ELSEVIER

Commodity price dynamics and the nonlinear market impact of technical traders: empirical evidence for the US corn market

Frank Westerhoff[a],*, Stefan Reitz[b]

[a]*Department of Economics, University of Osnabrück, Rolandstraße 8, 49069 Osnabrück, Germany*
[b]*International Business School, Brandeis University, Waltham, MA 02454-9110, USA*

Abstract

We develop a simple model with technical and fundamental traders to explain the cyclical motion of commodity prices. The crucial element of our model is a nonlinear market impact of technical traders: Estimation of our STAR-GARCH model using monthly US corn price data reveals that technical traders increasingly enter the market as booms or slumps enlarge. One reason may be that they only gradually learn about the emergence of persistent price trends. The behavior of trend-extrapolating speculators obviously enforces mispricings and thus contributes to cyclical motion as observed in actual commodity markets.
© 2004 Elsevier B.V. All rights reserved.

*Corresponding author.

E-mail addresses:* fwesterho@oec.uni-osnabrueck.de (F. Westerhoff),
stefan.reitz@wirtschaft.uni-giessen.de (S. Reitz).

1. Introduction

Models with heterogeneous interacting traders [1–6] have proven to be quite successful in replicating the stylized facts of financial markets [7–10], i.e., the models generate time series which display intricate price dynamics, bubbles and crashes, fat tails for the distribution of the returns and volatility clustering. This branch of research is quite important since it may help us to devise better models of risk management [11], trading strategies [12] or regulation of financial markets [13–15]. So far, most of these models have been designed for asset markets.

Although commodity markets differ in several aspects to asset markets they also share some similarities. On the one hand, they roughly display the same stylized facts [16]. On the other hand, most commodities are traded at stock exchanges and are thus also influenced by the activity of speculators. The goal of this paper is to develop a simple commodity market model which explicitly focuses on the trading behavior of heterogeneous agents. A second goal is to confront our model with actual data. Instead of calibrating the model by hand such that it produces realistic price dynamics we seek to estimate our model. Surprisingly, only few attempts exist where parameters of multi-agent models are directly derived from the data. One reason may be that one has to sacrifice certain real-life market details: If the setup is too complicated, econometric analysis is precluded. However, we think that empirical evidence for a model is valuable, even if some interesting model elements have to be excluded.

The structure of our model is roughly as follows: We consider two types of agents: fundamentalists and chartists [17–20]. Fundamentalists are convinced that prices will return toward their long-run equilibrium values. Hence, if the price is below (above) its fundamental value, they will buy (sell) the commodity. Such a trading strategy tends to stabilize the market since prices are pushed toward their equilibrium values. Technical traders aim to identify price signals from past price trends. The basic principle of technical analysis is that prices move in trends. Technical traders thus buy the commodity when prices increase and sell the commodity when prices decrease. While the market impact of fundamental traders is constant over time, the market impact of technical traders is time varying and depends on market circumstances.

We test our model for the US corn market. A STAR-GARCH estimation setup indicates that the further the corn price deviates from its long-run equilibrium value, the more technical traders enter the market. As a result, bubbles may become self-fulfilling since they attract an increasing number of destabilizing trend-extrapolating agents (and the power of fundamental traders simultaneously remains constant). Our mechanism may be explained by the fact that agents only gradually learn about the emergence of a new bubble process. For instance, it may take some time for the agents to recognize the price trend or for them to meet someone already trading in that market. In a broader sense, our view of a slow, yet persistent process of information dissemination has recently also been proposed to explain irrational exuberance in stock markets [21].