**Test Module Spatial Statistics**

1. **What is the spatial autocorrelation?**

It is the correlation of a variable with itself due to the spatial location of the observations

It is a measure of the correlation of a variable with itself

It is a scatterplot of spatial data against its spatially lagged values

It is the correlation between the outcome variable and each regressor included in the model

1. **Moran’s I… (multiple answers are possible)**

ranges from −1 (perfect dispersion) to +1 (perfect correlation)

ranges from 0 (perfect correlation) to 2 (perfect dispersion) where 1 is no spatial autocorrelation.

if it is equal to zero it indicates a random spatial pattern

measures the spatial autocorrelation of categorical variables

identifies local patterns of spatial association and local instabilities in overall spatial association

1. **What is the main drawback of global measures of spatial autocorrelation?**

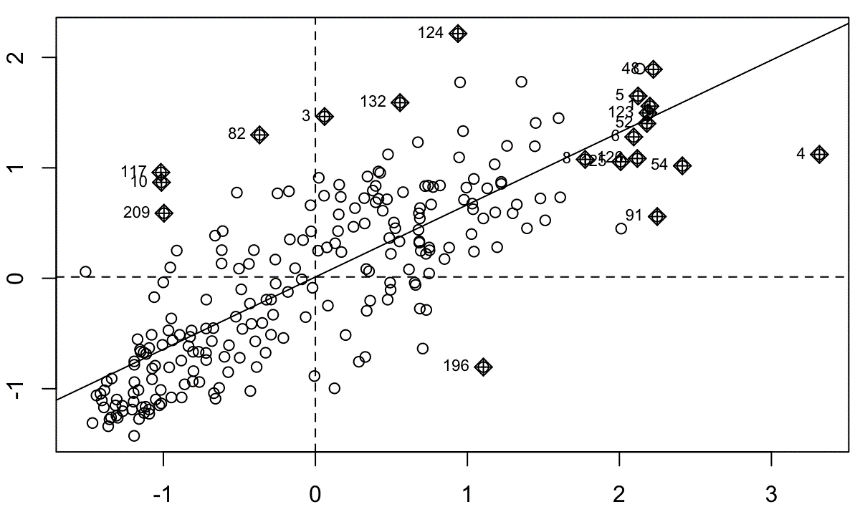
The normality assumption

The assumption of spatial stationarity

The assumption of randomisation

The target variable must be a continuous random variable

1. **The following plot shows the Moran’s diagram with income on x-axis and spatially-lagged income on y-axis. What can you conclude?**



There is not spatial autocorrelation

There is positive spatial autocorrelation

There is negative spatial autocorrelation

The value of the Moran’s I will be close to 0

1. **LISA indicators allow to….**

detect clusters (units with dissimilar neighbors) and hotspots (units with similar neighbors)

detect clusters (units with similar neighbors) and hotspots (units with dissimilar neighbors)

identify just the overall spatial association

identify the proximity of the observations

1. **Using Rook's contiguity**

Cells sharing a common vertex are considered contiguous

Cells sharing a common edge, or a common vertex are considered contiguous

Cells sharing a common edge are considered contiguous

Cells sharing a common edge and a common vertex are considered contiguous

1. **Using Queen's contiguity**

Cells sharing a common vertex are considered contiguous

Cells sharing a common edge, or a common vertex are considered contiguous

Cells sharing a common edge are considered contiguous

Cells sharing a common edge and a common vertex are considered contiguous

1. **Which of these sentences are true? (multiple answers are possible)**

The weights matrix can be row-standardized

The spatial weights matrices cannot take into account the distance between the geographical zones

The weight matrix is always a binary contiguity matrix

The weights matrix reflects the neighbour definition

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1. **Spatial-lag models**

account for spatial dependence in the error term

account for spatial dependence in the random terms

account for spatial correlation in the dependent variable

represent a mixture of both spatial dependence in the dependent variable and spatial dependence in the disturbance

1. **In spatial-error models**

Regression coefficients have the same interpretation of linear models

the observations are assumed to be spatially independent

the spatial autoregressive parameter is equal to 1

the effect of a covariate is the sum of a direct and a spillover effect

1. **Fitting a spatial lag model, you obtain an estimated coefficient for the spatial autoregressive coefficient equal to -0.6 (statistically significant).**

Fitting a standard regression model, we obtain the same results

It indicates the presence of negative spatial autoregressive relation between and

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1. **Suppose you have fitted a spatial lag model using housing prices as outcome variable and type of house as covariate, in a given city. You obtain an estimated coefficient for the spatial autoregressive coefficient equal to 0.1 (statistically significant).**

The positive value indicates that lower house prices raise the predicted price of neighbourhood areas.

The positive value indicates that lower house prices raise the predicted price of neighbourhood areas.

The positive value indicates that higher house prices also raise the predicted price of neighbourhood areas.

It indicates that type of house raises the predicted price of neighbourhood areas.

1. **Spatial Durbin model…**

includes spatially lagged dependent variable and spatially lagged explanatory variables

allows the inclusion of only spatially lagged explanatory variables

is the SEM model with the insertion of spatially lagged explanatory variables

includes only the spatially lagged dependent variable

1. **Spatial Lag X model…**

includes spatially lagged outcome variable

assumes spatial dependence in the error terms

assumes no spatial dependence in the error terms

is equivalent to the SAR model

# **R Quizzes**

To solve R quizzes you have to use the files “silcAUT2006.csv” which contains the simulated silc data in Austria for 94 districts). The file contains the following variables:

Districts\_ID: id of the districts

Female: share of female

Eqsize: average household size

unempl\_ben: average unemployment benefits received

age\_ben: average age benefits received

inc: average household income

The file “shape\_austria\_dis.shp” is the shapefile.

1. Considering the districts as the areas of interest (variable: BKZ), build a binary weights matrix using Rook'c criterion
2. Considering the districts as the areas of interest (variable: BKZ), build a row standardised weights matrix using Queen'c criterion
3. Considering the income as the target variable, calculate and comment the Moran's I using the weights matrix defined at point 2
4. Plot the Moran’s diagram
5. Test the presence of spatial autocorrelation in the following OLS model:

model1 <- inc ~ female+ eqsize+ unempl\_ben + age\_ben

1. What kind of spatial model is more appropriate for modelling the income in Austria? (considering model1)
2. Apply a test on the "common factor hypothesis" to choose between SEM and SDM
3. Fit SAR model. Evaluate if it is providing a better fit of OL and evaluate the autoregressive parameter.
4. Fit SAR model and estimate the direct, indirect and total effects with the standard errors