Title

intro — Introduction to longitudinal/panel data manual

Description

This entry describes this manual and what has changed since Stata 8.

Remarks

This manual documents the `xt` commands and is referred to as [XT] in cross-references.

Following this entry, [XT] **xt** provides an overview of the `xt` commands. The other parts of this manual are arranged alphabetically. If you are new to Stata's `xt` commands, we recommend that you read the following sections first:

[XT] **xt**	Introduction to xt commands
[XT] **xtreg**	Fixed-, between-, and random-effects, and population-averaged linear models

Stata is continually being updated, and Stata users are always writing new commands. To find out about the latest cross-sectional time-series features, type `search panel data` after installing the latest official updates; see [R] **update**.

What's new

This section is intended for previous Stata users. If you are new to Stata, you may as well skip it.

1. The big news is new command `xtmixed`—Stata now fits linear mixed models, also known as hierarchical models or multilevel models.

   Mixed models include what social scientists call random-effects models, including one-way, two-way, multi-way, and hierarchical models, and it includes random coefficient models.

   Estimates are obtained using maximum likelihood (ML), restricted maximum likelihood (REML), or expectation maximization (EM). Covariances among random effects are estimated and may be independent (no covariance), exchangeable (common covariance), or unstructured (unique covariance for each pair of effects).

   `xtmixed` estimates standard errors and confidence intervals for the fixed parameters, and it estimates the standard deviations (variances) and correlations (covariances) of the random effects and the full VCE matrix among them.

   For details, see [XT] **xtmixed**.

   After estimation with `xtmixed`,

   a. `estat recovariance` displays the estimated variance–covariance matrix of the random effects for each level.

   b. `estat group` summarizes the composition of the nested groups, providing minimum, average, and maximum group size for each level in the model.

`predict` after `xtmixed` can compute best linear unbiased predictions (BLUPs) for each random effect. It can also compute the linear predictor, the standard error of the linear predictor, the fitted values (linear predictor plus contributions of random effects), the residuals, and the standardized residuals.

2. Most [XT] estimation commands allow new option `vce()` for selecting how the variance–covariance estimates (VCE) of the estimated parameters are to be estimated. This new option provides direct support for panel- and cluster-based bootstrapping and for jackknifing the estimated parameters, and it provides an alternative way of specifying robust VCEs, where allowed.

   a. Option `vce(bootstrap)` specifies that standard errors, significance tests, and confidence intervals be normal-based bootstrap estimates, rather than the default analytic estimates based on the observed information matrix (OIM). After estimation, you can also obtain percentile-based or bias-corrected confidence intervals using new command `estat bootstrap`; see [R] **bootstrap postestimation**.

   b. Option `vce(jackknife)` specifies that standard errors, significance tests, and confidence intervals be jackknife estimates.

   c. Option `vce(robust)` is just a synonym for option `robust`.

   `vce(bootstrap)` and `vce(jackknife)` automatically perform cluster sampling if it is required by the estimator.

   Notably, both options compute bootstrap or jackknife estimates of the complete VCE matrix. This means that most of Stata's postestimation commands are available. You can form linear and nonlinear combinations or functions of the parameters and obtain jackknife or normal-based bootstrap standard errors and confidence intervals for the combinations using [R] **lincom** and [R] **nlcom**. Similarly, you can perform linear and nonlinear tests using [R] **test** and [R] **testnl**.

   [XT] estimation commands that support `vce(bootstrap)` and `vce(jackknife)` include `xtabond`, `xtfrontier`, `xtcloglog`, `xtgee`, `xthtaylor`, `xtintreg`, `xtivreg`, `xtlogit`, `xtprobit`, `xtrc`, `xtreg`, `xttobit`, all documented in this manual.

3. New features have been added to the maximum-likelihood estimators that do not have closed-form solutions and require numeric evaluation of the likelihood. These estimators include helpb xtlogit, `xtprobit`, `xtpoisson`, `xtcloglog`, `xtintreg`, and `xttobit`.

   a. The likelihood may now be approximated using adaptive Gauss–Hermite quadrature (the new default) or non-adaptive quadrature (the previous default). Adaptive quadrature substantially increases the accuracy of the approximation, particularly on difficult problems such as data with large panel sizes or data with a large variance for the random effects.

   b. Linear constraints may now be imposed using the new option `constraints()`. Constraints are specified the standard way; see help constraint:bf:[R] constraint.

   c. New option `intpoints()` replaces old option `quad()`, although `quad()` continues to work. The new name is more meaningful, especially when used with estimators that integrate likelihoods using methods other than quadrature.

4. Existing command `xtreg` now allows options `robust` and `cluster()` when estimating fixed-effects (FE) and random-effects (RE) models; see [XT] **xtreg**.

5. Most [XT] commands that previously did not allow time-series operators now support them. These commands include `xtgls`, `xtreg`, `xtsum`, `xtcloglog`, `xtintreg`, `xtlogit`, `xtpoisson`, `xtprobit`, `xttobit`, and `xtgee`.

6. New command `xtrc` is old command `xtrchh`, renamed, and with new features. New option `beta` reports the best linear predictors (BLUPs) for the group-specific coefficients, along with their standard errors and confidence intervals. For details, see [XT] **xtrc**.
7. `predict` after `xtrc` has the new option `group()` to compute the BLUPs of the dependent variable using the BLUPs of the coefficients.
8. New command `xtline` plots panel data and allows either overlaid or separate graphs for each panel; see [XT] **xtline**.
9. New section [XT] **glossary** of this manual defines commonly used terms and how they are used here.

For a complete list of all new features in Stata 9, see [U] **1.3 What's new**.

Also See

Complementary: [U] **1.3 What's new**

Background: [R] **intro**