Staggered updating in an artificial financial market

Christophre Georges*

Department of Economics, Hamilton College, Clinton, NY 13323, USA

Received 29 September 2006; accepted 2 November 2007

Available online 28 January 2008

Abstract

We consider an environment in which traders search for trading opportunities and update their forecast rules at random intervals by OLS. The staggering of this updating process across traders allows differences in opinion to persist over time, generating nontrivial price dynamics. The nature of these dynamics is sensitive to the degree of overparameterization of forecast rules relative to market fundamentals.

© 2008 Elsevier B.V. All rights reserved.

JEL classification: D83; D84; E44

Keywords: Learning; Expectations; Agent-based modeling

1. Introduction

This paper considers the behavior of artificial agents in a simple market environment with over-the-counter trading. These agents base their trading decisions on forecast rules which they fit to recent data by OLS. We consider both minimum state variable (MSV) forecast rules and rules that are overparameterized relative to
the fundamentals of the market. Agents have limited memory and face random wait times between updates.

Simulation results for the MSV case are consistent with the analytical results of Honkapohja and Mitra (2003). Price dynamics converge to a noisy version of the stationary rational expectations equilibrium. The limited memory of agents causes learning to be incomplete, and there is persistent excess volatility of asset returns. Here, however, this volatility depends crucially on the heterogeneity of expectations which is sustained by the staggering of rule updating across agents.

When agents use overparameterized forecasting rules, the ongoing discovery and adoption of rules far from the MSV rational expectations rule induces heightened volatility, volatility clustering and the occasional formation of explosive bubbles. The frequency of these bubbles is decreasing in the memory of the agents and increasing in the rate of updating (i.e., the rate of learning) and the degree of overparameterization of forecast rules. We also show that the use of overparameterized forecast rules can survive specification testing by agents who wish to avoid overfitting the available data.

Our focus on overparameterized forecasting rules is motivated by Grandmont (1998), who argues that, in the face of model uncertainty, economic agents should be prepared to extrapolate a wide variety of trends from the recent past. This stands in contrast to the recent literature on adaptive learning by agents with misspecified forecasting models that are underparameterized relative to the market fundamentals (Evans and Honkapohja, 2001, Chapter 13; Cho et al., 2002; Branch and Evans, 2006).

Other models of expectational heterogeneity that have been proposed in the economics and finance literatures include the ‘sticky information’ approach to the Phillips curve offered by Mankiw and Reis (2002), Carroll’s (2003) model of information diffusion, stochastic choice models such as that used by Brock and Hommes (1998), and LeBaron’s (2001) model with heterogeneity of memory length.

---

1Those models often possess ‘restricted perceptions equilibria’ or ‘misspecification equilibria’ that are stable under learning. Expectations at these equilibria cannot be rational (due to the underparameterization of forecast rules), but they are confirmed by the data given the misspecification.

2Another related paper is Adam et al. (2006), in which agents forecast growth rates in a nonstationary environment.
دریافت فوری
متن کامل مقاله
امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات