# **STATA** Features

# Spatial autoregressive (SAR) models

- • Linear models for spatial data
  - – Spatially autoregressive and heteroskedastic errors
  - – Spatial lags of dependent variables
  - – Spatial lags of independent variables
  - – Spatial lags given by one or more spatial weighting matrices
  - – Different types of spatial weighting matrices
  - – Maximum likelihood and generalized method of moments (GS2SLS) estimators
- • Estimate direct and indirect (spillover) effects
- • Moran's test of spatial error correlation
- • SAR models for longitudinal or panel data
- • Instrumental-variables SAR models
- • Create and manage spatial weighting matrices
- • Import shapefiles

```
Viewer - view sp1.smcl                                              —    □    ✕
view sp1.smcl  ✕
+                                                    Dialog ▾  Also see ▾  Jump to ▾

. spregress y x, ml dvarlag(W) errorlag(W)

Spatial autoregressive model                          Number of obs =  1,412
Maximum likelihood estimates                          Wald chi2(2)  =  25.76
                                                      Prob > chi2   = 0.0000
Log likelihood = -4656.3167                           Pseudo R2     = 0.0020

          y │ Coefficient  Std. err.      z    P>|z|    [95% conf. interval]
────────────┼──────────────────────────────────────────────────────────────
y           │
      xtset │   .762087    .1667529     4.57   0.000     .4352573    1.088917
      _cons │  3.331143    1.748412     1.91   0.057    -.0956816    6.757968
────────────┼──────────────────────────────────────────────────────────────
W           │
          y │ -.5038401    .2096501    -2.40   0.016    -.9147468   -.0929335
        e.y │  .8295794    .1026362     8.08   0.000     .6284162    1.030743
────────────┼──────────────────────────────────────────────────────────────
    var(e.y)│ 36.56831     2.830766                      31.42049    42.55952
────────────┴──────────────────────────────────────────────────────────────
Wald test of spatial terms:         chi2(2) = 589.63     Prob > chi2 = 0.0000
                                                                  CAP  NUM  INS
```

## Stata's Sp suite of commands fits simultaneous autoregressive (SAR) models to spatial lattice data.

### Declare or import spatial lattice data

Use **spset** to declare your spatial data-recording coordinates

```
. spset spid, coord(longitude latitude) coordsys(latlong)
```

Or import your spatial data from a shapefile

```
. spshape2dta shapefilename
```

### Create spatial weighting matrices

Create a contiguity matrix based on nearest neighbors

```
. spmatrix create contiguity W
```

### Check for spatial dependence

Fit linear regression

```
. regress y x
```

Perform Moran's spatial test

```
. estat moran, errorlag(W)
```

### Fit your model

Spatial error model

```
. spregress y x, ml errorlag(W)
```

Spatial lag model

```
. spregress y x, ml dvarlag(W)
```

Simultaneous autoregressive model

```
. spregress y x, ml dvarlag(W) errorlag(W)
```

(See output at top of page.)

### Perform postestimation analysis

Estimate direct and indirect effects after fitting your model

```
. estat impact
```

And more.

# SAR models for cross-sectional data

SAR model using inverse-distance weighting matrix **M** for errors and contiguity matrix **W** for spatial lags of dependent and independent variables:

```
. spregress hrate ln_population ln_pdensity gini,
        gs2sls dvarlag(W) errorlag(M)
        ivarlag(W: ln_population ln_pdensity gini)
```



# SAR models for longitudinal or panel data

Random-effects SAR model with inverse-distance weighting matrix **M** for errors and spatial lags:

```
. spxtregress hrate ln_population ln_pdensity gini, re
        dvarlag(M) errorlag(M)
```



**spxtregress** also supports a fixed-effects estimator.

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### Spatial data

- Data with shapefiles
- Data with spatial coordinates
- Nongeographic data such as networks
- Automatic translation of shapefiles
- Planar coordinates or longitude and latitude
- Calculate distances

### Spatial weighting matrices

- Nearest-neighbor, inverse-distance, and custom
- Normalization: spectral, min–max, or row
- Manage matrices: list, summarize, copy, save, and more
- Import and export matrices from text files
- Use and save matrices in Stata format

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# Use commands or point and click





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