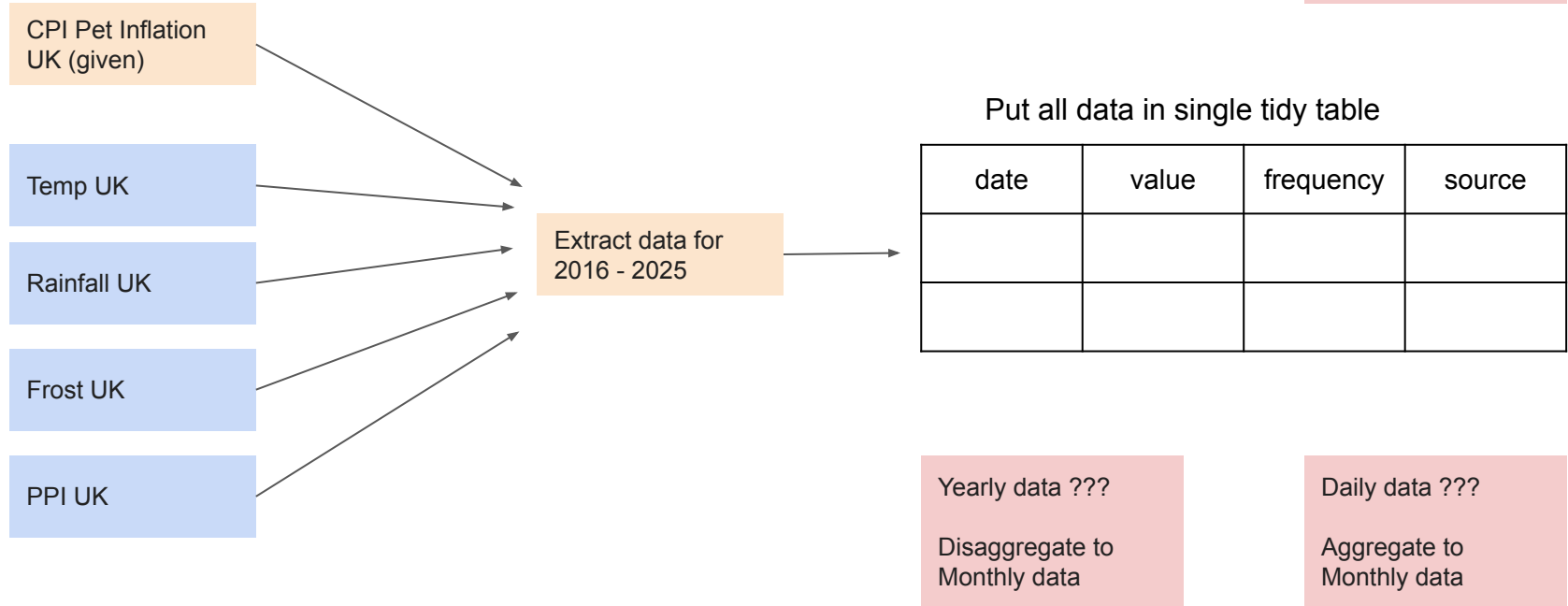


Pricing Analyst

Pet Inflation Analysis - Walkthrough

<https://chatgpt.com/share/68e0bd27-73e4-8011-95b6-e087cd1f81b0>

Prepare Data



Prepare Data

Tidy Table

date	value	frequency	source
2016-01-01	102.4	monthly	ONS CPI – vet services
2016-02-01	103.0	monthly	ONS CPI – vet services
2016-01-01	101.8	quarterly	ONS CPI (all items)
2016-04-01	102.5	quarterly	ONS CPI (all items)
2016-01-01	5.1°C	monthly	Met Office – avg temperature
2016-02-01	6.0°C	monthly	Met Office – avg temperature

Good for Models and PowerBI: Easy to filter by source, date, frequency

Prepare Data

External Sources

Consumer trends / household expenditure on pet services

- ONS “Consumer trends time series” – includes “Veterinary and other services for pets” (CP NSA) in £ million, downloadable .csv/.xls [Office for National Statistics](#)

Producer price indices / input cost inflation

- ONS / related UK data on producer price inflation (PPI), input cost indices → useful to capture cost side. (Check ONS PPI datasets)
- Office for Budget Responsibility (OBR) – forecasts for inflation and CPI projections in downloadable reports / tables [Office for Budget Responsibility](#)

