ALICE: A new inflation monitoring tool

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Abstract

- We develop Area-wide Leading Inflation CyclE (ALICE) indicators for headline and core inflation in the euro area.
- The aim is to provide early signals about turning points in inflation.
- Methodology: traditional non-model based composite leading indicators (CLIs) with leading series selected from a large dataset.
- Both ALICE indicators identify main turning points in the inflation cycle *ex post* and perform well in a pseudo real-time exercise.
- ALICE demonstrate good performance in terms of forecasting the direction of inflation changes.

Contribution

- The first study to construct CLIs for both headline inflation as calculated based on the Harmonised Index of Consumer Prices (HICP) as well as HICP inflation excluding energy and food components ("core" inflation).
- Sample period includes the Great Recession and the euro area debt crisis, extending the sample used by Binner et al. (2005).
- Careful and systematic analysis of over 160 potential leading series covering different parts of the economy to select component series for the CLIs.
- Standard *ex post* and a pseudo real-time evaluation of the indicators.
- The examination of ALICE quantitative inflation forecasting abilities.

Reference cycle

The composite leading indicator based approach is applied to construct leading indicators that combine cyclical information from several economic series into one single leading series that correlates well with and leads the cycle of a reference series.

- The inflation cycle is defined in terms of inflation deviations from its long-run trend, i.e. the deviation cycle approach.
- The reference series for ALICE are year-on-year growth rates of the HICP and HICP excluding energy and food.
- The Random Walk asymmetric band pass filter by Christiano and Fitzgerald (2003) is used to measure the cyclical component of time series isolating the frequencies between 12 and 120 months.

Figure 1. HICP inflation and the corresponding reference cycle
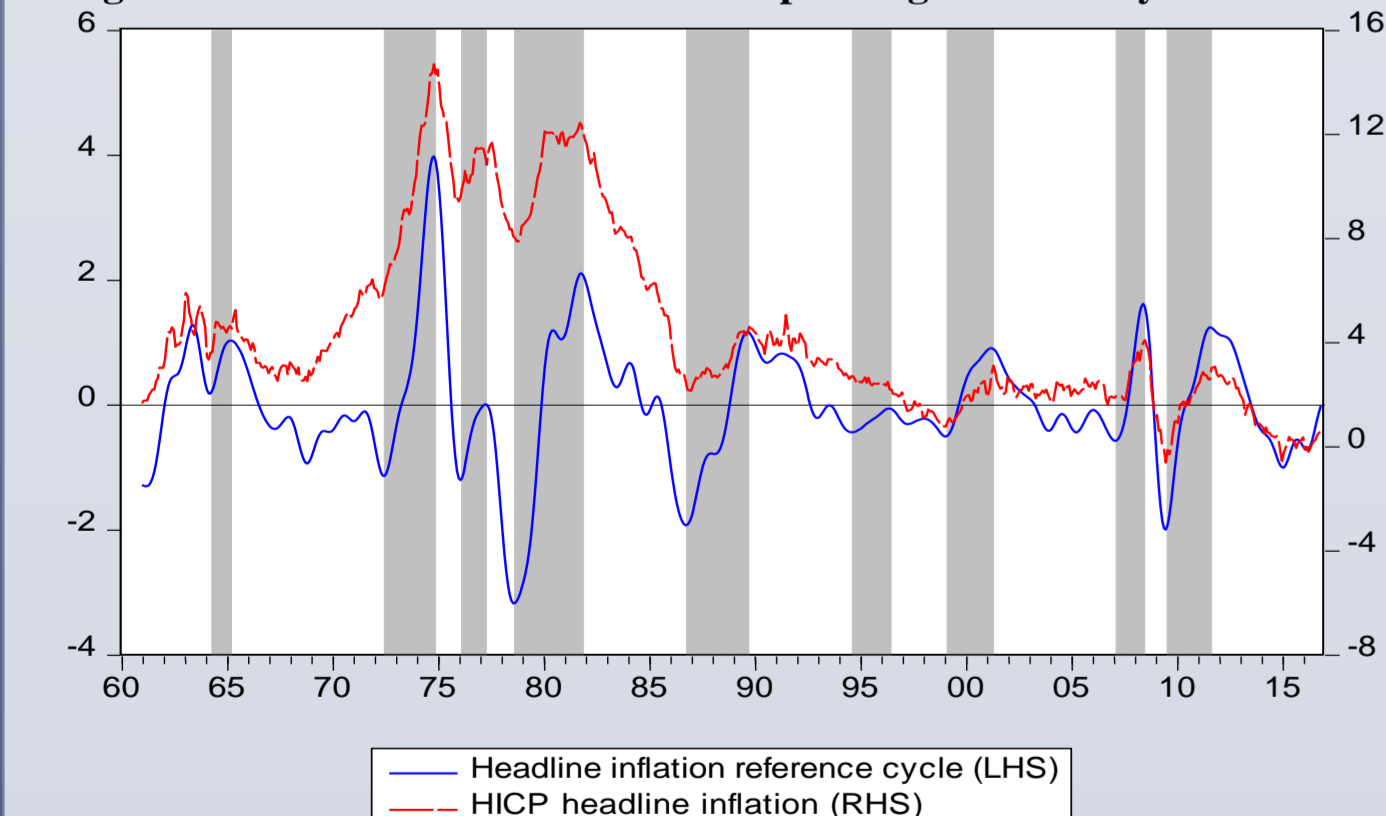
Notes: This figure plots annual percentage changes in the HICP as well as its cyclical component. The shaded areas denote the periods between a trough and a peak in the inflation cycle dated according to Artis et al. (1995).

