The state of macro-economic modelling

There are currently two approaches within economics to modelling the overall economy at the macro-level.

The first is based upon the seminal work of Nobel Prize winner Larry Klein in his 1947 paper[1]. This has two basic components. First, an essentially Keynesian system of *macro*-theoretical relationships. Second, fitting curves (planes) through empirical macro-data using econometric (statistical) techniques to estimate parameters for these theoretical relationships. Over the past 60 years, the models have expanded their theoretical content and the econometric estimation techniques have become more sophisticated.   But the models currently in use in central banks, treasuries and private consultancies around the world would be immediately recognisable to the Larry Klein of 1947.

The second and much more recent approach, which finds widespread support amongst academic economists, is based upon *micro* theoretical relationships.   The approach has also become influential in recent years in central banks. The approach posits that the economy can be understood by reference to a single so-called 'representative agent', who takes decisions to maximises his/her utility over an infinite time horizon. Woodford (2009) is a good recent reference[2]. The approach is based upon the core model of individual behaviour in economic theory, that of the rational agent who forms rational expectations about the future.

These models ('dynamic stochastic general equilibrium' or DSGE for short) do not use statistical techniques to estimate their parameters. Instead, the macro-behaviour which emerges from the micro-foundations of the model is calibrated against 'stylised' macro-relationships, such as the cross-correlation over the business cycle between hours of work and leisure. In principle this is a more scientific approach than that of macro-modelling, because it does not rely on curve fitting to data. Instead, it seeks to explain emergent features of the macro economy from micro level behavioural principles.

But neither approach is at all satisfactory by scientific standards.

A key factor in the current crisis, for example, is how debtors and creditors react to events. These form two very distinct groups, whose behaviour may very well not be the simple mirror image of each other. Yet the DSGE models posit that the behaviour of the economy as a whole can be modelled with reference to a *single* agent. So it is not possible to have different behaviour of debtors and creditors in these models. Incredibly, given current circumstances, money and credit/debt play no direct role in such models, and the technical properties of the model ensure that financial markets have no impact on

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[1] LR Klein, 'The use of econometric models for policy purposes', *Econometrica*, 15, 1947

[2] M Woodford, 'Convergence in macroeconomics: elements of the new synthesis', *American Economic Journal: Macroeconomics*, 1, 2009

the economy in the long-run[3]. Further, the idea that economic agents form expectations 'rationally' is hard to reconcile with recent events.

The macro-econometric models also face serious problems, albeit of a completely different nature. There are two key points to make.

First, a principal use of these models is in short-term (no more than 2 years ahead) forecasting of macro-economic variable such as GDP growth and inflation. The track record of these models is very poor by scientific standards, and shows no sign of improving over time. For example, neither the severity of the current crisis in the West nor the very serious crisis in East Asia in 1998 were predicted at all by these models.

More generally, the forecasting record exhibits a certain degree of accuracy in that the average error over time is smaller than the size of the variable being predicted. But the error is still large compared to the actual data, and most of the accurate forecasts were made when economic conditions were relatively stable. Recessions in general have not been forecast prior to their occurrence, and the recessions following the 1974 and 1981 peaks in the level of output in America were not recognised even as they took place[4]

Second, despite the intensive research effort put into these models, especially over the 1970-2000 period, there is no sign of agreement arising between the various models on what the effects of policy changes might actually be on the economy. Estimates, for example, of the impact of a fiscal stimulus on the economy vary widely from model to model.

It is clear that different approaches are needed to the scientific question of understanding the behaviour of the macro-economy.

The complex systems approach is a natural one to examine, and initial work has been done in this area[5]. The economy is made up of large number of individual agents – consumers, firms – who interact with each other at the micro level. From these interactions, the macro features of the economy emerge. The key to progress, however, is to use much more realistic models of behaviour at the micro level. As 2002 Nobel Prize winner Daniel Kahneman put it 'rational models are psychologically unrealistic….. the central characteristic of agents is not that they reason poorly, but that they often act intuitively. And the behavior of these agents is not guided by what they are able to compute, but by what they happen to see at a given moment.'[6]

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[3] See, for example, Wolfgang Münchau, *Financial Times*, 6 July 2008, http://www.ft.com/cms/s/0/8362b1d0-4b59-11dd-a490-000077b07658.html?nclick_check=1

[4] R Fildes and H Stekler 'The state of macroeconomic forecasting', *Journal of Macroeconomics*, 24, 2002
[5] For example, G Dosi, G Fagiolo and A Roventini 'An evolutionary model of endogenous business cycles', *Computational Economics*, 2006 and P Ormerod and A Heineke, 'Global recessions as a cascade phenomenon with interacting agents', *Journal of Economic Interaction and Control*, forthcoming, 2009
[6] D Kahneman, 'Maps of bounded rationality: psychology for behavioral economics', *Am Ec Rev.*, 93, 1449-1475, 2003