

Kicking over former models

A new book is shaking the basis of economic science. Constantin Gurdgiev talks to Prof Roman Frydman about the prediction of change.

Occasionally, once in a decade or two, there is a moment of pivotal change in economics that marks the end of an entire generation of past theories and the beginning of a new era of exploration of human behaviour and social interactions. At moments like these, a single scientific article or a book can turn upside down the entire universe of our knowledge, leaving behind the rubble of old theories and setting off the rebirth of the discipline. These moments make economists both insecure in their own knowledge and proud of their discipline.

Usually, such a new theory is firmly anchored to a renewed confidence in models that provide a better approximation of reality and, thus, better forecasting power.

Yet, for all the dramatic improvements in econometrics and mathematical modelling achieved in the field over the last 100 years or so, any new breakthrough in economics leaves unabated the sense of imprecision and indeterminism that seem to form the foundation for all human behaviour. Rational expectations theory – a brainchild of the 1960s and 1970s that came to prominence thanks to the Nobel Prize-winning work of Robert Lucas – was succeeded by the mathematical and orderly irrationality of behavioural economics models (in the Nobel Prize work of Amos Tversky and Daniel Kahneman) and other less illustrious but nonetheless powerful theories. They all faced troubles dealing with the simple fact that human behaviour can be (a) completely unpredictable, (b) seemingly irrational and (c) non-replicable. In other words, many economists in the past have understood that, in the end, people tend to behave in their own ways and that a stable permanent state of equilibrium for any social reality is an artificial construct.

In mathematics, this ultimate unpredictability of any theoretical system based on axiomatic (indisputable, artificially imposed and fundamental) assumptions is implied by inherent contradictory nature of the system. This was proven by young Czech mathematician Godel in 1931. Yet in economics – a science built on axiomatic



Prof Roman Frydman

models – Godel’s conjecture (effectively implying the impossibility of forecasting in a deterministic manner) was always conveniently ignored.

Roman Frydman and his co-author Michael Goldberg are two pioneering economists whose latest book, *Imperfect Knowledge Economics*, in effect challenges the dogmatic view of modern economics that human behaviour is predictable, stable and uniform.

Edmund Phelps, winner of the 2006 Nobel Prize in Economics, said that “the modern economy is marked by the feasibility of endogenous change”. More importantly, this change is not necessarily incremental or conditional on the past, nor does it lead to a uniform response by economic agents. Instead, such change can take the form of a drastically discontinuous departure from the past, as well as from the norms of mathematical models. Such change leads not only to dramatic changes in the outcomes of economic policies, but it makes these outcomes theoretically indeterminable, unpredictable and, thus, unforecastable.

This indeed a rare view of economics, but is it that novel? After all, in his famous *Econometric Policy Critique*, a paper written in 1976, Robert Lucas himself warned economists that changes in underlying economic fundamentals can trigger radical

shifts in people’s responses to policy shocks. This can lead to a complete breakdown of econometric models.

Frydman, professor of economics at New York University, is critical of Lucas’s rational expectations work. He is nonetheless quick to recognise the foresight of the father of modern macroeconomics. “*Econometric Policy Critique* is, of course, a paper that has two parts. The first part is the attack on conventional Keynesian aggregate mechanical models of the post-WWII era in which one established the effects of economic policy by simply changing the relevant parameter relating to specific policy, assuming that the rest of the structural relationship continues to hold despite the policy change. As Lucas, building on the work of Phelps, has pointed out, when the government changes policy, market participants will change expectations, thus changing the parameters of the model that are fundamental to the model itself. In other words, the structural parameters changed, not just the policy parameter itself. That would invalidate the structural model itself – exactly as what you characterised as discontinuous change. Those were very profound insights built on the [individual behaviour-based] microfoundations that led to rational expectations formation mechanism.

“The problem with Lucas’s analysis started in the second part of the paper – more properly the part for which Lucas has been awarded the Nobel. Lucas asks ‘what is the solution to this problem?’ Lucas’s proposition was that economists actually do have a way of knowing perfectly how the policy changes will translate into market behaviour. The new way of doing policy analysis emerged in which if one changes the policy parameter in the model, there is a resulting change in market participants’ expectations in a way that is entirely predetermined and predictable to the economist, and then one can actually see what happens as a result of change in the policy parameter. It is this part of Lucas’s work that we find to be false. The first part is fundamentally sound, but the

second part is a mistake. We have gone down Lucas's path as a profession and the results are less than impressive. We now know that the idea that we can predict how the markets will react to policy change, let alone the idea of predicting it exactly, is fanciful. But the illusion that we can predict such outcomes is a result of the rational expectations."

