

Economics crisis

Thomas Lux and Frank Westerhoff

Economic theory failed to envisage even the possibility of a financial crisis like the present one. A new foundation is needed that takes into account the interplay between heterogeneous agents.

Once viewed as mystic monetary engineer, Alan Greenspan, former Chairman of the US Federal Reserve, has been re-cast as irresponsible villain, one who laid the ground for the present worldwide financial catastrophe. Asked whether his 'ideology' had pushed him to make decisions he now regrets, Greenspan confessed¹ that he would have deemed impossible the ongoing disruptions to the financial system and that "his belief in deregulation had been shaken".

He is not the only one who has been taken entirely by surprise. Most economists did not in any way foresee the depth of the current crisis, or even consider it possible. Even those who warned² of over-exuberance in the US housing market did not have any clue about the impending meltdown, which, to the shocked public, looks as if some Dr Strangelove on Wall Street had pushed the button on a financial Doomsday Device. Greenspan's supposed ideology certainly coincided widely with that of mainstream economists who believe in the self-regulating forces of unrestrained financial markets, the 'efficiency' of asset-price formation, and the increased efficiency in risk allocation and sharing through the introduction of ever more financial instruments.

All of this is just the finance version of that textbook economic paradigm, 'homo economicus', who has unlimited insightfulness and capability of deliberation (economists typically speak of 'rationality'). This admirable person manages his financial affairs as a side-aspect of his utility maximization problem, taking into account all potential future happenings with the correct probabilities. As there is only one way to be perfectly rational, this agent is usually the lone actor in economic models — a representative Robinson Crusoe.

Of course, this Crusoe has been often derided as a straw-man illustration of the dominant paradigm, criticized by non-mainstream economists, unbelieving natural scientists and a similarly unbelieving public. Still, the straw man

is alive, and was well — at least until the current financial crisis started to unfold. Although the principles outlined above are still the basis of most contemporary scholarly activity in economics, there are other trends. These include innovative work in 'behavioural economics' and experimental work with human subjects — recognized in the award of the 2002 Nobel Prize to Daniel Kahneman and Vernon L. Smith — which have revealed a plethora of behavioural patterns that contradict the assumption of perfectly rational behaviour.

To the shocked public, it looks as if some Dr Strangelove on Wall Street had pushed the button on a financial Doomsday Device.

However, these developments still occupy only a marginal position. The widespread perception within our profession is that behavioural research delivers a curious set of anomalies or exceptions that lack coherence, and whose impact gets washed out in the aggregate. In contrast, the mainstream paradigm is seen as a more solid and consistent framework. Economic policy advice, particularly in financial economics, will therefore typically be based on a set of axioms and hypotheses derived ultimately from the Robinson Crusoe scenario. As the prevailing financial crisis cannot be explained using these standard tools, economic theory basically offers policy makers little guidance about what to do in the current situation.

A major problem is that despite many refinements, this is not at all a system based on and confirmed by empirical research (as the naive believer in 'positive science' might expect). The vision (or ideology) encapsulated in the mainstream approach is of a more 'pre-analytical' nature and is supported mainly by elegant but idealistic models of the economy. Perfect rationality and optimizing behaviour are used so

pervasively in economics education that their basic tenets are taken for granted as the principles ruling the real world, despite all of the anomalies and exceptions discovered in empirical research.

For instance, it would be hard to find supporting evidence for the firmly held belief that more derivative instruments — which should allow agents to insure themselves better against the stochastic wheels of fortune — lead to a better allocation of resources and thus an increase in market efficiency. This assertion is based entirely on the benefits of contingent claims in the textbook general-equilibrium model. Derived in the abstract, the efficiency gain through derivatives is only a hypothesis, yet this is not how economists are used to thinking of such theorems: it is the mathematical proof within the model economy that is considered its validation, rather than any empirical evidence.

A glance at real-life operations in derivative markets easily shows why the theory fails: instead of hedging away risk, many market participants use derivatives in an 'anomalous' way, to build up speculative positions so as to profit from higher returns, as long as the downside risk does not materialize. The near disaster brought about in the late 1990s by the collapse of notorious hedge fund Long-Term Capital Management (intellectually based on modern derivative theory) should have raised some doubts. If that was not compelling enough, the present crisis should constitute its ultimate rejection.

The dominance of the rational-agent paradigm is intimately intertwined with an even more cumbersome 'conceptual reductionism'. As there can only be one way to act fully rationally, everyone should display exactly the same behaviour. Therefore, a representative agent would be sufficient. Taking both aspects together, the typical format of current economic models is that of a single household or firm maximizing its utility or profit over a finite or infinite lifespan. Technically, this is a dynamic programming problem.

This methodological preference excludes the study of interaction among economic agents. However, most of what is relevant and interesting in economic life has to do with the interplay and connection between diverse economic actors. The current crisis is a perfect example of the importance of interactions at various levels. It was the interaction between highly connected international financial markets that has generated the spillover from the US subprime-mortgage problem to other layers of the financial system.

Securitization of credit risks enabled lenders to sell various parts of their mortgage portfolios to other financial institutions thus creating new links with these buyers as well as, indirectly, among them. Other new asset classes, such as credit default swaps, added additional new links between formerly unconnected entities. This gives us a glimpse of how financial innovations have increased the degree of connectivity within the financial system. It is well known that highly connected systems might be 'robust yet fragile'³, but such important aspects have been out of reach of the mainstream approach to economics.

