Universiteit Utrecht

Copernicus Institute of
Sustainable Development

TITLE

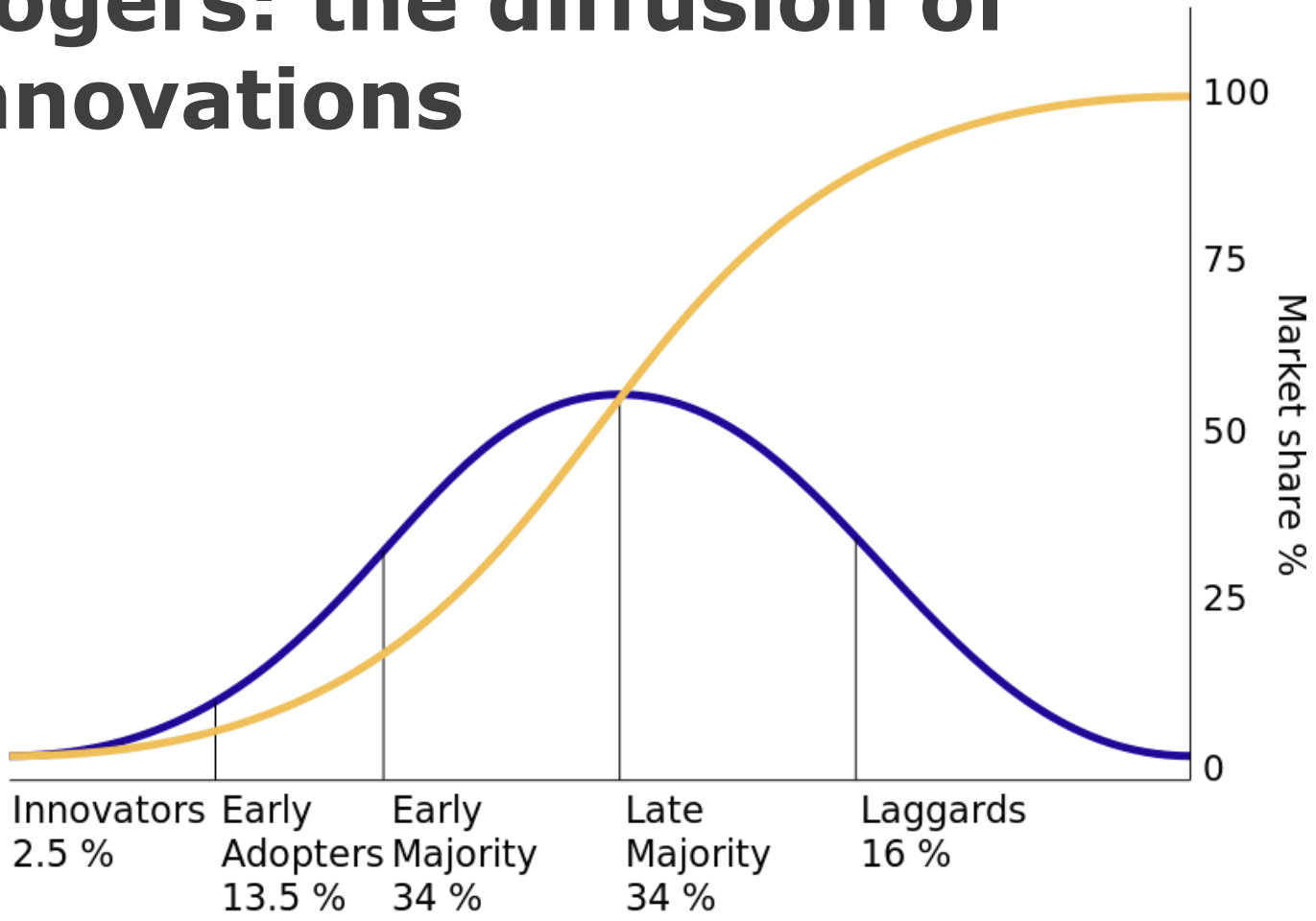
Why models?

- What do you already know about innovation and technological change?
- What would you like to know..... If you were a:
  - Manager?
  - Policymaker?

Model building

- Observe facts..
- Treat these facts as if they were the end product of a process that we do not know, and speculate about what that process might look like (i.e. build a model)
- Deduction: What would be other observable implications and consequences if our model of the underlying (but unobservable) process would be true?
- Test whether or not these implications and consequences do in fact occur (this

Rogers: the diffusion of innovations



Can we think of a model that explains the S-curve?

