Positivism, Axioms, and Responsible Decision Making: The Samuelson–Friedman Dispute

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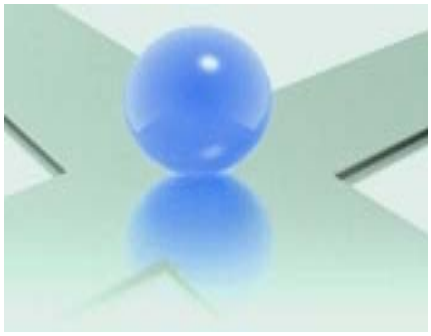

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Contents

1 *Highlights*

§ Can models help? What skeptics say.

§ Samuelson-Friedman dispute:

- **Is truth a guide to good decision-making?**
- **Are axioms a good basis for models?**
- **Is logical consistency necessary for decision-making models?**

2 *Can Models Help? What Skeptics Say*

§ Models are gross approximations to a messier reality.

- **Lab tests vs vehicle on the Moon.**
- **Human factors in system behavior.**
- **Strategic interactions; learning.**
- **Non-linearities.**
- **Non-stationarity.**

§ Next year's models will be better, but we must decide today.

- **30 yrs ago scientists predicted an ice age.**
  Now they predict global warming.
- **Engineers predicted disruptions at yr 2000:**
  Nothing happened.
- **1994 Northridge earthquake:**[1]
  Major damage; no code violations.

[1] http://en.wikipedia.org/wiki/1994_Northridge_earthquake

§ Major engineering catastrophes:

- **Sinking of the Titanic, 1912.**[2]
- **Cracking of the liberty ships, WWII.**[3]

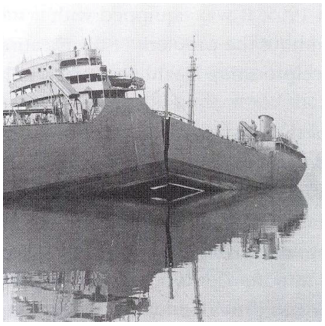

Figure 1: S.S. Schenectady.

- **3-Mile Island nuclear reactor, 1979.**[4]
- **Challenger crash, 1986.**[5]
- **Unstable Millennium Bridge, London.**[6]
- **Fukushima nuclear reactor, 2011.**[7]

[2] http://en.wikipedia.org/wiki/Sinking_of_the_RMS_Titanic
[3] http://matdl.org/failurecases/Other_Failure_Cases/Liberty_Ship
[4] http://en.wikipedia.org/wiki/Three_Mile_Island_accident
[5] http://en.wikipedia.org/wiki/Space_Shuttle_Challenger_disaster
[6] http://en.wikipedia.org/wiki/Millennium_Bridge_(London)
[7] http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster

§ Analysis vs Synthesis:

Models are analytic: reductionist.

We must be synthetic: system-oriented.

- Challenger catastrophe:

  Teams didn't communicate.
- Micro models miss macro interactions.
- Emergent phenomena:

  Macro phenomena (e.g. evolution)

  obscure at micro level.

§ Models can't make value judgments.

Math is too rigid, literal, simplistic.

- **How safe is safe enough? Not math query.**
- **How good is this model?**
- **Does this model make sense?**
- **Will the system change?**
- **Is the past a good guide to the future?**

§ Experts disagree among themselves.

- **Mechanical failure models:**

  von Mises vs Rankine vs Tresca.

- **Economic models:**

  Keynes vs Friedman vs Samuelson ...

- **Expert opinion: always diverse.**

§ Science attempts to understand the world.

We must design or manage the world.

§ Positivism (Comte):

Understanding brings control.

- Ivory tower vs practicality.
- Engineers are useful only

  5 yrs after graduation.
- Systems are complex and changing.
- Engineering is goal oriented;

  Science is truth oriented.

§ Preliminary discussion:

What do you think about these claims?

