Statistics Poland

Voorburg Group
Den Haag 2026

Methods for adjusting the quarterly SPPI to the needs of the monthly ISP

Cross-cutting topic (Part 10)

The 40th Voorburg Group Meeting
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Plan of presentation

- Introduction: challenges and objectives
- Survey background: current state of SPPI
- Current method: linear interpolation & benchmarking
- Temporal disaggregation: exploring advanced methods
- The Denton-Cholette method: implementation&benefits
- Key conclusions: moving forward

Introduction

The challenge

Services producer price indices (SPPIs) are currently compiled quarterly, which significantly limits their utility in a rapidly changing, dynamic economy.

Regulatory requirements

The European Business Statistics (EBS) Regulation emphasizes and prioritizes the timeliness and increased frequency of short-term business statistics.

User demand

Macroeconomists and policymakers urgently require monthly price data to construct indicators such as the Index of Services Production (ISP) and Gross Domestic Product (GDP).

Objective

Develop and test robust methodologies for estimating monthly indices based on available quarterly aggregates.

Survey background

Expanded scope

The survey now monitors majority of services activities classified into the NACE sections: H, J, L, M & N

Quarterly shift

Since 2018, all services activities are observed strictly on a quarterly basis within one unified *Services Producer Price Survey*

Data collection

Utilizes harmonized C-06 and C-09 modular questionnaires, targeting enterprises with 10+ employees. Units are purposively selected to ensure representative data quality.

Current method: linear interpolation & benchmarking*

Phase 1: Mid-point linear interpolation

Calculates a constant monthly difference to mathematically eliminate discrete jumps between mid-points of adjacent quarters.

$$\Delta = \frac{Q_{k+1} - Q_k}{3}$$

Phase 2: Additive Benchmarking

A constant adjustment value is applied across the interpolated months.

This proces ensures the arithmetic mean of three months equals the quarterly index stock variable.

$$C_k = Q_k - \frac{M_{k,1} + M_{k,2} + M_{k,3}}{3}$$

** two-step mid-point linear interpolation with flat additive benchmarking*

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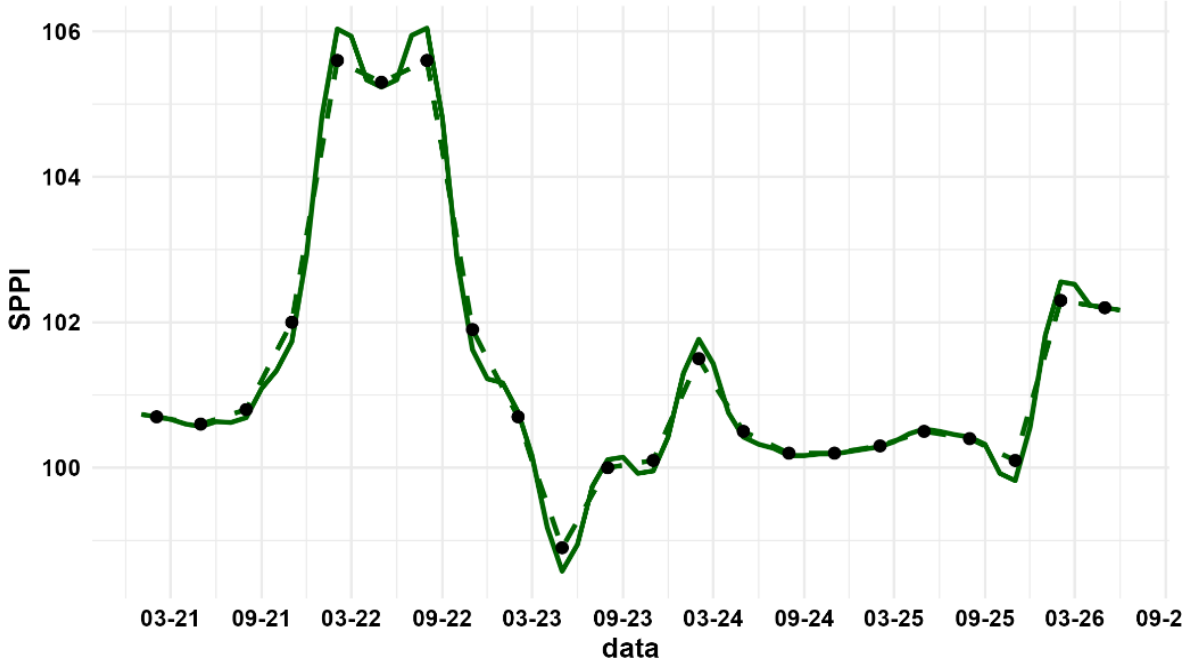
Evaluation of current approach

