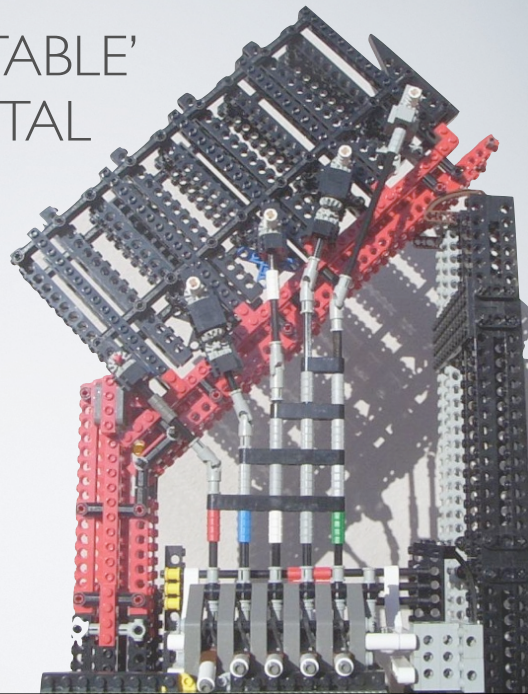


THE 'COMPUTABLE' IN EXPERIMENTAL ECONOMICS



Herbert Simon Lectures, 2
Stephen Kinsella,
University of Limerick



EXPERIMENTS AS RECIPES

recipe/what is an experiment/why are they useful?/tools,
rules, fools/edges of validity/example

RECIPE: INGREDIENTS

Subjects.

Environment.

Institutions.



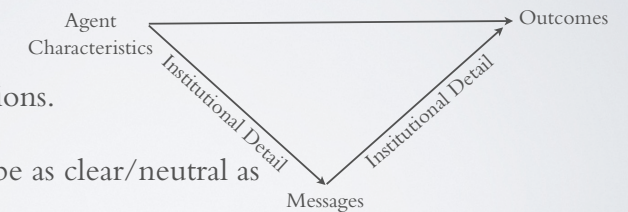
RECIPE: DIRECTIONS

Design of experiment normally comes
from literature.

Pilot study.

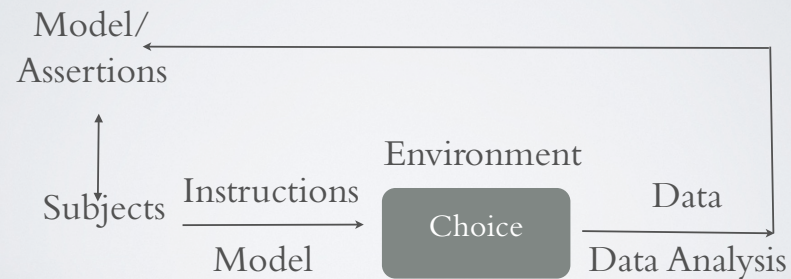
Real study. Instructions.

Instructions should be as clear/neutral as
possible.



RECIPE: DIRECTIONS

Following simple descriptive statistics, inferential data analysis can be applied to test different hypotheses (or assertions) statistically.



COMPUTABLE/ EXPERIMENTAL ECONOMICS

An **experiment** is a effective procedure for the discovery of, and selection between, different possible explanations that are of equivalent or greater or lesser importance to us.

The **goal** of computable and experimental economics is an increased understanding of real world phenomena by designing effective experiments to *systematically break* model assertions.



TODAY

edges of validity/Simonian precursors/Local task-invariant behaviours/an experiment/turing machines & experiments/a way forward

“We can know nothing that we have not made”
Giambattista Vico, The New Science, 1725

The friends that have I do it wrong

Whenever I remake a song

Should know what issue is at stake

It is myself that I remake.

—WB Yeats

SIMONIAN PRECURSORS

Human Problem Solving. Human agents are best described as information-processing systems.

Programs. Well described behaviours can be represented via programs with different structures and contents.

Task environment. The task environment (plus the intelligence of the problem solver) determine to a large extent the behaviour of the problem solver, independently of the detailed internal structure of his information processing system.