Figure 2. HICP inflation excluding energy and food and the corresponding reference cycle
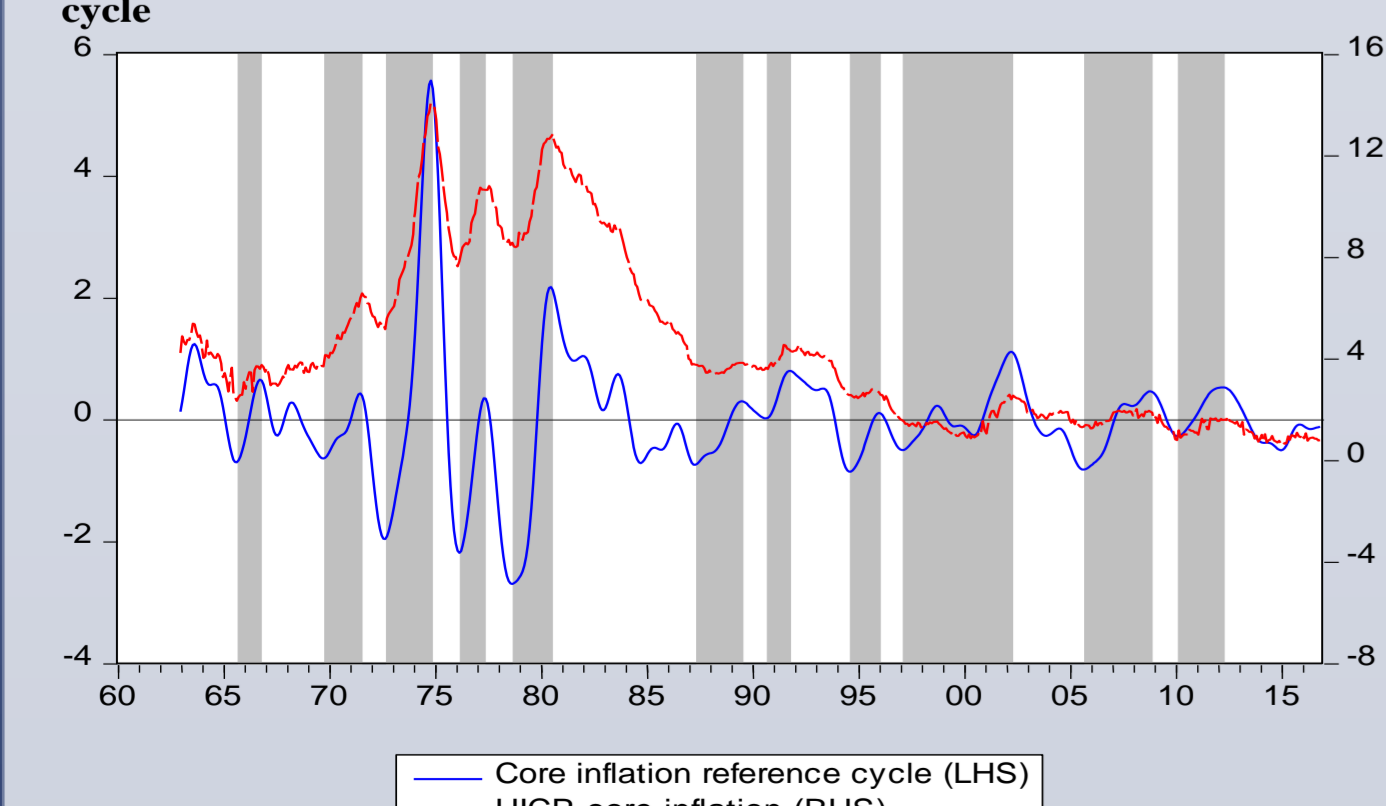
Notes: This figure plots annual percentage changes in the HICP excluding energy and food as well as its cyclical component. The shaded areas denote the periods between a trough and a peak in the inflation cycle dated according to Artis et al. (1995).