A small experiment

- Use the Lave and March method
- Think of a single process that explains adoption Roger's style

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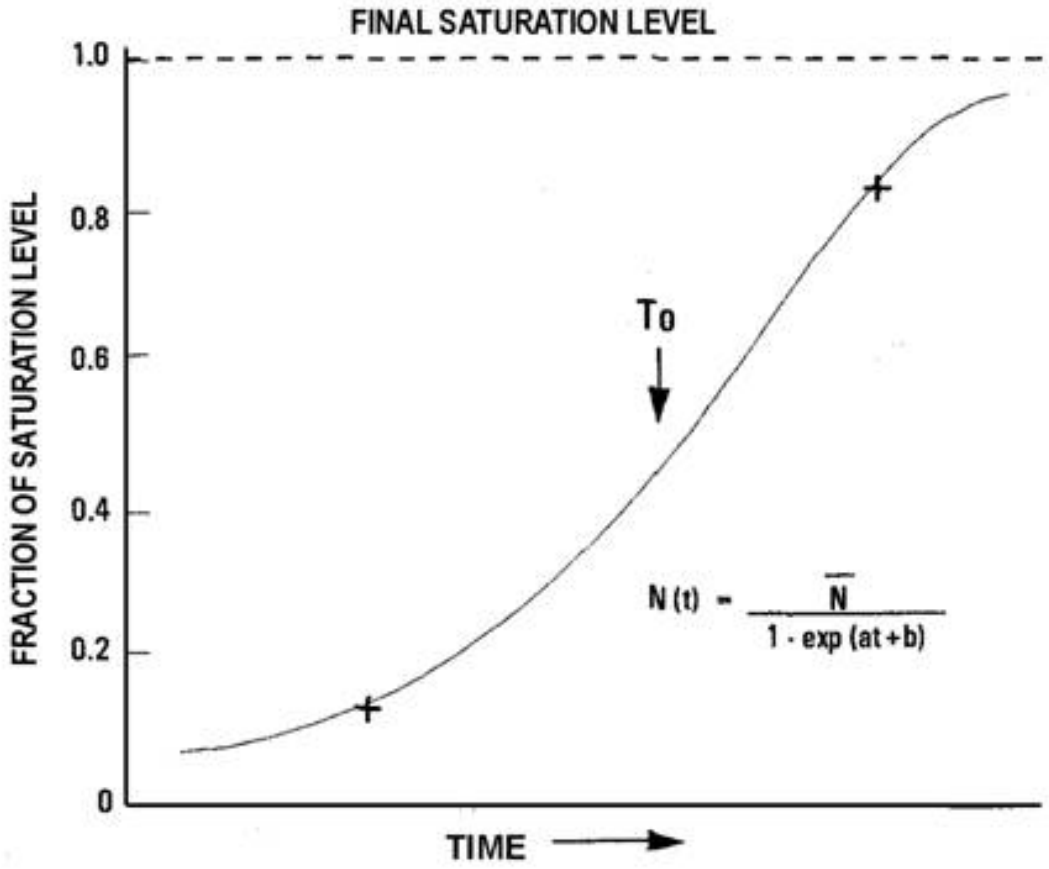
Diffusion models

- Roger model has little predictive value
- Can we predict the shape of the curve before diffusion really takes off?

