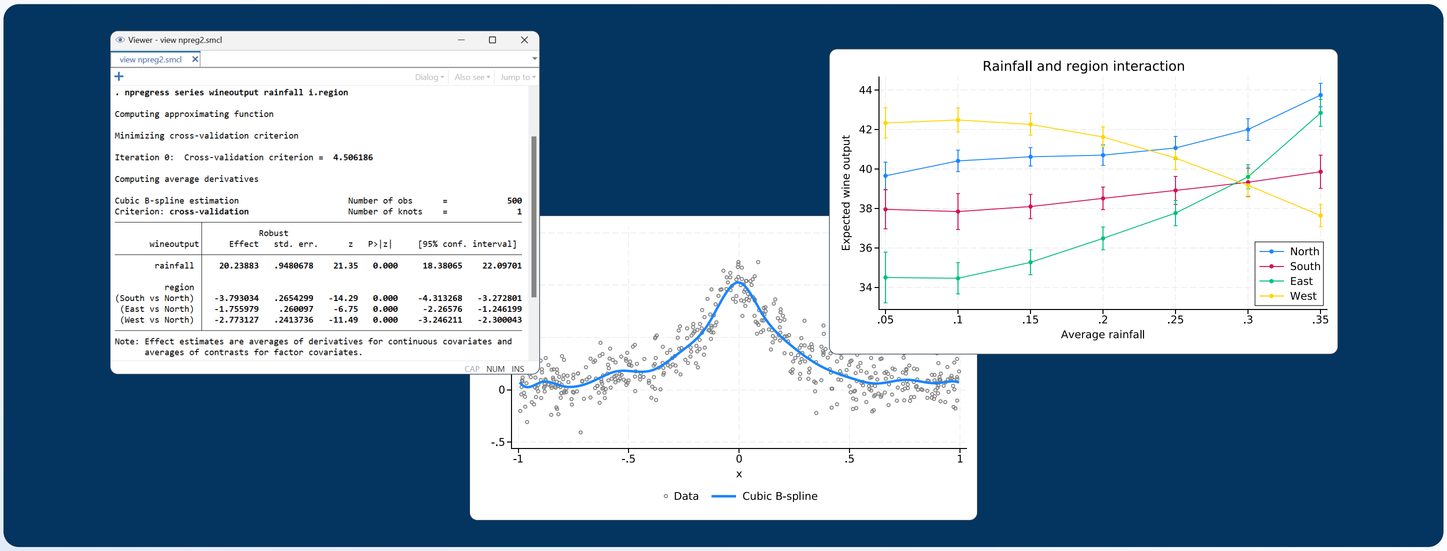
STATA Features

Nonparametric regression

Agnostic about functional form? Poisson or negative binomial?
Cubic or quadratic on a covariate? No problem.
Fit your model. Graph it. Make inferences.



Kernel regression

- Local-linear and local-constant estimators
  - Eight kernels for continuous covariates
  - Two kernels for discrete covariates
- Graph results
  - With one covariate, plot the nonparametric function and your data
  - With multiple covariates, plot a slice of the function across values of covariates
- Optimal bandwidth computation
  - Cross-validation
  - Improved AIC
- Estimate means, derivatives, and contrasts
- Interface to **margins**
  - Population and subpopulation means and effects
  - Fully conditional means and effects
  - Confidence intervals
  - **marginsplot**

Series regression

- B-spline, piecewise polynomial spline, and polynomial basis functions
- Estimates of mean derivatives and contrasts
- Additively separable nonparametric and semiparametric models
- Optimal knot and polynomial selection
  - Cross-validation
  - Generalized cross-validation
  - AIC
  - BIC
  - Mallows's C_p
- Estimate means, derivatives, and contrasts
- Interface to **margins**
  - Population and subpopulation means and effects
  - Fully conditional means and effects
  - Confidence intervals
  - **marginsplot**

Easy model specification

Local-linear kernel regression with continuous **x1** and discrete **a**

```
. npregress kernel y x1 i.a
```

B-spline regression

```
. npregress series y x1 i.a
```

Local-linear regression and Gaussian kernel for **x1**

```
. npregress kernel y x1 i.a, kernel(gaussian)
```

Cubic spline regression

```
. npregress series y x1 i.a, spline
```

User-specified bandwidth vector

```
. npregress kernel y x1 i.a, bwidth(H)
```

User-specified knot matrix

```
. npregress series y x1 i.a, knotsmat(K)
```

Additively separable model

```
. npregress series y x1 x2 x3, nointeract(x2 x3)
```