Selection of leading series

- The dataset goes in part back to the 1960s and reflects different areas of the economy: **measures of external factors** (commodity prices, exchange rates, global indicators, etc.); **domestic price and cost variables** (such as wages and producer prices); **"soft" data from surveys** (PMI and European Commission surveys on prices, employment expectations, confidence, etc.); **inflation expectations** (survey and market-based measures over different forecast horizons); **economic activity variables** (production, euro area business cycle indicator, various productivity measures, etc.); and **financial variables** (interest rates, monetary aggregates, asset prices, etc.).

- The cyclical components of candidate leading series are measured applying the same filtering method as for the reference series. The selection of the series for the CLI is conducted in terms of the normalised cycles.

- A general-to-specific selection procedure based upon **three main criteria** to identify the best leading series is followed (de Bondt and Hahn, 2014):

  - ✓ lead time should be sufficiently long and relatively stable over time (minimum (effective) lead time 3 months);
  - ✓ correlation coefficient between the reference cycle and the candidate series cycle is at least 0.55 in the sample period 1999:1-2016:11;
  - ✓ selected series should contain information about different parts of the economy and, preferably, should come from different sources.

The cyclical components of shortlisted series are synchronised and aligned with the reference cycle: all series are shifted according to their average optimal lead time and series with negative correlation coefficients are multiplied by -1 to induce a positive relationship with the reference cycle. The selected series are then combined together into a CLI by taking a simple average.

Table 1: Correlation coefficients between the composite indicators and the reference cycle for headline inflation

Composite leading series	Full-sample	1999 – 2016
Group 1960 OECD CLI (7) and annual oil price inflation (4)	0.50	0.62
Group 1970 Adding M1/GDP ratio (19)	0.58	0.75
Group 1980 Adding inflation in world raw material prices of food & tropical beverages (4) and the growth rate of EA building permits (17)	0.69	0.79
Group 1985 Adding selling price expectations from the industry survey (3)	0.73	0.79
Group 1990 -	-	-
Group 1995 Adding non-energy non-food commodity price inflation (17)	0.80	0.80
Group 1999 Adding annual inflation in farm-gate and wholesale market prices (5) and 1 year-forward 1 year ahead inflation-linked swap rate (3)	-	0.85

Notes: This table reports the calculated correlation coefficients between the respective composite leading indicators and the reference cycle for headline inflation over the full sample and the sample period Jan 1999 – Nov 2016. The full sample starts according to the starting point of the shortest available series included in the composite indicator. The average optimal lead time is reported in parentheses.