- Two models
  - The Bass model
  - The Fisher-Pry curve



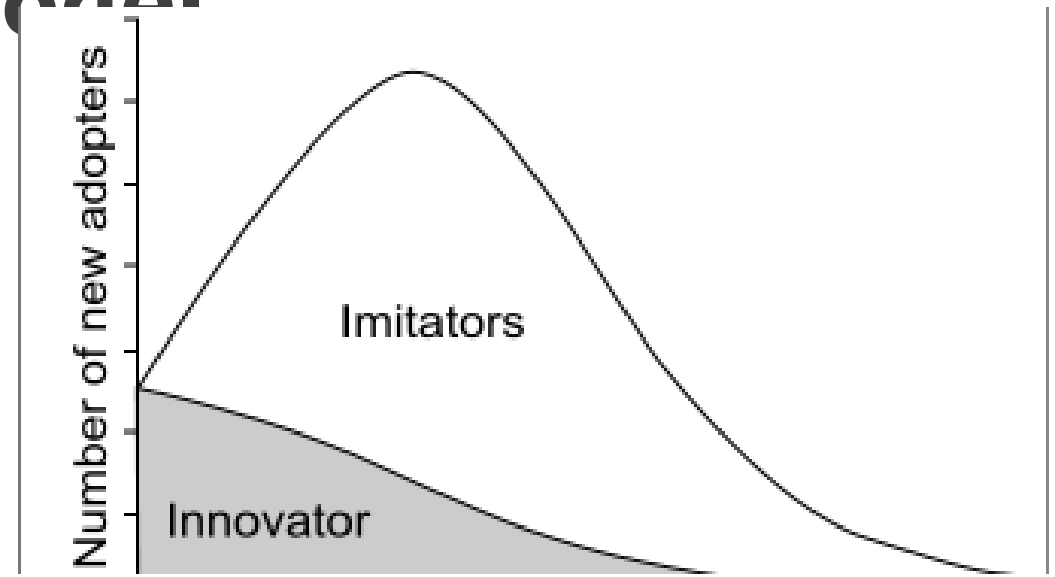
$f(t) = \frac{1}{2} [1 + \tanh \alpha (t - t_0)$

f fraction substituted

α half annual fractional growth in early years

At t_0, $f = 1/2$

The Bass model



The probability of adoption is a linear function of the total potential market (m), p the coefficient of innovation (external influence), and q the coefficient of imitation.

$P(t) = p + (q/m)\, Y(t)$

Where Y(t) is the cumulative number of adopters, so sales at time t ,

$S(t) = pm + (q-p)Y(t) - q/m\, Y^2(t)$

With two or more pieces of data on sales, you can estimate p and q

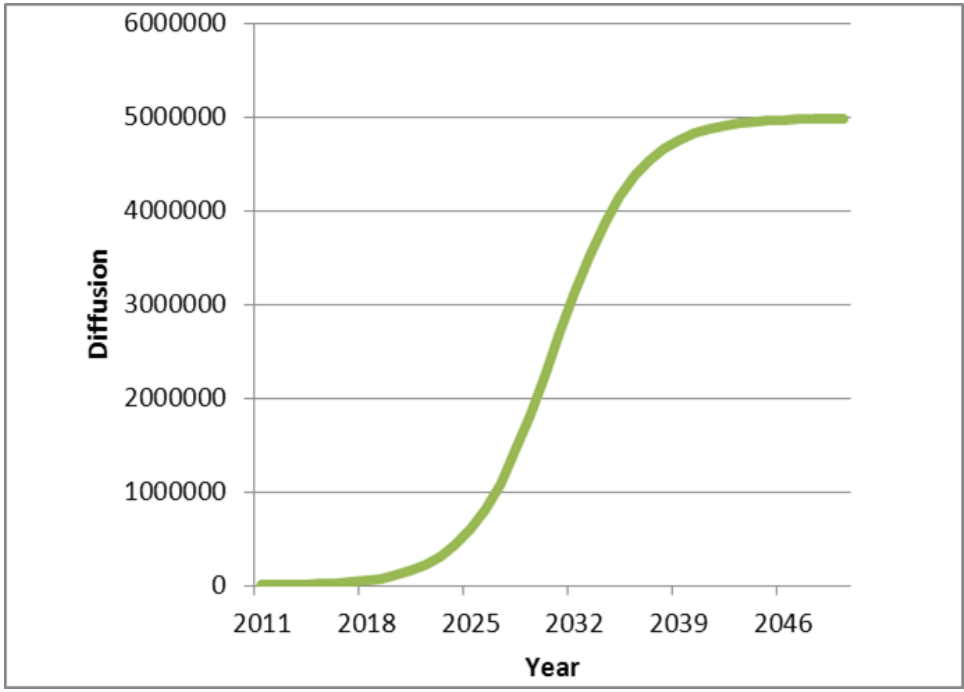
Assignment 1

- Question 1 and 2: literature search, use Scopus or Web of Science
- Question 3: research questions and hypotheses
- Question 4: data exploration
- Question 5: modeling
- Question 6: Netlogo
- Question 7: modeling
- Question 8: PV

Data

- RDW data on plug-in electric vehicles
- Data on loading stations
- Data on consumers (income, voting behaviour, etc)
- Data on adoption of solar panels
- Data about the grid

- Methodology: estimate diffusion using simulation, Bass model and Fisher Pry estimates.