EDGES OF VALIDITY

“In any confrontation between theory and observation the theory may work or fail to work. When the theory works it becomes believable in proportion to its predictive "miracle," instead of only respectable in proportion to its internal elegance or its association with authority. But when it works, you lean mightily upon the theory with more challenging "boundary" experiments designed to uncover the edges of validity of the theory where certainty gives way to uncertainty and thereby lays the basis for extensions in the theory that increase its empirical content.”

Smith, JEP, 1989.

LOCAL TASK INVARIANCE

2 pertinent analogies to late 19th/early 20th Century physics

1. Corpus of Experimental Knowledge > Theoretical Knowledge (Smith, JEBO, 2010)
2. Search for invariance principles, (Wigner, 1967, McCauley, 2009)

“The history of physics shows that mathematical law cannot be discovered from empirical data unless something is repeated systematically.”

—Joseph McCauley, *Dynamics of Markets: The New Financial Economics*, 2nd ed, 2009.

Claim. The *only* way to discover these invariances is by careful, controlled, experiment.

Why?

Why?

[L]aboratory microeconomies are real live economic systems, which are certainly richer, behaviorally, than the systems parameterized in our theories.

—Vernon Smith, 1982

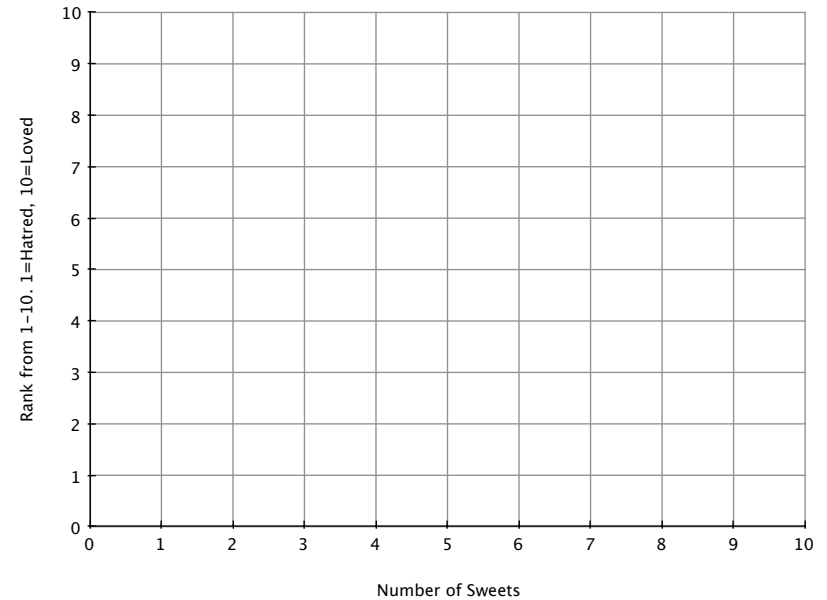
VOLUNTEERS



INSTRUCTIONS

You have ten sweets in front of you. Please eat as many of them as you can. As you eat, consider how eating the sweet makes you feel, that is, how much pleasure do you get from eating the sweet. Rank your pleasure from 1 to 10, with 1 being hatred of the sweet, and 10 being love of the sweet. Please report your results by filling in the chart below. The first one to finish the experiment will be paid 100 TND.

