Bifurcation Analysis of New Keynesian Functional Structure
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Date Defended: April 17 2007
Date Approved: April 17 2007

Abstract
The parameter space of most dynamic models is stratified into subsets, each of which supports a different kind of dynamic solution. Since we do not know the parameters with certainty, knowledge of the location of the bifurcation boundaries is of fundamental importance. Without knowledge of the location of such boundaries, there is no way to know whether the confidence region about the parameters' point estimates might be crossed by such a boundary, thereby stratifying the confidence region itself and damaging inferences about dynamics.

Current research goes in line with the work of Barnett and He (1999, 2001, 2002). First, they investigated a Bergstrom-Wymer continuos-time dynamic macroeconometric model of the UK economy. Barnett and He found transcritical, codimension-two, and Hopf bifurcation boundaries. A second class of models that had been analyzed is the Leeper and Sims (1994) model, where Barnett and He (2006) find a singularity induced bifurcation.

More recently, interest in policy in some circles has moved to New Keynesian models, which have become common in monetary policy formulations. As a result, we explore bifurcations within the class of New Keynesian models. We study different specifications of monetary policy rules within the New Keynesian functional structure. After searching the parameter space, we find the possibility of a Hopf and a Period Doubling bifurcation, with the setting of the policy parameters influencing the existence and location of the bifurcation boundary. Hopf bifurcation is the most commonly seen type among economic models, since the existence of a Hopf bifurcation boundary is accompanied by regular oscillations in an economic model. Central results in this research are the theorems on the existence and location of Hopf bifurcation boundaries in each of the considered cases. We also solve numerically for the location and properties of the Period Doubling bifurcation boundaries and their dependency upon policy-rule parameter settings.

Beginning with the Bergstrom-Wymer policy-relevant Keynesian model, then continuing the path to the Euler equation macroeconomic models, and now to the New Keynesian models. So far all these results suggest that the initial findings with the path-breaking policy-relevant Bergstrom-Wymer model appear to be generic.