Curve estimation using Bass model and policy goals

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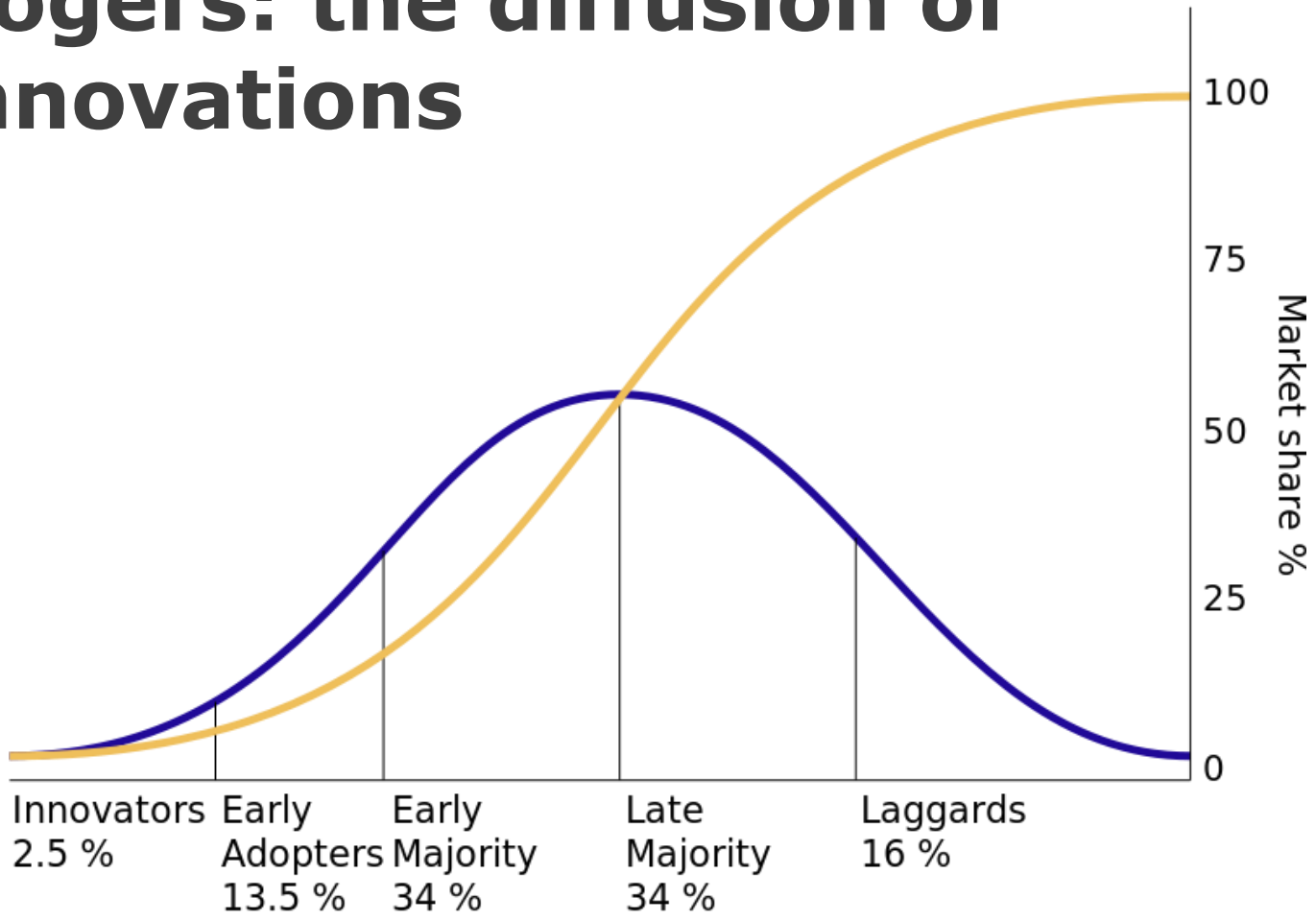

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improved product quality, and foremost (iv) reduced product prices. Producers aimed a miniaturizing CFL design and offering CFL for a broader range of lighting applications Due to considerable price reductions (see also Section 4.5.5) and quality improvements CFL sales increased in the past 20 years in absolute terms (Figure 73).