(Return to pp.6–12)

3 *Samuelson–Friedman Dispute*

§ Outline:

- **Positivism**
- **Argument in a Nutshell**
- **The Dispute**
- **My Dispute w/ Friedman and Samuelson**
- **Shackle-Popper Indeterminism**
- **Shackle-Popper and the Newtonian Paradigm**
- **Methodological Implications**

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3.1 *Positivism*

§ Positivism:[8] (Merriam-Webster[9])

"A theory that

• theology and metaphysics are earlier imperfect modes of knowledge

and that

• positive knowledge is based on natural phenomena and their properties and relations as verified by the empirical sciences."

§ Positivism (OED):

[8] http://en.wikipedia.org/wiki/Positivism
[9] http://www.merriam-webster.com/dictionary/positivism

§ Positivism (OED:)

- **"A philosophical system elaborated from the 1830s by the French thinker Auguste Comte (1798–1857)."**
-

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§ Positivism (OED):

- "A philosophical system elaborated from the 1830s by the French thinker Auguste Comte (1798–1857)."
- "recognizing only observable phenomena and empirically verifiable scientific facts and laws".
- "rejecting inquiry into ultimate causes or origins as belonging to outmoded metaphysical or theological stages of thought".
- In later use:

"the belief that every cognitively meaningful proposition can be scientifically verified or falsified, and that the (chief) function of philosophy is the analysis of the language used to express such propositions."

3.2 *Argument in a Nutshell*

§ Protagonists: 2 Economists

- **Milton Friedman (1912–2006).**[10]
- **Paul Samuelson (1915–2009).**[11]

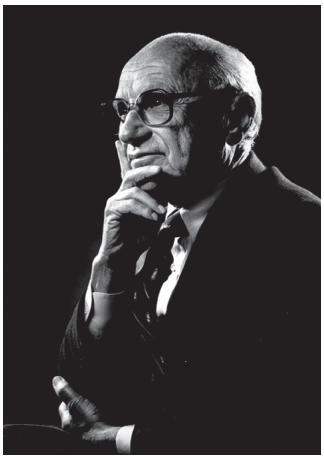

Figure 2: **Milton Friedman.**

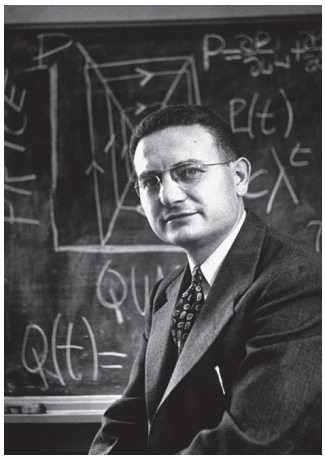

Figure 3: **Paul Samuelson.**

[10] http://en.wikipedia.org/wiki/Milton_Friedman
[11] http://en.wikipedia.org/wiki/Paul_Samuelson

§ Argument in a nutshell:[12]

- **Friedman is right: good theories depend on axioms that capture an essential truth, and violate a messier reality.**

"Your bait of falsehood takes this carp of truth" **(Shakespeare)**

-

[12] Ben-Haim, 2010, *Info-Gap Economics,* pp.227–228.

§ Argument in a nutshell:

• **Friedman is right:** good theories depend on axioms that capture an essential truth, and violate a messier reality.

"Your bait of falsehood takes this carp of truth" (Shakespeare)

• **Samuelson is right:** factual inaccuracy of a theory detracts from its validity in prediction and policy formulation.

Thanks to the negation sign, there are as many truths as falsehoods; we just can't always be sure which are which." (Quine)

•

§ Argument in a nutshell:

- Friedman is right: ...
- Samuelson is right: ...
- Samuelson and Friedman agree: economic science, like natural science, improves over time and progresses towards truth.

"The movement of ideas toward truth may be glacial but, like a glacier, it is hard to stop." (Galbraith)

-

§ Argument in a nutshell:

- Friedman is right: ...
- Samuelson is right: ...
- Samuelson and Friedman agree: ...
- However, an inherent indeterminism in economic systems precludes the shared belief of Samuelson and Friedman.

