Modeling Preferences - 1

Decision Supports Systems 2017/18, Lecture 06

Marko Tkalčič

Alpen-Adria-Universität Klagenfurt

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- in decision under uncertainty, the fundamental trade-off question is
  - **How much risk is a decision maker willing to take?**

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- we will learn how to model our risk attitude
  - through the concept of a utility function
  - the utility function reflects personal expected gain (as opposed to the expected monetary value)

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Risk

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- ... but it can lead to decisions that may not seem intuitively appealing.

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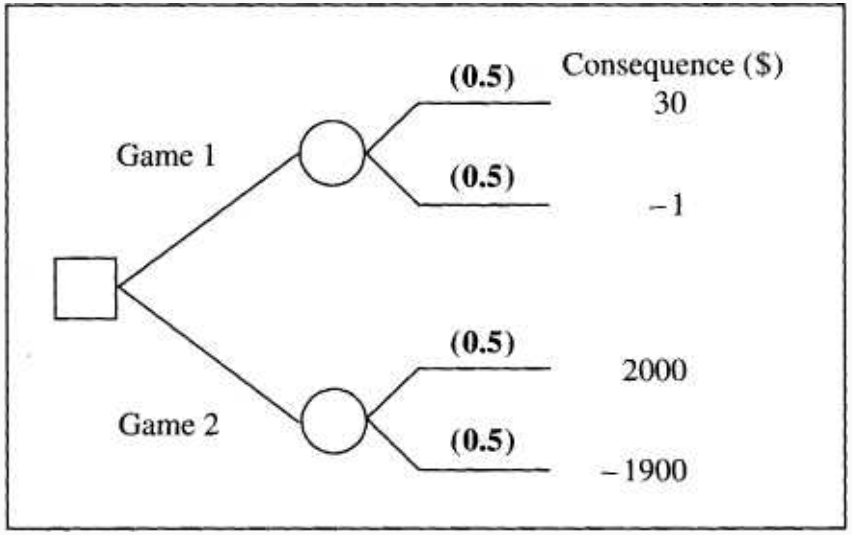
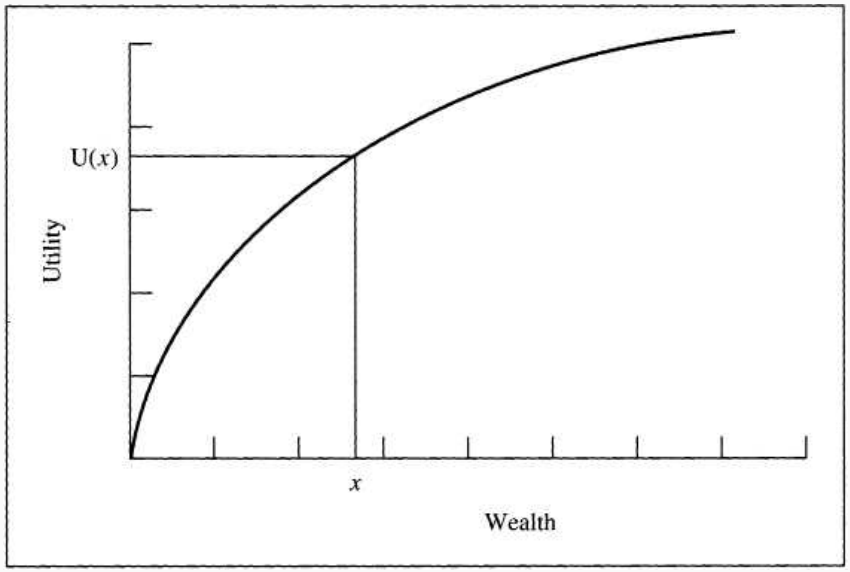
- example
  - you can play one of the two games at the time
  - Game 1: EMV = 14,50
  - Game 2: EMV = 50,00
  - EMV says to choose Game 2
  - most people would choose Game 1
- EMV does not capture risk attitudes



Utility function

- a utility function models the expected utility (of a decision maker) against possible outcomes
- $U(x)$, where x are the possible outcomes
- decision makers can be:
  - afraid of risk (risk averse): $U(x)$ is concave, e.g. $U(x) = log(x)$
  - risk neutral, e.g. $U(x) = k \cdot x$
  - risk-seeking: $U(x) is convex, e.g. $U(x) = x^2$



Risk Attitudes

- Imagine that you are forced to play the following game:
  - Win $500 with probability 0.5
  - Lose $500 with probability 0.5
- Would you pay to get out of this situation? How much?
- $EMV = 0$

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  - e.g. insurance is risk aversion

