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Testing the Prebisch–Singer hypothesis since 1650: Evidence from panel techniques that allow for multiple breaks☆

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A B S T R A C T

In this paper, we re-examine two important aspects of the dynamics of relative primary commodity prices, namely the secular trend and the short run volatility. To do so, we employ 25 series, some of them starting as far back as 1650 and powerful panel data stationarity tests that allow for endogenous multiple structural breaks. Results show that all the series are stationary after allowing for endogenous multiple breaks. Test results on the Prebisch–Singer hypothesis, which states that relative commodity prices follow a downward secular trend, are mixed but with a majority of series showing negative trends. We also make a first attempt at identifying the potential drivers of the structural breaks. We end by investigating the dynamics of the volatility of the 25 relative primary commodity prices also allowing for endogenous multiple breaks. We describe the often time-varying volatility in commodity prices and show that it has increased in recent years.

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1. Introduction

The present paper re-examines two important aspects of the dynamics of relative primary commodity prices using long time series, some of them starting as far back as 1650. The dynamics of relative primary commodity prices can be decomposed into essentially three components: The secular trend which Prebisch (1950) and Singer (1950) have conjectured should be declining, the long cycles that affect relative primary commodity prices and finally the volatility which has been found often time varying and generally increasing in recent years.[1] In this paper, we do not examine the long cycles component for lack of space (cf. Erten and Ocampo, 2012 and references therein). We focus on the Prebisch–Singer hypothesis (thereafter PSH) and the volatility of relative primary commodity prices using recent panel data technology.

The first step in testing the PSH is to test for the stationarity of the series. This is important because depending on whether or not the series are stationary we must use the appropriate regression framework to test for the PSH. If y_t, the logarithm of the relative commodity price is generated by a stationary process around a time trend, then the following equation is:

$$y_t = \alpha + \beta t + \varepsilon_t, \quad t = 1, \ldots, T, \tag{1}$$

where t is a linear trend and the random variable ε_t is stationary with mean 0 and variance σ_ε^2. The parameter of interest is the slope β, which is predicted to be negative under the PSH. If the real commodity prices were generated by a so called difference-stationary or $I(1)$ (thereafter DS) model, implying that y_t is non-stationary, then we should employ the following equation:

$$\Delta y_t = \beta + v_t, \quad t = 1, \ldots, T, \tag{2}$$

where v_t is stationary. It is well known that if y_t is a DS process, then using equation (1) to test the null hypothesis of $\beta = 0$ will result in acute size distortions, leading to a wrong rejection of the null when no trend is present, even asymptotically. Alternatively, if the true generating process is given by equation (1) and we base our test on equation (2), our test becomes inefficient and less powerful than the one based on the correct equation. Therefore, when testing the PSH we have first to test the order of integration of our relative commodity prices in order to use the right regression. In this paper, we use the Hadri and Rao (2008) panel stationarity test in order to test jointly for the stationarity of our series, in turn increasing the power of the test relatively to individually testing each time series. Using the Hadri and Rao (2008) panel stationarity test also allows us to incorporate the information contained in the cross sectional dependence of our series. It is well known that there are generally positive and significant correlations between real primary commodity prices. Pindyck and Rotember (1990) noted this strong correlation in the real prices of unrelated commodities which they refer to as “excess co-movement”. They found that even after controlling for current and expected future values of macro-economic variables this excess co-movement remains.

We use long time series, some of them starting in 1650. It is thus highly likely that they will show multiple breaks. Since the pioneering work of Perron (1989), it is widely accepted that the failure of taking into account structural breaks is likely to lead to a significant loss of power in unit root tests. Similarly, stationarity tests ignoring the existence of breaks diverge and thus are biased toward rejecting the null hypothesis of stationarity in favour of the false alternative of a unit root hypothesis. This is due to severe size distortion caused by the presence of breaks (see *inter alia* Lee et al. (1997). Therefore in our panel stationarity tests, we allow for endogenous multiple breaks in order to avoid biases in our tests. The other innovation in this paper compared to most previous papers is that not only do we use very long series but we also use relative primary commodity prices instead of aggregate indices. By doing so, we avoid the aggregation bias and the generally ad-hoc weighting rule to combine the commodity prices involved. The final step deals with testing the significance and finding the sign of the slopes of the appropriate regressions in order to find out if the PSH is not rejected by the data. We also make a first attempt at identifying the potential drivers of those breaks by exploiting information related to the break dates and the change of the signs in the piecewise regressions of the trend.

[1] See Hadri (2011) for an analysis of the implications of these components for policymakers.