

40th Voorburg Group Meeting

How to use quarterly deflators to calculate monthly ISP

Croatian experience and practical challenges

Cross cutting topic

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Overview

How can quarterly price information be used in a monthly volume indicator without distorting short-term movements?

1 Framework

Monthly ISP combines turnover, deflators, weights and aggregation rules.

2 Challenge

Turnover is monthly, while some key price indices are quarterly and arrive later.

3 Methods

Croatia uses rule-based estimation and disaggregation methods.

4 Quality

Method choice matters for monthly dynamics, revisions and seasonal adjustment.

Croatian ISP compilation framework

Purpose

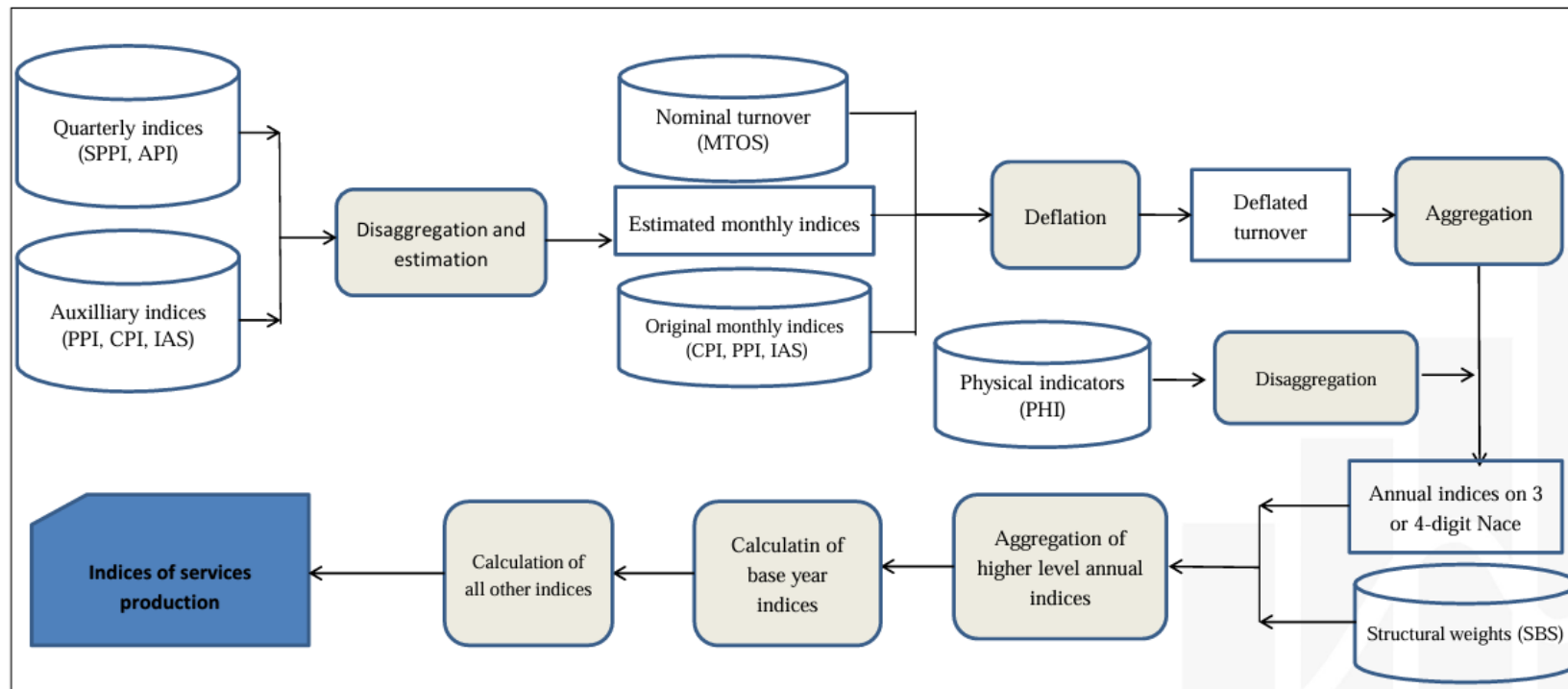
Measure short-term changes in services production as a monthly volume indicator.