"For fallibilism is the doctrine that our knowledge is never absolute but always swims, as it were, in a continuum of uncertainty and of indeterminacy." (Peirce)

-

§ Argument in a nutshell:

- Friedman is right: ...
- Samuelson is right: ...
- Samuelson and Friedman agree: ...
- However, an inherent indeterminism ...
- Hence optimization—of models or of policy outcomes—is fatuous (or serendipitious).

"Optimization works in theory but risk management is better in practice. There is no scientific way to compute an optimal path for monetary policy." (Greenspan)

-

§ Argument in a nutshell:

- Friedman is right: ...
- Samuelson is right: ...
- Samuelson and Friedman agree: ...
- However, an inherent indeterminism ...
- Hence optimization is fatuous.
- Nonetheless, satisficing can sometimes be done reliably.

Hence the need for "a little stodginess at the central bank." (Blinder)

§ Questions for preliminary discussion:

- **What do you think about the basic conflict, p.22?**
- **What do you think about the basic agreement, p.23?**

3.3 *The Dispute*

§ Friedman is right:[13]

- **"Truly important and significant hypotheses will be found to have 'assumptions' that are wildly inaccurate descriptive representations of reality, . . .**
-

[13] Friedman, Milton, 1953, On the methodology of positive economics, In: Friedman, Milton, *Essays in Positive Economics,* University of Chicago Press, 1953, p.14.

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• **"Truly important and significant hypotheses will be found to have 'assumptions' that are wildly inaccurate descriptive representations of reality, . . .**

• **"the more significant the theory, the more unrealistic the assumptions. . . .**

• **"A hypothesis is important if it 'explains' much by little, that is, if it abstracts the common and crucial elements from the mass of complex and detailed circumstances surrounding the phenomena to be explained and permits valid predictions on the basis of them alone."**

§ Example: Galileo's "wildly inaccurate"

Law of Inertia:

A body moves at constant velocity unless acted upon by a force.

- **This perpetual motion never observed.**
- **Aristotle's law is more realistic:**

A body loses speed unless acted upon by a force.

- **Galileo's law has great theoretical fruitfulness and predictive power.**
- **Friedman would say:**

Galileo's Law strips away dissipative forces and cuts to the essence of dynamics.

§ Samuelson summarized Friedman's 'F-Twist':[14]

- **"A theory is vindicated if (some of) its consequences are empirically valid to a useful degree of approximation;**
- **"the (empirical) unrealism of the theory 'itself,' or of its 'assumptions,' is quite irrelevant to its validity and worth."**

§ Samuelson is right that Friedman

"is fundamentally wrong in thinking that unrealism in the sense of factual inaccuracy even to a tolerable degree of approximation is anything but a demerit for a theory or hypothesis (or set of hypotheses)."

[14] Samuelson, P.A., 1963, Problems of methodology — discussion. *American Economic Review*, Papers and Proceedings of the 75th Meeting of the American Economic Association, May 1963, 53: 231–236.

§ Samuelson's 3 arguments from logic:

- **Logical contradiction can predict anything.**
- **Contradiction with observation: reduces confidence in theory.**
- **Agreement with observation: raises confidence in theory.**

§ Interim summary:

- **Friedman is right:**

  Useful axioms explain much by little.

-

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  Friedman allows

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§ Interim summary:

- **Friedman is right:**

  Useful axioms explain much by little.

- **Samuelson is right:**

  Friedman allows

  logical and empirical contradiction.

- **Can they both be right?**
- **Whose camp are you in?**
- **Is there truth in both camps?**

3.4 *My Dispute with Friedman and Samuelson*

§ Samuelson and Friedman agree:

- **Economic science, like natural science, improves over time and progresses towards truth.**
- **A single unified theory is possible.**

§ Disputants:

- **Habermas: social science is not law-like.**
- **Shackle-Popper indeterminism.**

3.5 *Shackle-Popper Indeterminism*

§ **Intelligence:**

What people know,

influences how they behave.

§ **Discovery:**

What will be discovered tomorrow

cannot be known today.

§ **Indeterminism:**

Tomorrow's behavior cannot be

modelled completely today.

