Evaluating multilateral index methods on scanner data

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It is well known that incorporating the available turnover information into chained monthly index calculation (e.g. superlative formulae such as Törnqvist) leads to chain drift. Although such information could lead to a more representative index calculation. Using multilateral methods maximizes the amount of matches in the data without running the risk of introducing chain drift [1].

X has recently started research in comparing the currently used dynamic method with multilateral methods, with a goal to switch to a multilateral method in 2020 in the official CPI. This paper evaluates these comparisons using a scanner dataset of a retailer for a period of 37 months.

Adding new (monthly) information to the multilateral comparison window may change the values of previously calculated indices. These revisions have to be avoided in official CPI calculations. To deal with revisions a rolling-window approach is suggested. Rolling-window approaches shift the estimation window (often 13 months) forward each period (in our case a period equals a month) and then splices the new indices onto the existing time series. Several splicing and extension methods are examined and evaluated: movement splice, window splice, half splice, mean splice, fixed base monthly expanding window and the fixed base moving window method.

A final issue that will be highlighted is how product relaunches (e.g. same product smaller content) are dealt with, not taking into account product relaunches might bias the index. Currently this is carried out using text mining with manual verification, more efficient ways of creating homogenous product groups will be examined.

1. METHODS

Short description of the current methodology that is applied for producing monthly CPI indices.

A short overview of the examined multilateral methods is given: Geary-Khamis [2] (and augmented Lehr [3][4]), Time Product Dummy [5] and GEKS-Törnqvist [6].

A short overview of the examined splicing and extension methods is given: movement splice [7], window splice [8], half splice [9], mean splice [10], fixed base monthly expanding window [2] and the fixed base moving window method [3]

2. RESULTS

All methods - except the augmented Lehr index - give very similar results compared to the dynamic method when using the full window (figure 1). The GEKS method has the smallest mean difference for all COICOP groups.

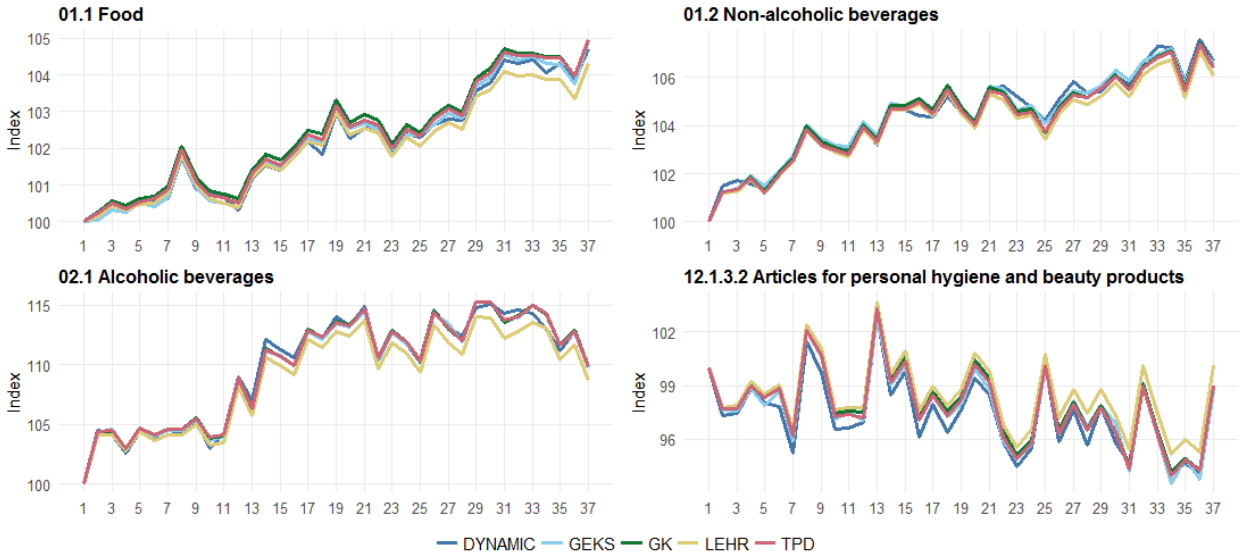

Figure 1: Difference between the dynamic method and multilateral methods (full window).