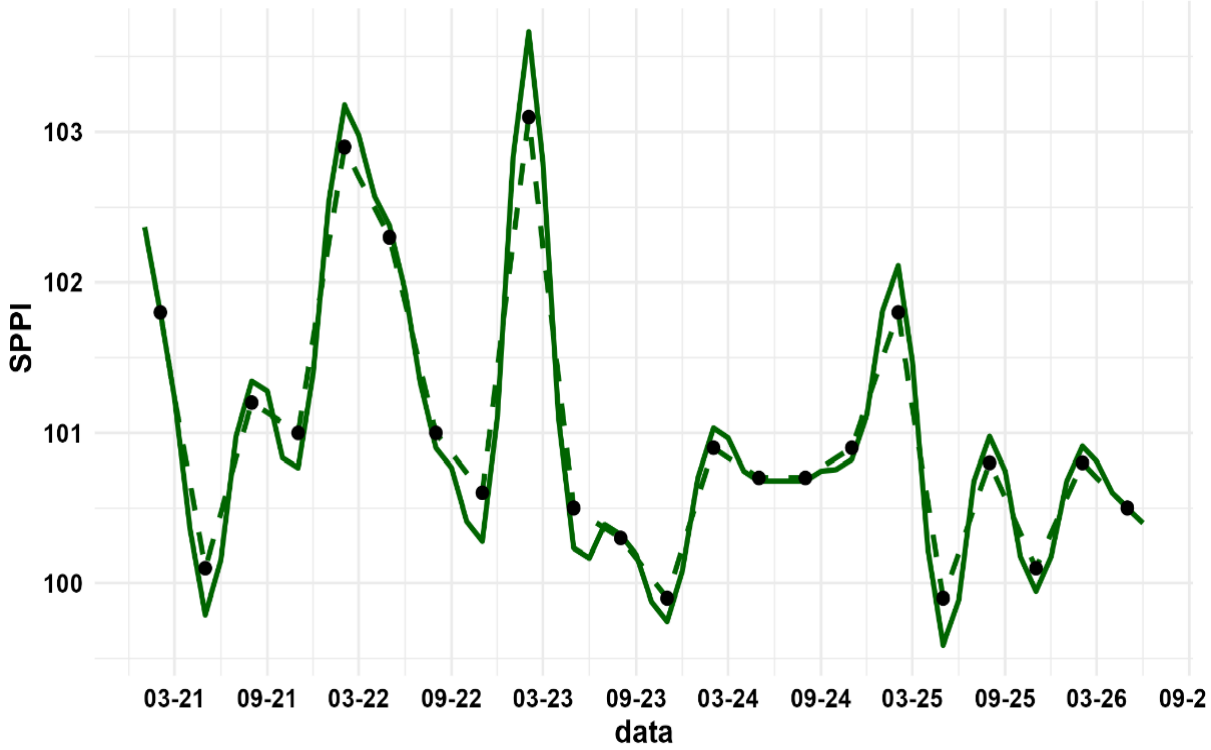
- ✓ **Operational Transparency:** The mathematical procedure is highly transparent and easily replicable by analysts using spreadsheets or automated scripts in R.
- ✓ **Natural Dynamics:** Unlike simple pro rata adjustments, this algorithm introduces a natural intra-quarter dynamic, minimizing severe step problems at quarter boundaries.
- ⚠ **Distortion of Dynamics:** The discrete nature of adjustments between quarters means the first derivative (monthly growth rate) may undergo artificial, non-linear fluctuations.
- ⚠ **Endpoint Instability:** Since adjacent quarters are missing for the first and last months of the series, extrapolating boundary conditions forces severe adjustment errors (tail effects) heavily onto January and December.