§ **Information-gaps, indeterminisms, sometimes cannot be modelled probabilistically.**

§ **Ignorance is not probabilistic.**

3.6 *Shackle-Popper and the Newtonian Paradigm*

Early modern:

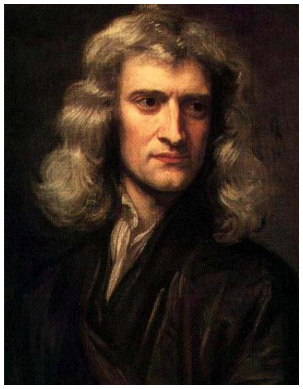

Figure 4: **Newton, 1642–1727.**

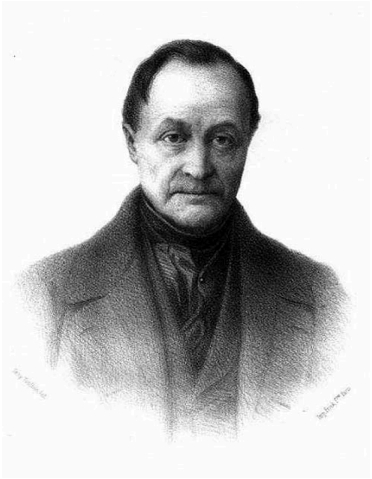

Figure 5: **Comte, 1798–1857.**

Late modern:

Figure 6: **Shackle, 1903–1992.**

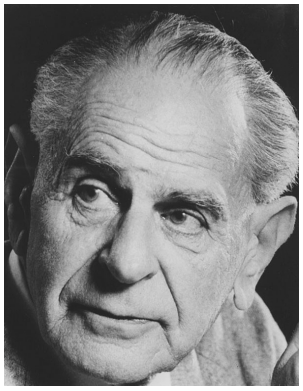

Figure 7: **Popper, 1902–1994.**

§ Newton, Comte, Positivism:

- **Creation ended. Universe fixed.**
- **There are true (final) laws of nature.**
- **Theories converge on the truth.**
- **Eq'ns of motion: predictive trajectories.**

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§ Shackle-Popper indeterminism:

- **Intelligent learning (open) systems.**
- **Laws of the system change.**
- **Theories (models) give insight.**
- **Prediction is always difficult . . .**

§ Newton, Comte, Positivism:

- **Creation ended. Universe fixed.**
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§ Shackle-Popper indeterminism:

- **Intelligent learning (open) systems.**
- **Laws of the system change.**
- **Theories (models) give insight.**
- **Prediction is always difficult . . .**
  especially of the future.

§ If not Newton, then what?

§ Crisis of models:

- Are they good for anything?
  (And if so, why do
  buildings fall, markets crash . . .)
- Economics: Why the frequent surprises?
- Engineering:
  - Can simulations keep up in real time?
  - Can engineering handle social problems?

Figure 8: **Henry Adams 1838–1918.**

"Images are not arguments, but the mind craves them. [T]wenty images better than one, especially if contradictory; since the human mind has already learned to deal in contradictions."

§ **Models, the more the merrier.**

Intelligent Learning System: Example.

Inflation Prediction

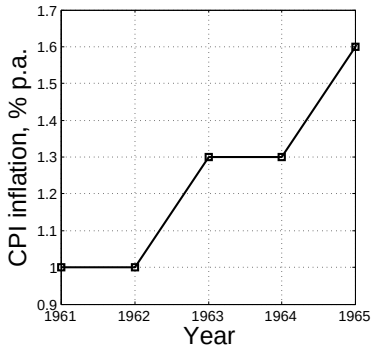

Figure 9: **US inflation vs. year, 1961–1965.**

§ Model US inflation '61–'65. Predict '66.

'61–'65: Linear?

