; and a bonus $b \geq 0$ which he receives additionally if the project succeeds. The project generates a revenue of $x_S = 840$ for Pam in case of a success and $x_F = 0$ in case of failure. Pam is risk neutral. Her utility when the revenue is x and paying a total amount of w to Jim is $x - w$.

Jim's effort costs are $c(e^L) = 10$ and $c(e^H) = 20$. Jim is risk averse and his utility when he receives monetary payment w and chooses effort e is $\sqrt{w} - c(e)$. Suppose for now that Jim has no other sources of income or savings so that his outside option is $\underline{u} = 0$.

- (a) [8 marks] Suppose that effort is verifiable so that the fixed salary and the bonus can depend on the effort e that Jim exerts. Specify an optimal contract. Which effort level will be implemented?

Assume for parts (b)-(f) that effort is **not** verifiable.

- (b) [8 marks] Specify (do not yet solve) Pam's optimisation problem for the optimal choice of s and b in case she wants to implement high effort e^H . Describe the role of the objective and of each constraint.
- (c) [6 marks] Solve for the optimal salary and bonus to implement e^H . What is Pam's expected profit?
- (d) [4 marks] Is it optimal for Pam to implement e^L or e^H under non-verifiable effort?
- (e) [8 marks] Is the optimal contract in (d) inefficient in comparison to (a)? If yes, describe the nature of the inefficiency. If no, why not?
- (f) [4 marks] Suppose now that Jim has savings of $y > 0$. Is Pam better or worse off when Jim has more savings? To justify your answer, explain what changes when Jim has more savings. [No calculations needed.]

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