

Spatial Association

Prepared by Tse-Chuan Yang

Definition: Spatial association means that attributes tend to relate with one another spatially. The first law of geography reads, “everything is related but things nearby are more related than things far away.” A positive or negative correlation between two spatial entities might suggest they are related. However, spatial association does not necessarily imply causality. Two things that are associated may be involved in a causal relationship, or there may be other hidden variables that facilitated this connection.

Though correlation is not causality, it still provides clues that could be assessed in light of theory. The types of spatial association could be distinguished by the format of data. The distance between two points is critical in deciding the relationship. Regarding line spatial association, not only does the distance matter, but the path could prove spatial association. Moreover, the areal spatial association could be determined by either distance or contiguity.

Application:

There are several indices used to measure spatial association, such as Moran’s I, Geary’s C, and Getis’s G. Between them, Moran’s I is more popular and could be interpreted like Pearson correlation coefficient. The values it takes on tend to range between -1 and 1. Values approaching 1 imply that similar values of variable x tend to cluster on a map, indicating positive spatial association. On the other hand, values approaching -1 imply that dissimilar x values tend to cluster, indicating negative spatial association.

The values of Geary’s C tend to range between 0 and 2. There is an absolute lower limit 0. Values approaching 0 imply that similar values of variable x tend to cluster spatially, indicating the positive spatial association is present. Values approaching 2 imply that dissimilar x values tend to cluster, indicating negative association. When values approaching the expected value of 1 imply that the x values tend to be randomly scattered, indicating an absence of spatial association.

References/Sources:

Anselin, Luc. 1995. Local Indicators of Spatial Association – Lisa. *Geographical Analysis*, 27(2):93-115.

Boots, B. 2002. Local measures of spatial association. *Ecoscience*, 9(2):168-176.

Cliff, A.D. and J.K. Ord. 1981. *Spatial processes: models and applications*. Pion Limited: London.

Getis, A. and Ord, J. K. 1992. The analysis of spatial association by use of distance matrices. *Geographical Analysis*, 24(3):189-206.