Table 2: Correlation coefficients between the composite indicators and the reference cycle for core inflation

Composite leading series	Full-sample	1999 – 2016
Group 1960 OECD CLI (17) and annual oil price inflation (25)	0.32	0.65
Group 1970 Adding real GDP (11) and M1 (23)	0.57	0.79
Group 1980 Adding MFI loans outstanding (6) and NEER (16)	0.67	0.86
Group 1985 Adding PPI non-food consumer goods price inflation (6)	0.78	0.85
Group 1990/1995/1999 -		

Notes: This table reports the calculated correlation coefficients between the respective composite leading indicators and the reference cycle for core inflation over the full sample and the sample period January 1999 – November 2016. The full sample starts according to the starting point of the shortest available series included in the composite indicator. The cyclical components are estimated only once using the whole sample period available for each series. The average optimal lead time is reported in parentheses.

Ex post evaluation

- **Headline ALICE** consists of **nine** series and has a 3-month effective lead time.
- **Core ALICE** includes **seven** series and has the effective lead time of 5 months.
- The component series are combined taking into account their different starting points, i.e. ALICE is calculated backwards and forward using the composite indicators of the subsets of the available underlying series.
- Four (five) series with the longest lead time are used to extend headline (core) ALICE beyond the point where all components are still available.
- Extensions of these indicators increase the effective lead times to 6 and 9 months for the headline and core ALICE, respectively.

Figure 3. Headline ALICE and the corresponding reference cycle
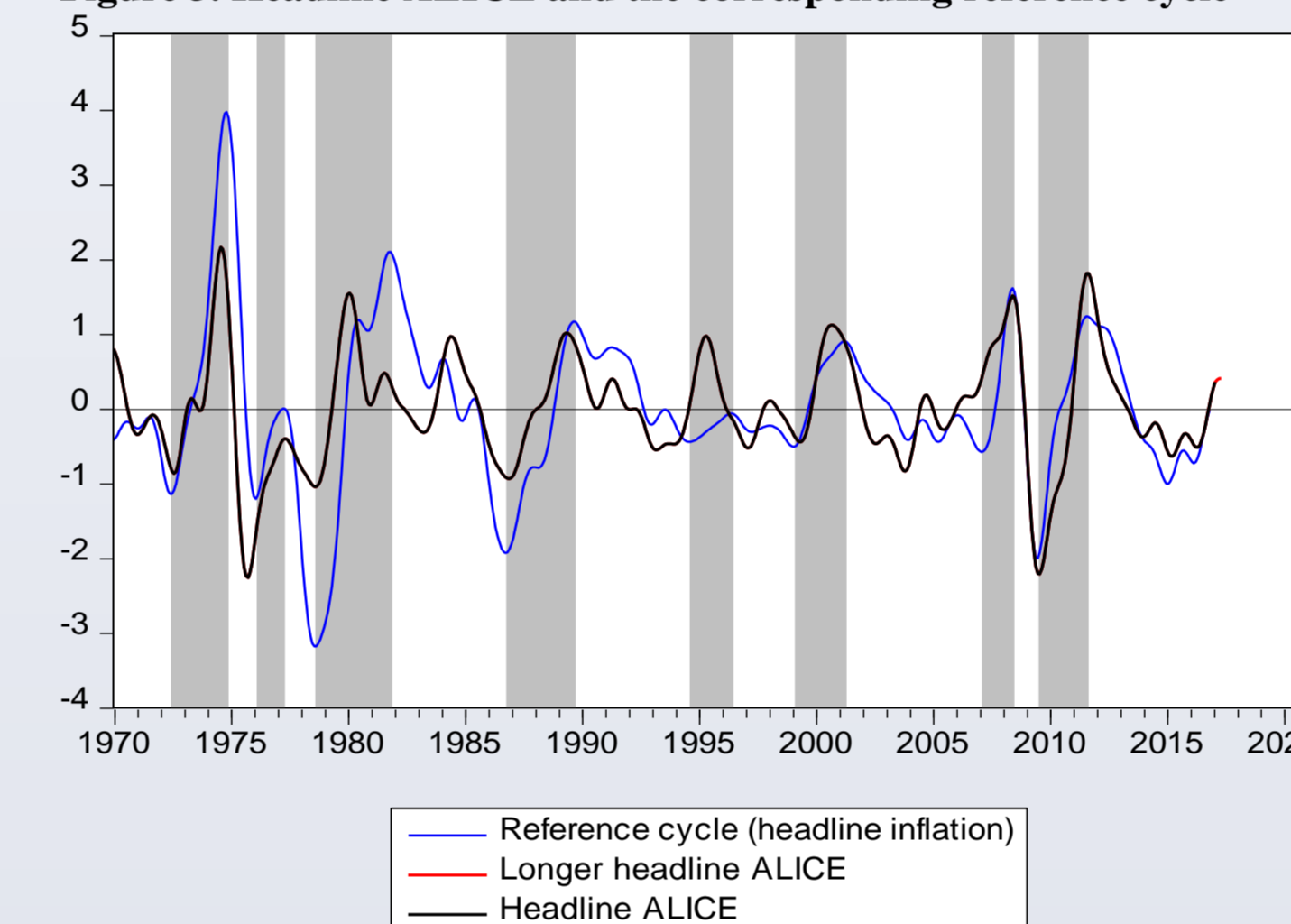
Notes: This figure plots the headline ALICE together with the corresponding reference cycle. The shaded areas denote the periods between a trough and a peak in the headline inflation cycle.