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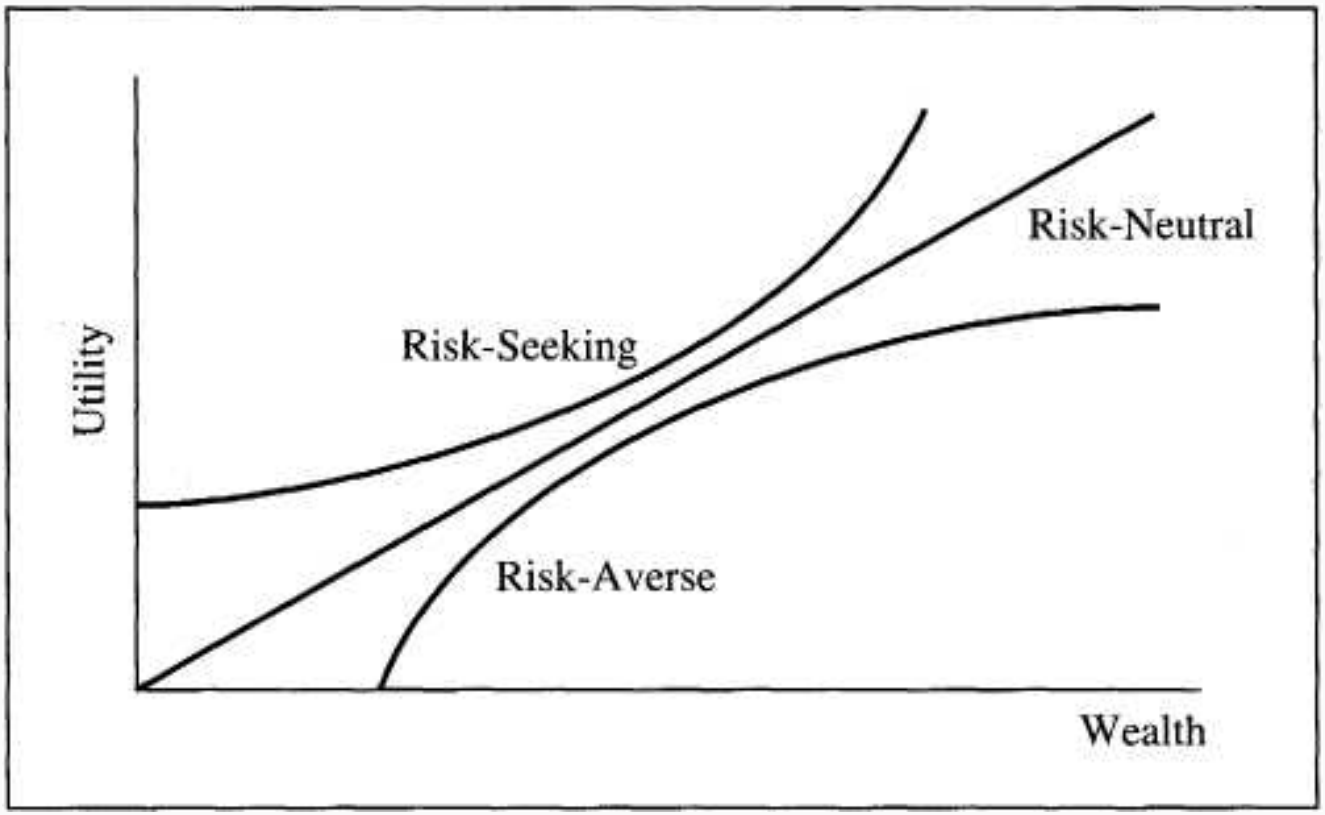
- if you would not do anything you are risk-neutral
  - maximizing utility = maximizing EMV