Broad economic & cost drivers

- OECD inflation data (CPI by country) – downloadable CSV / Excel via OECD data portal [OECD](#)
- World Bank / World Development Indicators (WDI) – macro series like GDP deflator, exchange rates, wage inflation, etc. [DataBank](#)
- Bank of England “Research datasets” (for wage growth, expectations, business prices) [Bank of England](#)

Prepare Data

External Sources

Agri-inputs / agricultural / feed / drug costs

- UK Government “Historical Statistics – agricultural price indices” – includes input cost indices (including veterinary services input) [GOV.UK](https://gov.uk)

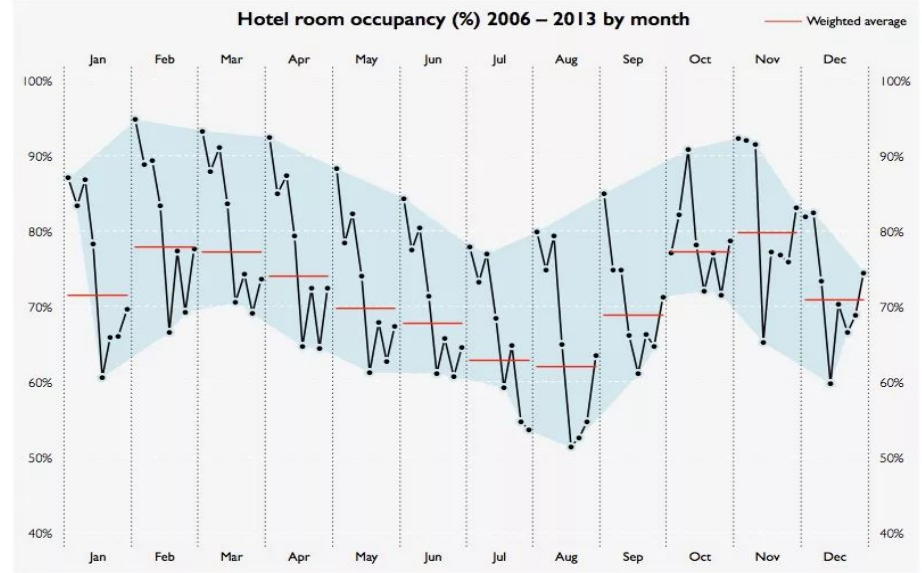
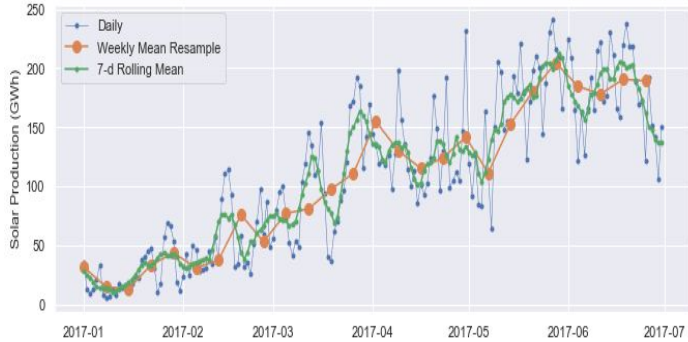
Veterinary sector / service pricing

- ONS veterinary services CPI component (mentioned above) is key. [Office for National Statistics](https://ons.gov.uk)

Temperature, Frosting and Rainfall

- Met Office UK and regional series. [Office for National Statistics](https://metoffice.gov.uk)

