ECN 103 Professor Giacomo Bonanno

THIRD MIDTERM EXAM: ANSWERS for VERSION 2

1. **(a)** **(a.1)** If p = 7.5 then only qualities 5, 6 and 7 will be offered for sale, thus only $\frac{3}{12}+\frac{1}{12}+\frac{5}{12}=\frac{3}{4}$ of the iPods are offered for sale. Hence 9,000 iPods. **(a.2)** $\begin{pmatrix} 5 & 6 & 7 \\ \frac{3}{9} & \frac{1}{9} & \frac{5}{9} \end{pmatrix}$.

(a.3) $1+\left(\frac{3}{9}5+\frac{1}{9}6+\frac{5}{9}7\right)-7.5=-0.278\text{-}0.28$.

(b) **(b.1)** If p = 8.3 then 100% of the iPods are offered for sale, that is, all 12,000 of them.

(b.2) $\begin{pmatrix} 5 & 6 & 7 & 8 \\ \frac{3}{12} & \frac{1}{12} & \frac{5}{12} & \frac{3}{12} \end{pmatrix}$. **(b.3)** $1+\left(\frac{3}{12}5+\frac{1}{12}6+\frac{5}{12}7+\frac{3}{12}8\right)-8.3=-0.633$.

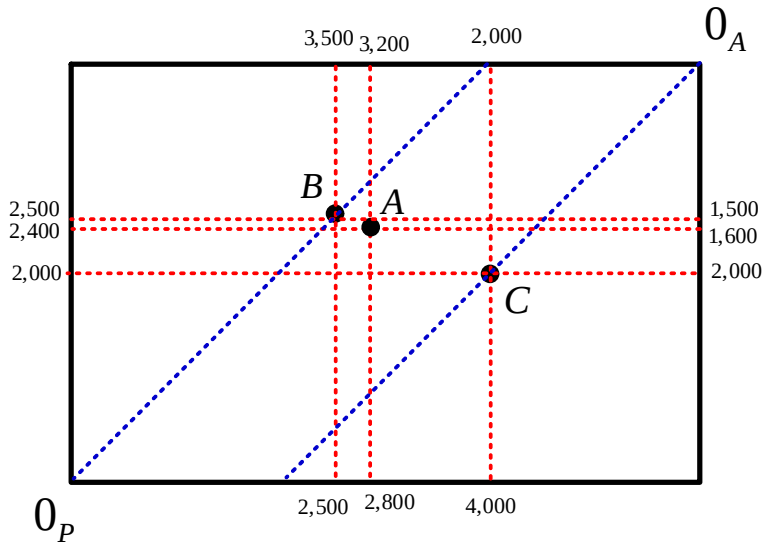
(c) **(c.1)** If p = 6.4 then only qualities 5 and 6 will be offered for sale, thus only $\frac{3}{12}+\frac{1}{12}=\frac{1}{3}$ of the iPods are offered for sale. Hence 4,000 iPods. **(c.2)** $\begin{pmatrix} 5 & 6 \\ \frac{3}{4} & \frac{1}{4} \end{pmatrix}$ **(c.3)** $1+\left(5\frac{3}{4}+6\frac{1}{4}\right)-6.4=-0.15$

2. **(a)** Only the *b* types would buy. Thus expected profits are $1000(900-\frac{1}{40}18000)=450,000$

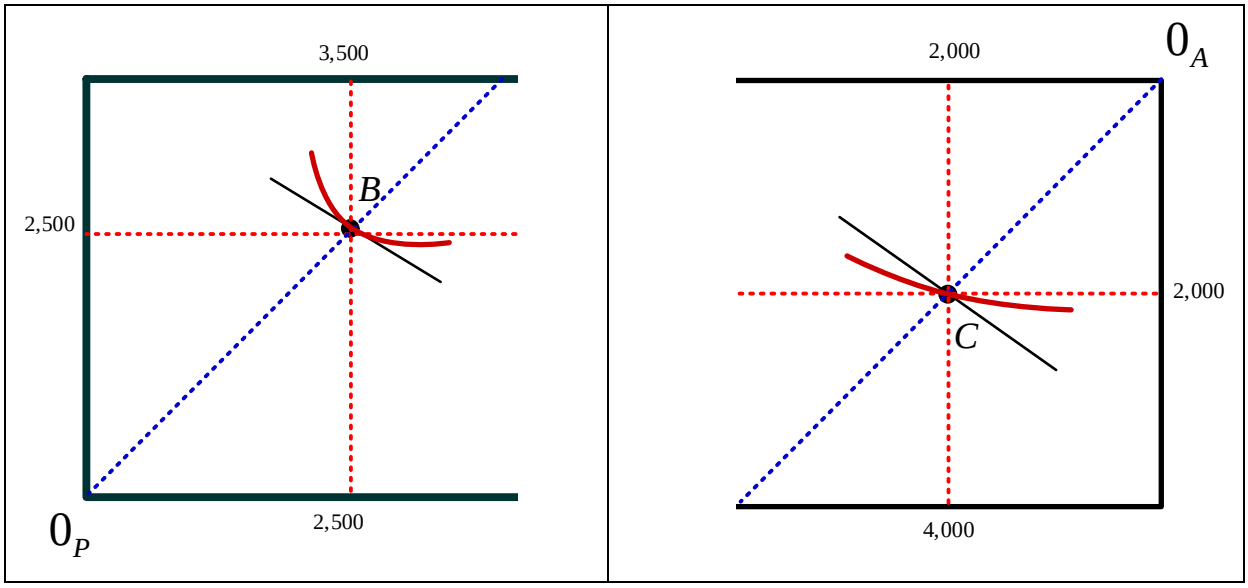
(b) Only the *b* types would buy and they would all choose contract *C*. Thus expected profits are 450,000 as in case (c).

(c) Type *a* would choose contract *A* and type *b* would choose contract *C*. Thus expected profits are 450,000 from type *b* and $1000[300-\frac{1}{120}(18000-1800)]=165,000$ from type *a*, for total of 615,000.

3. **(a.1)**



(a.2) See below. The straight lines are the Agent's indifference curves and the curved lines are the Principal's indifference curves. The two indifference curves are tangent at contract *B*, while the Principal's indifference curve is less steep than the Agent's indifference curve at contract *C*:



(b) Pareto efficiency requires that the risk-averse party be guaranteed a fixed income. Thus the only Pareto efficient contract is contract B (which is on the 45^o line for the Principal).

(c) From the Principal's point of view, contract A is the lottery $\begin{pmatrix} 2{,}800 & 2{,}400 \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ whose expected utility is $\frac{1}{5}\sqrt{2{,}800}+\frac{4}{5}\sqrt{2{,}400}=49.77$, contract B is the sure lottery $\begin{pmatrix} 2{,}500 \\ 1 \end{pmatrix}$ whose expected utility is $\sqrt{2{,}500}=50$ and contract C is the lottery $\begin{pmatrix} 4{,}000 & 2{,}000 \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ whose expected utility is $\frac{1}{5}\sqrt{4{,}000}+\frac{4}{5}\sqrt{2{,}000}=48.43$. Thus the Agent ranks the contracts as follows: $B \succ A \succ C$.