

Practical Spatial Statistics & Econometrics with R

Session 8: Spatial (Linear) Regression

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What should we know/will we learn in this session?

Understanding

What we should know:

- Linear regression, OLS
- Classical assumptions for OLS
- Spatial auto-correlation - how it violates
- Spatial models (SLX, SAR, SER)

Skill

What we should have already done:

- Loading new libraries, learning R by reading help manuals, working with spatial data

What we will do now:

- **Prepare spatial data for regression analysis**
- **Build neighborhood (weights) matrix**

Quick Review - Spatial Regression Models (the simple ones)

SAR (spatial auto-regressive)

$$Y = \rho Wy + X\beta + \varepsilon$$

Each of these models captures different spatial effects.

SAR - the value of the dependent variable in the spatial neighborhood influences its value at the current location.

SLE (spatial error)

$$Y = X\beta + u, \quad u = \lambda Wu + \varepsilon$$

SLE - the same as SAR but the influence occurs due to unobserved variation

SLX (spatial lag in X)

$$Y = X\beta + WX\theta + \varepsilon$$

SLX - the values of observed covariates in the spatial neighborhood influences the value of the dependent variable at the current location

Demo 8: Live Coding Session with R

Summary

- **Prepared spatial data for spatial regressions**
- **Built weights matrix using the spdep package**
- **Visualized neighborhood relationships**