EDA



Power BI or R

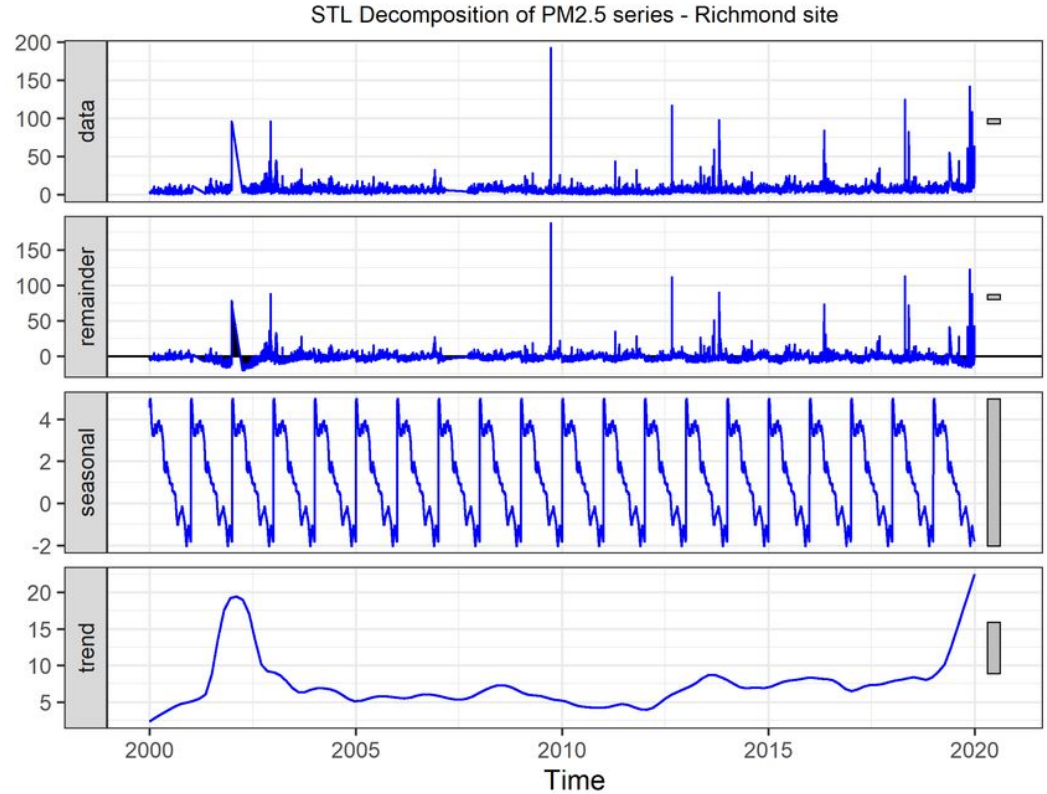
Check for outliers and sudden jumps — label them and investigate (COVID, supply shocks).

EDA

Check for outliers and sudden jumps
— label them and investigate
(COVID, supply shocks).

Plot decomposition (trend / seasonal /
remainder).

Power BI or R



EDA

Key Events in UK

Date / Period	Event / Description	Likely impact on vet/pet costs
Dec 2019 – Jan 2020	Early COVID awareness, limited public restrictions	Minor initial uncertainty
Mar 23 – May 2020	First UK COVID lockdown: non-essential businesses closed, vet visits restricted	Vet visits drop → claims costs fall, CPI dip possible
Jun – Sep 2020	Gradual reopening, pent-up demand for services	Spike in service utilization, slight inflation uptick
Nov 2020	Second COVID lockdown (partial)	Temporary disruption to vet services, small dip in cost
Dec 2020 – Jan 2021	Holiday period + COVID restrictions	Seasonal spike masked by partial lockdown
Jan 1, 2021	Brexit trade transition officially completed	Supply chain adjustments → slight cost increases, possible vet supply cost rise
Feb – Apr 2021	Vaccination rollout, gradual easing of restrictions	Recovery in service costs, normalization
Late 2021	Global supply chain disruptions & energy price rises	Input costs up → higher vet service costs
Early 2022	Omicron wave (COVID variant)	Minor temporary dip/spike in vet visits
Feb – Mar 2022	Ukraine war → energy & commodity price shocks	Rising operational costs for services → inflation spike

EDA

Key Events in UK

Date / Period	Event / Description	Likely impact on vet/pet costs
Mid 2022	Peak UK inflation (headline CPI ~9–10%)	General cost increases, including veterinary services
Late 2022	Bank of England rate hikes to combat inflation	Cooling effect on consumer demand, vet service cost inflation slows
2023	Inflation gradually moderates (~6–7% early, ~4–5% later)	Stabilization of vet service costs
2024 (projected)	Expected normalizing post-pandemic & post-energy shock	Trend returns to 3–4% annual inflation for services

Overlay key events
in charts

Justify spikes and dips

Shade regions for durations

These help in evidence based assumptions

EDA

KPIs

◆ 1. Latest Value / Current Index

- **What:** Most recent value in the series (e.g., Dec 2024 vet CPI = 120).
- **Why:** Shows the current **level of cost** or claim driver.
- **Power BI:** Use a **Card visual**: `Value = LASTNONBLANK(Series[Value], 1)`.

