What is in people's minds when they buy stocks?

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When people buy stocks, they tend to have beliefs in place about how well the investments will perform and which ones are riskier bets.

Economists would love to know what is going on in people's minds, but because that is not always possible, they instead come up with models to predict how people will behave. The models are acting *as if* people have certain beliefs in mind.

The most popular theory of this sort, called the subjective expected utility theory, or SEU, models people's behaviors in making financial choices under uncertain circumstances. The theory holds that a person trying to decide between two stocks, say IBM and Google, behaves as if they have subjective beliefs about how risky investments are to them personally as well as about the probability that one stock will do better than the other.

"As analysts, we can't measure what is in people's minds but we can model their behavior. We can look at the choices they make," says Federico Echenique, the Allen and Lenabelle Davis Professor of Economics. "For instance, if somebody buys orange juice then we presume they like orange juice. A preference is meaningful if I can set up a choice experiment in which I allow someone to choose between one item and another, and they choose one item. To us economists, preference means choice."

Echenique, with Caltech professor of economics Kota Saito and other colleagues, has been busy taking a closer look at the SEU theory and related models over the past several years. In 2015 and 2016, the researchers published theoretical work proposing new mathematical tools to test whether behavior is consistent with the SEU theory. A core assumption of SEU is that individuals will buy less when prices are higher. Nonetheless, researchers have had a hard time validating that condition in data derived from actual decisions people make in their day-to-day lives because one cannot control the underlying fundamental economic conditions, such as what lies behind uncertain returns in stocks. For example, the various indicators of the relative strength or

weakness of the economy may lead one to expect stock market returns in 2019 that are very different from what one might expect in 2020.

Given the ambiguities inherent in field data, Echenique and Saito opted to test their theories in controlled laboratory experiments with college students and, more recently, in online experiments in a study funded by the TIAA Institute, the research arm of the financial planning company. In those experiments, subjects chose how much to invest in a set of assets from which they would earn monetary rewards based on the performance of the assets. Participants were given a choice between purchasing two stocks, for which the unit prices varied, while the fundamental economic conditions underlying stock performance were kept fixed. SEU would predict that investment in an expensive stock must be reflected in optimistic beliefs. While beliefs are unobservable, by presenting subjects with multiple investment opportunities with fixed underlying fundamentals, SEU presumes there are limits to how often investors will buy the more expensive stock. Both the laboratory and online experiments, however, generated surprising results showing that most people were not as price sensitive as the SEU theory would have predicted.

The data also revealed that those who had ranked higher in previous cognitive and financial literacy tests acted significantly more consistently with SEU. In contrast, a person's age was found to have no effect on the outcome of the tests. "Age is not predictive of compliance with the theory," says Echenique. "This is of particular interest to TIAA and retirement planners who want to assess how individuals of a different age respond to financial decisions."

"Our data showed that people's decisions were not entirely consistent with the theory," says Saito. "While the model did accurately predict the general direction in which people would react to prices and quantities, generally buying less assets as they become more expensive, their buying

behavior did not change to the extent the SEU theory would predict." The researchers said they were also surprised to see no differences between the students they tested in a lab and the adults who answered survey questions via a computer program.

What are the next steps? The economists are thinking about how they might revise SEU theories to be more accurate.

"One way to adjust the model would be to make it less precise, and only require interplay between prices and quantities," says Echenique. "In this way, we would be putting less emphasis on the idea that people have probabilities in mind for various stocks."

More information: Federico Echenique et al. Savage in the Market, *Econometrica* (2015). DOI: 10.3982/ECTA12273

Christopher P. Chambers et al. Testing theories of financial decision making: Table 1., *Proceedings of the National Academy of Sciences* (2016). DOI: 10.1073/pnas.1517760113

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