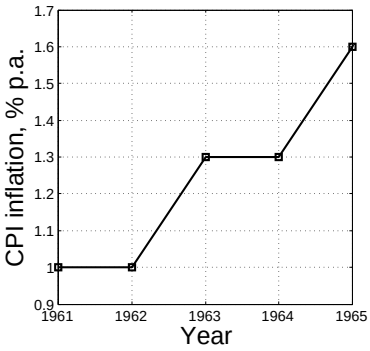

Figure 10: **US inflation vs. year, 1961–1965.**

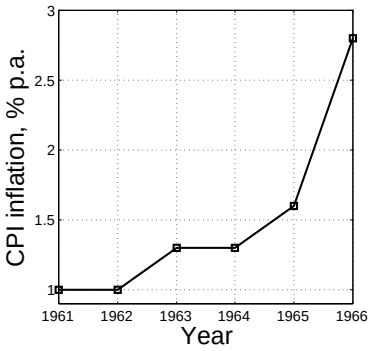

Figure 11: **US inflation vs. year, 1961–1966.**

§ '61–'65: Linear?

§ '61–'66: Quadratic?

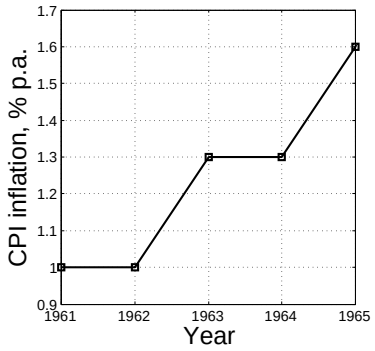

Figure 12: **US inflation vs. year, 1961–1965.**

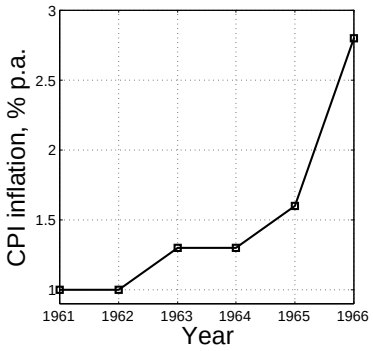

Figure 13: **US inflation vs. year, 1961–1966.**

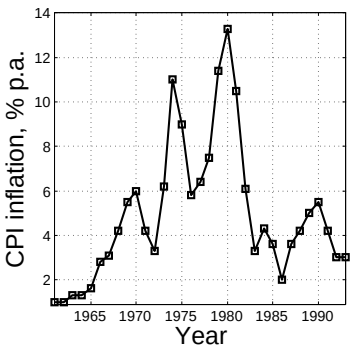

Figure 14: **US inflation vs. year, 1961–1993.**

§ '61–'65: Linear?

§ '61–'66: Piece-wise linear?

§ '61–'93: A mess?

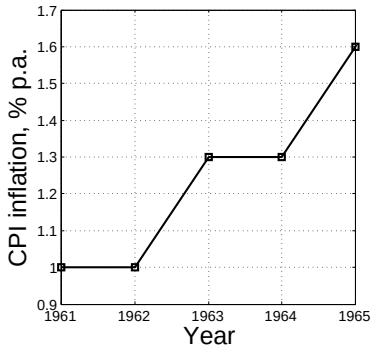

Figure 15: **US inflation vs. year, 1961–1965.**

§ US inflation '61–'65:

- **Model '61–'65 for predicting '66.**
- **Use data and contextual insight.**

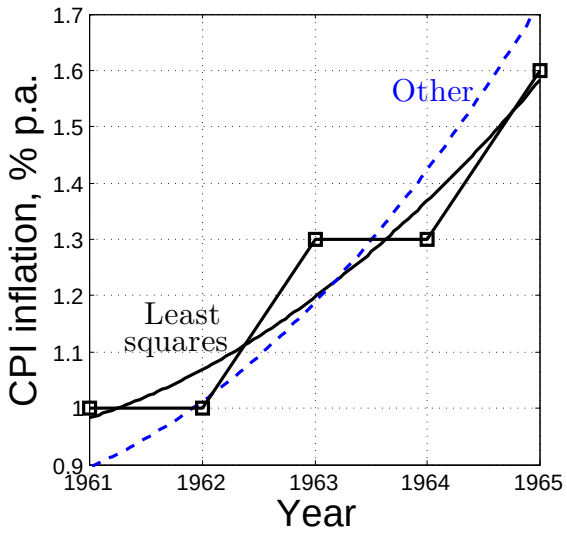

Figure 16: **US inflation vs. year, 1961–1965, and least squares fit (solid) and other fit (dash).**

§ Least squares and other fit: fig. 16.