Figure 4. Core ALICE and the corresponding reference cycle
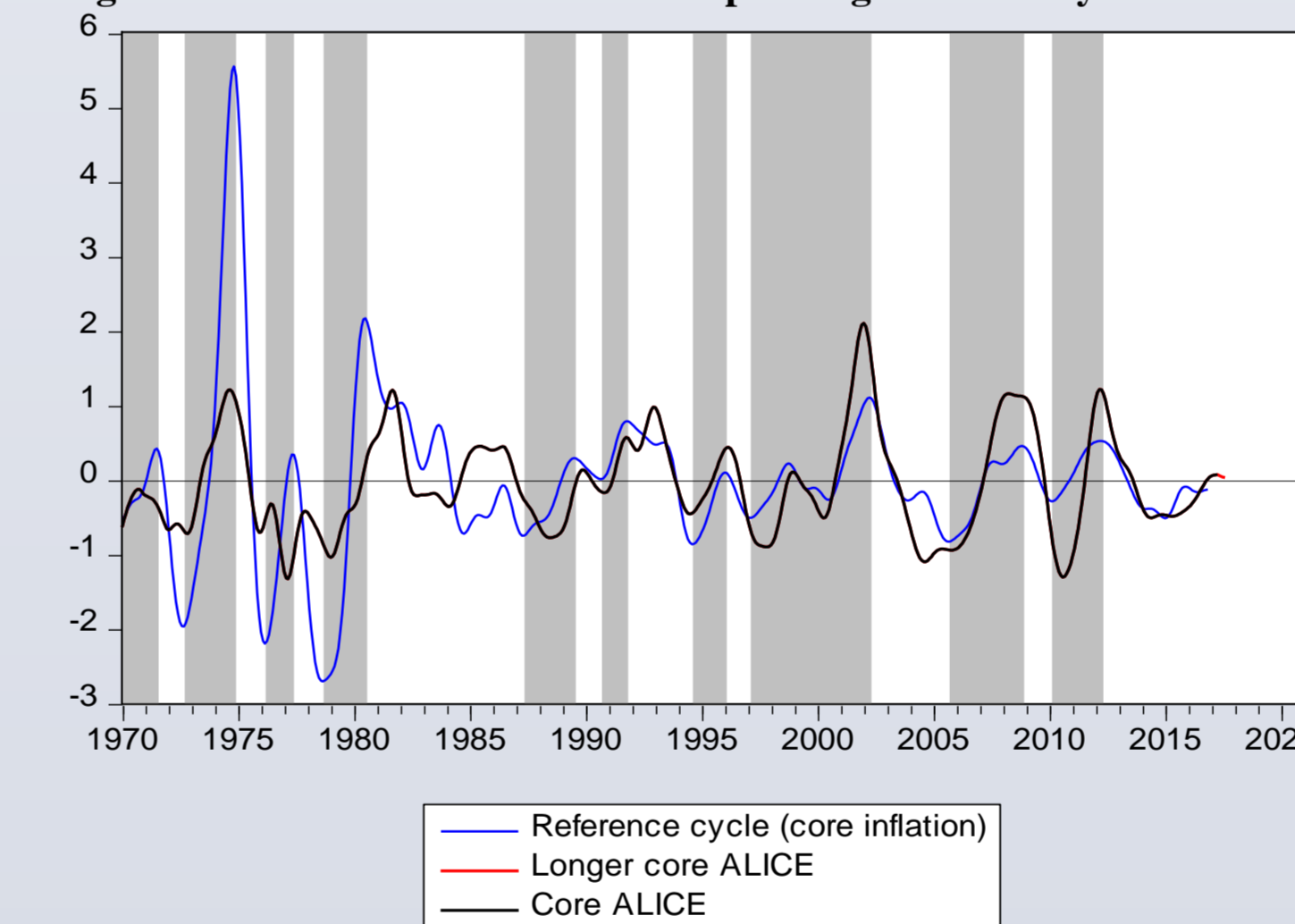
Notes: This figure plots the core ALICE together with the corresponding reference cycle. The shaded areas denote the periods between a trough and a peak in the core inflation cycle.