Main approach

Deflate nominal turnover using the most appropriate price index. Direct volume indicators are used only in selected cases.

Data sources

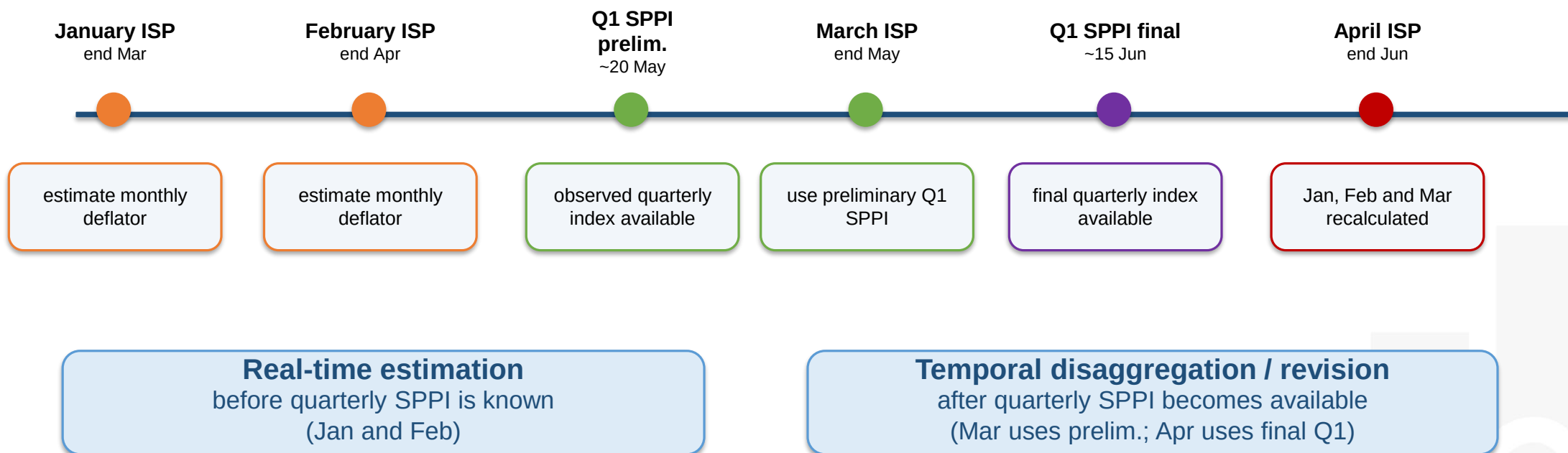
Turnover survey + VAT; SPPI, CPI, PPI and API; salary indices; physical indicators; SBS weights.



Quarterly and monthly information is combined in a web-based production application.

The mixed-frequency challenge

Monthly ISP must be produced before the corresponding quarterly price information is fully available.



In April ISP production, after the final Q1 SPPI is available, January, February and March are recalculated.

Croatian decision rule for monthly deflators

Method choice depends on two questions:

Is the quarterly index available?

Is a suitable monthly auxiliary series available?

Information available	Auxiliary	Procedure	Result
Quarterly index not yet available	Yes	AUX forecast	Preliminary monthly deflator
Quarterly index not yet available	No	Historical-movement forecast	Preliminary monthly deflator
Quarterly index available	Yes	AUX disaggregation	Quarterly-consistent monthly deflator
Quarterly index available	No	Linear method (LM)	Quarterly-consistent monthly deflator
Monthly source index available	not required	Use monthly source directly	Monthly deflator

The distinction is operational: estimation before the quarter is known, disaggregation after it is observed.

Real-time estimation: producing the first estimate

Auxiliary-indicator forecast

Used when a suitable monthly proxy exists.

The latest monthly deflator is extrapolated using the current movement of the auxiliary series.

Historical-movement forecast

Used when no suitable monthly proxy exists.

The current deflator follows the month-to-month movement observed in the corresponding period of the previous year.

Temporal disaggregation after the quarterly index is observed

Once the observed quarterly index is available, preliminary values are replaced by monthly deflators consistent with the observed quarter.

AUX method

Suitable monthly indicator exists.

Quarterly value is distributed according to the observed monthly pattern.

