



Exchange rate dynamics, central bank interventions and chaos control methods[☆]

Cristian Wieland, Frank H. Westerhoff*

Department of Economics, University of Osnabrueck, Rolandstrasse 8, D-49069 Osnabrueck, Germany

Received 28 January 2003; received in revised form 30 May 2003; accepted 15 December 2003
Available online 22 December 2004

Abstract

We use a simple chartist–fundamentalist model developed by Day and Huang to explore recent chaos control algorithms as potential candidates for central bank intervention rules. We find that methods such as delayed feedback control, OGY and constant feedback have, in principle, the potential to reduce exchange rate variability and deviations from fundamentals even in the presence of large dynamic noise.

© 2004 Elsevier B.V. All rights reserved.

JEL classification: F31; E58; G18

Keywords: Exchange rate dynamics; Central bank interventions; Chaos control; Technical and fundamental trading rules

1. Introduction

The chartist–fundamentalist approach (e.g., Day and Huang, 1990; Huang and Day, 1993; Brock and Hommes, 1998; Lux and Marchesi, 2000; Chiarella et al., 2002; Farmer and Joshi, 2002; Rosser et al., 2003) has proven to be quite successful in replicating the

[☆] Presented at the Complexity 2003 Workshop, Aix-en-Provence, May 2003, and at the 8th Viennese Workshop on Optimal Control, Dynamic Games and Nonlinear Dynamics, Vienna, May 2003. We thank the participants for their helpful discussions, especially Richard Day, Cars Hommes, Erik Mosekilde and Barkley Rosser.

* Corresponding author. Tel.: +49 541 969 27 43; fax: +49 541 969 127 42.

E-mail address: fwesterho@oec.uni-osnabrueck.de (F.H. Westerhoff).

stylized facts of financial markets. For instance, some of the more recent contributions generate artificial data that is hard to discriminate from actual data. Although buffeted with dynamic noise, price dynamics are at least partially due to an endogenous nonlinear law of motion. Such nonlinearity may originate from the fact that traders use nonlinear trading rules to determine their investment position.

If price fluctuations are stimulated endogenously, central authorities may have some chance to control the dynamics. Indeed, recently some methods to stabilize chaotic behavior have been introduced (Schuster, 1999). First, the OGY method, named after Ott et al. (1990), or the delayed feedback control (DFC) method of Pyragas (1992) may be used to stabilize unstable periodic orbits embedded within a chaotic attractor. While the OGY method slightly perturbs an accessible system parameter, the DFC method adds a linear feedback to the system. Second, the constant feedback (CF) method (e.g., Parthasarathy and Sinha, 1995; Wieland, 2002) is used to suppress chaos.

The aim of this paper is to investigate chaos control methods within the chartist–fundamentalist approach. Specifically, we study whether the chaos control literature offers ways to improve the effectiveness of central bank interventions. Our analysis is based on the seminal work of Day and Huang, which we adjust to foreign exchange markets. The contribution of Day and Huang not only established the study of models with chartists and fundamentalists on a sophisticated scientific level but also produced many descendants (Lux and Marchesi, 2002).

Although the empirical literature is ambivalent about the usefulness of intervention operations, central banks intervene quite frequently in foreign exchange markets (e.g., LeBaron, 1999; Neely, 2001; Sarno and Taylor, 2001). As it turns out, the two most common heuristic intervention strategies “leaning against the wind” and “targeting long-run fundamentals” are somehow related to concepts discussed in the chaos control literature. Our paper provides an analytical and numerical underpinning of central bank intervention strategies. Given the policy importance of central bank interventions, it is surprising that this aspect has until now received only scant attention in the literature.

Our main results are as follows. While “leaning against the wind” fails to stabilize the market, “targeting long-run fundamentals” may reduce both volatility and distortion. In order for the latter method to work, however, central banks have to intervene quite considerably. If they fail to do so, the exchange rate may not be driven towards fundamentals. The OGY method in our model is a more sophisticated version of “targeting long-run fundamentals.” For instance, this rule is only activated if the exchange rate lies within a promising intervention zone. With the CF method, central banks have the opportunity to direct the exchange rate towards a desired level while simultaneously reducing volatility.

The paper is organized as follows. In Section 2, we briefly present the model of Day and Huang. In Section 3, we extend the model by noise traders and a central bank. In addition, we explore the workings of DFC (Section 3.2), OGY (Section 3.3) and CF (Section 3.4). In Section 4, we discuss the methods. The final section concludes the paper.

2. The model

According to questionnaire studies such as Taylor and Allen (1992), Menkhoff (1997) and Lui and Mole (1998), professional foreign exchange traders surprisingly rely on rather

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ 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