Quarterly SPPI and monthly disaggregated SPPI – linear interpolation&benchmarking

Land transport and transport via pipelines (49 by NACE Rev. 2)



Computer programming, consultancy and related activities (62 by NACE Rev. 2)



quarterly SPPI

preliminary monthly disaggregated SPPI

final monthly disaggregated SPPI (after benchmarking)

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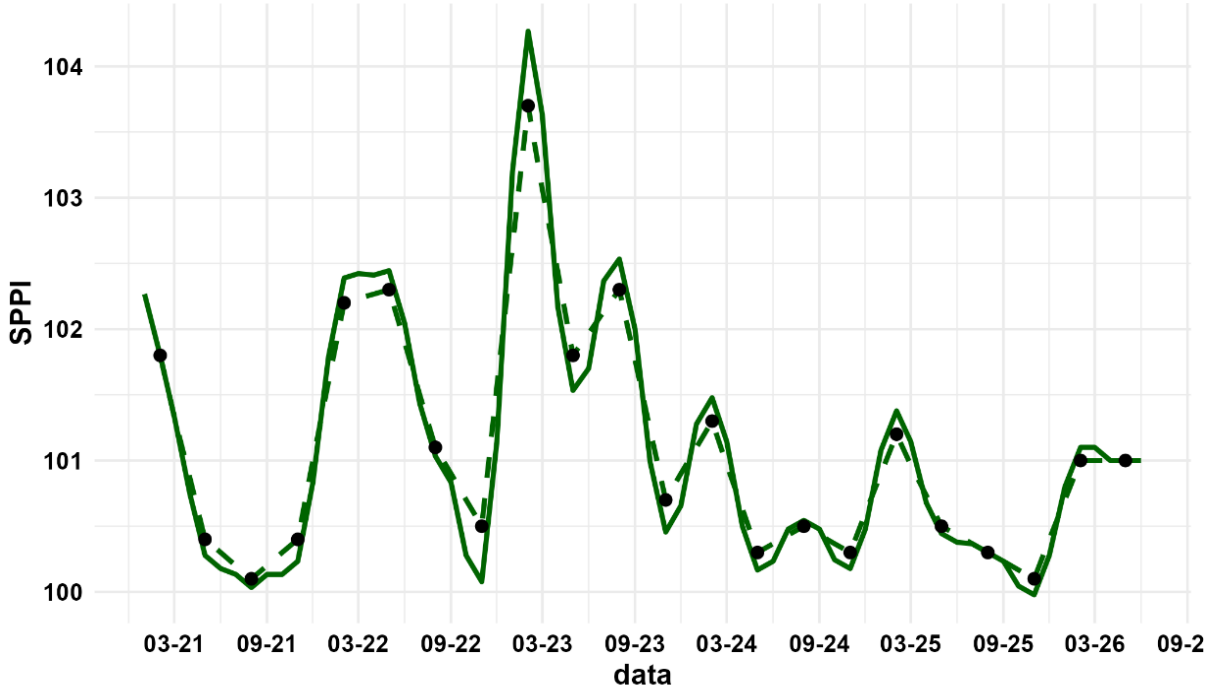
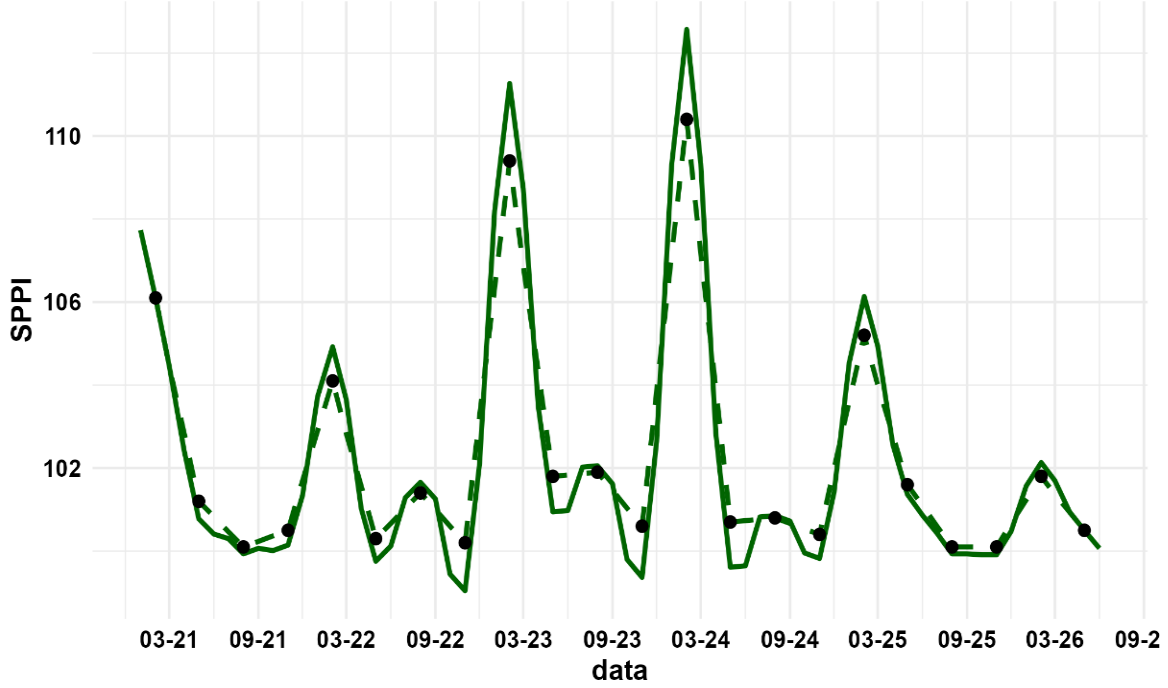
Quarterly SPPI and monthly disaggregated SPPI – linear interpolation&benchmarking

