An Econometric Approach to the Construction of Complete Panels of Purchasing Power Parities: Analytical Properties and Empirical Results

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Purchasing Power Parities (PPPs)

PPPs are amounts of currencies, of different countries, that have the same purchasing power as one unit of a reference currency (e.g. US$) with respect to a selected basket of goods and services.
Main Sources of PPPs

PPPs from ICP benchmark studies

- Compiled periodically, roughly once in 5 years
- PPPs from International Comparison Program (ICP) 2005 has been completed.
- ICP 2011 is currently underway and PPPs are expected at the beginning 2014.
- ICP coverage was limited in the early years but increasing over time.
- PPP data over time and countries are not available. Only exception is the Penn World Tables (PWT) which provide extrapolated data.
ICP Benchmarks – country participation

<table>
<thead>
<tr>
<th>ICP Phase</th>
<th>Benchmark year</th>
<th>No. of participating countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1970</td>
<td>10</td>
</tr>
<tr>
<td>II</td>
<td>1973</td>
<td>16</td>
</tr>
<tr>
<td>III</td>
<td>1975</td>
<td>34</td>
</tr>
<tr>
<td>IV</td>
<td>1980</td>
<td>60</td>
</tr>
<tr>
<td>V</td>
<td>1985</td>
<td>64</td>
</tr>
<tr>
<td>VI</td>
<td>1993</td>
<td>117</td>
</tr>
<tr>
<td>VII</td>
<td>2005</td>
<td>146</td>
</tr>
</tbody>
</table>

OECD and Eurostat compile PPPs for their member countries every three years
Sparse Matrix of PPPs from ICP

Main Task: To fill the gaps using all the information available
Current Econometric Practice

Penn World Tables is the main source and its methodology has two elements:

1. Extrapolate to non-participating countries
   Based on predictions from a price level regression

2. Use “derived growth rates” in prices to extrapolate over time
   Using the published National Accounts data on GDP Deflators
Our Approach

- Use all available benchmark information – an unbalanced panel
- Set up an econometric model to predict $PPP_i$ combining ICP benchmark with other available information
- Write it in a state-space form
- Use a Kalman filter and smoother to produce predictions and associated standard errors
1. We consider ICP PPPs to be observations of true PPPs with error.

\[ \tilde{p}_{it} = p_{it} + \xi_{1it} \]

2. Regression relationship between ln(PPP/XR) and economic variables

\[ r_{it} = x_{it}^{'}\beta_{it} + u_{it} \rightarrow \hat{p}_{it} = x_{it}^{'}\hat{\beta}_{it} + \ln(ER_{it}) \]

3. Updating PPPs

\[ PPP_{i,t} = PPP_{i,t-1} \times \frac{GDP_{Def_{i,[t-1,t]}}}{GDP_{Def_{US,[t-1,t]}}} \rightarrow p_{it} = p_{i,t-1} + c_{it} + \eta_{it} \]

4. Normalisation: \( p_{US,t} = 0 \)
Main Features of our approach

- The Model can be made to track Benchmark PPPs
- Model can constrained to follow the observed growth rates and deflators.
- Under some conditions our predicted PPPs are weighted averages of extrapolations from different benchmarks.
- The method is invariant to the choice of reference country.
UQICD – Version 2.0

- URL: http://uqicd.economics.uq.edu.au
- Our website to make PPPs and real incomes available to users
- Country coverage: 180 COUNTRIES
- Period: 1970 – 2010
- Data Series available on the website:
  - PPPs; Exchange Rates
  - GDP in national currency units
  - Nominal and Real GDP for cross-country comparisons
  - Auxiliary Data: Population, components of GDP, etc