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ScienceDirect
ELSEVIER Journal of Economic Dynamics & Control 30 (2006) 2725–2748
JOURNAL OF Economic Dynamics & Control
www.elsevier.com/locate/jedc

Are hyperinflation paths learnable?

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Received 4 May 2004; accepted 7 September 2005
Available online 29 November 2005

Abstract

Earlier studies of the seigniorage inflation model have found that the high-inflation steady state is not stable under learning. We reconsider this issue and analyze the full set of solutions for the linearized model. Our main focus is on stationary hyperinflationary paths near the high-inflation steady state. These paths are shown to be stable under least-squares learning if agents can utilize contemporaneous data. In an economy with a mixture of agents, some of whom only have access to lagged data, stable hyperinflationary paths emerge only if the proportion of agents with access to contemporaneous data is sufficiently high.

JEL classification: C62; D83; D84; E31

Keywords: Indeterminacy; Inflation; Stability of equilibria; Seigniorage

1. Introduction

The monetary inflation model, in which the demand for real balances depends negatively on expected inflation and the government uses seigniorage to fund in part its spending on goods, has two steady states and also perfect foresight paths that converge to the high-inflation steady state.[1] These paths have occasionally been used

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[1]The model is also called the Cagan model after (Cagan, 1956).

0165-1889/$ - see front matter
doi:10.1016/j.jedc.2005.09.003

as a model of hyperinflation, see e.g. (Fischer, 1984), (Bruno, 1989) and (Sargent and Wallace, 1987). However, this approach remains controversial for several reasons. First, the high-inflation steady state has 'perverse' comparative static properties since an increase in seigniorage leads to lower steady-state inflation. Second, recent studies of stability under learning of the high-inflation steady state suggest that this steady state may not be a plausible equilibrium.

Marcet and Sargent (1989) and Evans et al. (2001) have shown that the high-inflation steady state is unstable for various versions of least-squares learning. Adam (2003) has obtained the same result for a sticky price version of the monetary inflation model with monopolistic competition. Arifovic (1995) has examined the model under genetic algorithm learning and the economy appears always to converge to the steady state with low, rather than high inflation. Experimental work by Marimon and Sunder (1993) also comes to the conclusion that the high-inflation steady state is not a plausible outcome in the monetary inflation model.

The instability result for the high-inflation steady state under learning has been derived under a particular assumption about the information sets that agents are assumed to have. Van Zandt and Lettau (2003) raise questions about the timing and information sets in the context of learning steady states. They show that, under what is often called constant gain learning, the high-inflation steady state in the Cagan model can be stable under learning with specific informational assumptions.[2] Under the more standard decreasing gain learning the high-inflation steady state is found to be stable only if inflation is estimated by a regression of the price level on its lagged value (without intercept) and the current price level is both included as part of the information set and used to update current parameter estimates as well.

The theoretical learning stability results of both Marcet and Sargent (1989) and Van Zandt and Lettau (2003) are for nonstochastic models and examine only the learnability of inflation steady states.[3] However, because the high-inflation steady state is indeterminate, there exists a multiplicity of solutions taking different forms. In stochastic models, near the high-inflation steady state the solutions include stochastically stationary first-order autoregressive solutions driven by the fundamental shocks and also more general solutions that depend on sunspots. The central goal of the current paper is to assess the stability under least-squares learning of the entire class of rational expectations (RE) solutions.[4] In doing so we pay careful attention to the information sets of the agents.

The monetary inflation model, like that of Duffy (1994), has the important feature that the temporary equilibrium inflation rate in period t depends on the private agents' one-step ahead forecasts of inflation made in two successive periods, $t-1$ and t. Except for some partial results in Duffy (1994) and Adam (2003), the different types of rational expectations equilibria (REE) in such 'mixed dating models' have

[2]However, constant gain learning is most natural in nonstochastic models, since otherwise convergence to rational expectations is precluded. In this paper we allow for intrinsic random shocks and thus use 'decreasing gain' algorithms, consistent with least-squares learning.

[3]Evans et al. (2001) analyze learning of stochastic steady states.

[4]In a related but different model, Duffy (1994) showed the possibility of expectationally stable nonstochastic dynamic paths near an indeterminate steady state.