Architectural and engineering activities; technical testing and analysis (71 by NACE Rev.2)



Security and investigation activities (80 by NACE Rev.2)



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Methods for temporal disaggregation

Two-step procedures aim to find an unknown high-frequency series that are consistent with a known low-frequency series:

- ✓ Step 1: Determination of the preliminary monthly series (p_m).
- ✓ Step 2: Allocation of residuals (u_q) using the distribution matrix D.

$$\mathbf{SPPI_m = p_m + Du_q} \qquad \mathbf{u_q = SPPI_q - Cp_m}$$

where:
D - distribution matrix
u_q -the vector of quarterly discrepancies
C - the conversion matrix averaging 3 months into a quarter

Mathematical methods

- preserve mathematical movements (e.g. **Denton, Denton-Cholette**);
- can be conducted with one or without any high frequency variable;

Statistical regression-based methods

- based on the econometrics models (e.g. **Chow-Lin, Fernandez, Litterman**);
- utilize one or multiple related high frequency variables aggregated into an indicator matrix;

Exploring the Denton-Cholette Method (without indicator)

- **Methodological shift:** Transitioning from purely mathematical movement preservation to a statistically robust framework to alleviate boundary constraints.
- **No auxiliary indicator required:** Applying the Denton-Cholette method without indicatoir utilizing a constant indicator (value 1), resolving the lack of high-frequency reference variables.
- **Minimizing deviation:** the method minimizes proportional squared deviations to perfectly smooth the final series.
- **Resolving start-up errors:** Cholette's modification of Denton method specifically removes spurious transient movements at the startof a series, correcting the exact flaw of our current model. The penalty/differencing matrix enforcing movement preservation replaced with an autocorrelation matrix to resolve boundary effect distortions.

Quarterly SPPI and monthly disaggregated SPPI – current method& *Denton-Cholette method (without indicator)*