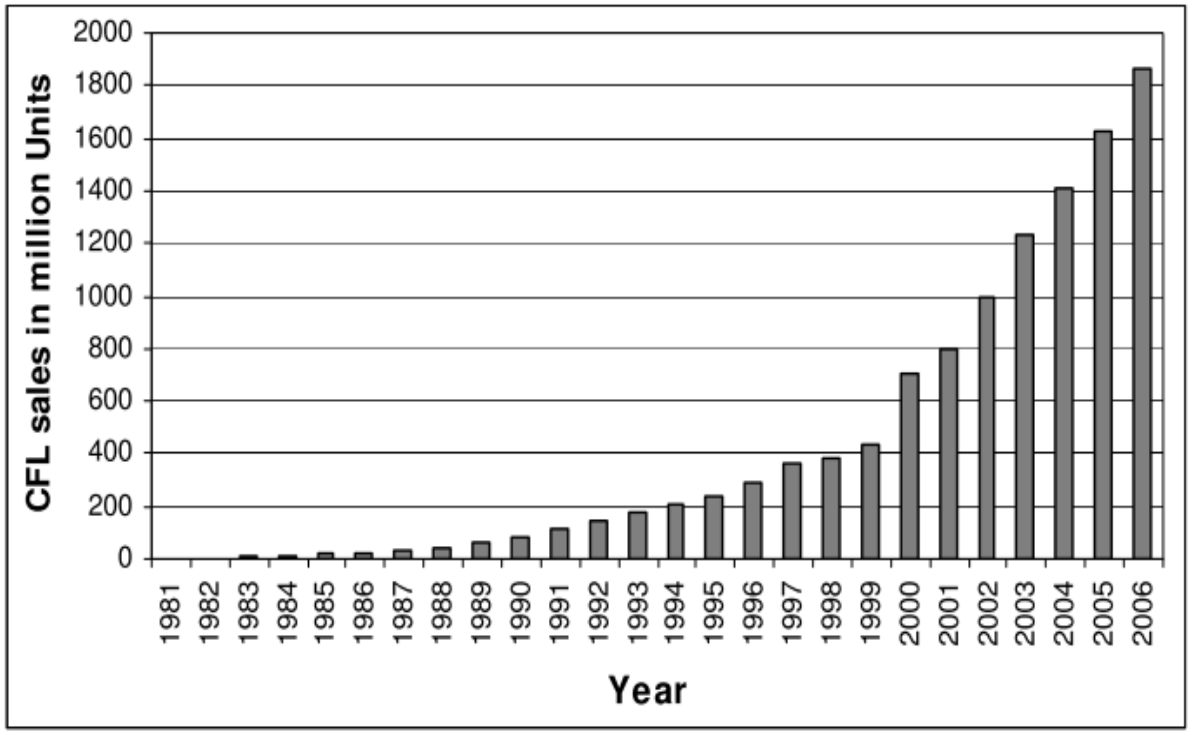

Figure 73: Worldwide CFL sales (Data sources: Borg et al. (1996), Ellis (2007), IEA (2006b))

Type: Report

Learning e
Experience
appliances
cooling , a

Authors: M. We

View re

Year: 2008

Pages:

Abstract:

Tags:

Keywords:

