Statistics and Data Analysis
Unit 06 – Lecture 07: ACF and PACF Interpretation

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https://github.com/tali7c/Statistics-and-Data-Analysis

Quick Links

Overview ACF PACF Exercises Demo Summary

Agenda

Learning Outcomes

- Define ACF and PACF (intuition)

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- Use ACF/PACF patterns to guess AR and MA orders (rough)

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- Use ACF/PACF patterns to guess AR and MA orders (rough)
- Recognize slow ACF decay as non-stationarity hint
- Explain why validation/diagnostics are still needed

ACF: Key Points

- Corr(x_t, x_t-k) vs lag k

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- Slow decay can suggest non-stationarity
- ACF cutoff after q lags can suggest MA(q) (rough)

PACF: Key Points

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- Partial correlation after removing lower lags
- PACF cutoff after p lags can suggest AR(p) (rough)
- Use with caution and validate

Exercise 1: ACF pattern

If ACF stays significant for many lags, what might it suggest?

Solution 1

- Non-stationary; try differencing.

Exercise 2: PACF AR hint

PACF cuts off after lag 2: what AR order to try?

Solution 2

- Try AR(2) as starting point.

Exercise 3: Rules not perfect

Why ACF/PACF rules are not perfect?

Solution 3

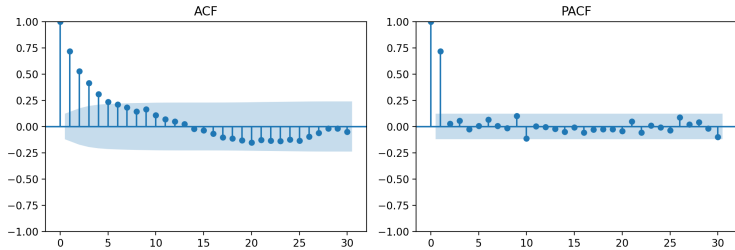- Finite sample noise, seasonality, mixed ARMA.

Mini Demo (Python)

Run from the lecture folder:

$$\texttt{python demo/demo.py}$$

Outputs:

- `images/demo.png`
- `data/results.txt`

Demo Output (Example)

Summary

- Key definitions and the main formula.

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- How to interpret results in context.

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- Key definitions and the main formula.
- How to interpret results in context.
- How the demo connects to the theory.

Exit Question

How do ACF and PACF help choose ARIMA orders p and q?