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Testing the stability of the 2000 US stock market "antibubble"

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Abstract

Since August 2000, the stock market in the USA as well as most other western markets have depreciated almost in synchrony according to complex patterns of drops and local rebounds. In (Quantitative Finance 2 (2002) 468), we have proposed to describe this phenomenon using the concept of a log-periodic power law antibubble, characterizing behavioral herding between investors leading to a competition between positive and negative feedbacks in the pricing process. A monthly prediction for the future evolution of the US S&P 500 index has been issued, monitored and updated in (http://www.ess.ucla.edu/faculty/sornette/prediction/index.-asp#prediction), which is still running as the article goes to press. Here, we test the possible existence of a regime switching in the US S&P 500 antibubble. First, we find some evidence that the antibubble has exhibited a transition in log-periodicity described by a so-called second-order log-periodicity. Second, we develop a battery of tests to detect a possible end of the antibubble of the first order which suggest that the antibubble was alive in August 2003 but has ended in the USA, when expressed in the local US dollar currency. Our tests provide

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quantitative measures to diagnose the end of an antibubble. Such diagnostic is not instantaneous and requires from three to six months within the new regime before assessing its existence with confidence. From the perspective of foreign investors in their currencies (S&P 500 denominated in British pound or in euro) or when expressed in gold so as to correct for an arguably artificial US$ valuation associated with the Federal Reserve interest rate and monetary policy, we find that the S&P 500 antibubble is still alive and running its course. Similar analyses performed on the major European stock markets (CAC 40 of France, DAX of Germany, and FTSE 100 of United Kingdom) show that the antibubble is also present and continuing there.

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1. Introduction

In 1999, in order to describe the evolution of the Japanese stock market since its all-time high in December 1989, Johansen and Sornette introduced the concept of an "antibubble" as a counterpart of a bubble resulting from the same herding behavior and characterized by log-periodic power-law (LPPL) structures but with decelerating (rather than accelerating) oscillations [1]. The term "antibubble" is inspired by the concept of "antiparticle" in physics. Just as an antiparticle is identical to its sister particle except that it carries exactly opposite charges and destroys its sister particle upon encounters, an antibubble is both the same and the opposite of a bubble; it is the same because similar herding patterns occur, but with a mostly bearish versus bullish slant. Some antibubbles can also describe increasing markets over long times, although a bearish phase is more commonly recognized in the markets [2–5]. In August 2002, we detected the existence of a clear signature of an antibubble in the relaxation of the US S&P 500 index since August 2000 with high statistical significance, in the form of strong log-periodic components [6]. Similarly to the prediction offered in Ref. [1] for the evolution of the Nikkei index which was later evaluated in Ref. [7], we presented a prediction for the future evolution of the US S&P 500 index [4,6]. This prediction has been monitored and updated once a month at the URL [8]. Accompanying the US stock markets, the antibubble regime since 2000 seems to be a world-wide phenomenon in the major western stock market [2]. These works on antibubbles extend a large amount of theoretical and empirical work on LPPL bubbles which often end in crashes or strong corrections (see [9–12] and references therein). In this context, Roehner has investigated the resilience pattern around large price peaks [13] and has found strong negative correlations between stock market crash-recovery and interest rate spread [14].

In contrast to a LPPL bubble whose end is automatically described by one of the parameters, the critical time t_c, the LPPL formulation of an antibubble does not say anything a priori about its duration. For prediction purpose, the agonizing question