

CEA case $[0.4, 0.3, 0.2, 0.1]$ $E = 40$ claim = 100

$E = 10$ so $X_0 = 10$ agent = 0

restricted $[0.4, 0.6, 0, 0]$

$$S_1 = 0.6 + 3 \times 0.3$$

$$S_2 = 0 + 3 \times 0.2$$

$$S_3 = 0 + 3 \times 0.1$$

$$\Rightarrow C = (40, 37.5, 15, 7.5)$$

$$7.5 + 3X = 40 \quad X = 10.83$$

unbounded $S_1 = 4 \times 0.6 = 2.4 \quad S_2 = S_3 = 0 \quad (40, 60, 0, 0)$

$$0 + 2X = 60 \quad X = 30$$

$$[10 \rightarrow 10.83 \rightarrow 20]$$

agent = 1 and agent 2 similar procedure and no change.

$$S_0 = 0.7 + 3 \times 0.4 = 1.9 \quad C_0 = 47.5$$

$$S_2 = 0 + 3 \times 0.2 = 0.6 \quad C_2 = 15$$

$$S_3 = 0 + 3 \times 0.1 = 0.3 \quad C_3 = 7.5$$

$$7.5 < X < 15 \quad 7.5 + 3X = 40 \quad X = 10.83$$

$$S_0 > 2.8 \rightarrow C_0 = 70 \quad C_2 = C_3 = 0$$

$$0 + 2X = 40 \quad X = 20$$

$$S_0 = 0.8 + 3 \times 0.4 = 2 \quad C_0 = 50$$

$$S_1 = 0 + 3 \times 0.3 = 0.9 \quad C_1 = 22.5$$

$$S_3 = 0 + 3 \times 0.1 = 0.3 \quad C_3 = 7.5$$

$$7.5 + 3X = 40 \rightarrow X = 10.83$$

$$0 + 2X = 40 \quad X = 20$$

agent 3. $0.4 + 0.3 + 0.2 = 0.9$

$$a + b + c = 0$$

$$[0.4 + a, 0.3 + b, 0.2 + c, 0.1]$$

$$\begin{cases} S_0 = 1.6 + a \\ S_1 = 1.2 + b \\ S_2 = 0.8 + c \end{cases}$$

$$C_0 = 25 + 25 \times 0.9 = 47.5$$

$$C_1 = 22.5$$

$$C_2 = 15$$

$$\sum_i X_i = \min(40, X) + \min(30, X) + \min(20, X) + \min(10, X) = 3X + 10 \quad X = 10$$

No improvement

$$[10 \rightarrow 10 \rightarrow 10]$$

$$\text{unbounded: } S_0 = 3.6 \quad S_0 = \frac{3.6}{4} = 0.9$$

$$S_1 = S_2 = 0 \Rightarrow$$

$$S_3 = 0.4 \Rightarrow S_3 = 0.4/4 = 0.1$$

$$C_0 = 100 \times 0.9 = 90$$

$$C_2 = 100 \times 0.1 = 10$$

$$\min(90, X) + \min(10, X) + \min(0, X) + \min(0, X)$$

$$X = 30 \quad X_3 = \min(10, 30) = 10$$

CEA $[0.2, 0.3, 0.3, 0.2]$ $E=40$ $clain=100$

$$4x = 40 \quad x=10$$

restricted of agent = 0

$$a+b+c=0.8$$

$$c_0 = 25 \times 0.8 = 20$$

$$S_1 = 0.3x + a = 0.9 + a$$

$$c_1 = 25 \times (0.9 + a)$$

$$S_2 = 0.3x + b = 0.9 + b$$

$$c_2 = 25 \times (0.9 + b)$$

$$S_3 = 0.2x + c = 0.6 + c$$

$$c_3 = 25 \times (0.6 + c)$$

$$a=0.8 \quad b, c=0 \quad c = (20, 42.5, 22.5, 15)$$

$$215 < x < 26 \quad \min(20, x) + \min(42.5, x) + \min(22.5, x) + \min(15, x)$$

$$= 3x + 15 = 40 \quad x = 8.3 \quad \text{not in range.}$$

$$\text{so for } 4x = 40 \quad x = 10 \quad \checkmark$$

$$\therefore x_0 = \min(20, 10) = 10.$$

unbounded $(0.8, 3.2, 0, 0)$ $\min(20, x) + \min(80, x) = 40.$

$$x = 20 \quad x_0 = \min(20, 20) = 20.$$

for agent 1.

restricted similarly $S_0 = 0.8 + 0.5 = 1.3.$

$$S_1 = 1.2$$

$$S_2 = 0.9$$

$$S_3 = 0.6.$$

since nothing change in other row. $[37.5, 30, 22.5, 15]$

$$x = 10 \quad x_1 = 10.$$

unbounded $S_0 = 2.8 (70) \quad S_1 = 1.2 (a=30) \quad S_2 = S_3 = 0.$

$$\min(70, x) + \min(30, x) = 40 \quad x = 20. \quad x_1 = \min(30, 20) = 20$$

CEA extreme $[0.7, 0.1, 0.1, 0.1]$

$$C = [70, 10, 10, 10] \quad \text{agent} = 0.$$

$$\sum_{j=1}^3 C_j = 100 - 70 = 30. \quad x = 10.$$

unbounded $\min(70, x) + \min(30, x) + 0 + 0 = 40$

$$20x = 40 \quad x = 20. \quad \text{If } x > 30 \quad 30 + x > 40$$

$$\therefore x_0 = 20 \quad [10 \rightarrow 10 \rightarrow 20]$$

agent = 1

original = 10.

