## **STATA** Features

# Panel data

Take full advantage of the extra information that panel data provide while simultaneously handling the peculiarities of panel data.

Study the time-invariant features within each panel, the relationships across panels, and how outcomes of interest change over time.

Fit linear models or nonlinear models for binary, count, ordinal, censored, or survival outcomes with fixed-effects, random-effects, or population-averaged estimators. Even perform Bayesian estimation.

Use difference in differences (DID) to estimate treatment effects.

Fit dynamic models or models with endogeneity.

And much more.



#### Linear panel-data models

- Fixed-effects, random-effects, and population-averaged
- Fixed and random effects with AR(1) disturbances
- Random coefficients
- Multiple levels of random effects

## Nonlinear panel-data models

- Probit
- Logit
- Ordered logit and probit
- Multinomial logit
- Mixed logit
- Interval regression
- Tobit
- Poisson
- Negative binomial
- Random coefficients
- Multiple levels of random effects

## Dynamic panel-data estimators

- Arellano-Bond
- Arellano-Bover
- Blundell-Bond
- Build your own dynamic model

#### Parametric survival models

Weibull, exponential, lognormal, loglogistic, or gamma

#### Instrumental-variables models

- Fixed effects
- Random effects
- First-differenced
- · Between effects

## Extended regression models

- Combine endogenous covariates, sample selection, and treatment effects
- · Linear, probit, ordered probit, and interval regression
- Random effects

## Test and diagnostics

- Panel-data unit-root tests
- · Panel-data cointegration tests
- Hausman test
- Overidentification and autocorrelation tests
- Breusch and Pagan Lagrange multiplier test for random effects

## Graphic and tabular analysis

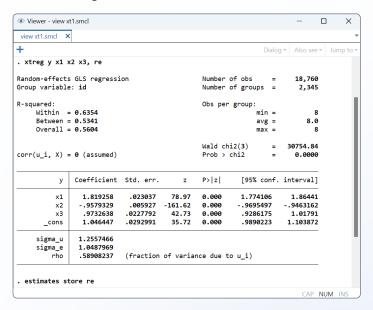
- Summary statistics and tabulations within and between panels
- Patterns of panel participation
- Graphs of marginal effects, elasticities, treatment effects, and marginal means

## **Bayesian estimation**

Before fitting any panel-data model in Stata, we specify the panel and time identifiers, in this case the variables **id** and **year**.

. xtset id year

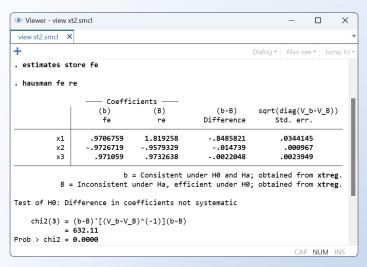
Now we are ready to fit a model. Let's start by fitting a random-effects linear regression model for **y** on **x1**, **x2**, and **x3** and storing the results.



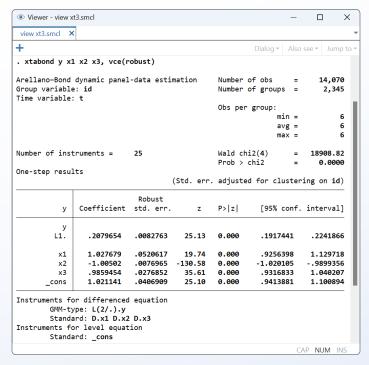
Fitting a fixed-effects model is just as easy. We can type

. xtreg y x1 x2 x3, fe

We can now store the results of this model and compare the models using a Hausman test.



If the model is correctly specified, the Hausman test indicates that time-invariant unobservables are not modeled correctly using random effects. Commands for more complex models are just as straightforward. For instance, let's fit a dynamic panel-data model using the Arellano-Bond estimator.



This is just the beginning.

Do you have a binary outcome? You can fit a random-effects probit model.

. xtprobit y x1 x2 x3

Do you have a count outcome? You can fit a conditional fixed-effects Poisson model.

. xtpoisson y x1 x2 x3, fe

Do you have prior information or want to make probability statements about the results?

You can perform Bayesian estimation.

. bayes: xtreg y x1 x2 x3

Do you have random coefficients for x1? You can fit a mixed-effects model.

. mixed y x1 x2 x3 || id: x1

Do you have a panel of individuals nested within companies? You can fit a three-level random-effects model.

. mixed y x1 x2 x3 || company: || id:

Do you want to estimate the average treatment effect on the treated? You can use DID estimation.

And so much more.