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Performance of asymmetric filters for trend-cycle extraction
Application to the COVID-19 crisis

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Introduction

Moving averages are ubiquitous in trend-cycle extraction and seasonal adjustment (e.g. : X-12-ARIMA):

$$M_\theta(X_t) = \sum_{k=-p}^{+f} \theta_k X_{t+k}$$

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➔ In general, *symmetric* moving averages ($p = f$ et $\theta_{-i} = \theta_i$)

➔ For **real-time** estimates, we must rely on *asymmetric* filters: revisions and delay in turning points detections

Comparison of three methods

- Local polynomial filters by Proietti and Luati (2008)
  - Direct asymmetric filter (DAF): local polynomial of degree 3 ➔ used in STL
  - Linear-Constant (LC) filter: trend is of degree 1 and asymmetric filter preserves of degree 0 (constant) ➔ Musgrave filters
  - Quadratic-Linear (QL) filter: trend is of degree 2 and asymmetric filter preserves trends of degree 1.

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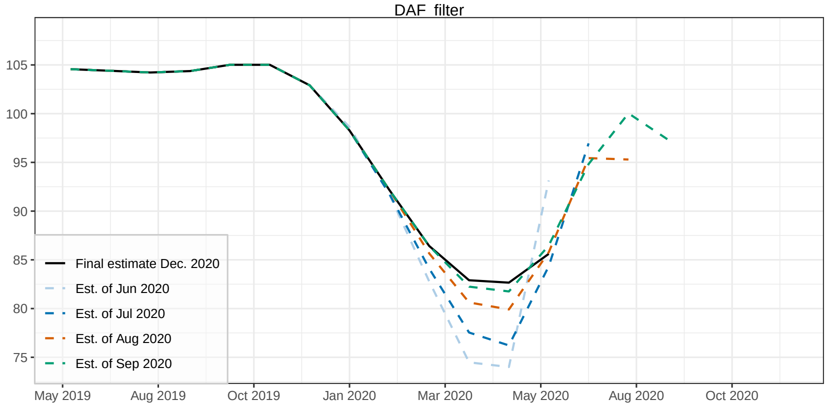
- Filters based on Reproducing Kernel Hilbert Space (RKHS) methodology by Dagum and Bianconcini (2008) ➔ $b_{q,\phi}$ = filters with a "bandwidth" that minimizes phase shift.

Example with the French IPI



Final estimate: Henderson filter of order 13 ($p = q = 6$).

Note: To see the animation, the PDF must be open with Acrobat Reader, KDE Okular, PDF-XChange or Foxit Reader.

Conclusion and improvements

- Different methods can lead to very different trend-cycle estimates
- Methods should also be compared in the seasonal adjustment process
- More series should be studied and more investigations on the different parameters (especially with FST)
- Outliers impact the decomposition process: during the COVID crisis several AO ➔ study of asymmetric filters based on robust methods

Thank you for your attention...

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package : palatej/rjdfilters

Bibliography:

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Proietti, Tommaso, and Alessandra Luati. 2008. "Real Time Estimation in Local Polynomial Regression, with Application to Trend-Cycle Analysis." *Ann. Appl. Stat.* 2 (4): 1523–53.