ECN 103 : ECONOMICS of UNCERTAINTY Professor Giacomo Bonanno

FIRST MIDTERM EXAM: ANSWERS for VERSION 1

1. **(a)** $A = (93{,}000\ ,\ 113{,}000)$, $B = (96{,}800\ ,\ 111{,}800)$, $C = (79{,}000\ ,\ 114{,}000)$.

(b) (b.1) We need $7{,}000 - p(40{,}000 - 20{,}000) = 8{,}200 - p(40{,}000 - 15{,}000)$, that is, $p = \frac{6}{25} = 0.24$.

(b.2) The slope is $-\frac{\frac{6}{25}}{\frac{19}{25}} = -\frac{6}{19} = -0.31579$.

(c) When $p = \frac{6}{25}$, the expected profit from *B* is 2,200 and the expected profit from *C* is $6{,}000 - \frac{6}{25}5{,}000 = 4{,}800$. Thus *C* lies on a **lower** isoprofit line (corresponding to higher profits) than the one that goes through contract *B*.

(d) For zero profits with full insurance we need the premium to be equal to the expected loss: $h = p(40{,}000)$.

(e) (e.1) $EU(A) = 0.3\sqrt{93{,}000} + 0.7\sqrt{113{,}000} = 326.79$,

$EU(B) = 0.3\sqrt{96{,}800} + 0.7\sqrt{111{,}800} = 327.39$

$EU(C) = 0.3\sqrt{79{,}000} + 0.7\sqrt{114{,}000} = 320.67$. Thus his ranking is $B \succ A \succ C$

(e.2) The utility of No Insurance is $0.3\sqrt{80{,}000} + 0.7\sqrt{120{,}000} = 327.34$. Thus he would choose not to insure.

2. **(a)** $U(A) = 80$ and $U(D) = 20$. Then the expected utility of $\begin{pmatrix} A & D \\ \frac{1}{4} & \frac{3}{4} \end{pmatrix}$ is $\frac{1}{4}80 + \frac{3}{4}20 = 35$. Hence $U(B) =$ 35. Thus the expected utility of $\begin{pmatrix} B & D \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ is $\frac{1}{5}35 + \frac{4}{5}20 = 23$, so that $U(C) = 23$.

(b) $\mathbb{E}[U(L)] = \frac{1}{10}80 + \frac{2}{5}23 + \frac{1}{2}20 = 27.2$ and $\mathbb{E}[U(M)] = \frac{2}{5}35 + \frac{3}{5}23 = 27.8$ thus she prefers *M* to *L*.

(c) We need $35p + 23(1-p) = 27.2$. Thus $p = \frac{35}{100} = 35\%$.

(d) Start from $\begin{matrix} A & B & C & D \\ 80 & 35 & 23 & 20 \end{matrix}$, subtract 20: $\begin{matrix} A & B & C & D \\ 60 & 15 & 3 & 0 \end{matrix}$ and finally divide by 60 to get

$\begin{matrix} A & B & C & D \\ 1 & \frac{15}{60} = \frac{1}{4} & \frac{3}{60} = \frac{1}{20} & 0 \end{matrix}$.