Extension methods for multilateral index series

Antonio Chessa
CPI unit, Statistics Netherlands

ag.chessa@cbs.nl

16th Ottawa Group meeting
Rio de Janeiro, 8-10 May 2019
Overview

• Problem statement
• Characterisation of extension methods
• Comparative study
• Results
• Conclusions
It’s one out of many choices

• Product definition (‘relaunches’)
• Index formula + weighting schemes
• Length of time window (ML methods)
• **Index extension method**

• Important: Impact of all these factors on index!
The “revision problem”

• ML methods allow us to compute transitive indices on a fixed time interval/window
• The window must be adapted in order to accommodate data of the next month
• Previously calculated indices may change
• However, indices cannot be revised in the CPI
• How could we link index series of subsequent windows?
Characterisation of extension methods

• **Time window:**
  • **Length:** e.g. 13 months, 25 months,...
  • **Window type 1:** Fixed-length rolling
  • **Window type 2:** Monthly expanding (with a fixed base month)

• **Linking month**

• **Index in the linking month:**
  • Linking on a *recalculated index*
  • Linking on a *published index*
Extension methods illustrated

**Full window splice**

- Published indices
- Windows: 

**Movement splice**

- Published indices
- Windows: 

**FBEW method**

- Published indices
- Index published in base month
- Windows: 

**FBRW method**

- Published indices
- Index published in base month
- Windows: 

FBEW = Fixed Base month, Expanding Window; FBRW = same, with rolling window; $x$ = linking month and index
Comparative study: (1) Data

<table>
<thead>
<tr>
<th>Data set</th>
<th># months</th>
<th>COICOPs</th>
<th># product categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermarket chain</td>
<td>48</td>
<td>01, 05, 12</td>
<td>11</td>
</tr>
<tr>
<td>Department store chain</td>
<td>47</td>
<td>01, 03, 05, 11, 12</td>
<td>34</td>
</tr>
<tr>
<td>Pharmacy store chain</td>
<td>43</td>
<td>06, 12</td>
<td>20</td>
</tr>
</tbody>
</table>
## Comparative study: (2) Methods and choices

<table>
<thead>
<tr>
<th>Choice aspect</th>
<th>Choices made in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index extension method</strong></td>
<td><strong>Splicing:</strong> Window and movement splice (WS, MS)</td>
</tr>
<tr>
<td></td>
<td><strong>Fixed base methods:</strong> FBEW and FBRW</td>
</tr>
<tr>
<td><strong>Index method</strong></td>
<td>Geary-Khamis (GK)</td>
</tr>
<tr>
<td></td>
<td>Time Product Dummy (TPD), only for supermarkets</td>
</tr>
<tr>
<td><strong>Window length</strong></td>
<td>13 months</td>
</tr>
<tr>
<td><strong>Product definition</strong></td>
<td><strong>By GTIN:</strong> COICOP 01, non-clothing items (dept.stores)</td>
</tr>
<tr>
<td></td>
<td><strong>By characteristics:</strong> clothing, pharmacy products</td>
</tr>
</tbody>
</table>
Results: (1) Splicing, GK, chain level
Results: (2) FB methods, GK, chain level

Supermarkets

Pharmacy stores
Results: (3) Splicing, GK, lower aggregates

Coffee and tea (supermarkets)
Hair care (pharmacy stores)
Results: (4) Splicing, GK, lower aggregates

Menswear (dept. stores)

Sugar and confectionery (supermarkets)
Results: (5) FB methods, GK, lower aggr’s

Coffee and tea (supermarkets)

Hair care (pharmacy stores)
Results: (6) FB methods, GK, lower aggr’s
Results: (7) Splicing, TPD method

Supermarkets

Coffee and tea

13-month benchmark  Window splice  Movement splice

13-month benchmark  Window splice  Movement splice
Results: (8) Window length, GK, chain level
Summary of first results

• Splicing methods:
  • Significant drift
  • Downward drift in WS, mixed behaviour for MS
  • Large deviations in year on year indices at chain level
  • Can be much larger for lower aggregates

• Fixed base methods:
  • Free of drift by construction
  • Much better performance, also for lower aggregates
Pitfalls with splicing: Clearance prices
Pitfalls with splicing: Clearance prices

Clearance prices dominate window

Reference price decreases

Price index is pushed down

Linking is on recalculated indices

Drift is likely to persist
Pitfalls with splicing: Clearance prices

- Clearance prices dominate window
- Reference price decreases
- Price index is pushed down
Pitfalls with splicing: Clearance prices

Clearance prices dominate window
Reference price decreases
Price index is pushed down
Linking is on recalculated indices
Drift is likely to persist
Illustration of window splice

[Link to WindowSplice.ppsx]

22
An amended proposal to splicing

• Behaviour of published series is what matters

• Linking on published indices:
  • Calculated year on year index = Published index
  • This is not the case in classical window splice!
  • Drift in published series is excluded over the length of time window

• Two splicing methods studied:
  • Window splice, with a 13-month window
  • Half splice, with a 25-month window
  • The half splice also links on published indices of 12 months ago
Splicing on published indices

Splicing_On_Published_Indices.ppsx
Results: (9) Window splice, GK, chain level

Supermarkets

- Benchmark (13M)
- Classical WS
- WS on published indices

Pharmacy stores

- Benchmark (13M)
- Classical WS
- WS on published indices
Results: (10) WS, GK, lower aggregates

Coffee and tea (supermarkets)

Hair care (pharmacy stores)
Results: (11) WS, GK, lower aggregates
Results: (12) Half splice, GK, chain level
Results: (13) HS, GK, lower aggregates
Results: (14) HS, GK, lower aggregates
Conclusions

• Fixed base extension performs (very) well (no drift)
• Classical splicing methods may lead to severe drift
• Splicing should be done on published indices:
  • Drift is avoided over the length of the time window
  • Window splice shows some variability in MoM changes
  • Half splice is more accurate and stable
Additional remarks on half splice

• Calculated YoY = Published YoY (also for WS)

• Product contributions to index:
  • Easier to compute for YoY
  • Probably more difficult for MoM

• 25M window advantageous for (strongly) seasonal items

• YoY indices should not suffer from switches to new data sources and/or methods in CPI

• Will differences between ML methods be reduced?
Thank you!

Questions?

E-mail: ag.chessa@cbs.nl