Statistics and Data Analysis
Unit 06 – Lecture 05: Stationarity and Non-stationarity

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

Quick Links

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Learning Outcomes

- Define stationarity (intuition)

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- Recognize non-stationary patterns (trend/seasonality)

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- Define stationarity (intuition)
- Recognize non-stationary patterns (trend/seasonality)
- Explain why stationarity matters for ARIMA-type models
- List basic fixes (differencing, transforms)

Stationarity: Key Points

- Mean/variance roughly constant

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- Autocorrelation depends on lag only

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- Mean/variance roughly constant
- Autocorrelation depends on lag only
- Trend/seasonality often implies non-stationarity

Fixes: Key Points

- Differencing removes trend

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- Seasonal differencing removes seasonality

Fixes: Key Points

- Differencing removes trend
- Seasonal differencing removes seasonality
- Log transform can stabilize variance

Exercise 1: Trend

Is a strong upward trend likely stationary?

Solution 1

- No; mean changes over time.

Exercise 2: Variance change

If fluctuations grow over time, is variance constant?

Solution 2

- No; non-stationary variance.

Exercise 3: Fix choice

Name one fix for non-stationary mean.

Solution 3

- Differencing.

Mini Demo (Python)
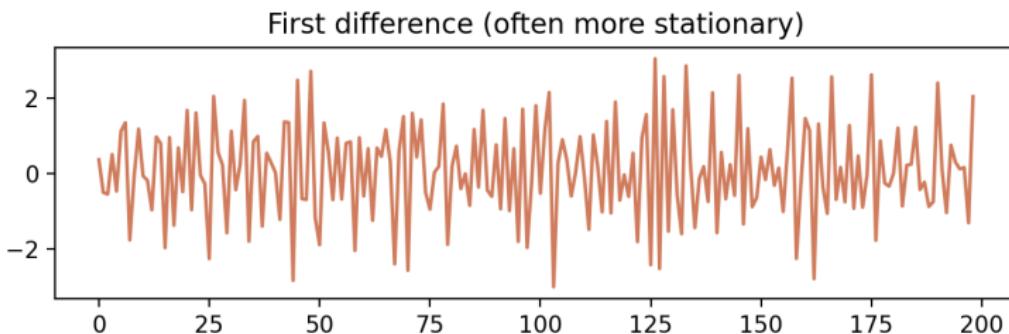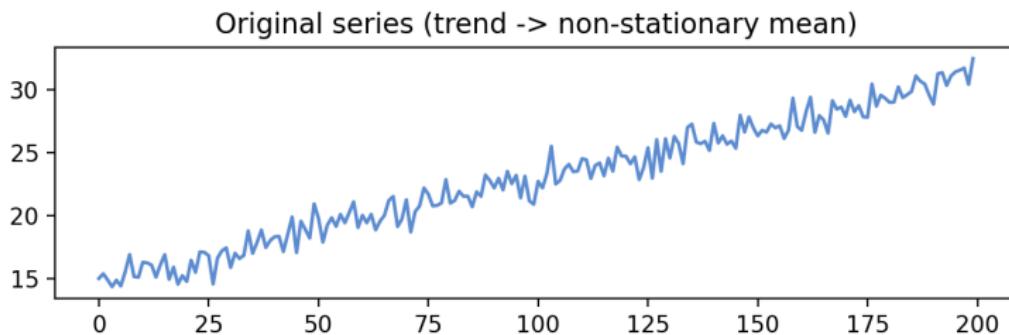
Run from the lecture folder:

python demo/demo.py

Outputs:

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

Demo Output (Example)

Original series (trend -> non-stationary mean)

First difference (often more stationary)

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

Why does non-stationarity make forecasting harder?