

Comment on Bent Nielsen paper: "On the explosive nature of hyper-inflation data"

Paper argues that explosiveness represents one of the key features of monthly time series during hyper-inflation, which implies the use of methodological framework that differs from those commonly applied to model such data. The monthly time series from the Serbian hyper-inflation episode are considered from December, 1990 to January, 1994. These are: money supply, black market exchange rate and retail price index.

Paper contains three main results that enable further understanding of the mechanism that generates hyper-inflation data. First, the application of co-explosive methodology of Nielsen (2005) shows that three time series considered share a common explosive trend. Furthermore, the standard linear specification of the Cagan money demand model seems to be inappropriate in capturing the monetary dynamics throughout the whole hyper-inflation episode. Second, the new measure of cost of holding money is defined and explained. Based on this redefinition of the cost of holding money, linear Cagan money demand specification is estimated up to the very end of this episode. Third, full-system modeling of real money, cost of holding money (or depreciation rate) and difference between cost of holding money and depreciation rate is provided in order to describe both, long-run cointegration relations, and the short-run adjustments.

Results presented in the paper are relevant for the econometric modeling of hyper-inflation data. However, they raise several questions that can be elaborated further. Some of them are:

1. In Section 3.1 the explosiveness of the data is considered within the VAR model that contains all three variables (prices, exchange rate and money supply). Here, the sample ends in October, 1993. Based on unrestricted model root of 1.21 is determined. However, explosive root cannot be found when VAR model is estimated for the first differences of prices, exchange rate and money. Also, when three bi-variate VAR models are estimated (between the first differences using the same VAR order and deterministic components), then explosive roots are absent from unrestricted models. How are these findings related to the ones reported in the paper?

2. In Section 3.3 the distinction between explosive and unit roots is presented. It seems that this discussion would benefit from the further analysis of whether prices contain rational bubble or not (Diba and Grossman, 1988). Co-explosive framework might be useful, as cointegration analysis is, in assessing this issue.

3. In Section 5 linear model is estimated based on the new measure of cost of holding money. In this section data from the whole hyper-inflation episode are used (sample ends in January, 1994). However, the last three months of this episode are excluded from the analysis in the previous sections of the paper. What is the reason for this change in the sample used?

4. In Section 5 estimated VAR model provides root of 1.035. Is this root insignificantly different than 1? What are other roots of VAR model?

5. Some of the previous results for the Serbian hyper-inflation (Cf. Petrovic and Mladenovic, 2000) were based on cointegration analysis between money deflated in foreign currency and money growth, which followed methodology advocated by Engsted (1993). Can the full-system empirical modeling in Section 5 account for this long-run relation?

Additional literature:

Engsted, T.(1993), Cointegration and Cagan's model of hyper inflation under rational expectations, *Journal of Money, Credit and Banking* 25, 350-360.

Diba, B. and H. Grossman (1988), Rational inflationary bubbles, *Journal of Monetary Economics* 21, 35-46.