Reconsideration of Weighting and Updating Procedures in the US CPI

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BLS Indexes: CPI-U

- Aggregated from item-area indexes
  - 8,018 basic indexes weighted using Consumer Expenditure Survey data
  - Most basic indexes calculated using weighted geometric mean formula
- Uses Lowe index form
  - Biennial weight revisions since 2002
  - 2-year weight reference periods
  - Base period has been 2005-2006 since January 2008
BLS Indexes: C-CPI-U

- Uses same basic indexes as CPI-U
- Series introduced in July 2002
  - Published series go back to January 2000
- Monthly-chained Törnqvist index
  - Subject to two revisions
  - Preliminary indexes use geometric mean
  - Data are final through December 2007
  - 2009 data become final in February 2011
Issues

■ CPI-U
  ▶ More evidence on consumer substitution
  ▶ More frequent weight revisions
  ▶ Shorter weight reference periods
  ▶ Modified price-updating of weights

■ C-CPI-U
  ▶ Comparison to annual superlative indexes
  ▶ Modified preliminary index formula
Organization of Paper

- Analysis of annual and biennial weights
  - Superlative indexes
  - Summary (CES) substitution elasticities

- Simulations of alternative Lowe weight revision regimes
  - Compared to CPI-U
  - Compared to chain C-CPI-U
  - Compared to Young index
## Television Price-Updating

<table>
<thead>
<tr>
<th>Base Period</th>
<th>Expenditure Share (%)</th>
<th>Updated CPI Rel. Imp. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2000</td>
<td>.19</td>
<td>.15</td>
</tr>
<tr>
<td>2001-2002</td>
<td>.21</td>
<td>.16</td>
</tr>
<tr>
<td>2003-2004</td>
<td>.23</td>
<td>.16</td>
</tr>
<tr>
<td>2005-2006</td>
<td>.28</td>
<td>.17</td>
</tr>
</tbody>
</table>
CES Index Model

- Provides summary measure of substitution
- Consistent with Sato-Vartia index $\lambda_{SV}$
- Can estimate $\sigma$ using Feenstra-Reinsdorf weighted regression:
  \[
  d\log s = (\sigma - 1) d\log \lambda_{SV} + (1 - \sigma) d\log \rho + \epsilon
  \]
Estimated Indexes (Table 1)

- Average percent difference 1999-2007, Annual Törnqvist change minus:
  - CPI-U (Lowe) -0.31
  - Annual Laspeyres -0.12
  - Annual Sato-Vartia -0.01
  - Annual Fisher 0.06
  - C-CPI-U (Monthly Törnqvist) 0.05 (7 yrs)
  - Annual Paasche 0.23
## Annual σ estimates (Table 2)

<table>
<thead>
<tr>
<th>Period</th>
<th>Base</th>
<th>Current</th>
<th>Parameter Estimate</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>2000</td>
<td></td>
<td>0.727</td>
<td>0.043</td>
</tr>
<tr>
<td>2000</td>
<td>2001</td>
<td></td>
<td>0.521</td>
<td>0.051</td>
</tr>
<tr>
<td>2001</td>
<td>2002</td>
<td></td>
<td>0.631</td>
<td>0.053</td>
</tr>
<tr>
<td>2002</td>
<td>2003</td>
<td></td>
<td>0.583</td>
<td>0.052</td>
</tr>
<tr>
<td>2003</td>
<td>2004</td>
<td></td>
<td>0.655</td>
<td>0.054</td>
</tr>
<tr>
<td>2004</td>
<td>2005</td>
<td></td>
<td>0.553</td>
<td>0.059</td>
</tr>
<tr>
<td>2005</td>
<td>2006</td>
<td></td>
<td>0.650</td>
<td>0.060</td>
</tr>
<tr>
<td>2006</td>
<td>2007</td>
<td></td>
<td>0.935</td>
<td>0.062</td>
</tr>
</tbody>
</table>
Conclusions, Part I

- Further evidence of consumer substitution in US expenditure behavior
  - Sato-Vartia indexes very close to Törnqvist
  - Results consistent with $\sigma$ between 0 and 1
  - Do not confirm either Laspeyres/Lowe or Geometric/Young assumptions

- Annual and biennial Törnqvist indexes have risen slightly faster than C-CPI-U
  - Difference may be worth studying further
## Index Correlations (Table 3)

<table>
<thead>
<tr>
<th>Index Year</th>
<th>On Prior Year Index Relative</th>
<th>On Biennial Update Period Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>-0.246</td>
<td>-0.035</td>
</tr>
<tr>
<td>2003</td>
<td>0.111</td>
<td>0.124</td>
</tr>
<tr>
<td>2004</td>
<td>0.054</td>
<td>0.057</td>
</tr>
<tr>
<td>2005</td>
<td>0.187</td>
<td>0.167</td>
</tr>
<tr>
<td>2006</td>
<td>-0.005</td>
<td>0.004</td>
</tr>
<tr>
<td>2007</td>
<td>0.163</td>
<td>0.271</td>
</tr>
</tbody>
</table>

Notes: Coefficients in bold are not statistically significant. Last line of Table 3 in paper is incorrect.
Simulated Indexes (Figure 1)
Conclusions, Part II

- Index changes are not reliably correlated from period to period
- More timely weight revisions reduce the growth rate of Lowe indexes
  - We find a monotonic relationship
  - No evidence of chain drift
  - Young index is lower than Lowe indexes
  - More timely revisions would not eliminate the gap between the CPI-U and C-CPI-U
Next Steps

- Continue to study more timely weight revisions
  - Annual revisions are feasible and appear well-behaved
  - New processing systems would permit quarterly updates
- Examine alternatives to geometric mean formula for preliminary C-CPI-U
  - Several alternatives being studied at BLS
Contact Information

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