Results



DISCUSSION/BREAK

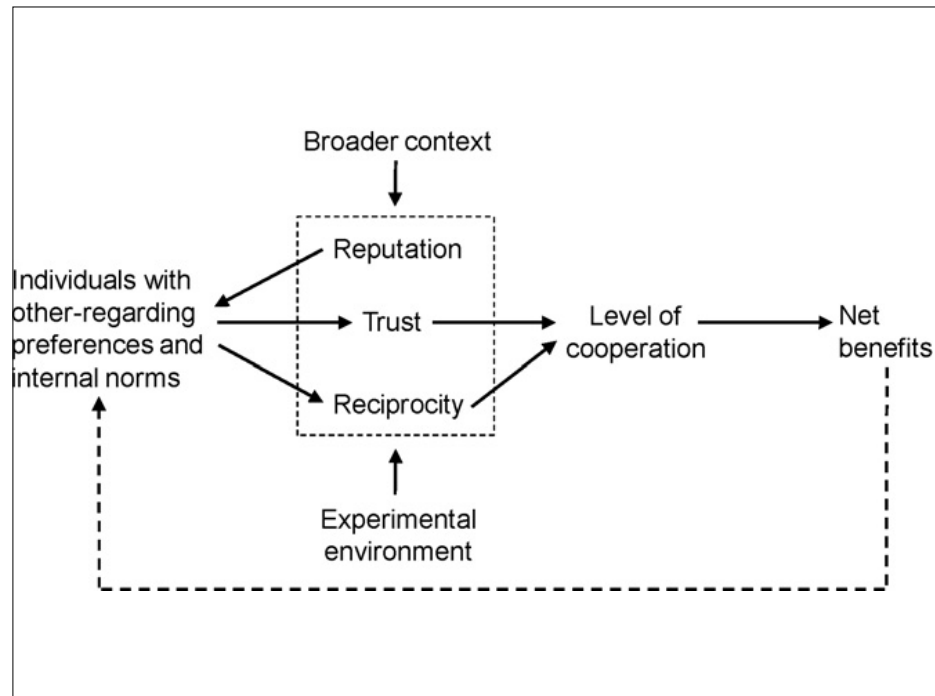
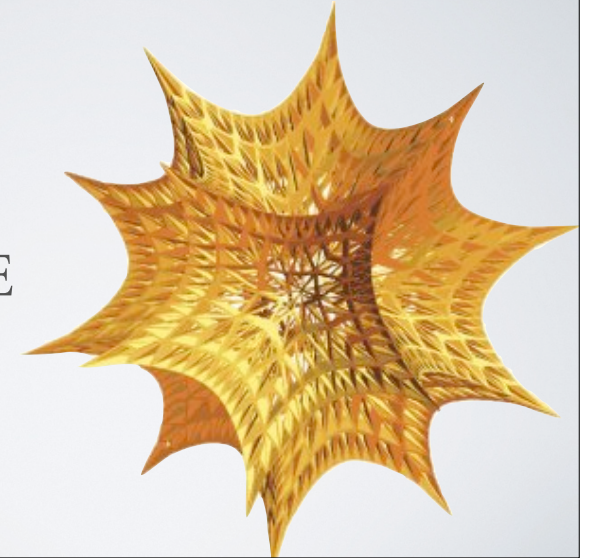
CHOICES & TURING MACHINES

- A function is **computable** if a finite procedure exists to complete or compute the function.
- Every computable function must have a finite program that completely describes how the function is to be computed.
- It must be possible to compute the function by just following the instructions; no guessing or special insight is required.

TURING MACHINES

- See Velupillai, 2000, Chapter 3.
- A Turing machine consists of a head that switches between states while reading from and writing on a tape, as in the cake-cutting example we saw yesterday. The symbols read or written are called colors.

EXAMPLE



Fundamental Approach

Choose a bid *function*

$$\text{bid} = b(\text{value to you})$$

$$b_j = b_j(v_j)$$

To maximize expected utility of wealth

$$u_j(w_j) = w_j^r \quad 0 < r \leq 1$$

$$\int \dots \int_{v_i \leq b_j^{-1}(v_j)} u(v_j - b_j) f(b(v_1), \dots, b(v_n)) dv_1, \dots, dv_n$$

Assume the values of others occur with a known probability distribution

Assume others follow the same strategy as you

find $b_j(v_j)$

A ROADMAP

1. Search for task-invariant properties, guide the search using simulations from the perspective of computational intelligence.
2. Use the systematic breaking of models as a guide for where to go next in this search.
3. Conceive of the subjects as information processors, that is, capable in some sense of computing the answer to a set of inputs.

CONCLUSION

Where is the computable in experimental economics? **Everywhere.**