Main advantage: the quarterly level is preserved while the intra-quarter profile uses monthly information.

Linear method (LM)

No suitable monthly indicator exists.

Monthly values are derived from the quarterly price series using linear interpolation.

Main limitation: the monthly path is imposed by the interpolation rule rather than observed monthly information.

Practical criterion: the derived monthly values must remain consistent with the observed quarterly index.

AUX method: preserving the quarterly level and monthly pattern

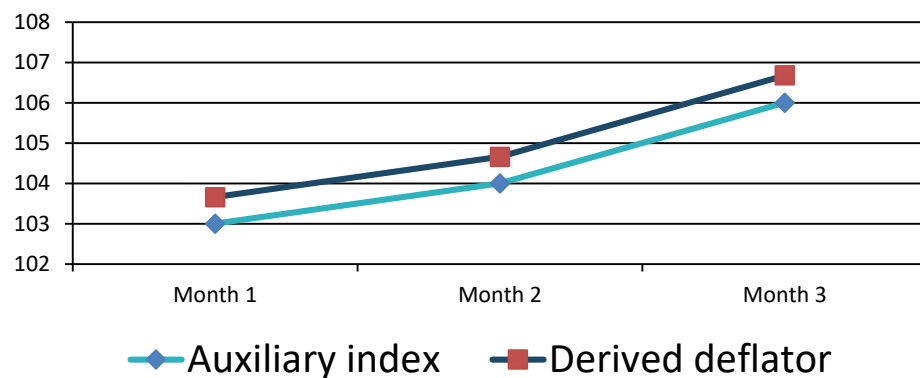
Observed quarterly price index = 105.0 | Monthly auxiliary pattern: 103.0 → 104.0 → 106.0

1 Start from observed quarterly SPPI

2 Use auxiliary monthly pattern

3 Adjust to preserve the quarter

Monthly pattern and derived deflator



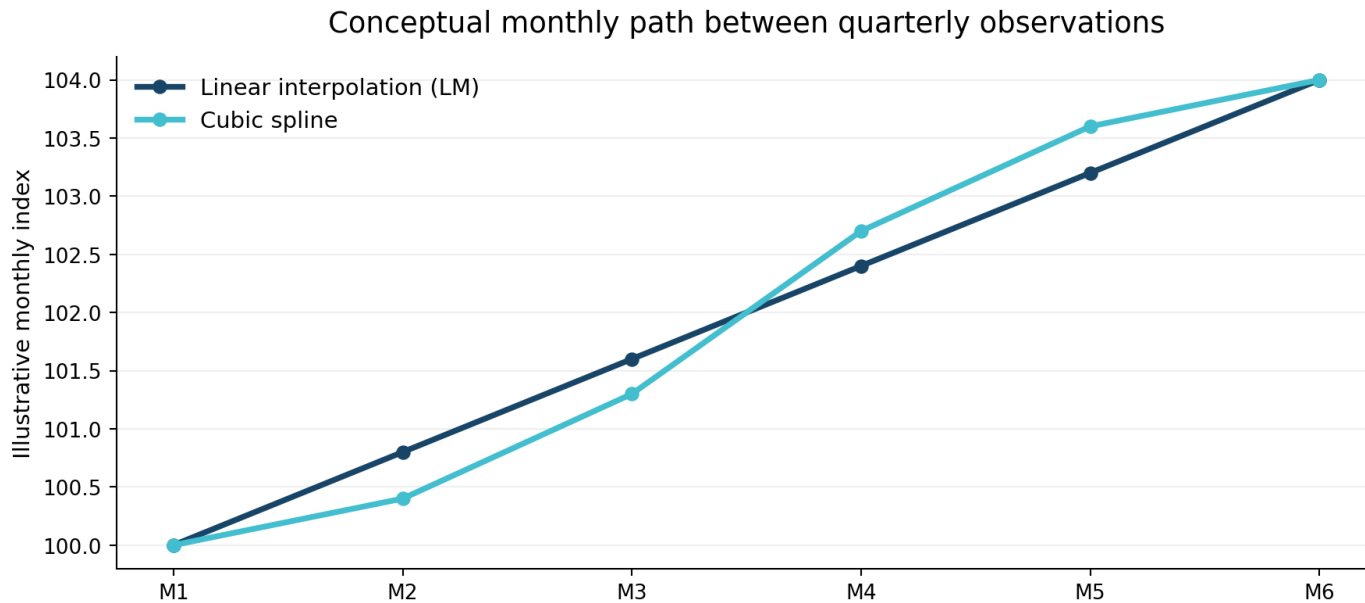
Month	Auxiliary index	Derived deflator	Nominal turnover	Deflated turnover
Month 1	103.0	103.66	100.0	96.47
Month 2	104.0	104.66	110.0	105.10
Month 3	106.0	106.68	120.0	112.49

