complete. Einstein and Rosen published another, earlier paper, "The Particle Problem in the General Theory of Relativity."[1]

Reference

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On the merits of mathematical models

I offer a few comments regarding "Is Economics the Next Physical Science?" by J. Doyne Farmer, Martin Shubik, and Eric Smith in the September 2005 issue of PHYSICS TODAY (page 37). Physicists have deployed mathematical models of interacting entities for two purposes: to establish the existence and properties of such entities—for example, quarks and other subatomic particles—by comparing precise calculations with precise measurements; and to predict and understand the properties of systems, such as doped semiconductors comprising known entities. To imagine an analogous research program for econophysics is to see at once how little can be expected from this field.

Human beings are unique, purposeful individuals whose properties cannot be captured in a few numerical parameters the way one specifies the properties of atoms and particles. It is implausible that we will add to our understanding either of human nature or of market economies by treating people as mathematical Tinkertoys. Yet that is precisely what econophysics appears to have in common with mainstream neoclassical economics.

There exists an older, more modest economic tradition, one that explores the implications of individual human choice in the pursuit of individual goals. The focus is not on solving equations but on reasoning directly about the actions of human beings as we know them through introspection and common experience. This approach offers a rich and fruitful insight that extends beyond the problems ordinarily regarded as "economic." As I have demonstrated elsewhere,[1] it can explain much about the conduct and dissemination of scientific research itself.

Farmer and coauthors seem puzzled by the weakness of price predictability, given that there are long-memory correlations among closely related data in the stock market. May I suggest an explanation? Price predictability offers profit opportunities, which people are likely to discover and exploit. In general, however, to exploit profit opportunities is to eliminate them. We can expect, therefore, that price predictability will be limited by profit-taking market speculators to a level at which only the most astute of them earn enough to stay in the game. There is no particular reason to expect other correlations in market data to be so limited, if they do not offer direct profit opportunities.

I had a look at the University of Fribourg website recommended by the authors. Some econophysicists seem to think that by criticizing mainstream economics, or by referring dismissively to "Adam Smith's invisible hand," they are also undermining the case for free markets. On the contrary, the mainstream's preoccupation with mathematical models of equilibrium obscures the market's dynamism and underlies counterproductive anti-trust legislation. At one time, uncritical faith in mathematical modeling lent false plausibility to the notion that one might in fact measure the parameters, solve the equations, and thereby centrally control an economy. Mainstream economists eventually shook off that pipe dream. Econophysicists would do well to avoid it.

Reference

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The article on economics and physics by Doyne Farmer, Martin Shubik, and Eric Smith reviews several interesting studies for senior- or graduate-level physics students who are well grounded in statistics. A much simpler study, one that I think would be informative and suitable for freshman physics and economics students, would be a measure of the operational efficiency of a country.

Other economic systems might also offer appeal, such as a comparison of the operational efficiencies of farms. Selecting a study on countries, however, has the advantage that the data for the total annual input energy consumed in a country are readily available from government websites.