For all COICOP groups the GEKS index shows no substantial difference between the splicing options (figure 2), in fact annual average inflation rates would hardly change at all when rounded to one-tenth of one percentage point. The Geary-Khamis index appears to show the largest difference between the splicing options (mostly driven by the window and movement splice).

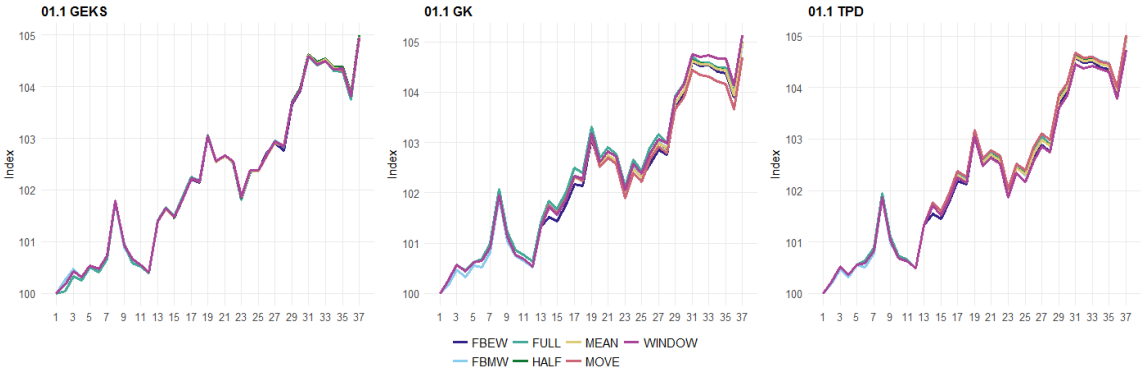

Figure 2: Difference between between splicing and extension options fori COICOP 01.1

The effect of linking these "extra" relaunches is for all methods quite significant, results are given for COICOP 01.1 (figure 3) for the full window index (extension methods give similar results). For all methods the final index for this COICOP group is around 0.30 index points higher with the extra relaunch linkings applied. Depending on the method, taking relaunches into account might matter more than which extensions method one chooses.

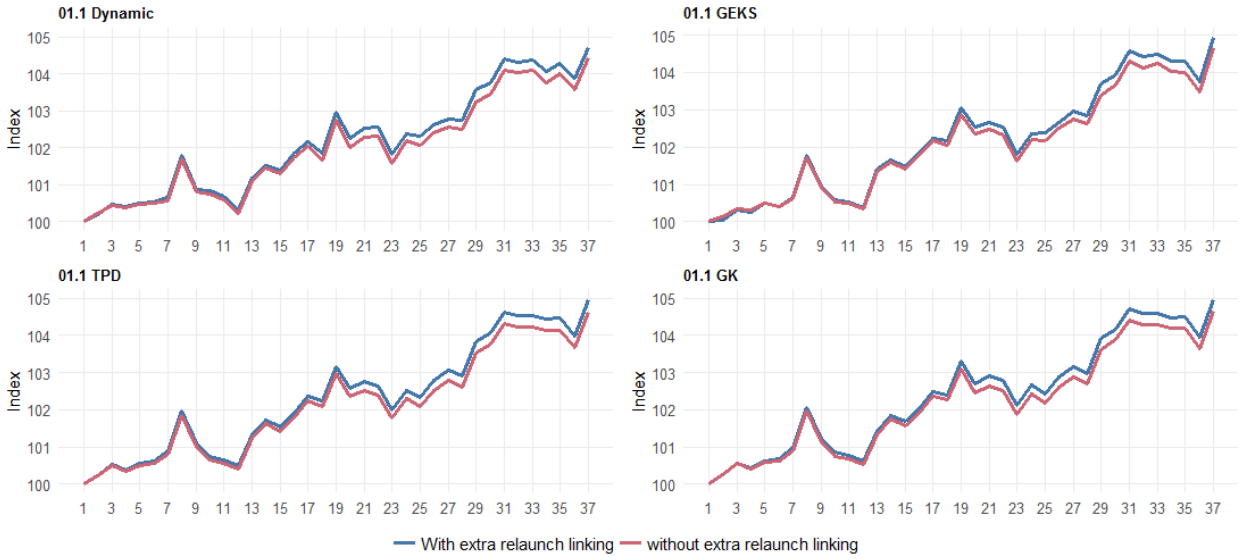

Figure 3: Effect of linking relaunches for COICOP 01.1 for all methods.