105.0

Average of derived monthly deflators = observed quarterly SPPI

Key message: the quarter is preserved, while the within-quarter profile follows related observed monthly information.

Linear interpolation and cubic spline



Linear interpolation (LM)

Current Croatian method when no suitable monthly proxy exists. Simple and transparent, but the monthly path is imposed by the interpolation rule.

Cubic spline interpolation

Potential alternative for testing. It allows a smoother, more flexible profile, but greater flexibility does not necessarily mean greater accuracy.

Both still require consistency with the observed quarterly index.

Comparison of the main methods

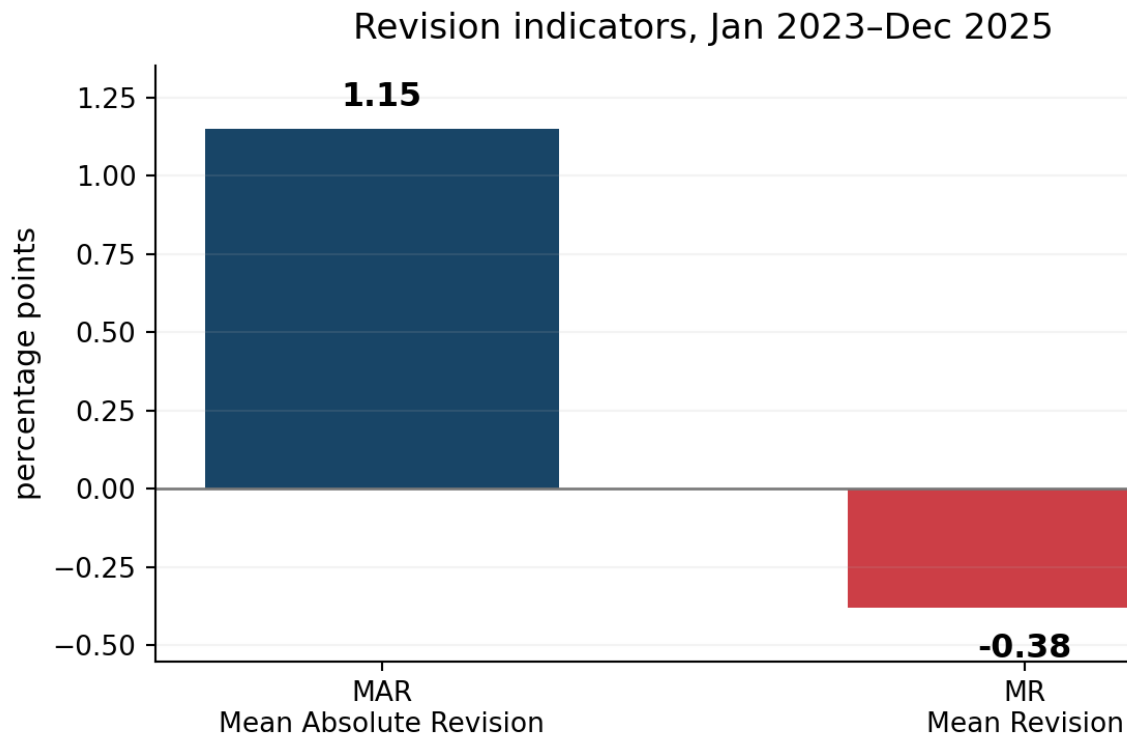
The key difference is whether the intra-quarter pattern is observed through a monthly proxy or mathematically derived from quarterly data only.

