The War of Attrition

Game

• $20 bill up for grabs
• Anyone can volunteer to participate now.
• Game proceeds in rounds.
• Each period presents choice of donating $2 to GSB or exiting.
• Last person in game gets $20.
• Tie for last: 2 get $10 each; 3-4 get $5 each, 5 or more get nothing

Examples

• Microsoft v. Netscape
• US Civil War
• Telecoms lobbying FCC
• Off-shore oil drilling (attempt to go last)
• Elk
• Lawsuits
  – BMC, Holly
• Competition in takeovers
War of Attrition
- War of attrition is situation where one must lose
- No splitting of the proceeds
- Races to be first to patent critical technology
- Race to set standard
- Race to be first supplier of satellite TV

Formal Model
- Prize worth $1, cost $c to fight per period
- Each player chooses probability $p$ of exiting per period
- If both exit, split prize
- Best response requires
  \[ \frac{1}{2} p = p - c + (1 - p) \frac{1}{2} p. \]
- Value of exit = value of staying in

Solution
\[ p = 1 - \sqrt{1 - 2c} \]

How long does war last? Turns out this is $1/2c$. Thus, for $c=.1$, war lasts five years on average
- Expected profits are $1/2p$. Small!
- Profits are increasing in $c$.
  - Effect on competitor outweighs own effect
Properties of War of Attrition

- Wars can last a long time
  - No definite end, once started
- Even winner may lose money
  - Random termination
- Reduce cost of fighting and the war lengthens
  - Expected cost of fighting the same
  - Reduced profits

Solutions to War of Attrition

- Merger
- Pay-off
- Split market
- Don’t fight in first place
- Convince other guy not to fight in the first place
- Signal commitment