## Moran’s I

### Define the weight matrix

We could also use k-nearest neighbor weight matrix

If we use the weight matrix defined above, and our situation is blow

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 |

Then, we should let , since we have 10 pairs border relationship. The dimension of our matrix is .

### Calculate the global mean

In this situation, our global mean is

### Calculate the global variance

### Calculate the Co-Variance by the weight matrix

For each pair of correlation, we calculate

For

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 |

We have 4 pairs of 1-1 border relations, 2 pairs of 1-0 border relations, 4 pairs of 0-0 relations, then

For

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |

We have

### Calculate Moran’s I

N is the total number of events we interested about, W is the sum of elements from weight matrix (how many relationships we care about), the fraction represents how many variance are contributed by location.

For

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 |

For

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |

Notice: Moran ‘I are limited from -1 to 1.