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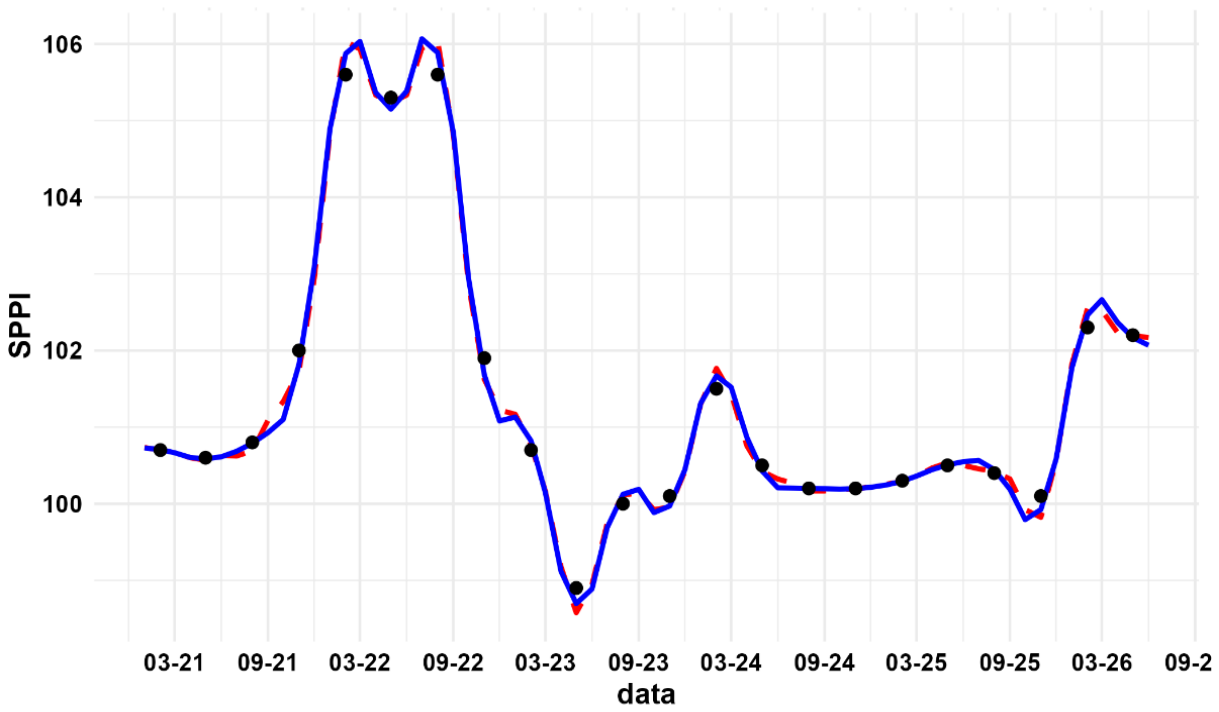

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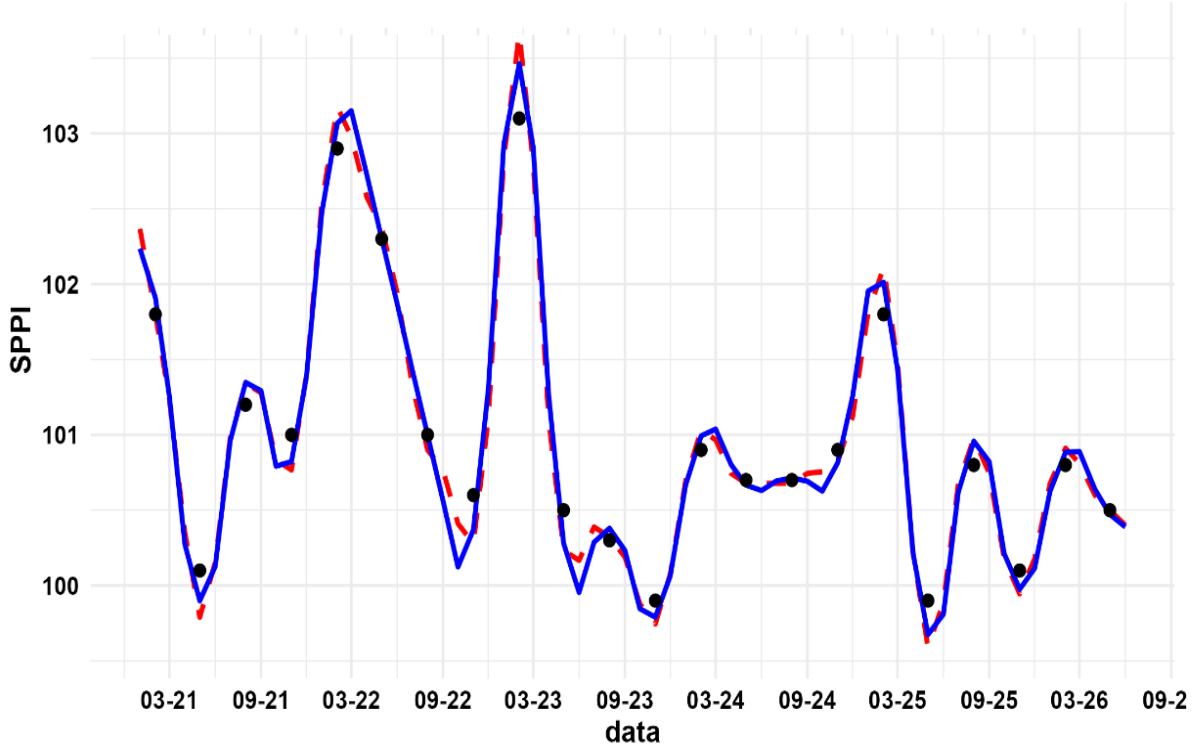

