



Economia, Finanza e Analisi dei Dati

Laurea Magistrale

Data Analysis for Economics

Topic 2: Prices and Taxation III

(Investigating price changes)

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Outline

- ▶ We now turn to studying how the (average) prices of petrol and diesel change around the excise change.
- ▶ For doing so we will:
 1. Import the price data (by component) and perform basic checks and cleaning
 2. Plot excise (and other taxes) over time
 3. Study the gross price change (and its components)
 4. Identify a 'control' group to deplete from confounders
 5. Re-scale series wrt baseline value
 6. Estimate retail margin

1. Import, inspect, and clean

Goal: Load the weekly fuel price dataset (`prezzi_carburanti_settimanali...`) and make it ready for analysis.

- ▶ Import essential libraries: `pandas`, `matplotlib.pyplot`, `numpy` (optional: `seaborn`).
- ▶ Inspect a few rows: What variables are present? How are prices recorded?
- ▶ Ensure numeric columns are parsed as numbers; convert dates to proper format.
- ▶ Filter the data to keep only recent years (e.g., from 2015 onward).

Hint: Adapt numbers to the US standard (1,000.00 not 1.000,00).

AI prompt: “How can I convert strings to numbers in Python?”

2. Plot excise and other taxes over time

Goal: Understand how excise and VAT evolved for different fuels.

- ▶ Plot the **ACCISA** (excise) for petrol over time.
- ▶ Add other fuels (diesel, LPG, heating oil) for comparison.
- ▶ Highlight the 2022–2023 excise change period using shaded areas (e.g., `axvspan`).
- ▶ Plot VAT (**IVA**) and the VAT **rate** defined as

$$\text{VAT_RATE} = \frac{\text{IVA}}{\text{NETTO} + \text{ACCISA}}.$$

Hint: Overlay multiple series in a loop; reuse the same policy shading for comparability.

AI prompt: “How can I highlight a period on a Matplotlib chart?”

3. Study the gross price and its components

Goal: Visualize how the total price changes and what drives those changes.

- ▶ Plot the gross price for petrol and diesel.
- ▶ Create a stacked area plot showing the decomposition by the different price **components**.
- ▶ Observe which component moved the most during the excise cut, and try to quantify the pass-through.

Hint: Use `plt.stackplot(x, y1, y2, y3, labels=[...])`.

AI prompt: “How do I create a stacked area chart in Matplotlib?”

4. Identify a control group

Goal: Separate the policy effect from market-driven changes.

- ▶ Choose a product not directly affected by the policy — e.g. **Heating diesel**.
- ▶ Plot both the treated (e.g. `Car diesel`) and control series together.
- ▶ Compare their dynamics around the excise cut.
- ▶ Look for divergence between treated and control after the policy intervention.

5. Re-scale series to a baseline

Goal: Compare changes relative to a common starting point.

- ▶ Define a baseline date (e.g. 2021-11-29).
- ▶ For each product, compute $\text{Index} = 100 \times \frac{\text{PRICE}}{\text{PRICE}_{\text{baseline (same product, same date)}}}$.
- ▶ Plot the indexed prices for treated vs control; add a horizontal line at 100.
- ▶ You can do the same for the NET PRICE, EXCISE...

Hint: Indexing helps visualize proportional changes even when price levels differ.

6. Estimate retail margin

Goal: Understand how retailers' margins evolved over time.

- ▶ Use heating diesel as a proxy for oil cost (same date).
- ▶ Compute: $VA_NETTO = NETTO_{auto} - NETTO_{heat}$.
- ▶ (Optional) Also compute $VA_LORDO = PREZZO_{auto} - PREZZO_{heat}$ and $VA_ACCISA = ACCISA_{auto} - ACCISA_{heat}$.
- ▶ Plot the margin(s) with the same policy window; discuss pass-through.

Hint: Think about the data steps you need to compute the retail margins.

Summary

- ▶ You now have enough **observations** to get some policy insight.
- ▶ Each chart should tell a clear story:
 - ▶ Excise and VAT dynamics
 - ▶ Gross price decomposition
 - ▶ Control comparison (causal perspective)
 - ▶ Index and margin
- ▶ Keep each script self-contained and well-commented.