ECO 317 – Fall Term 2009
Economics of Uncertainty
Final Examination

Important instructions:

[1] This exam is open-print, but closed-electronic. You can bring any books, notes, etc. printed on paper, but should keep all electronic equipment off: computers, calculators, cell phones, ... Any numerical calculations needed should be carried out using only paper and pencil or (preferably) pen.

[2] The exam has **four** pages; make sure you have them all.

[3] The exam is in two sections, A and B. Write your answers to questions in these sections in separate, clearly marked, booklets. Within each section you can write your answers to the questions in any order, but keep all the pages on which you answer any one question together. Failure to follow these instructions may lead to loss of points in grading.

[4] For your convenience, the point total is 180, so you should plan to spend approximately one minute per point. At the end of the allotted three-hour time, you can "buy" extra time at the rate of 4 points per minute.

[5] **Print** your name clearly on the front cover of each answer booklet. Write your answers clearly. We won't grade unreadable answers.

[6] Show the steps of your calculations and arguments. Use well-labeled diagrams where appropriate, and explain any symbols or notation you introduce.

[7] Write and sign the honor pledge – "I pledge my honor that I have not violated the honor code during this examination." – on the front cover of your Section A answer booklet.

SECTION A

Question 1: (25 points)

Briefly state any two critiques of expected utility theory. Which one do you regard as more damaging to that theory? Briefly explain the reasons for your choice.

Question 2: (30 points)

You have 1 million dollars to invest. There are three people whose enterprises sell stocks, Fred Fogey (FF), George Gogetter (GG), and Harry Hairbrained (HH). The gross rate of return (1 plus the rate of dividend or capital gain) on each these stocks is normally distributed, and the three are mutually independent. The return on FF has mean 1.1 and standard deviation 0.1, that on GG has mean 1.2 and standard deviation 0.2, and that on HH has mean 1.3 and standard deviation 0.3.

You cannot buy these stocks directly. You can only buy two mutual funds, Safer, which is invested 50:50 in FF and GG, and Riskier, which is invested 50:50 in FF and HH. Suppose you decide to hold x million in Safer and $(1-x)$ million in Riskier.

(a) Write down expressions for the expectation $\mathbf{E}[W]$ and variance $\mathbf{V}[W]$ of your final wealth W, both as functions of x. (Warning: Be careful.)

(b) Suppose you have a mean-variance objective function $\mathbf{E}[W] - 4\ \mathbf{V}[W]$. Find your optimal choice of x. You may do this either from first principles or using a formula from the textbook or the class notes, but if you use such a formula, state and cite it clearly.

SECTION B

Question 3: (30 points)

As the 2012 presidential election approaches, the country is polarized into equal numbers of Democrats and Republicans. Each side is optimistic about victory: The Democrats believe that their candidate has a 70% chance of winning, and the Republicans think that theirs has a 60% chance of winning. The two sides can bet in competitive markets for Arrow-Debreu securities. Each individual has a logarithmic utility-of-consequences function. The Republicans have twice as much initial wealth as the Democrats.

(a) Find the optimal choices of the two sides, and the relative price of the two securities in equilibrium.

(b) Are the absolute prices determinate? Why or why not?

(c) In equilibrium, who holds how many of which securities? Translate this into betting behavior.

Question 4: (30 points)

You are the owner of a production process that requires a manager to run it. If the manager makes effort e, the probability that the process yields output Q_1 is $F(E)$, where F is an increasing, strictly concave function. With the complementary probability $1 - F(E)$, output will be $Q_2 < Q_1$. Each unit of effort yields disutility k to the manager.

You are risk-averse, and have a utility-of-consequences function $U(Q - W)$ that is increasing and strictly concave, where W denotes your payment to the manager. The manager is risk-neutral, and u_m is his outside opportunity utility level.

(a) Suppose you pay the manager W_1 if output is Q_1 and W_2 if output is Q_2, and the manager makes effort E. Write down the expressions for yours and the manager's expected utilities.

(b) First suppose the manager's effort is verifiable. Find the first-order conditions for the contract that is optimal from your perspective. (Ignore second-order conditions; assume they are unproblematic.)

(c) Now suppose the manager's effort is unverifiable. Show that the manager's choice of effort will satisfy the first-order condition

$$F'(E)\ (W_1 - W_2) = k\,.$$

(d) Infer the connection between the optimal contracts when the effort is verifiable and when it is not. Give an intuition for your conclusion.

Question 5: (30 points)

Consider a monopsonist who will derive profit $B(Q) - R$ if he buys quantity Q and pays R for it. Here B is a twice-differentiable increasing and strictly concave function with $B(0) = 0$ and $B'(0) = \infty$. The monopsonist knows that his potential suppliers come in two types $i = 1,\ 2$. He also knows that (1) the probability of a supplier being of type i is θ_i, (2) type i has constant unit cost of production c_i, with $c_1 < c_2$, (3) the supplier of either type wants to maximize his profit $R - c\,Q$, where Q is the quantity he supplies and R is the total payment he receives, and (4) any supplier requires non-negative profit.

The monopsonist offers a menu of choices of quantities and total payments (Q_i, R_i) for $i = 1,\ 2$, intending that if the supplier is of type i he should select menu i, to maximize his expected profit.

(a) What are the participation constraints for the two types?

(b) What are the incentive compatibility constraints for the two types?

(c) Write down the expression for the monopsonist's expected profit.

(d) Assume that the participation constraint of type 1 and the incentive compatibility constraint of type 2 can be ignored. Derive the first-order conditions for the maximization of the monopsonist's expected profit.

(e) Derive the results

$$B'(Q_1) = c_1, \qquad B'(Q_2) = c_2 + \frac{\theta_1}{\theta_2}\ (c_2 - c_1)\,.$$

Give intuitive interpretations for these results.

(f) Show that the participation constraint of type 1, and the incentive compatibility constraint of type 2, are both automatically satisfied.

Question 6: (35 points)

Choose any situation within the health care system that involves adverse selection. For your choice, discuss briefly (in less than 500 words), (a) how well or poorly the US system copes with the problem, (b) how well or poorly other systems in other countries cope with the same problem, (c) what solution you would recommend and why. Your arguments should be grounded in the relevant economic theory. You should not propose utopian solutions

that ignore information asymmetries or assume human perfectibility. Moreover, you should recognize that the solution you propose for the chosen problem may interact with and possibly aggravate other problems with the system.

Your answer will be graded taking into account: [1] the correctness and cogency of your facts and arguments, [2] the use you make of economic theory in your reasoning, [3] the overall organization of your essay. Many of these elements are subjective, and our decision in these matters is final.
