



REAL-WORLD ECONOMICS RISING

By John German

ONE INSIDER HAS CALLED ECONOMICS A PROFESSION THAT HAS “LOST ITS LICENSE OF EXPERTISE.” Not only did most mainstream economists fail to see the financial crisis coming, they might have helped fuel it, unwittingly, through strategies fashioned from a rigid adherence to neoclassical economic theories and models.

Those models, which feature an implicit assumption that all actors make informed and rational choices most of the time, are inadequate for describ-

ing the complex adaptive systems that make up the world’s economies today, says SFI Professor J. Doyne Farmer. What’s worse is that because they don’t have reliable models, economists and policy makers tend to draw on common sense and loose analogies with past crises in dealing with emerging ones, he says.

“The leaders of the world are flying the economy by the seat of their pants,” Farmer says.

He and SFI External Professors Robert Axtell and John Geanakoplos believe they have a better way.

They want to build an agent-based model of the entire U.S. economy, one that accounts for the behaviors of individual actors in markets and in the systems that influence them.

Traditional top-down econometric models use past data to forecast future trends, so they fall short when facing an unprecedented crisis. General equilibrium models, the other kind of traditional model, assume that economies and markets fluctuate around and return to a perfect, stable, crisis-free equilibrium—the “at rest” condition of a system in which competing influences are balanced.

Agent-based modelers don’t make assumptions about how the whole economy behaves. Instead they build an economy’s behavior from the bottom up, assigning particular behavioral rules to each decision-making agent in their simulations. This enables, for example, more life-like representations of the copy-cat behavior that leads to “herding” among investors. Agents may learn from experience or switch their strategies according to majority opinion. Or they might aggregate into institutional structures such as banks and firms. Just like real life.

And because an agent-based model is built from the behaviors of individual actors, which aggregate into behaviors of groups of actors, such a model can incorporate the interactions among different sectors of the economy—such as housing and finance—at different scales, something the traditional models don’t do very well.

Agent-based modeling might seem like the obvious choice, but infusing complexity thought and new models into mainstream economics isn’t as easy as simply making a case for it. “Economists tend to reject any model that doesn’t employ an equilibrium,” Farmer says.

But some are listening. Farmer and Axtell have begun to form alliances with economists who think the field

needs a re-think. At an April 2010 conference in Cambridge, England, organized by The Institute for New Economic Thinking (INET), participants agreed that many of the assumptions on which the current models are based—such as efficient financial markets and rational expectations—aren’t rational.

Farmer asked the crowd, which included four Nobel laureates and many prominent economists, to shed the dogma that says markets self-stabilize, and instead create much more complex models based on actual “rational” behavior—that of agents making decisions with incomplete information in complex, changing environments. Farmer says the response was generally positive, with some expressing skepticism that agent-based modeling could succeed at such a complex undertaking.

But that concern is being addressed as well. At a June 2010 conference on the topic in Washington, D.C. sponsored by the National Science Foundation, participants explored the potential uses of massive data sets and enormous computing power available today.

Although Farmer’s calls haven’t yet penetrated the din of Wall Street, the chorus of voices is getting louder. Kenneth Arrow, a former SFI visiting scholar and 1972 Nobel Prize winner in economics, who co-designed the best-known mathematical proof of a market-clearing equilibrium, has said publicly

that his profession has taken the wrong lessons from his work. He added that investors, savers, and consumers are simply burdened with too much faulty or incomplete information to make truly rational decisions most of the time.

“Using agent-based models to model the complexity of real economies, instead of pencil and paper to model imaginary, highly idealized economies, will drive a fundamental breakthrough in the usefulness of the discipline of economics,” Farmer says. The research continues to gain momentum. Recently INET funded Farmer’s team to develop just such a model. “We are going to do it with economists or without them,” Farmer says. Changing the view of the whole field is not going to be easy.” ◀

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SFI Professor J. Doyne Farmer, along with SFI External Professors Robert Axtell and John Geanakoplos, hope to build an agent-based model of the entire U.S. economy.