◆ 2. Year-over-Year Change (YoY%)

- **What:** % change compared to the same month last year.
- **Formula:** `(CurrentMonth - SameMonthLastYear) / SameMonthLastYear * 100`
- **Why:** Measures **inflation trend** and seasonality.
- **Power BI:** Use a **Card or KPI visual** to highlight spikes in inflation.

◆ 3. Month-over-Month Change (MoM%)

- **What:** % change vs previous month.
- **Formula:** `(CurrentMonth - PreviousMonth) / PreviousMonth * 100`
- **Why:** Detect **short-term volatility** and sudden spikes/dips.
- **Power BI:** Line chart or KPI card with conditional formatting to flag large changes.

EDA

KPIs

◆ 4. Average / Median Value (Over Period)

- **What:** Mean or median of the series over 12 months or multiple years.
- **Why:** Shows **baseline level** for forecasting and sanity checks.
- **Power BI:** Card visual or measure: `AVERAGE(Series[Value])`.

◆ 5. Max / Min Values

- **What:** Highest and lowest points in the series.
- **Why:** Detect **extremes** that may be outliers or shocks.
- **Power BI:** Card or KPI visual; can highlight the date of max/min using a tooltip.

◆ 6. Volatility / Standard Deviation

- **What:** Standard deviation of monthly or quarterly series.
- **Why:** Shows **risk and variability**, important for pricing decisions.
- **Power BI:** Create measure: `STDEVX.P(Series, Series[Value])`

EDA

KPIs

◆ 7. Seasonal Pattern KPI

- **What:** Average value for each month across years.
- **Why:** Confirms **seasonality**, which affects expected claims costs.
- **Power BI:** Line chart with Month on X-axis and Value on Y-axis, multiple lines per year.

◆ 8. Forecast vs Actual (Optional, if already forecasting)

- **What:** Difference between model forecast and actual observed values.
- **Why:** Validates model performance, important if presenting in Power BI.
- **Power BI:** Line chart with actual vs forecast, shaded area for confidence interval.

◆ Tips for presentation

- Use **cards for single-number KPIs**: Latest value, YoY%, MoM%, Max/Min.
- Use **line charts / small multiples** for trends & seasonal patterns.
- Conditional formatting: Highlight **high spikes (>5–10%)** in red to draw attention.
- Add tooltips: Include source and frequency for transparency.

Time Series Analysis

Choosing a Model

Data Pattern / Feature	External Variables	Recommended Model(s)	Why / Notes
Trend only, no seasonality	None	ETS (trend only), ARIMA	Simple, interpretable, captures steady increase. Easy to explain to stakeholders.
Trend + annual seasonality	None	SARIMA, ETS (trend + seasonal)	Explicitly models repeating yearly patterns in vet costs. Good baseline.
Trend + seasonality + known events/spikes	COVID lockdowns, energy price shocks, holidays	Prophet	Handles trend, seasonality, and can include known events as regressors. Generates clear plots for stakeholders.
Trend + seasonality + external numerical predictors	CPI, monthly average temperature, energy index	XGBoost, RandomForest	Can capture nonlinear relationships between vet costs and external drivers. Requires enough data.
High uncertainty, mix of linear & nonlinear patterns	CPI, temperature, holidays	Ensemble (e.g., ETS + Prophet + XGBoost)	Combines strengths of multiple models. Reduces risk of poor single-model choice.
Short series or sparse data	None	ETS or SARIMA	Simpler models work better on limited data; ML models may overfit.
Seasonality only, minimal trend	None	ETS seasonal, Prophet	Focus on repeating pattern; avoids overfitting trend.

Time Series Analysis

Model Evaluation

◆ MAPE (Mean Absolute Percentage Error)

