

Alternating moves and ultimatum game paper
 Section 3 and Table 2 computations

#1: CaseMode := Sensitive

#2: InputMode := Word

Share of the first mover in game 0

#3: $\phi \in \text{Real } (0, 1)$

* t=0: game zero, A moves before B

#4: $\text{profita}_0 = \phi$

#5: $\text{profitb}_0 = 1 - \phi$

#6: $s_0 = \phi - (1 - \phi)$

#7: $s_0 = 2 \cdot \phi - 1$

* t=-1: game -1, B moves to divide the surplus

#8: $a_1 = (1 - \phi) \cdot s_0$

#9: $a_1 = (1 - \phi) \cdot (2 \cdot \phi - 1)$

#10: $b_1 = \phi \cdot s_0$

#11: $b_1 = \phi \cdot (2 \cdot \phi - 1)$

#12: $\text{profita}_1 = \phi - \phi \cdot (2 \cdot \phi - 1)$

#13: $\text{profita}_1 = 2 \cdot \phi \cdot (1 - \phi)$

#14: $\text{profitb}_1 = 1 - \phi + \phi \cdot (2 \cdot \phi - 1)$

#15: $\text{profitb}_1 = 2 \cdot \phi^2 - 2 \cdot \phi + 1$

$$\#16: \text{profita}_1 + \text{profitb}_1 = 2 \cdot \phi \cdot (1 - \phi) + 2 \cdot \phi^2 - 2 \cdot \phi + 1$$

$$\#17: \text{profita}_1 + \text{profitb}_1 = 1$$

$$\#18: s_1 = 2 \cdot \phi^2 - 2 \cdot \phi + 1 - 2 \cdot \phi \cdot (1 - \phi)$$

$$\#19: s_1 = (2 \cdot \phi - 1)^2$$

* t=-2: game -1, A moves to divide the surplus

$$\#20: a_2 = \phi \cdot s_1$$

$$\#21: a_2 = \phi \cdot (2 \cdot \phi - 1)^2$$

$$\#22: b_2 = (1 - \phi) \cdot s_1$$

$$\#23: b_2 = (1 - \phi) \cdot (2 \cdot \phi - 1)^2$$

$$\#24: \text{profita}_2 = \text{profita}_1 + a_2$$

$$\#25: \text{profita}_2 = 2 \cdot \phi \cdot (1 - \phi) + \phi \cdot (2 \cdot \phi - 1)^2$$

$$\#26: \text{profita}_2 = \phi \cdot (4 \cdot \phi^2 - 6 \cdot \phi + 3)$$

$$\#27: \text{profitb}_2 = \text{profitb}_1 - a_2$$

$$\#28: \text{profitb}_2 = (2 \cdot \phi^2 - 2 \cdot \phi + 1) - \phi \cdot (2 \cdot \phi - 1)^2$$

$$\#29: \text{profitb}_2 = -4 \cdot \phi^3 + 6 \cdot \phi^2 - 3 \cdot \phi + 1$$

$$\#30: \text{profita}_2 + \text{profitb}_2 = \phi \cdot (4 \cdot \phi^2 - 6 \cdot \phi + 3) + (-4 \cdot \phi^3 + 6 \cdot \phi^2 - 3 \cdot \phi + 1)$$

$$\#31: \text{profita}_2 + \text{profitb}_2 = 1$$

$$\#32: s_2 = \phi \cdot (4 \cdot \phi^2 - 6 \cdot \phi + 3) - (-4 \cdot \phi^3 + 6 \cdot \phi^2 - 3 \cdot \phi + 1)$$

$$\#33: s_2 = (2 \cdot \phi - 1)^3$$

* t=-3: game -1, B moves to divide the surplus

$$\#34: a_3 = (1 - \phi) \cdot s_2$$

$$\#35: a_3 = (1 - \phi) \cdot (2 \cdot \phi - 1)^3$$

$$\#36: b_3 = \phi \cdot s_2$$

$$\#37: b_3 = \phi \cdot (2 \cdot \phi - 1)^3$$

$$\#38: \text{profita}_3 = \text{profita}_2 - \phi \cdot s_2$$

$$\#39: \text{profita}_3 = \phi \cdot (4 \cdot \phi^2 - 6 \cdot \phi + 3) - \phi \cdot (2 \cdot \phi - 1)^3$$

