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The Efficacy of “Complexity in Economic and Financial Markets”

The model currently used to analyze economics is called the standard model, this model views all of the parties involved (agents) with the economy that is being model as purely rational, completely objective, in agreement about the probability of events occurring in the future given the same information, and completely deductive in their predictions and decisions. Additionally, the standard model assumes that all useful information is represented by the current value of an instrument (an item that can be traded) and the current information given (for example the news). In “Complexity in Economic and Financial Markets” Arthur explores, establishes the usefulness , and increased accuracy of an more realistic model where all agents involved can make inductive decisions about the future values of their assets as what actions to take and can have their own beliefs about how the market works. To accomplish this Arthur first establishes that the standard model has some definite problems when applied to reality and changes it to more accurately model the real world. Then to show that this inductive version of the model is useful Arthur creates a simulation of the market and adds agents to it of both types. This results in strong evidence that his hypothesis is correct. This paper has some qualities that make it a very convincing and memorable read. First it is logically sound and walks the reader through the logic used in a very unique way. Second, Arthur’s paper supports any new claims it makes with well explained experimental evidence. Finally, it is an enjoyable read.

Arthur’s work is very logically sound, every claim clearly follows the previous claims. The reader is not expected to make leaps of logic on their own. This block of text talking about why rational expectations do not adequately model the motives of agents is an exemplary example:

“Rational expectations are useful in demonstrating logical equilibrium outcomes and analyzing their consequences. But in the real world they break down easily. If some agents lack the computing power to deduce the posited outcome; or if some arrive logically at different conclusions from the same data (as they might in a pattern recognition problem); or if there is more than one rational expectations equilibrium with no means to coordinate which is chosen; then some agents may deviate in their expectations. And if some deviate, the world that is created may change, so that others should logically predict something different and deviate too. And so rational expectations can unravel easily. Unless there are special circumstances, they are not robust.”

As well as having clear logic Arthur leads the reader through thought experiments that help solidify the ideas presented multiple times as most prominently demonstrated in the section about the standard model. For example to demonstrate the issues that come along with rational expectations Arthur presents the Guessing Game (Nagel, 1994) but walks the reader through it using rational expectations as the basis for the players to make decisions. This effectively demonstrates in a fashion that can be explained to anyone when rational expectations break down.

Arthur supports any new claims he is making with research that is well documented and explained in a manner that leaves nothing to the reader to figure out. When Arthur is presenting the software that he and his team developed to test the accuracy of each model each component of the software is meticulously described in close to plain English. For example when describing what kind of models the software agents in his simulation can construct he gives a concrete example:

“For example, (in words) a model might be “If today’s price is higher than its average in the last 100 days, predict that tomorrow’s price will be 3% higher than today’s.”

This excerpt is completely free of computer and economic jargon, but still clearly demonstrates the style of model that the software agent can create. By doing this consistently throughout the paper Arthur has made the paper much clearer and enables the reader to spend more time thinking about the ideas presented rather than spend it thinking about what Arthur was trying to say.

Not only was Arthur’s paper a very solid read it was and enjoyable read. In Arthur’s paper there are multiple instances where Arthur uses a metaphor that is not technical to guide the direction of the paper. Arthur did this twice, once while presenting the logical contradictions created when you try to apply the standard model to a system where people have different beliefs about the market “Let us follow the story logically, and watch it unravel.” And second when introducing the reasoning for the market simulation: “And given the innate complication of dealing with not just one expectational model but an ocean of beliefs, how might its implications be studied?”

Not only did Arthur’s paper very effectively and accessibly describes some of the core concepts used in modern economic complexity theory. Arthur also demonstrated the use of thought experiments to help the reader solidify new ideas and used accessible language describe complex experiments. The ideas that this paper presented are also critical in the design of software trading agents. This has directed my research towards using a system that can quickly acquire, discard, and propagate patterns so that it can co-evolve with the market (as described in the article).