

Overview

Modeling is applied math; mapping between the real world and mathematical framework. Getting the mapping right is the hardest part. All models are wrong (attr. George Box): want an approximate solution to the right question, rather than an exact solution to a different question a mathematical box. The logical box is coarse but strong. The mathematical box is fine-grained but flimsy. The mathematical box is a beautiful way of wrapping up a problem, but it will not hold the phenomena unless they have been caught in a logical box to begin with.

Tools:

- Spreadsheets
intuitive, visible, auto-updating hard to reproduce, non-transparent, numerically sloppy, often closed-source
- Programming languages (R, Python, MATLAB(Scilab or Octave))
free and open (some), flexible, extendable, widely used, harder to learn, somewhat limited for big data, no support/arrogant
- Analytical solutions
general, rigorous, computationally efficient, very hard

abstract	concrete
strategic	tactical
general	specific
theoretical	applied
qualitative	quantitative
descriptive	predictive
mathematical	statistical
mechanistic	phenomenological
pattern	process
analytical	computational
dynamic	static
continuous	discrete
population-based	individual-based
deterministic	stochastic

linear	nonlinear
univariate	multivariate
discrete	continuous time
deterministic	stochastic
also: discrete	continuous state
individual	population-based