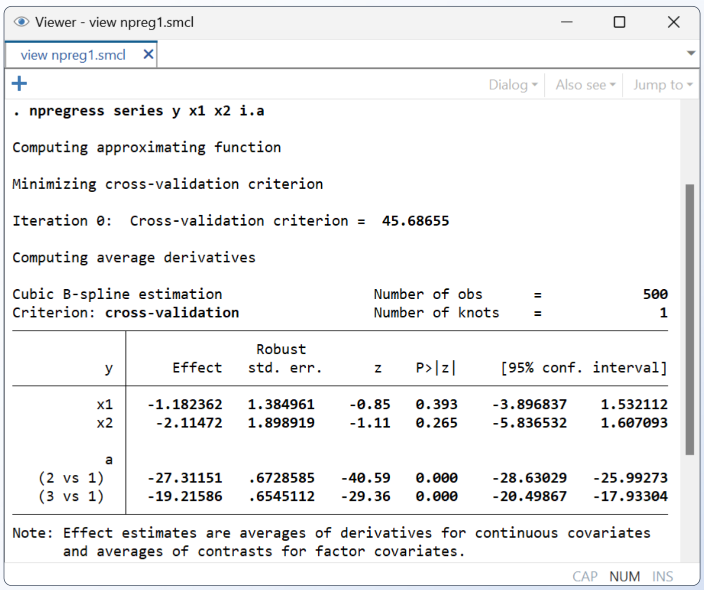
Semiparametric estimation $(y = g(x_1) + \beta x_2 + \epsilon)$

```
. npregress series y x1, asis(x2)
```

Let's see it work

We fit a nonparametric model with two continuous covariates (**x1** and **x2**) and one discrete covariate with three levels (**a**). We type

```
. npregress series y x1 x2 i.a
```



```
. npregress series y x1 x2 i.a

Computing approximating function

Minimizing cross-validation criterion

Iteration 0:  Cross-validation criterion =  45.68655

Computing average derivatives

Cubic B-spline estimation                    Number of obs     =        500
Criterion: cross-validation                  Number of knots   =          1
```

y	Effect	Robust std. err.	z	P>|z|	[95% conf. interval]	
x1	-1.182362	1.384961	-0.85	0.393	-3.896837	1.532112
x2	-2.11472	1.898919	-1.11	0.265	-5.836532	1.607093
a						
(2 vs 1)	-27.31151	.6728585	-40.59	0.000	-28.63029	-25.99273
(3 vs 1)	-19.21586	.6545112	-29.36	0.000	-20.49867	-17.93304

```
Note: Effect estimates are averages of derivatives for continuous covariates
      and averages of contrasts for factor covariates.
```

Instead of a B-spline regression, we can use local-linear kernel regression to fit the model.

```
. npregress kernel y x1 x2 i.a
```

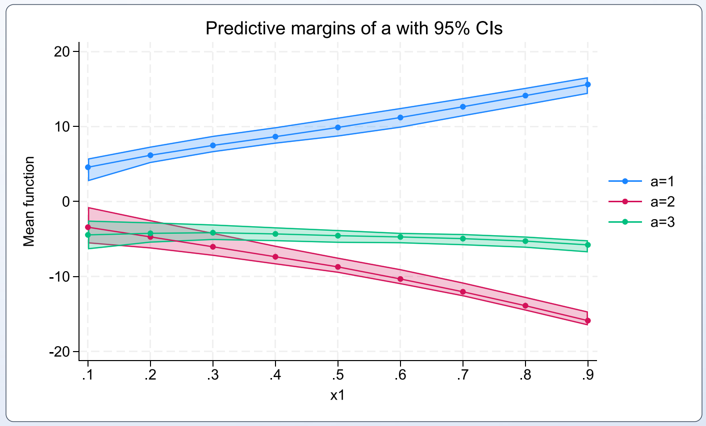
We can ask about the expected mean of **y** for different counterfactual values of the discrete covariate.

```
. margins a
```

Or we can explore the mean for these counterfactual values of **a** and different values of **x1**.

```
. margins a, at(x1=(.1(.1).9))
```

Then we plot them using **marginsplot**.



Here we looked at the mean function for values of **a** and **x1** and averaged values of **x2**. We might explore the function for different values of **x2**.

```
. margins a, at(x1=(.1(.1).9)) at(x2=(.1(.1).9))
```

We may also compute contrasts (differences) across the counterfactual levels of **a**,

```
. margins r.a
```

and then evaluate them at different values of the covariates.

```
. margins r.a, at(x1=(.1(.1).9)) at(x2=(.1(.1).9))
```

The point is you have no ex ante knowledge of the functional form, and yet your nonparametric estimates allow you to obtain consistent estimates and answer many questions of interest. This is exciting and unique to Stata.

stata.com/npreg