City:
Utrecht

Institution:
Utrecht University

URL:
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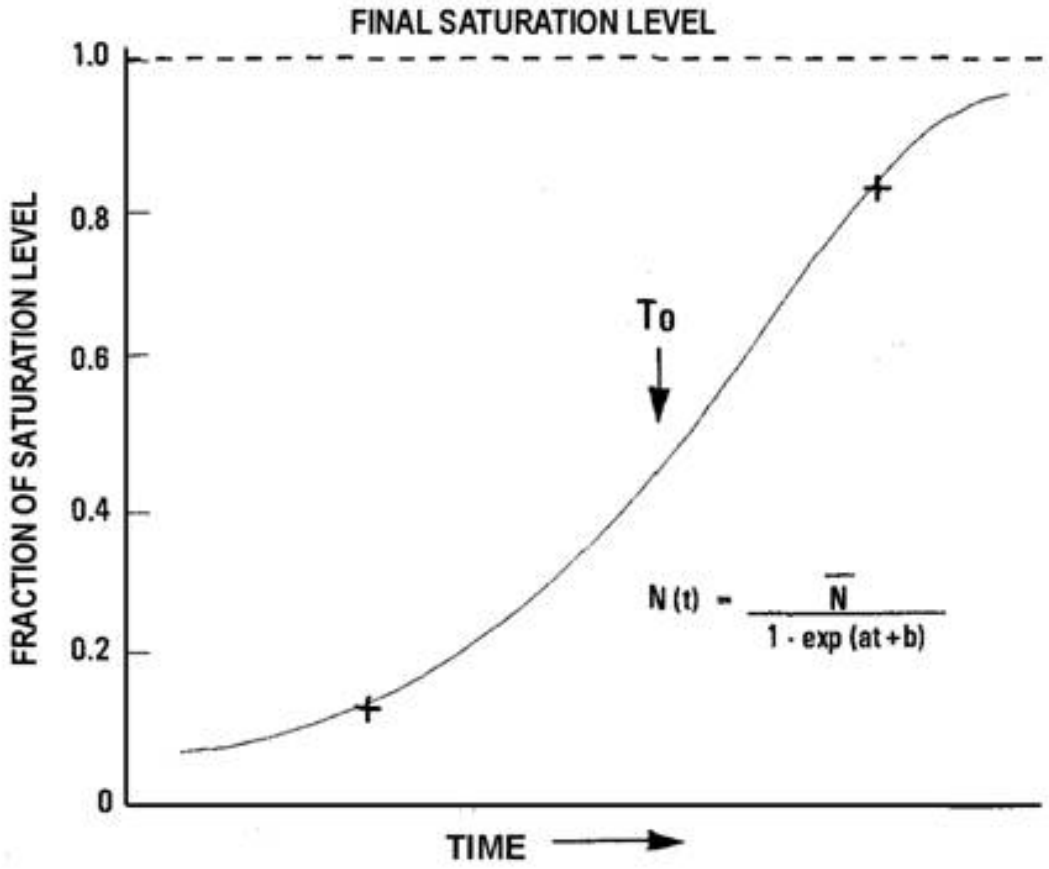

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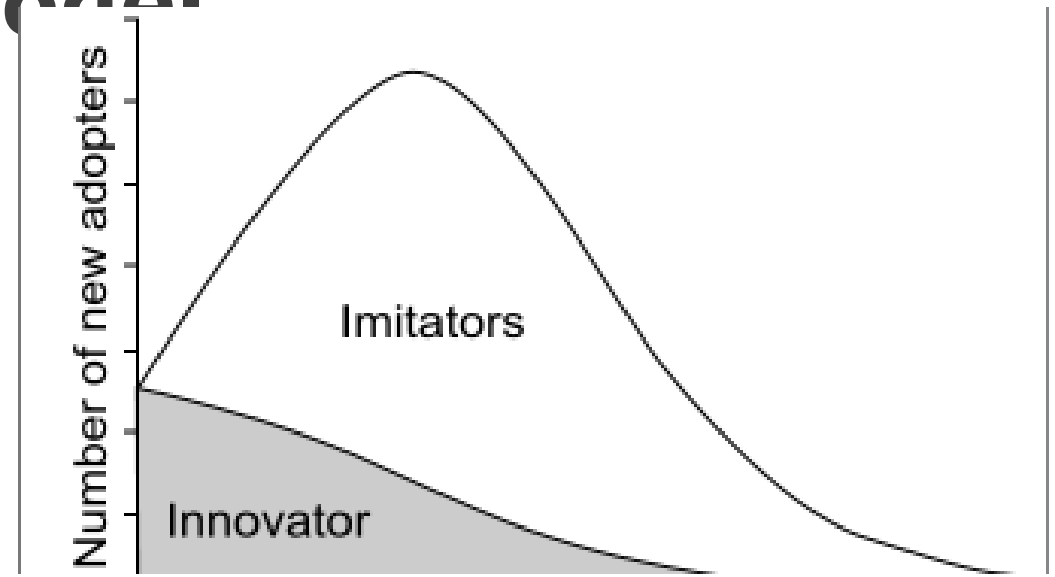

