University of California, Davis -- Department of Economics

ECN 103 : ECONOMICS of UNCERTAINTY Professor Giacomo Bonanno

WINTER 2024 - SECOND MIDTERM EXAM **Version 1**

Answer all questions. **If you don't explain (= show your work for) your answers you will get no credit.**

NAME:_____ University ID:_____

- **By writing your name on this exam you certify that you have not violated the University's Code of Academic Contact** (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).

- **If you submit the exam without writing your name and ID, you will get a score of 0 for this exam.**

- **If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.**

1. [20 points] Consider the following money lotteries:

$$A = \begin{pmatrix} \$16 & \$20 & \$36 & \$40 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{12} & \frac{1}{4} \end{pmatrix} \text{ and } B = \begin{pmatrix} \$16 & \$18 & \$20 & \$34 & \$36 & \$40 \\ \frac{1}{6} & x & \frac{1}{36} & y & \frac{1}{12} & \frac{1}{4} \end{pmatrix}$$

Find all the values of x and y that are such that *every* person who (1) has von Neumann-Morgenstern preferences and (2) prefers more money to less, strictly prefers A to B. [In order to get credit you need to show your work.]

2. [27 points] Consider the following money lotteries: $A = \begin{pmatrix} \$30 & \$36 & \$45 & \$48 \\ \frac{p}{2} & \frac{1}{20} & p & \frac{1}{4} \end{pmatrix}$, $B = \begin{pmatrix} \$30 & \$32 & \$40 & \$45 & \$48 \\ \frac{7}{30} & x & y & \frac{7}{15} & \frac{1}{4} \end{pmatrix}$. Find the value of one unknown and write two equations in the other two unknowns whose solution guarantees that *B* is a mean-preserving spread of *A*. [No need to solve the equations. In order to get credit you need to show your work.]

3. [53 points] Consider the following money lotteries: $A = \begin{pmatrix} \$100 & \$25 \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ and $B = \begin{pmatrix} \$4 & \$49 \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$.

(a) [4 points] How does a risk-neutral person rank them?

(b) [4 points] If you know that John is risk-averse, can you tell how he ranks them?

(c) [8 points] Suppose that Amy's utility-of-money function is $U(m) = \sqrt{m}$. What would she choose between *A* and *B*?

Now consider binary lotteries of the form $\begin{pmatrix} \$y & \$z \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ with $y \geq 0$, $z \geq 0$. In your diagrams **measure *y* on the horizontal axis and *z* on the vertical axis.**

(d) [8 points] In the (y, z) plane draw the indifference curve that goes through point *A* = (100,25) for an individual who is risk neutral. Clearly show where point *B* = (4,49) lies relative to this indifference curve. **Write your answer on the next page.**

$A = (100,25)$, $B = (4,49)$

(e)[8 points] In the (y, z) plane draw the indifference curve that goes through point A = (100, 25) for Amy (whose utility function is $U(m) = \sqrt{m}$). Clearly show where point B = (4, 49) lies relative to this indifference curve.

(f) [5 points] For a risk-neutral person calculate the slope, at point A = (100,25), of the indifference curve that goes through point A.

(g) [8 points] For Amy (whose utility function is $U(m) = \sqrt{m}$) calculate the slope, at point A = (100,25), of the indifference curve that goes through point A and the slope, at point B = (4,49), of the indifference curve that goes through point B.

(h) [8 points] Calculate, at point $C = (40, 40)$, the slope of the indifference curve that goes through point C for a risk-neutral person and for Amy (whose utility function is $U(m) = \sqrt{m}$).