	LM	Cubic spline	AUX
Data used	Quarterly series only	Quarterly series only	Quarterly + related monthly indicator
Monthly profile	Straight-line movement between observations	Smooth curved movement	Monthly profile follows proxy
Main advantage	Simple, transparent and easy to apply	More flexible and smoother profile	Uses observed monthly information
Main risk / limitation	Imposed path may not reflect actual price movement	Flexibility does not necessarily mean accuracy	Quality depends on proxy-target relationship

Use in Croatia: LM = yes | Cubic spline = possible alternative for testing | AUX = yes when a suitable monthly indicator exists

Practical criterion: prefer observed monthly information when it is relevant; otherwise monitor revision performance and plausibility of monthly movements.

Quality assessment: what revisions show



Size of revisions

MAR = 1.15 p.p.
average absolute difference between preliminary and revised growth rates.

Direction of revisions

MR = -0.38 p.p.
revised growth rates were slightly lower on average; revisions occur in both directions.

Why it matters

Persistent revisions can indicate an unsuitable proxy, forecasting rule or disaggregation method.

Key quality criterion: plausible monthly movements and a limited gap between the first estimate and the later quarterly-consistent result.

Croatian good-practice examples – AUX method

Low MAR in the two preliminary months suggests that the selected auxiliary monthly information provided a stable preliminary profile.

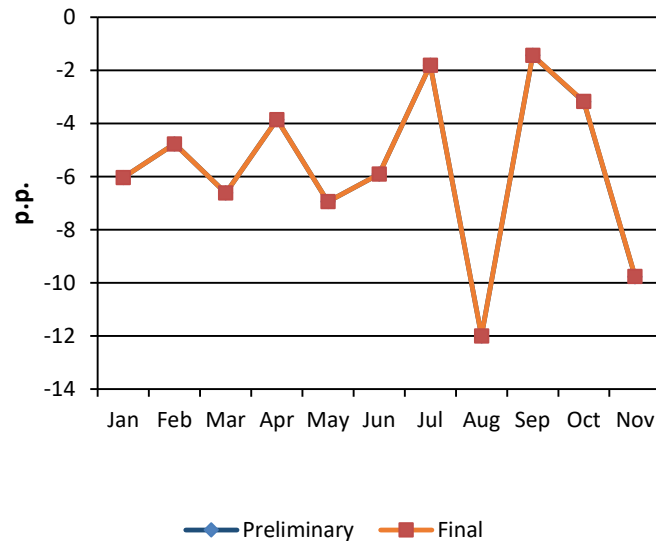
NACE 78 – Employment activities

MAR (Oct–Nov 2025) = 0.01 p.p.

Source: SPPI

Auxiliary source: IAS

Disagg. method: AUX



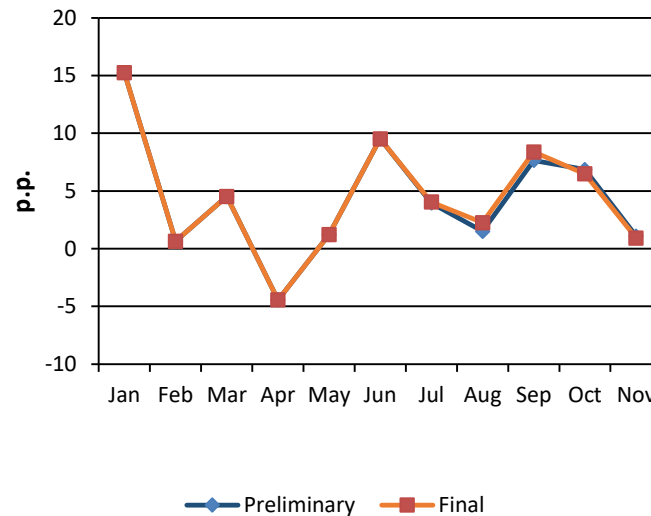
NACE 46 – Wholesale trade

MAR (Oct–Nov 2025) = 0.28 p.p.