quarterly SPPI

monthly disaggregated SPPI - a two-step mid-point linear interpolation with flat additive benchm

monthly disaggregated SPPI – Denton-Cholette method (without indicator)

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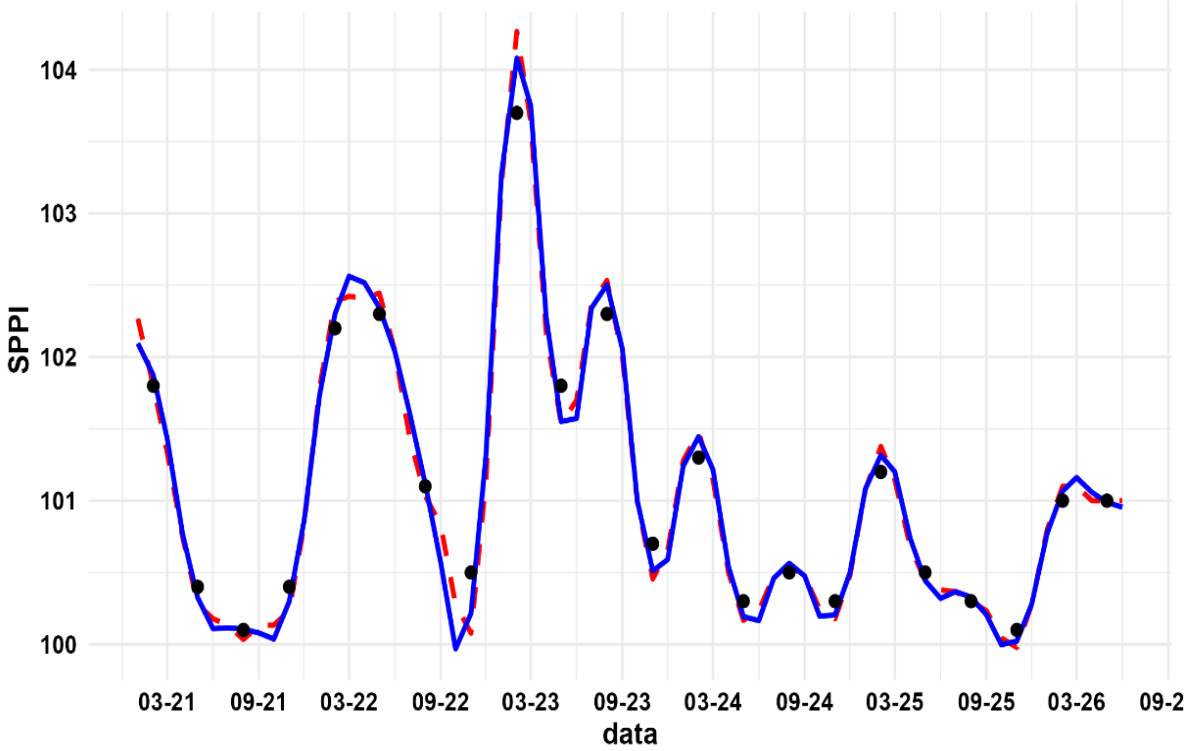