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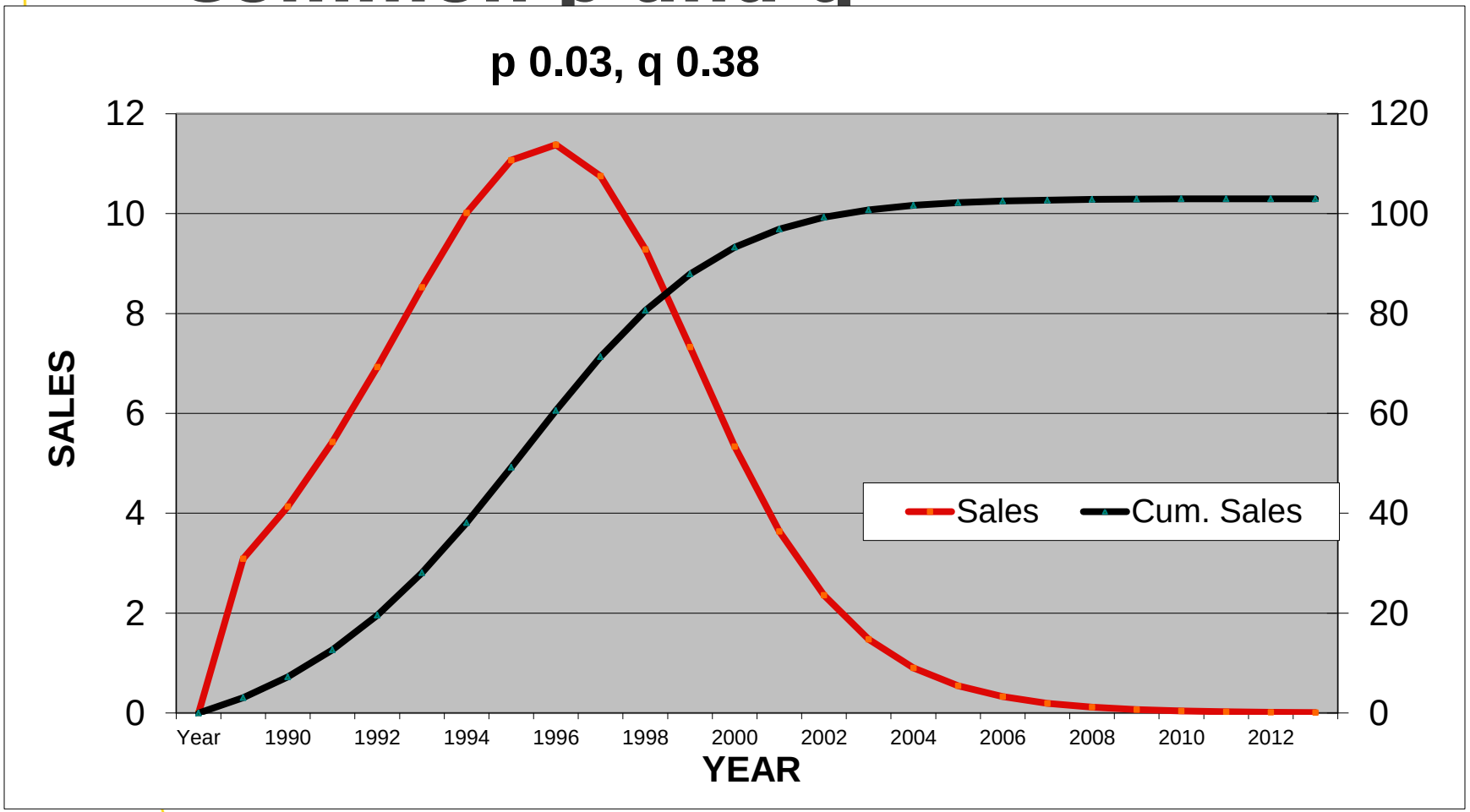
Playing with the models

