

**Calculating Long-Term Trends in the *Real Real* Prices
of Primary Commodities:
Deflator Adjustment and the Prebisch-Singer Hypothesis**

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Abstract

This note proposes a quick method for re-assessing all earlier studies on long-term trends in commodity prices by accounting for the overstatement of inflation when using the U.S. CPI as a deflator. The corrected trends can be calculated directly from published estimates. This obviates the need replicate existing empirical studies after calculating a corrected 'real real' commodity price series, as was done recently, for example, in Svedberg and Tilton (2006).

Key Words: primary commodity prices, Prebisch-Singer hypothesis, inflation corrections, relative price trends

JEL Codes: E31 - Price Level; Inflation; Deflation
O13 - Agriculture; Natural Resources; Energy; Environment;
Other Primary Products
Q32 - Exhaustible Resources and Economic Development

Calculating Long-Term Trends in the *Real* Real Prices of Primary Commodities: Deflator Adjustment and the Prebisch-Singer Hypothesis

There is a huge literature in economic development and natural resource economics assessing long-run trends in primary commodity prices, much of it motivated by the Prebisch-Singer (PS) hypothesis of a secular deterioration in primary commodity prices relative to manufactured goods. Many of these investigations use broad commodity price indices such as the Grilli-Yang (1988) index variously deflated by a manufacturing unit value index for exports to LDCs (MUV), the U.S. GDP deflator, Producer Price Index (PPI), or Consumer Price Index (CPI). See Cuddington et al (2007) for a review of the PS literature.

In the mid-1990s, the Boskin Commission report argued that measurement errors in the U.S. CPI have resulted in overstatement of the inflation rate by roughly 1.1 percent over the 1975-1995 period. Svedberg and Tilton (ST) (2006) recently highlighted that this overstatement has important implications for all tests of long-term trends in real commodity prices – at least those using the CPI as a deflator.¹ If the CPI inflation is overstated, the long-term growth rate in real commodity prices using the CPI as a deflator would be understated.² That is, the alleged *decline* in real commodity prices may, in fact, be *smaller* than previous analysts have suggested. To investigate the potential importance of consideration, ST re-analyze long-term trends in copper prices after correcting the CPI deflator.

Given the absence of a corrected CPI series, ST define the corrected deflator, P_t , as the CPI adjusted downward by the *average* overestimation of inflation, g :

¹ The focus of the Boskin report is the CPI. It is not clear whether or to what extent the PPI or the personal consumption expenditure deflator (PCED) also overstate inflation. The report mentions, in passing, a 1990 study that found that the PCED also overstates inflation. Nevertheless, one should be cautious about claiming that many or all deflators imply an overstatement of the U.S. inflation rate.

$$P_t = CPI_t * e^{-gt} \quad (1.1)$$

Equivalently, the corrected inflation rate equals CPI inflation (where hats denote percentage changes) minus the correction factor g :

$$\hat{P} = \hat{CPI} - g \quad (1.2)$$

ST wish to examine the time trend in the real price of primary commodities using the corrected deflator. This corrected real price series they dub the ‘real’ real price of primary commodities:

$$rrpc_t \equiv \frac{pc_t}{P_t} \quad (1.3)$$

After calculating $rrpc_t$ using a range of correction factors ($g=0.005, 0.010$ and 0.015), they re-estimate the long-term trend in copper prices using both trend stationary and difference stationary models. They conclude (pp. 515-6) that, “When the nominal price of copper is converted to a real price using the CPI with no correction for the overestimation of inflation, the linear trend over the 130-year period, 1870–2000, is downward and statistically significant. When the CPI is reduced by 0.5%, 1.0%, and 1.5% points a year to correct for its upward bias, [the regression results suggest that] the estimated trend is upward and, with the 1.5% point adjustment, it is statistically significant at the 1% level.”

This note proposes a quick method for re-assessing all earlier studies on long-term trends in commodity prices by accounting for the overstatement of inflation when using the CPI as a deflator. The corrected trends can be calculated directly from published estimates. This obviates the need replicate existing empirical studies after calculating a corrected ‘real real’ commodity

² This statement assumes there is no need to adjust nominal commodity prices (for quality improvements, say).

price series.

When using the trend stationary (TS) specification:

$$\log(rrpc_t) = \alpha + \beta^c t + \varepsilon_t \quad (1.4)$$

where the error process is assumed to be stationary, the estimated parameter of interest is the coefficient on the time trend, which we denote as β^c to indicate the ‘corrected’ trend.

Substituting (1.1) and (1.3) into (1.4), it can be seen that:

$$\log\left(\frac{pc_t}{CPI_t}\right) = \alpha + \beta t + \varepsilon_t \quad \text{where } \beta = \beta^c - g \quad (1.5)$$

This expression tells us how to interpret the estimated time trend coefficient β from regressions in the literature that use the (unadjusted) CPI as deflator: simply take the time trend estimate, $\hat{\beta}$ say, and add the hypothesized downward inflation correction g (from the Boskin report or other experts) to get an estimate of the corrected time trend in the *real* real price of commodities:

$$\beta^c = \beta + g. \quad (1.6)$$

The adjustment is the same when the estimated trend using the CPI as deflator is obtained from the difference stationary (DS) specification. The corrected trend can be estimated using the *real* real price:

$$d \log\left(\frac{pc_t}{P_t}\right) = \beta^c + u_t \quad (1.7)$$

Alternatively, one can take estimates from the existing literature based on:

$$d \log\left(\frac{pc_t}{CPI_t}\right) = \beta + u_t \quad (1.8)$$

and, from (1.1), calculate the corrected trend rate $\hat{\beta}^c = \hat{\beta} + g$.

Those familiar with the Prebisch-Singer literature will be aware that many authors consider TS and DS models with one or more breaks (at either known or unknown dates). Applying a *constant* growth adjustment factor to the deflator should have no effect on either the timing or the magnitude of possible breaks. Therefore, the calculations above also apply to the case where there are data breaks in either the level or growth rate of the real price series.

In sum, the Svedberg and Tilton analysis of ‘real’ real commodity price trends can quickly be repeated for other commodities by simply correcting the point estimates for growth rates in real commodity prices (using the uncorrected CPI as the deflator) that are already in the literature. Similar corrections obviously apply in cases from economists are estimating long-term trends in other real prices such real wages, real housing prices, etc.

Whether the quick correction method described here or the ST approach is used to get estimates of the trend in the *real* real price of commodities, hypothesis tests of the significance of the trend should be interpreted with caution. Either approach implicitly assumes that the statistical significance of the estimated trend can be assessed by using the standard error of β (the uncorrected trend) in order to test the null hypothesis $H_0 : \hat{\beta}^c = 0$.³ However, (1.6) implies that:

$$Var(\hat{\beta}^c) = Var(\hat{\beta}) + 2Cov(\hat{\beta}, \hat{g}) + Var(\hat{g}) \quad (1.9)$$

(The square root of this expression is that standard error that would be used to construct a t-test for the null hypothesis that the corrected trend is equal to zero.) Although we don’t know the variance of the inflation correction factor from year to year ($Var(g)$), there is a presumption that it

³ The quick method proposed here and the ST approach always yield exactly the same standard errors on the regression coefficients.

is positive. (After all, the Boskin report gives a *range*