The Modeling Process

- Convert real world situation to mathematical context
- Goal: Added Value → learn something novel from model
  (no mathematical wheel spinning)

Examples

- Should stock be bought or sold?
- Is the earth becoming warmer?
- Does creating a law have a positive or a negative societal effect?
- What is the most valuable property in monopoly?
- What is the maximal tolerable connectivity of power stations (or chips)?
- What is the optimal speed of an aircraft at a given wind speed?
- For which sales price and investment in ads for a commodity is the profit maximal?

Modeling Process

- Identify problems and questions
- Identify relevant variables (ignore irrelevant ones)
- Identify type of mathematical model (function, difference equation,….)
- Set up the model (relate variables to each other)
- Simplify until tractable (depends on tools for analysis)
  - Analytical: Need solvable equations
  - Computer: Need tolerable complexity of solution algorithm
- Solve equations
- Answer questions (added value)
- Tweak model and compare solutions (what's its sensitivity?)
- Compare model output with observations