- How will the parameters affect the curve?
- How can you speed up the curve

Common p and q

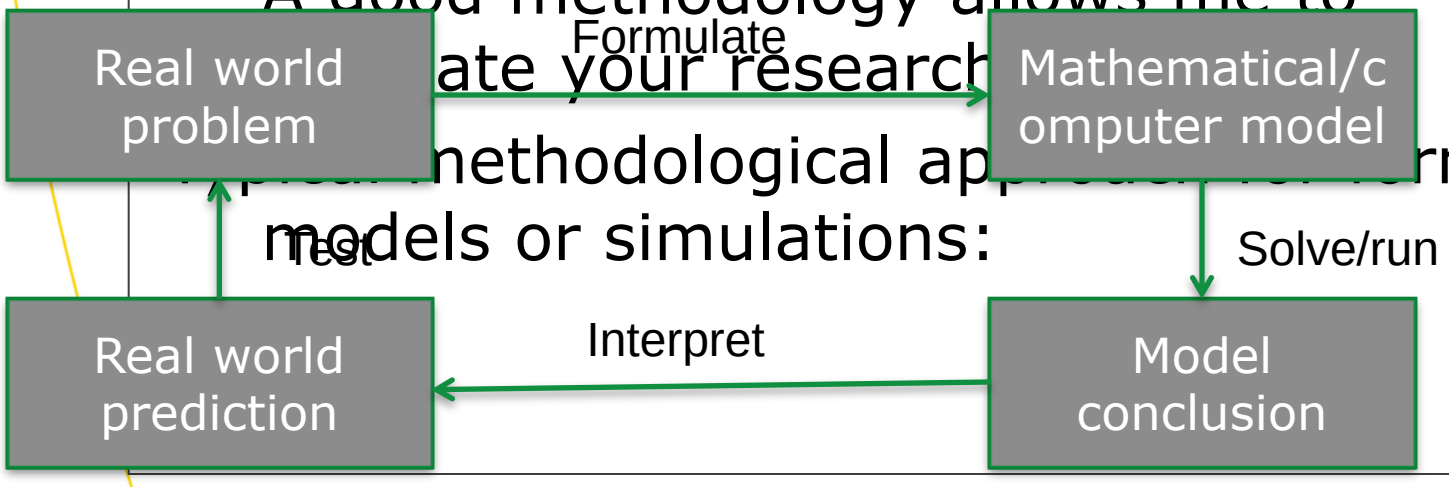


George Box

Essentially, all models are wrong, but some are useful."

Methodology

- A step-by-step description of the actions necessary to answer the research question
- Be precise, complete and specific.
- A good methodology allows me to
  ate your research
  nethodological ap rmal models or simulations:



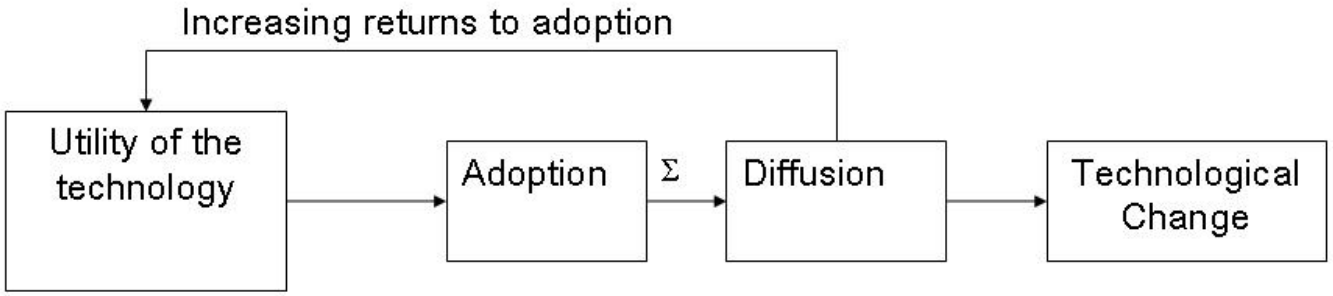
- Arthur, W.B. Competing Technologies, Increasing Returns, and
- Lock-In by Historical Events. The Economic Journal, 99(394):
- 116-131, 1989.

- What are competing technologies?
- What are increasing returns to adoption?
- Which observation could have been the trigger for this article?
- What are the managerial/policy implications of increasing returns
- to adoption?
- What are the sources of increasing returns to adoption?
- What are the managerial/policy implications of each of these
- sources?

- Formulate a hypothesis explaining technological change based upon
- Arthur.

- Technological change occurs when the technologies that are used by
- rms and consumers change, that is when adoption and diusion have
- occurred. Many new technologies are characterized by increasing
- returns to adoption. When two technologies that have increasing
- returns to adoption compete a small event in the beginning of the
- diusion process can cause lock in into one of the technologies. When

- Draw a conceptual model of technological change based upon the
- article by Arthur
- Conventions: independent variables on the left, dependent on the
- right. End with technological change.


Increasing returns to adoption
Utility of the technology
Adoption
Σ
Diffusion
Technological Change

Example: homogeneous agents

Agent type	Technology A	Technology
R	$a_r + rn_A$	$b_r + rn_$
S	$a_s + sn_A$	$b_s + sn_$

le: Returns to A or B given previous adop

Exercise

ıte how many B adoptions are required before R-agents will
h to B in each case.

Parameter	Case 1	Case 2
a_r	2	10
b_r	1	1
a_s	1	1
b_s	2	10