

ECON 200C, Spring 2021

Homework 3

Due: 5/7/2021, before the beginning of the discussion session

**Problem 1.** Consider a problem with 2 actions and 2 outcomes. Show that in this case, FOSD implies MLRP. Also show that this is not true in the general setting. (Show that FOSD does not promise MLRP in e.g. 2 action 3 outcome case)

**Problem 2.** Solve parts (A), (B), and (C) of 11 in Kreps, chapter 17 (page 659) (Part (D) considers a case where both moral hazard and adverse selection involve, if you are interested you should try yourself)

**Problem 3.** (2018 Midterm #3) Consider a relationship between a principal and an agent in which the agent's effort influences the result but is not observable. The principal is risk neutral, and the agent is risk averse, having a utility function  $u(w, e) = \sqrt{w} - e^2$ , where  $w$  represents the wage and  $e$  represents the effort. The agent can choose between low effort  $e = 0$ , or high effort  $e = 3$ . His reservation utility is 21. The production technology is such that only three results  $x \in \{0, 1000, 2500\}$  are possible, where  $x$  represents the value of the result to the principal. The probabilities conditional on effort are:  $\pi(x = 0|e = 0) = 0.4$ ;  $\pi(x = 1000|e = 0) = 0.4$ ;  $\pi(x = 2500|e = 0) = 0.2$ ;  $\pi(x = 0|e = 3) = 0.2$ ;  $\pi(x = 1000|e = 3) = 0.4$  and  $\pi(x = 2500|e = 3) = 0.4$ .

- (a) What are the optimal symmetric information contracts for each effort? What effort level will the principal demand from the agent?
- (b) What is the optimal contract under which agent will exert an effort  $e = 0$  if the only verifiable variable in the relationship is result  $x$ ?
- (c) Given asymmetric information, characterize the optimal contract if the principal wants the agent to exert an effort of  $e = 3$ .
- (d) Which contract will the principal offer the agent under asymmetric information?

(e) Discuss the optimal contract under asymmetric information if the agent were risk neutral.

**Problem 4.** (2018 Final #4) A worker can be *careful* or *careless*, and generate mistakes with probabilities 0.25 and 0.75, respectively. His utility function is  $U = 100 - 10/w - x$  where  $w$  is his wage and  $x$  is the effort cost that takes the value 2 if he is careful and 0 otherwise. Whether or not a mistake is made is observable and contractible, but effort is not. Employer is risk neutral. Output is worth 0 if a mistake is made and 20 otherwise. Employer's profits are given by output net of payments made to the agent. Agent's reservation utility is zero.

- (a) At the optimal contract, will the worker be paid anything if he makes a mistake?
- (b) Will the worker be paid more if he does not make a mistake?
- (c) How would the contract be affected if employer is risk-averse?

**Problem 5.** Reconsider Problem 5 in HW2. Note that it is an insurance problem with moral hazard issues.