

Economic policy-making tools for pre- and post-crisis periods

by [Zakaria Babutsidze](#) and [Mauro Napoletano](#)

The worldwide financial crisis has questioned the relevance of economic models that are currently used by central bankers and macro analysts. In contrast, the recent economic events seem to be better described by models featuring boundedly rational heterogeneous agents and wherein markets do not necessarily clear at all times. Agent Based Models (ABMs) are a new class of models that embed all the above features, and therefore qualify as a promising alternative to conventional models.

An economic crisis, such as the current one, is a clear divide between processes before and after it. For instance, economic policies can be split into two groups: pre-crisis and post-crisis policies. While the latter aim at helping the economy to move out of the crisis to a more favourable state, the former policies concentrate on averting it.

Currently popular economic models can (to an extent) discuss post crisis policies. These models view economies as closed systems that move along one of (few) balanced equilibria. A modeller can introduce a large external shock in the system that can be interpreted as the crisis and further discuss policies to help the system move back to the previous (or even better) equilibrium. However, there is a problem with these policies. The main assumption of modern mainstream economics is hyper-rational agents, which assumes that economic agents (including households) possess complete information about the future of the economy and by acting rationally on this information the future that was foreseen is actually realized.

Modellers argue that this is reasonable even if we know that

people do not optimize. The argument is that due to market selection only the best performing agents will survive. As optimization guarantees the best response to the current situation every agent that is present at the equilibrium has to be behaving "as if" she is optimizing. Notice that this argument rests on the notion of equilibrium and says nothing about how this equilibrium will be reached. Now recall that modellers had to assume a large shock knocking the system out of the equilibrium in order to discuss the crisis. Then the approximation with hyper-rationality cannot properly describe the agent behaviour after crisis.

Concerning pre-crisis policies the problems are even greater. Current mainstream models exclude the possibility of generating the crises endogenously. While, it is a known fact that modern economic crises are rarely related to external shocks. They are generated endogenously by the system. They emerge from the factors (like non-price interactions, localized learning processes, outrageous banking and investment practices etc.) that are directly assumed away from the mainstream modelling. Therefore, these models are inherently inadequate to discuss policies directed to prevention of crises.

We believe that an economic tool that is to be successful in designing economic policy to avert the economic crises requires three characteristics. Firstly, it has to take account of the individual behaviour. Secondly, it has to model the behaviour in a way that is consistent not only with equilibrium, but also with non-equilibrium states. Finally, it has to allow for the possibility of endogenously generating crises.

Currently popular policy making tools fail in at least one of these three respects. Take for example Dynamic Stochastic General Equilibrium (DSGE) models. They represent the workhorse of modern monetary policy. This modelling strategy conforms to the first requirement listed above: DSGE is a

micro-founded modelling strategy that replaced previous techniques that were abstracting from individual agent behaviour and thus were prone to Lucas (1976) critique.[\[1\]](#)

Alas, DSGE fails in two other respects. Microeconomic behaviour is based on perfect foresight that requires hyper-rational agents that were mentioned above, and therefore, as argued above, does not describe well agent behaviour during the out-of-equilibrium dynamics. In addition to this, stochasticity of the system allows only for small perturbations and large shocks (such as crises) have to be exogenously injected in the system. Perhaps, these failures are the cause of difficulties that DSGE modelers are having in predicting and managing current crises, as acknowledged by some central bankers ([Trichet, 2010](#); [Kocherlakota 2010](#)).

It is true that DSGE models take into account micro-behaviour as well as institutions (see for example Smets and Wouters 2003), which is the model widely used by European Central Bank). However, what they fail to take into account is the possibility of endogenous (co-)evolution of these structures, the heterogeneity and non-price interactions among economic agents that can lead the system to breakdown without external interference.

One promising tool for economic policy design goes under the name of Agent Based Modelling (ABM). The characteristics of this approach are discussed at greater length in a recent OFCE [briefing paper by Napoletano, Gaffard and Babutsidze 2012](#). In contrast to mainstream economics (such as DSGE), ABM is more flexible to model relevant processes as dynamical systems of heterogeneous agents who interact through price and non-price channels. The approach treats time as the key variable. This is in contrast to orthodox models. Take the crises again. In mainstream modelling at the moment of crisis new equilibrium becomes known to everyone instantaneously and perfectly rational individuals adjust their choices accordingly. This drives the system to the new equilibrium. In ABM individuals

do not get information about new equilibrium to which the system is supposed to converge to and each individual has to navigate in its own way. This feature allows for the plethora of learning processes (which, according to Howitt 2012 are extremely scarce in modern Macroeconomic theory) to be also taken on board.

ABM concentrates on open-ended dynamics and allows for an equilibrium (defined as an ergodic state of the system) as an emergent and optional outcome ([Leijonhufvud 2011](#)). While current mainstream modelling is based on the centralized information processing structure that is fed with all the available information in the system, ABM takes a bottom-up approach that starts modelling realistic micro-foundations (in contrast to DSGE) and analyses the resulting behaviour of the model at upper levels. The dynamics of aggregate variables are the result of complex, continuously (and endogenously) changing micro-structure. This yields substantial advantages in modelling policy on macro (LeBaron and Tesfatsion 2008), as well as on industry (Chang 2009) and market (Duffy and Unver 2008) levels.

Using Agent Based tools a modeller can specify the agent's micro behaviour and understand how the dynamics of the system leads to the critical state and a subsequent breakdown (endogenously generated crisis). This is a common occurrence in physical systems and Agent Based approaches are routinely used for their analysis. Using such a model the policies to direct the path of the economy away from the critical state can be discussed. From this prospective ABM has clear advantage in discussing pre-crisis policies over orthodox approaches.