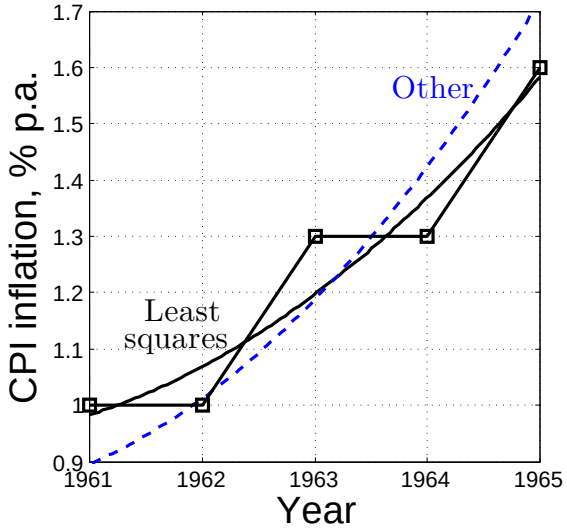

Figure 17: **US inflation vs. year, 1961–1965, and least squares fit (solid) and other fit (dash).**

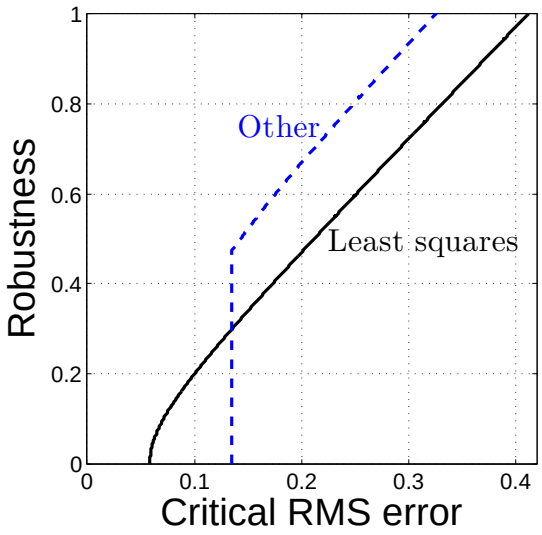

Figure 18: **Robustness vs. critical root mean squared error for inflation 1961–1965 for least squares fit (solid) and other fit (dash).**

§ **Least squares and other fit:** fig. 17.

§ **Robust of LS and other fit:** fig. 18.

Curve-crossing: preference reversal.

§ What about:

- **Newtonian paradigm: Law & prediction.**
- **Shackle-Popper: Indeterminism.**
- **Adams: 20 images better than 1.**

§ **What about:**

- **Newtonian paradigm: Law & prediction.**
- **Shackle-Popper: Indeterminism.**
- **Adams: 20 images better than 1.**

§ **Info-gap theory:**

- **Unstructured uncertainty.**
- **Satisficing vs optimizing.**
- **Robustness.**

3.7 *Methodological Implications*

§ **Laws of intelligent learning systems exist,**

and

Models are useful, but . . .

§

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Models are useful, but . . .

§ **Positivism is (only) partly true:**

- **Models converge on the truth.**
- **The "truth" keeps moving.**

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§ **Two types of models are needed:**

- **Models of the processes.**
- **Models of the uncertainties.**

§

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and

Models are useful, but ...

§ Positivism is (only) partly true:

- Models converge on the truth.
- The "truth" keeps moving.

§ Two types of models are needed:

- Models of the processes.
- Models of the uncertainties.

§ Two types of uncertainties:

- Aleatoric: randomness, noise.
- Epistemic: ignorance, change.

4 *Questions for Discussion*

§ **What do you think about the basic conflict, p.22?**

§ **What do you think about the basic agreement, p.23?**

§ **What do you think about YBH's critique?**

- **Limitation of optimization, p.25.**
- **Limitation of Newtonian paradigm, 47.**
- **Elusiveness of truth, 60.**