Running spatial regressions in Excel

Note of caution: this is just to demonstrate how far one might get with Excel. Some of the estimation is strictly inappropriate because it applies OLS which is an inconsistent estimator with an endogenous spatial lag. While consistent 2sls estimation can be carried out, this is left as an exercise for the student. Likewise, the Moran's I analysis is informal and dedicated software should be used to carry out inference. Excel is definitely not the preferred software for spatial econometrics. Here we are dealing with a simple problem involving 25 regions, and hence a 25 by 25 W matrix. Doing the same with more regions (eg 250) would be somewhat more difficult.

1. Open Excel_demo_c.xslm, sheet W (or Excel_demo_c.xlsx if macros not available)
   This is a contiguity matrix for a 5 by 5 lattice (25 regions)

Ensure that Data Analysis can be seen on the extreme right of the Data tab, if NOT then
File..options….add ins…manage Excel addins….tick Analysis Toolpack and Analysis Toolpack- VBA

2. Run Macro1 (in Excel tab at top, view, macros) OR
   a) In sheet W, Select the cells a1 to 25y, replace selected cells in top left hand corner by the letter W, hit return
   b) In sheet yx1x2, select the cells a1 to a25, replace selected cells in top left hand corner by the letter y, return
   c) In sheet yx1x2, select the cells b1 to c25, rename as Xs
      Now create the spatial lag Wy as the matrix product of W and y
   d) Click on *fx*, select MMULT (found in math & trig)
      For array 1 type W, for array 2 type y
      Hold down shift (up arrow) +control(Ctrl) +return (left arrow) simultaneously
      {} should appear around the command
      Hit return and the matrix product of W and y will appear in column D
3. Run regression_1
   This regresses y on x1 and x2, putting the residuals (resids) in a column
4. Run resWres
   This creates a vector of the spatial lags of the residuals (Wresids), so that we can then regress the lagged residuals (Wresids) on resids to find the value of Moran's I.
   The method is the same as in 2d) this time using W and resids, thus creating the column Wresids
5. Run resreg1
   This is the regression of Wresids on resids, giving the Moran's I statistic equal to the slope. So in this case Moran's I = 0.3377. Note that we cannot strictly use the t ratio to test the significance of I
6. Run regression_2
   This regresses y on x1, x2 plus Wy, so we try to account for the spatially autocorrelated residuals by including the spatial lag Wy
   Notice that the coefficient on the spatial lag Wy is equal to 0.6143, so it appears to be significant. However strictly we should be estimating this model by ML or 2sls because of the endogeneity of Wy. The residuals from this regression are created, which we call res2_.
7. Run res2Wres2

This forms a column of the spatial lag of the residuals (Wres2) so that the regression of Wres2 on res2_ can be carried out. Here we expect to see the extent of spatial autocorrelation is reduced because of the presence of Wy in the regression creating res2_.

8. Run resreg2
   This is the regression of Wres2 on res2_. The slope gives a new measure of residual spatial dependence which can approximately be compared to Moran's I. In this case it is equal to the much smaller value of 0.0339.