restricted

$$\begin{cases} S_0 = 2.8 - x \\ S_1 = 0.1 \times 4 = 0.4 \\ S_2 = 0.4 + y \\ S_3 = 0.4 + z \end{cases}$$

$$x = y + z$$

$$C = (70 - 75x, 10, 10 + 25y, 10 + 25z)$$

let $x=0 \quad y=z=0$ will be min.

$$\min(70, x) + 3 \min(10, x) = 40 \quad x_1 = \min(10, 10) = 10$$

unbounded

$$\text{If } x > 10, \quad 10 + 3x = 40 \quad x \text{ still} = 10$$

$$S_0 = 2.8 - 0.8 = 2.0$$

$$S_1 = 0.4$$

$$S_2 = S_3 = 0.$$

$$C_0 = 25 \times 3.6 = 90. \quad C_1 = 10 \quad C_2 = C_3 = 0.$$

$$\min(90, x) + \min(10, x) = 40.$$

$$\text{If } x > 10, \quad x + 10 = 40 \quad x > 30$$

$$x_1 = \min(10, 30) = 10. \quad \text{no improvement}$$

$$[10 \rightarrow 10 \rightarrow 10]$$

uniform $[0, 25, 0.25, 0.25, 0.25]$

still $4x = 40 \quad x = 10$

restricted

$$0.25, 0.25 + x, 0.25 - x, 0.25 - 2x, y + 2x$$

new row $(0.25, 0.75, 0, 0)$

$$S_0 = 0.25x_1 = 1$$

$$S_1 = 0.25x_1 + 0.75 = 1.3$$

$$S_2 = 0.25x_1 = 0.75$$

$$S_3 = 0.25x_1 = 0.75$$

$$C = (2.5, 3.5, 1.75, 1.75)$$

$$x_0 = \min(2.5, x) \quad x_1 = \min(3.5, x) \quad x_2 = x_3 = 1.75$$

$$2.5 < x < 3.5, \quad x + 1.75 + 1.75 = 40 \quad x > 1.75 \text{ not in the range}$$

$$x < 1.75 \quad 4x = 40 \quad x = 10 \quad x_0 = \min(2.5, 10) = 2.5$$

unbounded

$$C = (0.25, 0.75, 0, 0) \quad x < 2.5 \quad \text{so } x = 2.5$$

$$x_0 = \min(2.5, 2.5) = 2.5$$

$$10 \rightarrow 10 \rightarrow 20$$

extreme $[0.7, 0.2, 0.05, 0.05]$ agent 1.

$$C(\min [70, 20, 5, 5]) \quad 5 + 5 + 2x = 40 \quad x = 15$$

$$x_0 = \min(70, 15) = 15$$

restricted

$$\begin{cases} S_1 = 0.7x_1 \\ S_2 = 0.2x_2 \\ S_3 = 0.05x_3 \\ S_4 = 0.05x_4 \end{cases}$$

$$a_1 + a_2 + a_3 + a_4 = 0.3$$

$$a_1 = 0.3 \quad a_2 = a_3 = 0$$

$$C = (70, 22.5, 3.75, 3.75)$$

$$2x + 3.75 + 3.75 = 40 \quad x = 16.25$$

$$x_0 = \min(70, 16.25) = 16.25$$

unbounded

$$C = 70$$

$$\min(70, x) + \min(30, x) = 40 \quad x = 20$$

$$x_0 = \min(70, 20) = 20$$

similar for agent 1.

$$C = (0, 20, 5, 0)$$

$$\min(70, x) + \min(50, x) = 40 \quad x = 20$$

$$x_1 = \min(20, 20) = 20$$

$$15 \rightarrow 16.25 \rightarrow 20$$

for agent 2.

$$x = 15 \quad x_2 = \min(0.15) = 5$$

restricted

$$\begin{cases} S_0 = 0.2x_1 + 0.05x_2 = 4.05 \\ S_1 = 0.2x_1 + 0 = 0.6 \\ S_2 = 0.05x_1 = 0.2 \\ S_3 = 0.05x_2 = 0.05 \end{cases}$$

$$C = (16.25, 15, 5, 3.75)$$

$$x + x + 5 + 3.75 = 40$$

$$2x = 40 - 8.75$$

$$x = 15.625$$

$$x_2 = \min(15, 15.625) = 5$$

unbounded

$$C = (0.95, 0.5, 0)$$

$$\min(95, x) + \min(50, x) = 40$$

$$x = 15$$

$$x_2 = \min(15, 5) = 5$$

$$5 \rightarrow 5 \rightarrow 5$$