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Purchasing power parity over two centuries?

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Abstract

This paper re-examines the purchasing power parity hypothesis for the dollar–sterling exchange rate using the two centuries of data from Lothian and Taylor (LT) (1996) [Real exchange rate behavior: the recent float from the perspective of the past two centuries. Journal of Political Economy 104 (3), 488–509]. Unlike LT, we conclude that the dollar–sterling RER is nonstationary, implying a rejection of the long-run PPP hypothesis. The differences in our conclusions are explained by: (1) sensitivity of ADF unit root tests to the choice of lag length, and/or (2) the presence of significant time trends in the ADF or Phillips–Perron unit root test equations. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

In the last 10–15 years, a large literature has emerged on testing the long-run validity of purchasing power parity (PPP), or equivalently the stationarity of the real exchange rate (RER), using modern time-series econometrics techniques. (See Rogoff, 1996, for recent references.) Lothian and Taylor (LT) (1996) emphasize that low power in standard unit root tests, especially with short data spans, may have caused researchers to incorrectly conclude that the RER is nonstationary. They present new unit root test results for the franc–sterling and dollar–sterling RERs using annual time series spanning two centuries. With the increased test power obtained by this large data sample, they are able to reject the unit root hypothesis using both aug-

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mented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. They therefore conclude that PPP is valid in the long run for the two bilateral exchange rates considered.

Although we agree with LT that the franc–sterling exchange rate is stationary, our re-examination of the dollar–sterling RER concludes that it is not stationary. The differences in our conclusions are explained by: (1) sensitivity of the ADF unit root tests to the choice of lag length, and/or (2) the presence of significant time trends in the ADF or PP unit root test equations. We argue that, with suitably long lag lengths in the ADF equations, the unit root hypothesis is not rejected. If the lag length is shortened to that considered by LT, the ADF equations have significant time trends. The time trend is also significant in the PP test equations. *Either* unit roots or deterministic time trends, of course, imply nonstationarity, and hence rejection of the PPP hypothesis.

2. Unit root tests and stationarity

Unit root testing is hazardous terrain. In general, the appropriate procedure is to use the general-to-specific (GTS) methodology by first estimating the ADF or PP[1] unit root testing equation including both an intercept and time trend:

$$\Delta q_t=\alpha_0+\alpha_1 t+\gamma q_{t-1}+\sum_{i=1}^{p}\beta_i\Delta q_{t-i}+\varepsilon_t \tag{1}$$

where q_t is the logarithm of the RER. The arguments in favor of beginning with the most general specification including the intercept and time trend is the usual one involving omitted variable bias versus loss of efficiency caused by redundant regressors. A time trend must be included initially to allow for the possibility of a deterministic trend in the alternative hypothesis when the null hypothesis of a unit root is tested (Hamilton, 1994).[2]

It is now well-known that ADF unit root tests are often sensitive to the choice of the lag length p in (1). Various criteria have been proposed in the literature. Hall (1994) and Ng and Perron (1995) argue convincingly, based on Monte Carlo analysis, that a GTS method they propose for lag selection dominates the Akaike and Shwartz criteria.[3]

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[1] Phillips and Perron (1988) provide a generalization of the ADF test that sets p=0 in (1), but allows for a weaker set of assumptions concerning the error process.

[2] If the null hypothesis of a unit root is not rejected using (1), the significance of the trend and intercept can then be tested in turn to see if they can be omitted from the test equation, thereby increasing the power of the unit root tests. See Enders (1995) for a detailed discussion of the GTS methodology and the appropriate critical values for testing the significance of the trend and intercept terms in the various specifications (in his Table 4.1).

[3] Their lag selection method starts with a "large" number of lags, with the square root of the sample size being a good rule of thumb. Examine the t-statistic on the last lag (which is asymptotically normal). If it is insignificant, drop the last lag and re-estimate the test Eq. (1). Continue dropping the last lag in the lag polynomial, one by one, until a significant lag (at, say, the 95% level) is found. Stop at that point, leaving all shorter lags in the regression and examine the significance of the ADF t-statistic using the appropriate DF distribution.