Using homogenous product groups instead of barcodes to calculate the price indices gives a different price evolution (figure 4), this is caused by problems in the metadata, mostly due to the instability of content and unit of measure. Likewise new products having a different price/content ratio can mess up the unit value in the homogenous product group.

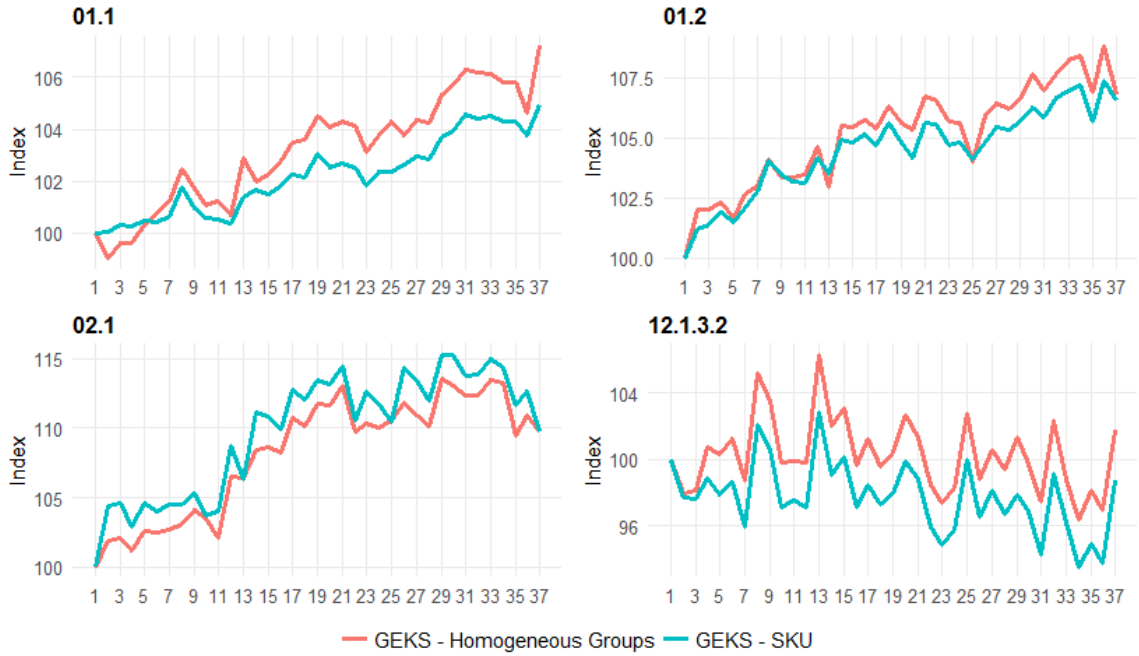

Figure 4: Effect of using homogenous product groups instead of product codes (GEKS method)

3. CONCLUSIONS

The analysis showed that the current dynamic method doesn't differ much from the multilateral methods at higher aggregated levels, meaning that using the current unweighted methodology doesn't appear to bias the index or that it suffers from chain drift. Only the augmented Lehr method has significant differences with all of the other

multilateral methods, it tends to underestimate inflation when prices are increasing and overestimate it when prices are decreasing.

Comparisons of the splicing options showed that the GEKS method has the smallest variance between the different options and that movement and window splice might cause some drift for some methods.

Taking into account product relaunches has a significant effect on price indices, also when using multilateral methods. Calculating price indices using homogeneous product groups worked for some product groups but for other products groups it caused problems due to problems with the metadata. Even with good metadata the question remains how products with a deviating price to content ratio should be introduced in homogenous product groups.

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