Source: API + CPI + PPI

Auxiliary source: CPI + PPI

Disagg. method: AUX



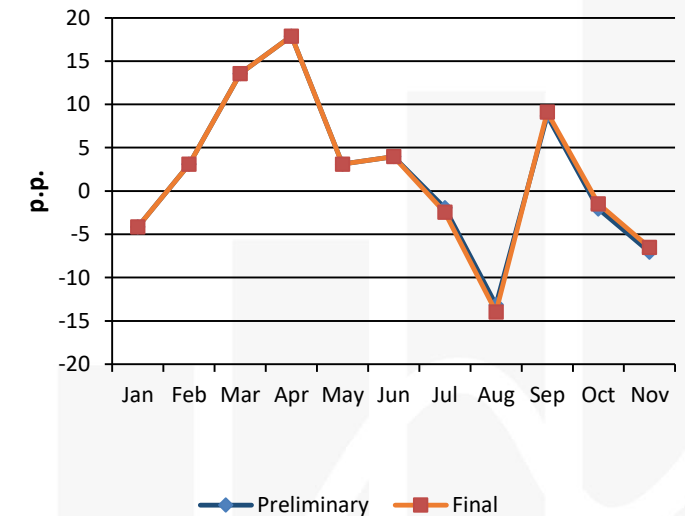
NACE 71 – Architectural and engineering activities

MAR (Oct–Nov 2025) = 0.56 p.p.

Source: SPPI

Auxiliary source: IAS

Disagg. method: AUX



Good practice criterion: low MAR (Oct–Nov 2025) and plausible monthly movements after revision.

AUX examples requiring further analysis

Larger October–November revisions suggest that the proxy-target relationship or revision behavior should be reassessed.

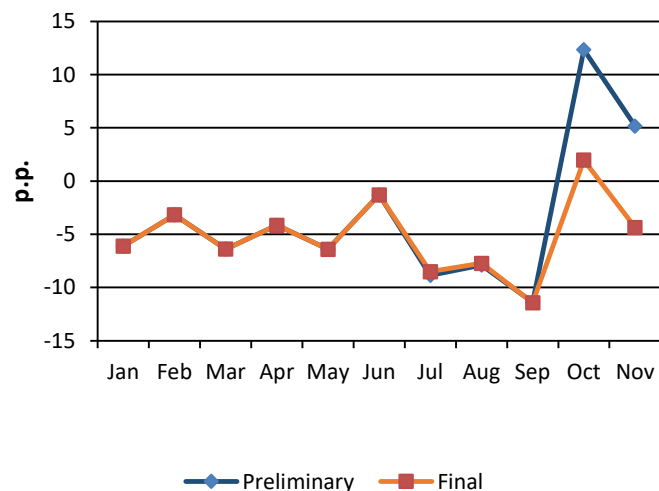
NACE 61 – Telecommunications

MAR (Oct–Nov 2025) = 9.95 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX



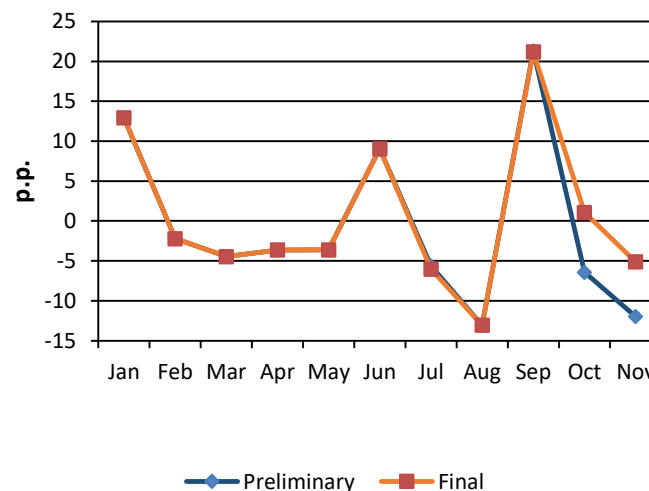
NACE 81 – Services to buildings and landscape activities

MAR (Oct–Nov 2025) = 7.18 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX



Further analysis should focus on auxiliary-indicator suitability, co-movement with the target SPPI and revision performance.

Croatian good-practice examples – LM + AUX present

At the 2-digit level, LM may appear together with AUX for selected sub-activities; examples below show relatively low revision impact.