Real-time evaluation

The pseudo real-time analysis of the performance of the headline and core ALICE indicators takes into account the reporting lag of the component series in real time. The cyclical components are re-estimated in each step using the final vintages of the data. Both ALICE based on the full set of leading series and their extensions with a longer lead time are calculated. These pseudo real-time calculations are conducted for the middle of each quarter over the period from February 2010 until mid-November 2016.

- The headline ALICE indicator preforms well as new data becomes available:

  - ✓ Leads the headline reference cycle
  - ✓ Does not suffer from major revisions
  - ✓ Identified turning points do not shift substantially over time

Similar results are found for the core ALICE.

Figure 5. Pseudo real-time developments of headline ALICE and the reference cycle
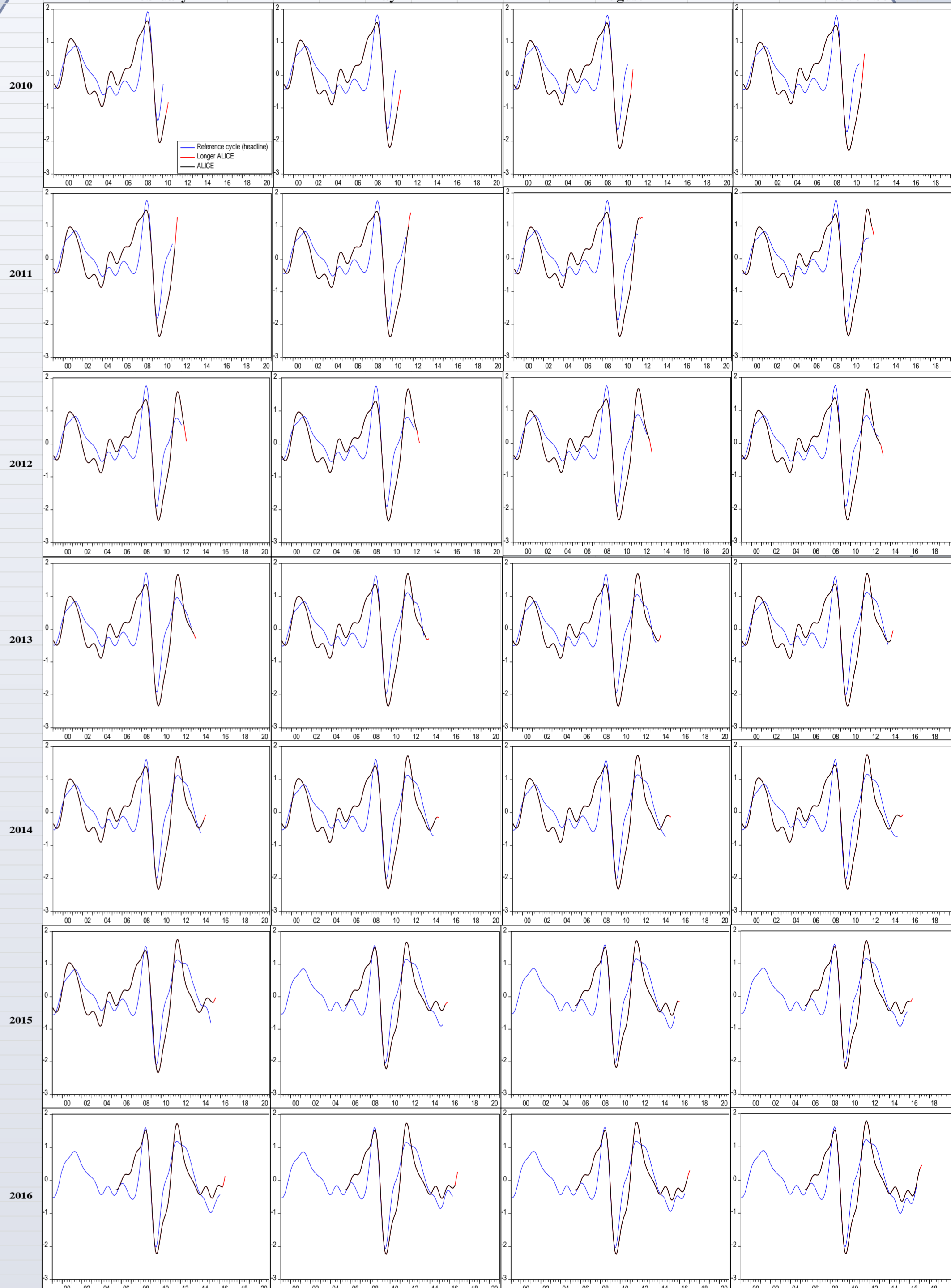
Notes: This figure plots the ALICE (black line) together with the longer ALICE (red line) for headline inflation and the reference cycle (blue line) in pseudo real-time over the period Feb 2010 – Nov 2016.

Quantitative forecasts

The pseudo real-time series for the headline (core) ALICE are available 6 (10) months ahead compared to the latest reference cycle data point. Thus, changes in headline inflation could be predicted 2 (3) quarters ahead using changes in ALICE. The forecast performance of ALICE is assessed by comparing it to: 1) the random walk model where the future *h*-period change in inflation is assumed to be zero; 2) monthly inflation forecasts from Euro Zone Barometer (EZB); 3) quarterly Eurosystem / ECB staff macroeconomic projection exercise (MPE).

- ALICE demonstrates on average better performance in terms of forecasting the direction of future inflation developments.
- In terms of quantitative forecast accuracy, ALICE performed better than EZB and MPE in the most recent years; however, it underperformed compared to RW and the performance varied considerably.

Conclusions

The headline and core ALICE identify major cyclical movements in inflation *ex post* as well as *ex ante* very well. ALICE indicators performed better than other forecasts in terms of forecasting the direction of future inflation developments two or three quarters ahead. Overall, ALICE is a new tool that has the potential to provide useful input for the real-time monitoring, analysis and forecasting of inflation in the euro area.

References

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