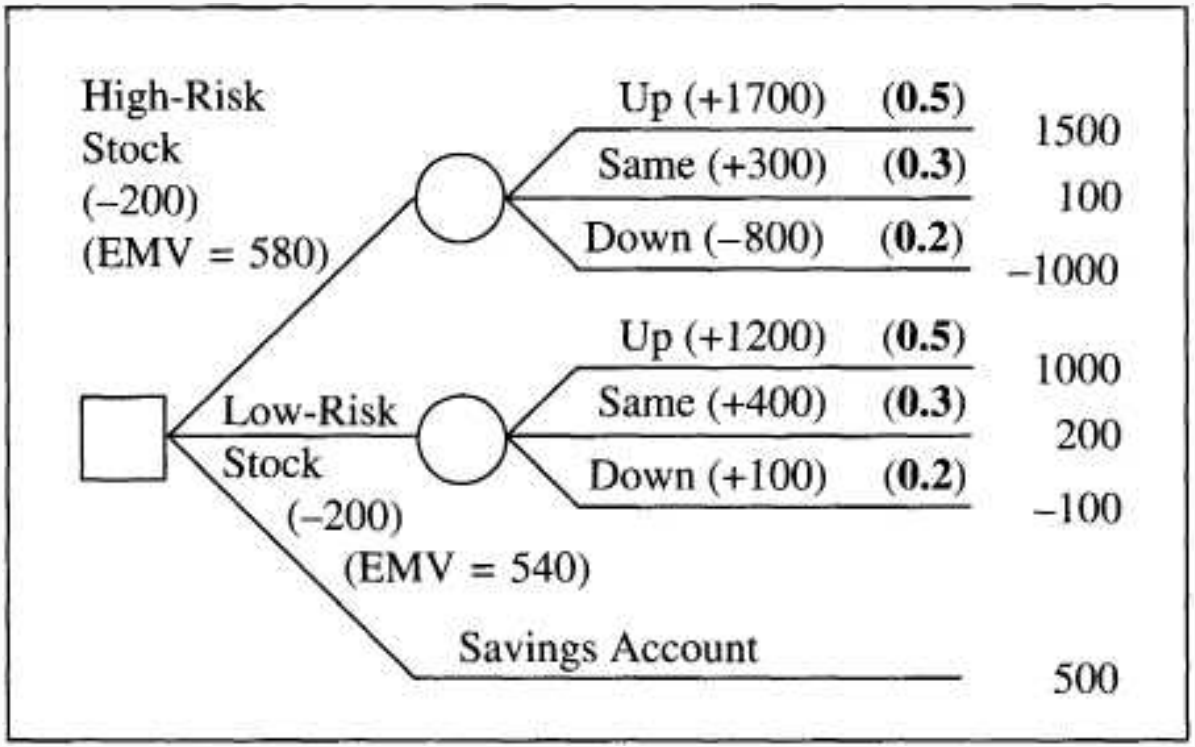
Risk attitudes



- The whole idea of a utility function is that it should help to choose from among alternatives that have uncertain payoffs.
- Instead of maximizing expected value, the decision maker should maximize expected utility.

Stock Market Example

- let's consider a stock market example
  - savings account yields 500
  - making an investment costs 200 (broker fee)
  - last column is net gain (fees included)



- a risk-neutral person would maximize EMV, hence would choose the risky path

Stock Market Example

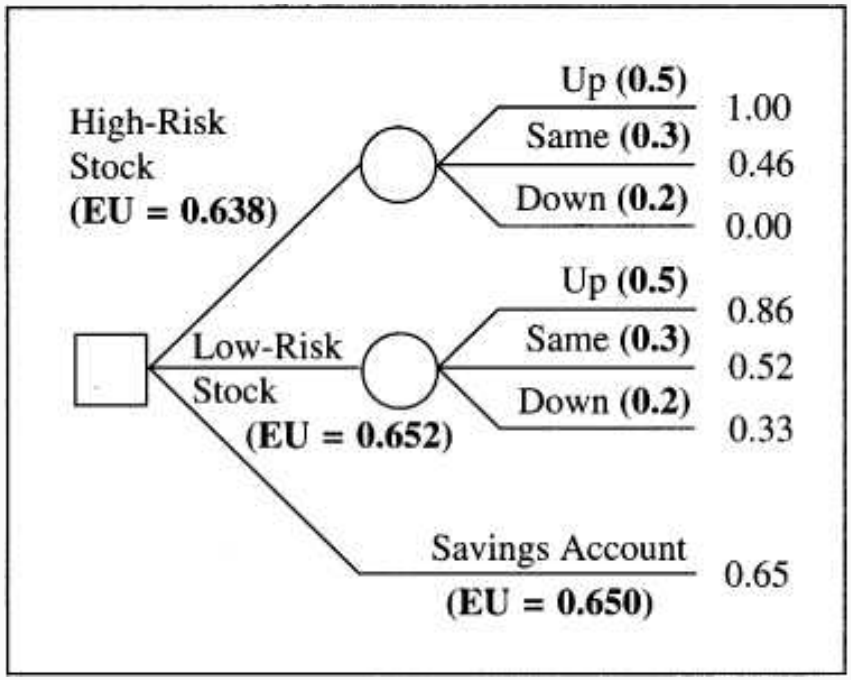
Money	Utility
1500	1.00
1000	0.86
500	0.65
200	0.52
100	0,46
-100	0.33
-1000	0.00

- the utility function re-ranked the preferences

$$EU(High - RiskStock) = 0.638$$

$$EU(Low - RiskStock) = 0.652$$

$$EU(SavingsAccount) = 0.650$$



References

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- Robert Clemen, Making Hard Decisions, 2nd Edition, 1996, Brooks Cole Publishing
- https://web.stanford.edu/~jdlevin/Econ%20202/Uncertainty.pdf