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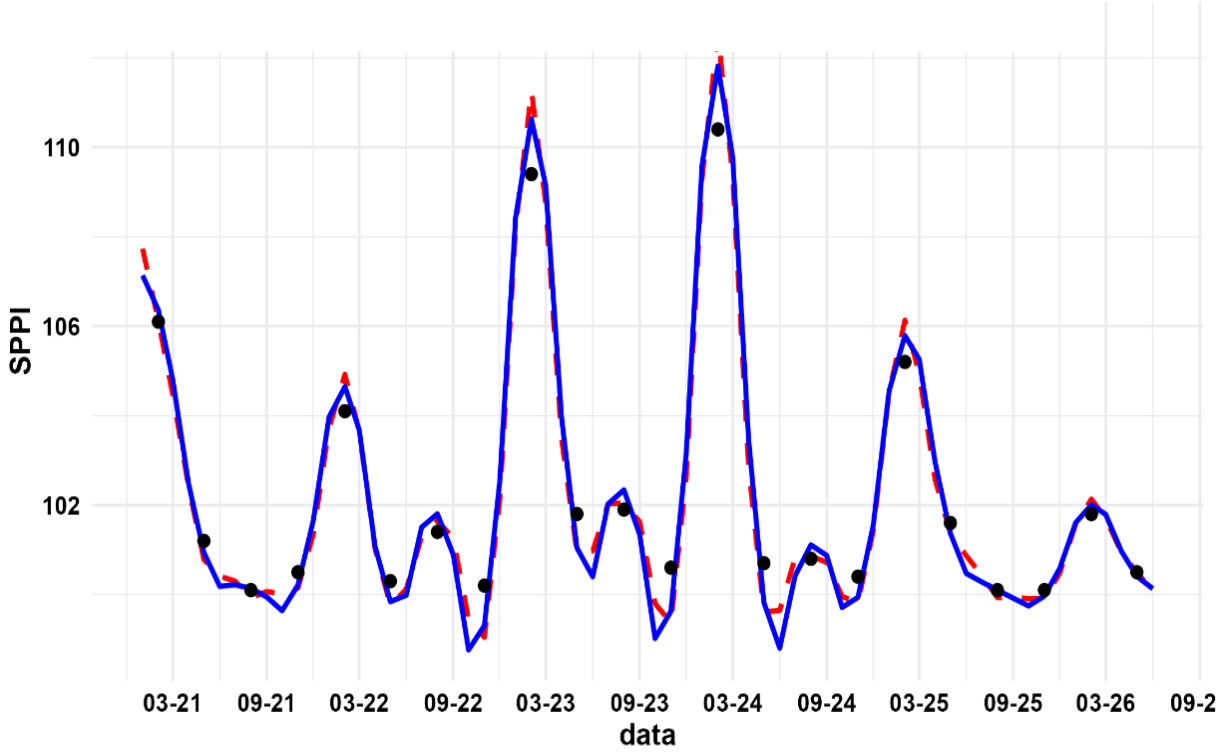

quarterly SPPI

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monthly disaggregated SPPI – Denton-Cholette method (without indicator)

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Methodology comparison summary

Feature	Current: Linear + Benchmarking	Proposed: Denton-Cholette
Indicator dependency	None required (Mathematical)	None required (Constant = 1)
Software execution	Spreadsheets / Basic R scripts	R Software (`tempdisagg` package)
Intra-quarter dynamics	Artificial, non-linear shifts	Smooth, proportional minimization
Endpoint stability	**High Error (Tail Effects in Jan/Dec)**	**Stable (Corrects start-up errors)**

Experimental phase findings

Denton-Cholette Advantages

The experimental use of the Denton-Cholette method demonstrates superior stabilization of time series end-points. Data shows significantly reduced January and December distortions compared to our linear benchmarks.

Regression Constraints

While statistical regression-based methods (e.g., Chow-Lin, Fernandez) were reviewed, they remain impractical. The lack of strongly cointegrated high-frequency indicator variables for SPPIs prevents their reliable implementation without threatening data integrity.

Key conclusions:

A superior alternative: The Denton-Cholette method successfully resolves the endpoint instability of the current two-step interpolation procedure without disrupting transparency.

Automation ready: Implementation via the tempdisagg R package ensures computations remain seamless, scalable, and fully automated within Statistics Poland.

Zero respondent burden: By utilizing statistical disaggregation on existing quarterly aggregates, we achieve EU compliance for monthly ISP data without increasing the reporting burden on enterprises.

Future implementation: Experimental results firmly advocate transitioning to Denton-Cholette as the primary standard for officially disaggregating SPPI data moving forward.

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Thank you for your attention

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