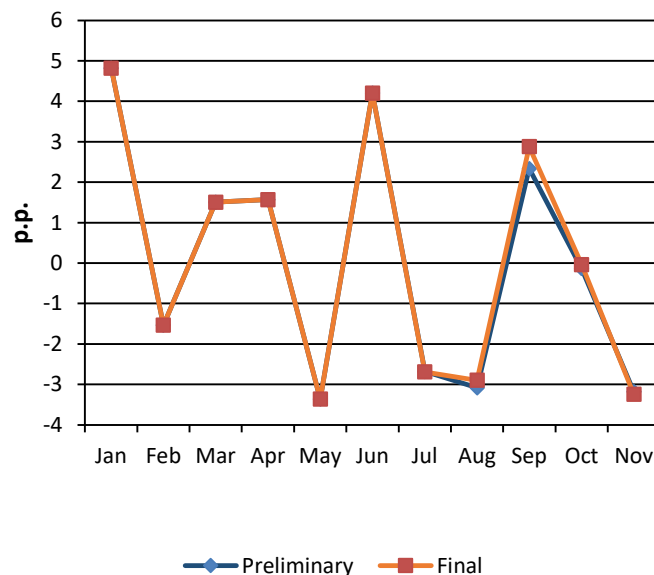
NACE 49 – Land transport and transport via pipelines

MAR (Oct–Nov 2025) = 0.08 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX + LM



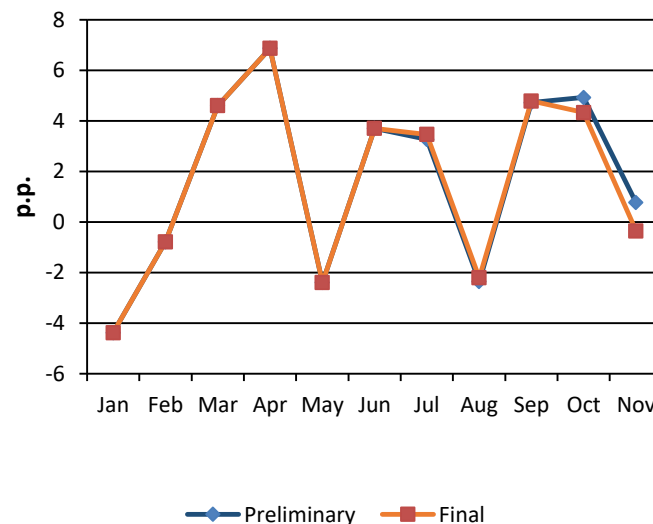
NACE 69 – Legal and accounting activities

MAR (Oct–Nov 2025) = 0.86 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX + LM



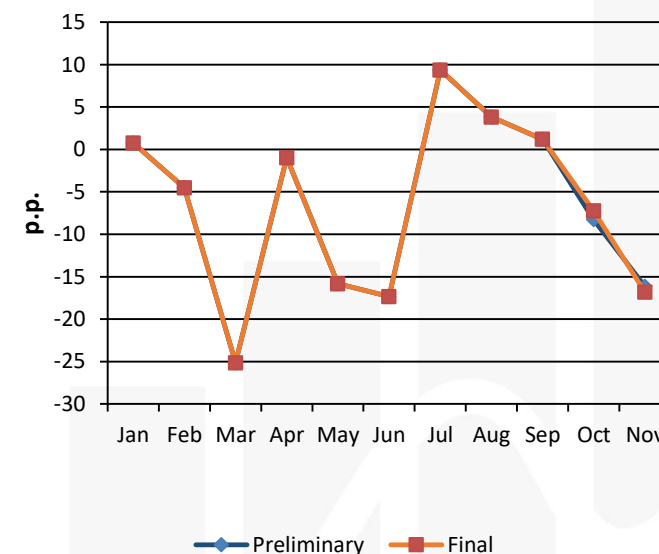
NACE 59 – Motion picture, video, TV and music publishing

MAR (Oct–Nov 2025) = 0.86 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX + LM



Good practice criterion: mathematically derived monthly profiles remain stable after quarterly information becomes final.

LM + AUX examples requiring further analysis

Where LM + AUX is present and revisions are larger, additional testing of interpolation choices and activity-specific diagnostics may be useful.

