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Tests for Explosive Financial Bubbles in the Presence of Non-stationary Volatility[*]

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Abstract

This paper studies the impact of permanent volatility shifts in the innovation process on the performance of the test for explosive financial bubbles based on recursive right-tailed Dickey-Fuller-type unit root tests proposed by Phillips, Wu and Yu (2011). We show that, in this situation, their supremum-based test has a non-pivotal limit distribution under the unit root null, and can be quite severely over-sized, thereby giving rise to spurious indications of explosive behaviour. We investigate the performance of a wild bootstrap implementation of their test procedure for this problem, and show it is effective in controlling size, both asymptotically and in finite samples, yet does not sacrifice power relative to an (infeasible) size-adjusted version of their test, even when the shocks are homoskedastic. We also discuss an empirical application involving commodity price time series and find considerably less emphatic evidence for the presence of explosive bubbles in these data when using our proposed wild bootstrap implementation of the Phillips, Wu and Yu (2011) test.

Keywords: Rational bubble; Explosive autoregression; Non-stationary volatility; Right-tailed unit root testing.

JEL Classification: C22; C12; G14.