$$\#40: \text{profita}_3 = -4 \cdot \phi \cdot (2 \cdot \phi^3 - 4 \cdot \phi^2 + 3 \cdot \phi - 1)$$

$$\#41: \text{profitb}_3 = \text{profitb}_2 + s_2$$

$$\#42: \text{profitb}_3 = (-4 \cdot \phi^3 + 6 \cdot \phi^2 - 3 \cdot \phi + 1) + \phi \cdot (2 \cdot \phi - 1)^3$$

$$\#43: \text{profitb}_3 = 8 \cdot \phi^4 - 16 \cdot \phi^3 + 12 \cdot \phi^2 - 4 \cdot \phi + 1$$

$$\#44: \text{profita}_3 + \text{profitb}_3 = -4 \cdot \phi \cdot (2 \cdot \phi^3 - 4 \cdot \phi^2 + 3 \cdot \phi - 1) + (8 \cdot \phi^4 - 16 \cdot \phi^3 + 12 \cdot \phi^2 - 4 \cdot \phi + 1)$$

$$\#45: \text{profita}_3 + \text{profitb}_3 = 1$$

$$\#46: s_3 = 8 \cdot \phi^4 - 16 \cdot \phi^3 + 12 \cdot \phi^2 - 4 \cdot \phi + 1 - -4 \cdot \phi \cdot (2 \cdot \phi^3 - 4 \cdot \phi^2 + 3 \cdot \phi - 1)$$

$$\#47: s_3 = (2 \cdot \phi - 1)^4$$

Verifying some values in Figure 1 to ensure that they are consistent with the above derivations (Table 2).

Set $\phi=0.8$

$$\#48: s_3 = (2 \cdot 0.8 - 1)^4$$

$$\#49: s_3 = 0.1296$$

$$\#50: \text{profita}_3 = -4 \cdot 0.8 \cdot (2 \cdot 0.8^3 - 4 \cdot 0.8^2 + 3 \cdot 0.8 - 1)$$

$$\#51: \text{profita}_3 = 0.4352$$

$$\#52: \text{profitb}_3 = 8 \cdot 0.8^4 - 16 \cdot 0.8^3 + 12 \cdot 0.8^2 - 4 \cdot 0.8 + 1$$

$$\#53: \text{profitb}_3 = 0.5648$$

$$\#54: s_2 = (2 \cdot 0.8 - 1)^3$$

$$\#55: s_2 = 0.216$$

$$\#56: \text{profita}_2 = 0.8 \cdot (4 \cdot 0.8^2 - 6 \cdot 0.8 + 3)$$

$$\#57: \text{profita}_2 = 0.608$$

$$\#58: \text{profitb_2} = -4 \cdot 0.8^3 + 6 \cdot 0.8^2 - 3 \cdot 0.8 + 1$$

$$\#59: \text{profitb_2} = 0.392$$

*** discussion below Figure 2

$$\#60: a_1 = (1 - 0.8) \cdot (2 \cdot 0.8 - 1)$$

$$\#61: a_1 = 0.12$$

$$\#62: b_1 = 0.8 \cdot (2 \cdot 0.8 - 1)$$

$$\#63: b_1 = 0.48$$

$$\#64: \text{profita_1} = 2 \cdot 0.8 \cdot (1 - 0.8)$$

$$\#65: \text{profita_1} = 0.32$$

$$\#66: \text{profitb_1} = 2 \cdot 0.8^2 - 2 \cdot 0.8 + 1$$

$$\#67: \text{profitb_1} = 0.68$$

$$\#68: s_1 = (2 \cdot 0.8 - 1)^2$$

$$\#69: s_1 = 0.36$$