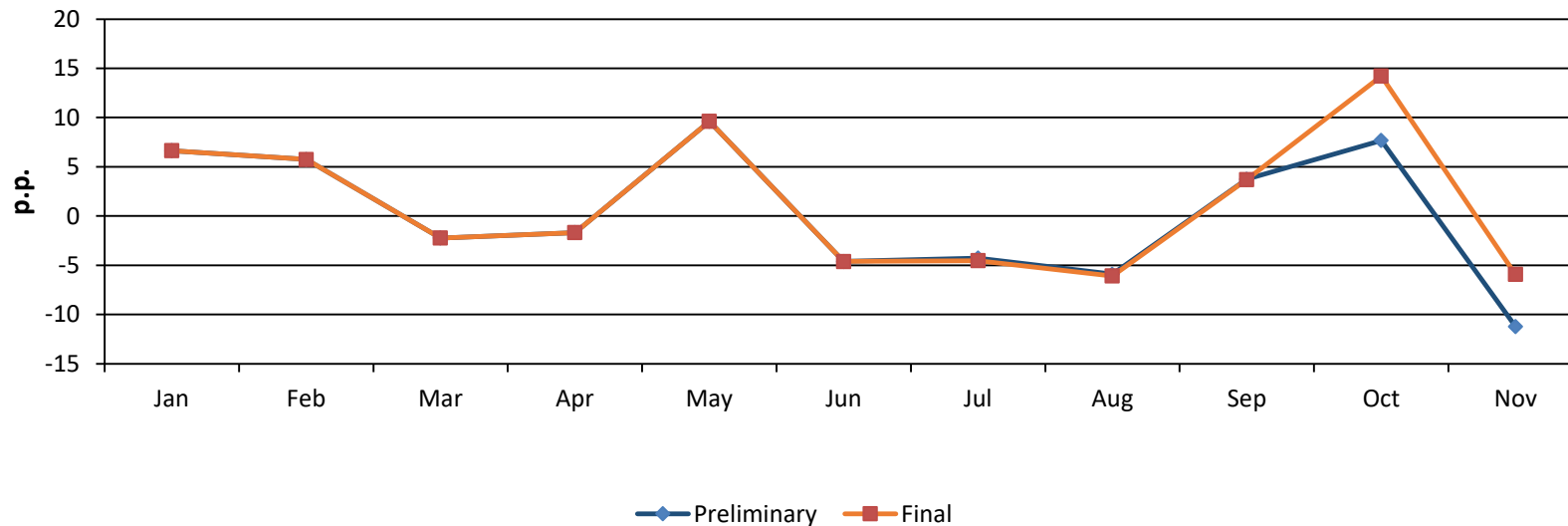
NACE 63 – Information service activities

MAR (Oct–Nov 2025) = 5.91 p.p.

Source: SPPI

Auxiliary source: CPI

Disagg. method: AUX + LM



Assessment of the current approach and further methodological work

Strengths

- Operationally feasible within T+60
- Transparent production rules
- No need for additional monthly price surveys
- Indicators can be selected by activity
- Preliminary values can later be aligned with observed quarterly information

Limitations

- First estimates may rely on estimated price movements
- AUX quality depends on proxy–target similarity
- Historical patterns can become outdated
- Different methods can produce different monthly paths
- Regular revisions are therefore expected

Further methodological work

- Assess auxiliary indicators activity by activity
- Compare correlation, co-movement and revision performance
- Test cubic spline where LM revisions are large or persistent
- Evaluate effects on unadjusted and adjusted series
- Expand automated diagnostics by source and method

Conclusions

- 1 Quarterly deflators can be used successfully in a monthly ISP, but they require both real-time estimation and later disaggregation.
- 2 AUX is preferred where a suitable monthly indicator exists because it preserves the quarterly level and reflects observed monthly dynamics.
- 3 LM remains useful when no proxy exists; cubic spline is a possible alternative for selected activities and should be tested empirically.
- 4 Quality assessment should focus on plausible monthly movements, revision performance and effects on seasonal adjustment—not only on smoothness.
- 5 The preferred method depends on the availability and quality of monthly information and on the characteristics of price developments in each activity.

Main message: no single method is necessarily optimal for all service activities.

Thank you

Questions and discussion

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