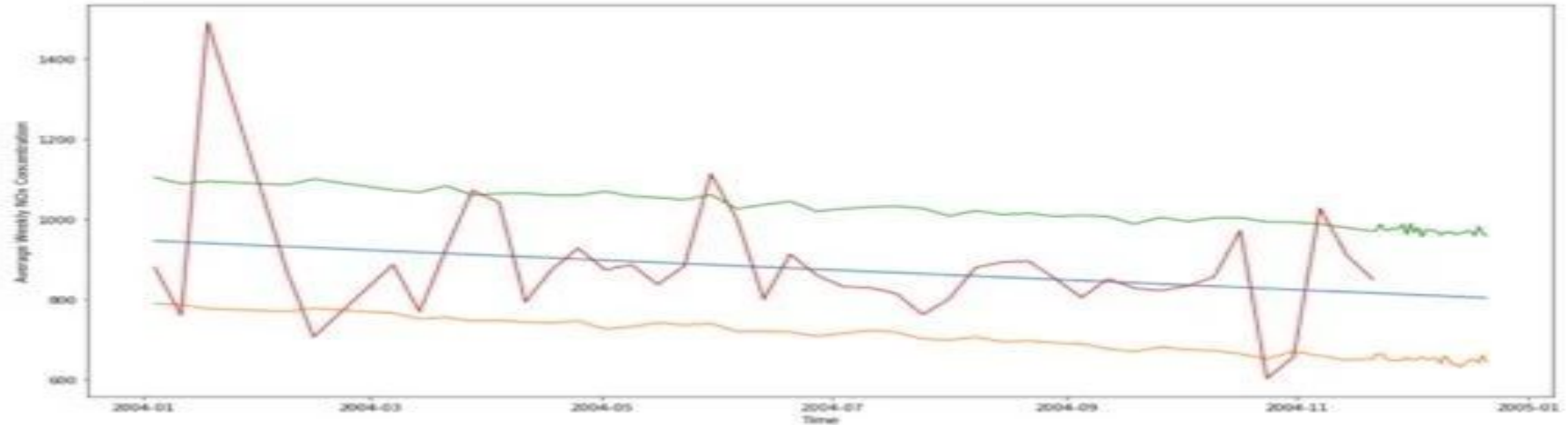
- Measures **average percentage difference** between forecast and actual values.
- **Lower MAPE** → **better** forecast.
- Example:
 - MAPE = 2.5% → model predicts very close to actuals
 - MAPE = 5% → model is less accurate

◆ RMSE (Root Mean Squared Error)

- Measures **average magnitude of errors**, giving more weight to large errors.
- **Lower RMSE** → **better** forecast.
- Example:
 - RMSE = 1.4 → small average errors
 - RMSE = 3.0 → larger deviations

Time Series Analysis

High, Central and Low



Central - Estimate

High - Worst-case or conservative forecast. Assumes higher-than-expected vet costs or inflation. Helps plan higher pricing or reserves.

Low - Best-case forecast. Assumes lower-than-expected costs. Helps plan competitive pricing or optimistic outlook.

Translate forecasts into pricing actions

Technical price (claims cost)

- **Definition:** The expected cost of claims the insurer will pay.
- **Effect:** If vet inflation rises, the **expected cost per claim increases**.

$$\text{Expected Claim Cost}_{new} = \text{Expected Claim Cost}_{old} \times (1 + \text{inflation rate})$$

Retail price (premium)

- **Definition:** The amount the customer pays.
- **Effect:** Must cover: Expected claims, Operating expenses, Profit margin, Reinsurance costs, Contingency for volatility

$$\text{New Premium} \approx \text{Current Premium} * (1 + \text{claims inflation} * \text{claims share} + \text{expense inflation} + \text{margin adjustment})$$

Translate forecasts into pricing actions

Pricing Proposal

- **Indexation clause**
 - a. Automatically adjusts claims or premiums based on an index (e.g., CPI for vet services).
 - b. Reduces manual repricing frequency.
- **Tiered pricing**
 - a. Different premiums by:
 - i. Pet type (dog, cat, exotic)
 - ii. Pet age (older pets → higher claims)
 - iii. Claims history (high-risk → higher premium)
- **Repricing strategy**
 - a. Apply new prices to:
 - i. Only **new business** (less customer pushback)
 - ii. Or **both new + renewals** (faster alignment with cost)
 - b. impact: e.g., 10% rise on new business only vs full portfolio → comparing total revenue impact.

Report

Power BI

- **Cover page:** title, summary sentence, date, your name.
- **Data page:** sources, last updated, notes on cleaning.
- **Exploration page:** time-series chart, seasonal plot, KPI cards (YoY%).
- **Model results page:** forecast lines (central + bands), model comparison table (MAPE), holdout chart.
- **Scenarios page:** scenario selector, forecast numbers for 2025 & 2026, % change.
- **Pricing impact page:** calculator visual (inputs: claims share, current premium, inflation), shows new premium and impact on margin.
- **Assumptions & limitations page:** short bullet list.
- **Recommendation page:** clear next steps and proposed price action.

Technical tips:

- Use bookmarks or slicers to create scenario toggles.
- Use “What-if” parameters for claims share and inflation to show live sensitivity.
- Export visuals to PDF or include live report for presentation.