In fact, the ubiquitous notion of 'systemic risk' signals that current events concern the financial system at an aggregate level. For natural scientists, the distinction between micro-level phenomena and those originating on a macro-, system-wide scale from the interaction of microscopic units is clear. The overall systemic features of the crisis would be seen as an emergent phenomenon of the dispersed micro-activity. To reduce these macro events to the outcome of the decision process of a single agent seems to be missing the point.

Economic theory offers policy makers little guidance about what to do in the current situation.

As with systemic risk, the notion of coordination failure (a term often used to characterize the endogenous nature of economic slumps and recessions) in itself encapsulates a perspective of the 'more is different' paradigm⁴, an involuntary negative collective outcome of a system of dispersed activity. Rather than looking for the explanation in a particularly odd case of a microscopic dynamic programming problem, it would seem much more plausible to investigate the 'logic of collective activity' on the macroscopic scale. However, due to the conceptual reductionist philosophy,

macroeconomics has been entirely reduced to microeconomic theory in the past few decades by insisting on representative rational agents. That the overall system is different from its parts is plainly incomprehensible from the viewpoint of the ruling school of thought.

Economics has thus, by its methodology, tied its own hands and prevented the analysis of vital aspects of economic systems. For example, despite the recent surge of research in network theory, the now apparent linkages between banks have received scant attention. In the few papers that have been published, the analyses are of a static nature based on equilibrium concepts and do not easily lend themselves to empirical applications. The even smaller number of studies using empirical data or realistic models come from authors with a background in physics⁵. Unfortunately, the study of anything at a systemic level has been defined away from economics by the insistence on micro-foundations that simply set the macro sphere equal to the microscopic base unit.

What could be the way out of this dilemma? In our view, a change of methodological orientation in economics is needed, to take into account the 'more is different' paradigm. On the one hand, economists need to take seriously the various deviations from 'rationality' revealed by behavioural research. On the other hand, however, to avoid getting lost in a patchwork of behavioural biases and anomalies, a new empirically based type of micro-foundation is necessary — one that stresses more the links between boundedly rational agents rather than the agents' internal processes. It would, therefore, also not be enough to replace the current paradigm by a representative 'non-rational' actor (as has sometimes been done in recent literature).

The experience of the natural sciences in coping with complex systems would suggest a parsimonious stochastic approach. Because agents in large economic systems will display heterogeneity in terms of their different micro motives, degrees of deliberation and information-processing capabilities, one might hope that this variability of human behaviour can be quantified in a tractable way using statistical laws. Ongoing work inspired by statistical physics shows that relatively simple models with plausible behavioural rules have the potential to replicate key empirical regularities of financial markets⁶. In these models, direct and indirect local and global interactions between market participants are important ingredients in understanding the dynamics

of financial markets. Currently, similarly simple stochastic models are being developed in the study of the distribution of income and wealth⁷, and some economists have even taken this approach to macroeconomic models⁸.

Economics should take stock of the experience of the natural sciences in handling complex systems with strong interactions.

The apparent systemic vulnerability of our globalized financial markets has brought to the fore another carelessly neglected facet of economic interactions. Most economic problems are emergent phenomena of complex societies that require a systemic perspective. A new micro-foundation based on interactions would be the missing macro counterpart to the microeconomic regularities revealed in behavioural economics. To develop a proper perspective on systemic phenomena, economics as a science should take stock of the experience of the natural sciences in handling complex systems with strong interactions. A partial reorientation in modelling principles and more methodological flexibility would enable us to tackle more directly those problems that seem to be most vital in our large, globalized economic systems. □

*Thomas Lux is in the Department of Economics, University of Kiel, Olshausenstraße 40, D-24118 Kiel, Germany, and is a member of the research group 'Risks in the Banking Sector' of the Kiel Institute for the World Economy.
e-mail: lux@bwl.uni-kiel.de*

*Frank Westerhoff is in the Department of Economics, University of Bamberg, Feldkirchenstraße 21, D-96045 Bamberg, Germany.
e-mail: frank.westerhoff@uni-bamberg.de*

References

1. Andrews, E. L. Greenspan concedes error on regulation. *The New York Times* online 23 October 2008.
2. Shiller, R. *Irrational Exuberance* 2nd edn (Princeton Univ. Press, 2005).
3. Watts, D. J. *Proc. Natl Acad. Sci. USA* **99**, 5766–5771 (2002).
4. Anderson, P. W. *Science* **177**, 393–396 (1972).
5. Iori, G., Jafarey, S. & Padilla, F. J. *Econ. Behav. Organ.* **61**, 525–542 (2006).
6. Lux, T. in *Handbook on Financial Economics* (eds Schenk-Hoppé, K. & Hens, T.) (Elsevier, in the press).
7. Chatterjee, A., Yarlagadda, S. & Chakrabarti, B. (eds) *Econophysics of Wealth Distributions* (Springer, 2005).
8. Aoki, M. & Yoshikawa, H. *Reconstructing Macroeconomics: A Perspective from Statistical Physics and Combinatorial Stochastic Processes* (Cambridge Univ. Press, 2007).

Acknowledgement

The authors are grateful to Mishael Milakovic for inspiring discussions.