Another substantial advantage of the methodology is its easiness to be implemented in a computational environment. Behavioural rules can be passed to the agents in computer simulations and respective outcomes can be observed. This is important for two reasons. Firstly, this makes models easily

understandable for policy-makers that are not necessarily proficient in mathematics that current orthodox methods heavily rely on ([Uri Wilenski](#), the developer of the most popular computational environment for ABM – NetLogo, is repeatedly making this point). Secondly, behavioural rules (and other settings) can be easily adjusted to fit the problem at hand. Due to their concern with the equilibrium, mainstream models are less flexible and consequently less appropriate for policy-making.

However, there are disadvantages to the approach. Detailed discussion of approach's shortcomings is presented in the above-mentioned [OFCE briefing paper](#). Here we concentrate on the one that is shared by all non-equilibrium approaches. It is that ABM does not (cannot) provide a comprehensive analysis of all the paths the model allows for. Once you leave the equilibrium, the number of paths an economic system can take become infinite. Therefore, in most of the cases, comprehensive analysis is not feasible.

While this criticism is relevant in face of commonly accepted practice in economic science, it is irrelevant to the ABM's powers as a policy-making tool. Policy makers are not concerned with all the possible scenarios in all the possible types of economies. They have a very specific problem at hand. They operate in a specific country/region, they are given a very specific initial condition (currently existent in the economy) and they want to achieve a certain well-defined goal with a specific policy tool. Agent Based Modelling gives them the opportunity to fine-tune the model to their specific situation and then analyse the effects of a specific policy instrument. The policy instrument controls one (or very few) parameters of the model. Given a specific market/economy and specific initial conditions exhaustive analysis of these policy tool can be performed and welfare improving (if not optimal) policy can be designed.

Merits of every modelling approach can be debated. But

allowing diversity in approaches is bound to make policy discussions more stimulating and is likely to help the discipline avert the crises that are now seen as the crises of the discipline itself (Kirman 2010).

References

R. Lucas (1976) Econometric Policy Evaluation: A Critique. In K. Brunner and A. Meltzer (eds.) The Phillips Curve and Labor Market. Carnegie-Rochester Conference Series on Public Policy, 1:19–46.

J.-C. Trichet (2010) [Reflections on the nature of monetary policy non-standard measures and finance theory](#). Opening address at the ECB Central Banking Conference.

N. Kocherlakota (2010) [Modern Macroeconomic Models as Tools for Economic Policy](#). Banking and Policy Issues Magazine, Federal Reserve Bank of Minneapolis.

F. Smets and R. Wouters (2003) An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area. Journal of the European Economic Association, 1:1123-1175.

M. Napoletano, J-L. Gaffard and Z. Babutsidze (2012) [Agent Based Models: A New Tool for Economic and Policy Analysis](#). OFCE briefing paper No3/March 15.

P. Howitt (2012) What the central bankers learned from modern macroeconomic theory? Journal of macroeconomics. 34:11-22.

A. Leijonhufvud (2011) [Nature of the economy](#). CEPR Policy insight No. 53.

B. LeBaron and L. Tesfatsion (2008) Modeling macroeconomies as open-ended dynamics systems of interacting agents. American Economic Review: Papers & Proceedings, 98:246-250.

M. -H. Chang (2009) Industry Dynamics with Knowledge-Based Competition: A Computational Study of Entry and Exit Patterns.

Journal of Economic Interaction and Coordination, 4:73-114.

J. Duffy and U. Unver (2008) Internet Auctions with Artificial Adaptive Agents: A Study on Market Design. Journal of Economic Behavior and Organization, 67:394-417.

A. Kirman (2010) The economic crisis is a crisis for economic theory. CESifo Economic Studies, 56:498-535.

[\[1\]](#) However, DSGE models downplay the possibility of multiple equilibria. Thus, their ability to overcome the Lucas critique by introducing micro-foundations presents only a limited advantage.

Yes, the national accounts will be revised after the election

By Hervé Péléraux and Lionel Persyn[1]

In a Europe that is heading more and more clearly towards a recession, in mid-February the INSEE reported a 0.2% rise in France's GDP. This fourth-quarter performance was surprising, as it contrasts sharply with the deterioration in the economic climate since summer 2011, which indicated that GDP growth would be less favourable than that announced.

The current figures from the national accounts are, however, not set in stone. [A note from the OFCE](#) describes the procedure since the release of the provisional results that marks the starting point in the process of revising the

accounts. This revision is spread over several years, first involving the tuning of the quarterly accounts with the annual accounts, then the revision of the annual accounts (the final version for 2011 will be announced in May 2014). The final changes are to the database for the national accounts, which will provide an opportunity to introduce methodological innovations that aim at greater accuracy on past estimates.

The enigma of the fourth quarter of 2011 may be resolved in the future as the revisions are worked out. It is useful to refer to past experience to try to identify the profile of the coming adjustments and to draw the likely implications for the current period. Since 1987, the revisions to the accounts seem to have been pro-cyclical, that is to say, the preliminary figures are mostly revised upwards in periods of recovery or rapid growth, and downwards in periods of downswings in the economic cycle. In some major cyclical episodes, the average revisions are significant and could affect the economic diagnosis.

This was what happened in 2008. After the INSEE announced a negative result for the second quarter of -0.3% , the initial estimate for the third quarter was a positive 0.1% , which for a while put off the prospect that the French economy was entering a recession. The subsequent assessments gave a more dramatic turn to the GDP's trajectory, with the current respective estimates for the two quarters being -0.7% and -0.3% . Had these been known at the time, this would probably have pushed forecasts downwards by fully revealing the severity of the impact of the financial crisis on the real economy.

[1] At the time this note was written, Lionel Persyn was an intern at OFCE and a doctoral candidate at the University of

Nice at Sophia Antipolis.