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Misspecification versus bubbles in hyperinflation data: Monte Carlo and interwar European evidence

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Abstract

This paper analyzes some new tests of the Cagan hyperinflation–money demand model which have several advantages relative to those in the literature. They do not confound specification error with rational bubbles, can be implemented with a linear procedure, and are frequently able to detect periodically collapsing bubbles which have challenged existing tests. After a Monte Carlo analysis, the tests are applied to data from hyperinflations in Austria, Germany, Hungary, and Poland. Evidence of misspecification is found for Austria, Germany and Hungary, while the model without a rational bubble component appears to fit the data for Poland. Published by Elsevier Science Ltd.

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1. Introduction

The Cagan model of money demand under hyperinflation (Cagan, 1956) has been a workhorse in monetary economics, comparable in its use as a benchmark (and in its geometrically discounted expected value structure) to the dividend–stock price model in financial economics and the permanent income–consumption model in macroeconomics. However, its empirical literature differs in an important way: most

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papers using the Cagan specification estimate the model's parameters and test particular restrictions, but do not test the overall validity of the model. As Taylor (1991) notes, the Cagan model literature is largely *verificationist* rather than *falsificationist*. Perhaps due to this situation, the basic question of whether or not it is a useful model provokes wide disagreement, even when assessed on a common data set.[2]

Part of the confusion is tied to the fact that the Cagan model has multiple equilibria: explosive, rational bubbles are consistent with the model's solution. In the literature that focuses on bubbles, the validity of the Cagan model is generally a maintained, but untested, hypothesis. Thus direct estimates of bubbles may be biased if the model is misspecified, and tests which regard deviations from the "market fundamentals" solution as evidence of bubbles may be misclassifying specification error. Other strands of the Cagan literature rule out a priori the existence of bubbles, despite potentially serious implications for estimates and tests.

Durlauf and Hooker (1994) developed a methodology for testing the model which does not confound bubbles and specification error. That methodology employs two transformations of the data: under the null of correct specification, one transformation is orthogonal to an information set no matter which of the multiple equilibria obtains, while the other is orthogonal only if the no-bubbles equilibrium is realized. Thus sequential application of the tests allows separate falsification of the model's general solution and rational bubble components of that solution. This paper extends that work in two ways.

First, it presents Monte Carlo evidence on the size and power of the tests. Most hyperinflation work, including that of Durlauf and Hooker, uses asymptotic distributions and very short, explosive data samples. As G. Evans (1991) and West (1994) have noted, there is a shortage of evidence on the small-sample performance of tests with explosive data. The tests in this paper may be implemented linearly, which greatly facilitates simulation experiments, in contrast to the many nonlinear and iterative approaches in the hyperinflation literature. Particular attention is paid to the hard-to-detect bubbles described in G. Evans (1991), and alleged to be present in the German hyperinflation and the recent Polish hyperinflation by Blackburn and Sola (1992) and Funke et al. (1994) respectively. The paper then applies the measures and tests to the classic interwar hyperinflations in Austria, Germany, Hungary, and Poland, evaluates this evidence using the small-sample critical values from the Monte Carlo simulations, and makes comparisons with existing results in the literature.

The paper is organized as follows. Section 2 reviews the Cagan model and the specification tests. Section 3 contains a discussion of some recent and related literature. In Section 4, Monte Carlo simulations for critical values are conducted, and test size and power against several potential bubble alternatives are reported. Applications of the tests to the interwar hyperinflation data are presented in Section 5, and Section 6 concludes.

[2] Most papers estimate the model on the German hyperinflation sample from the early 1920s.