

---

<http://www.youtube.com/watch?v=SSbZrQp-HOk>

# Allais example (take 2!)

---

- Famous example of Allais (1953)
  - **A**: [1.0, \$1k]
  - **B**: [0.89, \$1k; 0.01, \$0k; 0.10, \$5k]
  - **C**: [0.89, \$0k; 0.11, \$1k]
  - **D**: [0.90, \$0k; 0.10, \$5k]
- Most people prefer  $A > B$ ,  $D > C$ 
  - This is inconsistent....

# Example: Insurance

---

- Consider the lottery [0.5,\$1000; 0.5,\$0]
  - What is its **expected monetary value**? (\$500)
  - What is its **certainty equivalent**?
    - Monetary value acceptable in lieu of lottery
    - \$400 for most people
  - Difference of \$100 is the **insurance premium**
    - There's an insurance industry because people will pay to reduce their risk
    - If everyone were risk-neutral, no insurance needed!

# Example: Insurance

- Because people ascribe different utilities to different amounts of money, insurance agreements can increase both parties' expected utility

You own a car. Your lottery:

$$L_Y = [0.8, \$0; 0.2, -\$200]$$

i.e., 20% chance of crashing

You do not want  $-\$200$ !

$$U_Y(L_Y) = 0.2 * U_Y(-\$200) = -200$$

$$U_Y(-\$50) = -150$$

Amount	Your Utility $U_Y$
\$0	0
-\$50	-150
-\$200	-1000

# Example: Insurance

---

- Because people ascribe different utilities to different amounts of money, insurance agreements can increase both parties' expected utility

You own a car. Your lottery:

$$L_Y = [0.8, \$0; 0.2, -\$200]$$

i.e., 20% chance of crashing

You do not want  $-\$200!$

$$U_Y(L_Y) = 0.2 * U_Y(-\$200) = -200$$

$$U_Y(-\$50) = -150$$

Insurance company buys risk:

$$L_I = [0.8, \$50; 0.2, -\$150]$$

i.e., \$50 revenue + your  $L_Y$

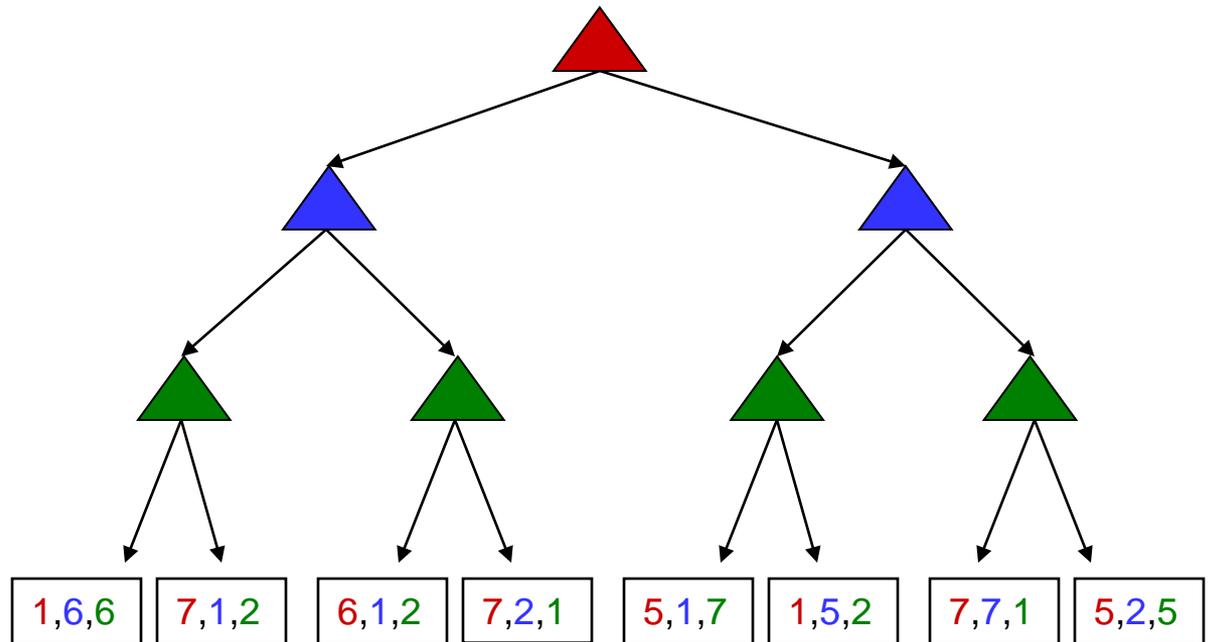
Insurer is risk-neutral:

$$U(L) = U(\text{EMV}(L))$$

$$\begin{aligned} U_I(L_I) &= U(0.8 * 50 + 0.2 * (-150)) \\ &= U(\$10) > U(\$0) \end{aligned}$$

# Non-Zero-Sum Utilities

- Similar to minimax:
  - Terminals have utility tuples
  - Node values are also utility tuples
  - Each player maximizes its own utility
  - Can give rise to cooperation and competition dynamically...



- 
- [http://videolectures.net/otee06\\_gelly\\_umc/](http://videolectures.net/otee06_gelly_umc/)
  - [http://videolectures.net/site/normal\\_dl/tag=8524/otee06\\_gelly\\_umc\\_01.pdf](http://videolectures.net/site/normal_dl/tag=8524/otee06_gelly_umc_01.pdf)
  - [http://www.wpi.edu/Pubs/E-project/Available/E-project-041808-104235/unrestricted/Random\\_Search\\_Algorithms\\_Final\\_Presentation.pdf](http://www.wpi.edu/Pubs/E-project/Available/E-project-041808-104235/unrestricted/Random_Search_Algorithms_Final_Presentation.pdf)