Control theorist Barmish challenges need to model financial markets

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(Phys.org) —B. Ross Barmish hopes his research will build a bridge between control theorists and financial scholars.

Barmish, a professor of electrical and computer engineering at UW-Madison, posits that not only are predictive models of financial markets

unreliable, but also that stock traders can do without predictive models, simply by applying control theory to the markets.

Control theory is a field of applied mathematics that has addressed the control and stability of systems ranging from physical machinery to economics.

Barmish's theory involves reactions to markets rather than predictions. "When I do my analysis, I say the model doesn't matter," Barmish says.

The reactive, algorithmic approach he's building could work just fine for someone who knows absolutely nothing about pricing patterns, who's never analyzed statistics of stocks' past behavior.

"You might say I'm agnostic about what direction the market's going to go," he says. "Just by reacting to markets, rather than trying to have a crystal ball, you can get certain levels of performance."

Enter control theory. Barmish is particularly interested in the notion of "robustness"—which, in control theory, means the ability of a system or approach to hold up under uncertainty and disturbances. Considering the complex and volatile nature of financial markets, it's easy to see why a "robustician" would want to dive in.

The day-to-day work of his current research involves running simulations of what returns a control-theory approach might yield with certain stocks. The simulation models a trader's decisions as part of a feedback loop, responding to returns on investment with patterns determined by various algorithms.

To simplify it greatly, sometimes this can mean investing more money as returns increase, or investing less as returns decrease.

In talks, Barmish frequently uses the example of Netflix to demonstrate how his approach can pay off. His simulation shows a trader gaining steadily as the stock rises—that's the easy part, of course—but quickly cutting losses or even short selling as the price falls.

"When the party is over, it gracefully gets me out," he says.

That said, Barmish already sees a lot of justification for his work in financial practice itself. He points out people like hedge fund managers often use adaptive, trend-following methods like the ones he proposes.

Additionally, he says, the stock market crashes of 2000 and 2008 show that classical predictive financial models can prove catastrophically faulty. To move forward, why not seek out theorems to back up non-predictive approaches?

"Instead of using statistics and saying, 'Well, something worked in the past,' I say, 'No, here's a theoretical basis that doesn't depend on the past or future,'" Barmish says.

For this provocative work, funded by the National Science Foundation, Barmish has been invited to give a plenary speech on Dec. 13 at the IEEE Conference on Decision and Control in Florence, Italy. His collaborators include Jim Primbs, a professor of systems engineering at the University of Texas at Dallas, and Shirzad Malekpour, a doctoral student working under his advisorship.

But rather than discuss this approach only within the friendly territory of engineering and control theory, Barmish is making a point of taking his research to university finance departments and financial conferences around the country.

"I like confrontation in research," Barmish says, "so I go out of my way

to pick a fight, metaphorically."

He even affably welcomed the opportunity to have a Cambridge University economist tear into his research at the 2013 Midwest Finance Association conference in Chicago. "He came after us big-time on many things, and we sat with him for hours hashing it out," Barmish says.

Beyond the academic skirmishes, Barmish actually believes financial scholars and practitioners will begin adopting his ideas in the not-too-distant future. If anything, he feels responsibility for making sure his research proves useful in the financial field.

"My accountability has to be to the application area," he says.

Provided by University of Wisconsin-Madison