The work of Frydman and Goldberg (the latter is a professor of economics at the University of New Hampshire) leads to a much deeper conclusion than simple criticism of the existent models of policy analysis. Instead, in a truly earth-shattering way, it suggests that Godel's proposition might apply to the day-to-day functioning of economics as a scientific discipline.

If, as Frydman and Goldberg postulate, the imperfect nature of our knowledge conditions heterogeneous and unpredictable responses from economic agents, there is virtually no way in which we can really "know" what the future might hold – not only in terms of economic policy outcomes, but also in terms of all social interactions.

"The connection between Godel's theorem and the entire idea of internal consistency of economics as a subject is not fully explored in our work. The suggestion that you've made points to the direction that economics as a science must be looking into. But what we are pessimistic about is the ability of any given economist to predict the changes in knowledge and therefore changes in expectations.

"How do economists model markets today? They start from some conceptual model of individual behaviour and then, as an integral part of this, they also develop a model as to how people respond to change in the future. From there on, the individual model is aggregated into an economy-wide model. Rational expectations theory closes the circle between individual behaviour and the aggregate economy. The bottom line of our imperfect knowledge economics hypothesis is that there is a limit to this translation of individual behaviour into the aggregate performance because it is impossible to predict precisely how markets will react to changes in knowledge. What is possible, perhaps, is to make qualitative predictions about broadly defined behavioural outcomes, but not specific and exact predictions. The accuracy of these predictions and the length of their validity will depend on how well the forecaster actually makes the conditional assumptions about individual behavioural responses."

This latter point is extremely important to Frydman and Goldberg's work. Phelps

wrote that "Rational expectations equilibrium theory as an element of our models of the modern sort of economics contradicts the very essence of an economy in which economic actors are free to exercise their 'creativity' by venturing to do something innovative."

In effect, according to Phelps (an opinion echoed by Frydman and Goldberg's work), the much-feared economic "irrationality" of people is a creative force to be *reflected* in the models, not to be assumed away (as is done under the rational expectations hypothesis).

"I would argue that it is actually necessary to think about all economic theories in this way," says Frydman. "Economic theory is about what people might do, what actions they might consider, given their knowledge

'It is impossible to predict precisely how markets will react to changes in knowledge'

and their environment. Forecasting, at least good forecasting, always involves a measure of actual mathematical modelling and also a measure of intuition – it is an art and is not deterministic. This point was made earlier by John Maynard Keynes and earlier again by Frank Knight."

In particular, Knight, in his classic 1921 work, *Risk, Uncertainty and Profit*, postulates that any possible outcome of change in the underlying environment can have probabilities assigned to it. However, these probabilities are unknown and mathematically unmeasurable, implying the existence of deeper uncertainty – now known as "Knightian uncertainty".

"One current example comes to mind," says Frydman. "In the currency market, there are people today who expect the dollar to fall further below parity with the euro. Then there are plenty of people who believe that the dollar has fallen far enough. How do we know this? We know this because there are two sides to the market – the bulls and the bears.

"Now, suppose I have a model that predicts that the dollar is going up – as consistent with rational expectations. Then people who now expect the dollar to go down would have to be utterly irrational to believe in such an outcome. But this is exactly what we do not want economics to do. We want economic theory that would

allow us to organise our body of knowledge about the market's participants that would allow us to think about a system of markets in which every individual participant can have their own choice of outcomes."

The intuitive approach to forecasting can be seen as a reflection of the intuitive thinking used by market participants to transform existing uncertainty about events into a probabilistic structure of risk – in other words a method of dealing with uncertain events by assigning them probabilities. This is best highlighted in financial market behaviour, where the speed of responses required to match market moves is very high and there is often no time for technical analysis. But is it true of entrepreneurs or of economic growth where decisions are spread over time and often conditioned by incremental change and inertia, not rapid intuitive responses?

"The part of a decision driven by inertia or incremental change can be modelled by a fixed rule approach, similar to the ones employed in conventional economics today. But creativity requires that we do not think about the world in a purely predetermined way. Suppose we can predetermine the behaviour of everybody and that everything in the world is being driven by inertia. Suppose that, on average, what the market predicts is what the economy delivers. In other words, suppose that what economists assume to happen at the individual level actually happens at the aggregate level. This hypothesis is rational in the world of fixed rule only if everybody thinks and acts in exactly the same way. Suppose you and I still think about the world in a fixed way, but we think in a different fixed way from everybody else. Then, if as a market what we think about the world is correct, for each one of us individually it must be systematically incorrect – in so far as we differ in our assessment from the average.

"Rational expectations theory requires getting rid of any diversity of views and any diversity of knowledge, which, of course, according to Hayek was the basis of the argument as to why markets are superior to planning."

Imperfect Knowledge Economics: Exchange Rates and Risk by Roman Frydman and Michael Goldberg, is published by Princeton University Press.
<http://press.princeton.edu/titles/8537.html>

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