

Title: Scientists, Scienster, Anti-Scientists & Economists

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Abstract: The syntax of economic theory closely resembles the syntax of physics. But physics deals with what seems to be the objective world. In contrast, the essence of economics is subjectivity and moral choice. What can you reasonably expect from treating economics as a branch of science? This talk compares the nature and efficacy of models in both physics and finance, and tries to reach a sane answer to the question above.

Science, AntiScience & Economics

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Overview

- Introduction
- Making Some Distinctions
 - Science, Engineering, Economics, Finance
- Models in Physics
 - Theories, Phenomenology aimed at the future
 - Isolated Systems, Coupled Systems
- Financial Valuations Models
 - Apartment pricing: calibration, the present
 - The Aims of Models
- Valuation in Practice
 - Replication of various kinds, plus adjustments from experience
- Can Science Help?
 - Some observations

Naive Materialism

- A Scientist On Saddam Hussein

"Imagine, in fancy, that some science fiction equivalent of Simon Wiesenthal built a time machine, travelled back to 1945 and returned to the present with a manacled Adolf Hitler. What should we do with him? Execute him? No, a thousand times no ... Psychologists, struggling to understand how an individual human being could be so evil and so devastatingly effective at persuading others to join him, would give their eye teeth for such a rich research subject. ... Saddam Hussein is not in the same league as Hitler but, nevertheless, in a small way his execution represents a wanton and vandalistic destruction of important research data ... Wasn't the judicial destruction of one of the very few research subjects we had — and a prime specimen at that — an act of vandalism? ... What were the formative influences on these men? Was it something in their childhood that turned them bad? In their genes? In their testosterone levels? Could the danger have been nipped in the bud by an alert psychiatrist?"

Naive Immaterialism

- Finance as Pure Mathematics

Fundamental Theorem of Finance. *Security prices exclude arbitrage if and only if there exists a strictly positive value functional, under the technical restrictions that the space of portfolios and the space of contingent claims are locally convex topological vector spaces and the positive cone of the space of contingent claims is compactly generated, that is, there exists a compact set K of X (not containing the null element of X) such that*

$$C = \{x \in X : x \geq 0\} = \bigcup_{\lambda \geq 0} \lambda K.$$

Intentional Unrealism?

Felix Salmon in Wired:

And (David) Li's Gaussian copula formula will go down in history as instrumental in causing the unfathomable losses that brought the world financial system to its knees."

Realism

Ben Stein in the NY Times

I'D like to bring up one more little bijou about the economic crisis. I read that [Lawrence H. Summers](#) — wonderful guy, fine economist, former [Harvard](#) president, high-ranking economic adviser to Mr. Obama — was paid about \$5 million last year by a large hedge fund, D. E. Shaw. Some other high-ranking Obama advisers were also fantastically well paid by the finance sector.

Of course, this phenomenon didn't begin with this administration. The last [Treasury](#) secretary, [Henry M. Paulson Jr.](#), was the head honcho of [Goldman Sachs](#) and was paid hundreds of millions by it. (Yes, that's one of the banks that we as taxpayers supported with many billions, via the [A.I.G.](#) conduit.)

I know people and I know money, at least the basics. If anyone thinks that a man who has had a taste of honey from Wall Street on that scale will ever really crack the whip on Wall Street, he's dreaming. Wall Street knows how to get its hooks into government. This is how the world works. Money talks.

The Second Coming?

The best lack all conviction, while the worst
Are full of passionate intensity.

Surely some revelation is at hand

- It would be nice, but seems increasingly unlikely.

April 25 Sunday New York Times:

“The rest of the nation may be getting back to basics, but on Wall Street, paychecks still come with a golden promise. Workers at the largest financial institutions are on track to earn as much money this year as they did before the financial crisis began, because of the strong start of the year for bank profits.”

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Making Some Distinctions

- Science
 - reductive
 - leapfrog between observation and insight/intuition
- Engineering
 - constructive building of almost-isolated universes
 - based on science and empiricism
- Economics
 - about consumption, assumes subjective utilities
 - engineering with science and limited empiricism
- Finance
 - time, money, value, risk and their interrelationships
 - needs models
 - isolated vs. coupled systems

Models in Physics

- Theories
 - dynamics, causality, aspirations

$$F = ma$$

$$F = \frac{GMm}{r^2}$$

- absolute, not relative
- Models
 - phenomenological, metaphors
 - relative
 - liquid drop model, involve calibration

Financial Valuation Models

- Interpolation in the present, not prediction into the future
- Apartment pricing
- Models are used to
 - rank similar but not identical securities on a linear scale
 - interpolate from liquid prices to illiquid value
 - transform intuitive linear qualities into nonlinear dollar values
- Models assume mostly isolated systems in the mathematics
 - users have to provide the coupling in their manipulation of inputs

Valuation in Practice

- The only law of finance

If you want to estimate the value of a target security which is illiquid, use the price of a replicating portfolio of securities which, taken together, behave similarly *under all circumstances*.

- Replication by as few assumptions as possible:
 - static and model-independent: needs little assumptions and resources
 - dynamic: model-dependent: needs great resources and assumptions
 - a sophisticated form of interpolation
 - mathematics: “under all circumstances”!
 - engineering: proving similarity

Comments on Applying Science

- The relevant variables are now human and mental
- Time often runs backwards
- There's a hole in the bucket
- History and Repeatability
- Dynamics is getter than statistics
- A good model sweeps dirt under a transparent rug
- A good model is vulgar in a sophisticated way
- In physics it pays to drop down deep: in finance it's better to stay in the shallows:
Is this reasonable?

$$\begin{aligned}
 dS_t &= \mu S_t dt + \sqrt{V_t} S_t dW_t^1 \\
 dV_t &= \kappa(\theta - V_t)dt + \sigma\sqrt{V_t}dW_t^2 \\
 dW_t^1 dW_t^2 &= \rho dt
 \end{aligned}$$

- What are observables are unobservables? Macro or micro?
Gases to atoms? Markets to agents? Agents to markets?
- Complementarity of explanations
- Limits of mathematics in the social sciences
- Every axiom is wrong
- Optimization is often pointless
- Statistical mechanics approaches may work best
- Models as gedanken experiments rather than theories
- The dangers of idolatry
Bow and arrows vs. Solid state physics

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