**Global Moran's test**

Moran’s test I is a correlation coefficient that measures the overall spatial autocorrelation of the data set. Its values range from -1 to 1: -1 – indicates that neighboring values are dissimilar, 0 - indicates that the spatial pattern is random, 1 - indicates that similar values appear close to each other, or cluster, in space.

*If the p-value is very small – this means that we reject the null hypothesis about the absence of autocorrelation.*

**Local Moran**

A positive value for **I** indicates that a feature has neighboring features with similarly high or low attribute values; this feature is part of a cluster. A negative value for **I** indicates that a feature has neighboring features with dissimilar values; this feature is an outlier. In either instance, the p-value for the feature must be small enough for the cluster or outlier to be considered statistically significant.

**Geary's test.**

**Geary's *C*** is a measure of spatial autocorrelation or an attempt to determine if adjacent observations of the same phenomenon are correlated. Positive spatial autocorrelation is found with values ranging from 0 to 1 and negative spatial autocorrelation is found between 1 and 2.

*If the p-value is very small – we reject the null hypothesis about the absence of spatial auto-correlation in the values.*

**Lagrange multiplier diagnostics for spatial dependence**

After this we can run the Lagrange multiplier diagnostics for spatial dependence. It conducts an empirical test to determine whether the spatial dependence is a spatial lag or a spatial error process. In a spatial error model, unobserved factors in neighboring areas are correlated leading to correlation in the error term across space. In a spatial lag model, observed outcomes are simultaneously determined with outcomes for neighboring areas, i.e., observations on the dependent variable are not independent due to spillovers.

The function returns 5 values: simple LM test for error dependence (LMerr), simple LM test for a missing spatially lagged dependent variable (LMlag), variants of these robust to the presence of the other (RLMerr tests for error dependence in the possible presence of a missing lagged dependent variable, RLMlag the other way round), and a portmanteau test (SARMA, in fact LMerr + RLMlag).

How does one determine whether we have a spatial lag or a spatial error?

The logic is the following:

* If neither LMlag nor LMerr are significant, but robust tests (RLMlag, RLMerr) are, then ignore the robust tests.
* When LMlag is more significant (lower p-value) than LMerr, and RLMlag is significant while RLMerr is not, then lag autocorrelation is most likely the correct error structure.
* When LMerr is more significant (lower p-value) than LMlag, and RLMerr is significant while RLMlag is not, then error autocorrelation is most likely the correct error structure.

**Direct, indirect and total effects,**

* The direct effect measures the impact of unit increase in xk in a given region on y in the same region (averaged over regions).
* The total effect measures the impact of unit increase in xk in a given region on y in all regions jointly (averaged over the regions where the impulse can potentially occur).
* Indirect effect measures the impact of unit increase in xj in a given region on y in all other regions jointly (averaged over the regions where the impulse can potentially occur).