xthdidfracreg postestimation — Postestimation tools for xthdidfracreg[+]

[+]Postestimation features after `xthdidfracreg` are part of StataNow.

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Postestimation commands

The following postestimation commands are of special interest after `xthdidfracreg`:

Command	Description
* `estat ptrends`	parallel-trends test
`estat atetplot`	plot the coefficients of ATET for each cohort
* `estat aggregation`	aggregate the ATETs to characterize the heterogeneity of treatment effects
* `estat moderation`	report moderating effects of covariates in the model

*`estat ptrends`, `estat aggregation`, and `estat moderation` are not available after estimation with bootstrap or jackknife standard errors.

The following postestimation commands are also available:

Command	Description
`estat summarize`	summary statistics for the estimation sample
`estat vce`	variance–covariance matrix of the estimators (VCE)
`estimates`	cataloging estimation results
`etable`	table of estimation results
`lincom`	point estimates, standard errors, testing, and inference for linear combinations of parameters
`nlcom`	point estimates, standard errors, testing, and inference for nonlinear combinations of parameters
`test`	Wald tests of simple and composite linear hypotheses
`testnl`	Wald tests of nonlinear hypotheses

estat

Description for estat

`estat ptrends` tests that all pretreatment periods are equal to zero.

`estat atetplot` plots the coefficients of ATET for each cohort across different periods.

`estat aggregation` aggregates the cohort-period ATETs to characterize the heterogeneity of treatment effects. Aggregation may be within cohorts, time periods, time exposed to treatment, or within cohort and time periods. You may display the output of `estat aggregation` simultaneously as a table and a graph. The default is the tabular output.

`estat moderation` reports moderating effects of covariates. These effects can be interpreted as the marginal effects of each covariate on the ATET. Factor variables may be specified, but interaction terms are not allowed.

Menu for estat

Statistics > Postestimation

Syntax for estat

Tests that all pretreatment periods are zero

```
estat ptrends
```

Plot coefficients for ATETs

```
estat atetplot [cohort_list] [, atetplot_options]
```

Aggregate ATETs

```
estat aggregation [, aggregation_options]
```

Moderating effects

```
estat moderation [varlist] [, level(#)]
```

cohort_list is a subset of all the cohorts when estimating the ATETs. By default, *cohort_list* contains all the cohorts. *cohort_list* is not allowed if the `hettype(time)` or `hettype(cohort)` option was specified during estimation.

varlist may contain factor variables; see **[U] 11.4.3 Factor variables**.

atetplot_options	Description
`level(#)`	set confidence level
Graph options	
Main	
`noci`	do not plot the confidence intervals
`posttteopts(`*scatter_opts*`)`	affect rendition of the posttreatment scatterplot
† `[no]cohortline`	suppress the x-axis reference line passing through the time when the treatment began for each cohort
† `cohortlineopts(`*refline_opts*`)`	affect rendition of the x-axis reference line passing through the time when the treatment began for each cohort
CI plot	
`ciopts(`*area_opts*`)`	affect rendition of the confidence interval
Y axis, X axis, Titles, Legend, Overall	
† `byopts(`*byopts*`)`	affect rendition of the graph by cohorts
twoway_options	any options other than by() documented in [G-3] ***twoway_options***

†These options are not allowed when `hettype(time)` or `hettype(cohort)` was specified during estimation.

aggregation_options	Description
`overall`	aggregate ATETs within cohorts and time periods; the default
`dynamic[(`*event_list*`)]`	aggregate ATETs within exposures to the treatment
`time[(`*time_list*`)]`	aggregate ATETs within time periods
`cohort[(`*cohort_list*`)]`	aggregate ATETs within cohorts
`[no]graph`	suppress or display the aggregation plot; `nograph` is the default
`graph[(`*graph_opts*`)]`	affect rendition of the aggregation plot
`level(#)`	set confidence level

Only one of `overall`, `dynamic()`, `cohort()`, or `time()` is allowed.

scatter_opts	Description
connect_options	change the look of lines or connecting method
marker_options	change the look of markers (color, size, etc.)

refline_opts	Description
`style(`*addedlinestyle*`)`	overall style of added line
`[no]extend`	extend line through plot region's margins
`lstyle(`*linestyle*`)`	overall style of line
`lpattern(`*linepatternstyle*`)`	line pattern (solid, dashed, etc.)
`lwidth(`*linewidthstyle*`)`	thickness of line
`lcolor(`*colorstyle*`)`	color and opacity of line

graph_opts	Description
Main	
`noci`	do not plot the confidence intervals
Marker options	
marker_options	change the look of markers (color, size, etc.)
Line options	
connect_options	change the look of lines or connecting method
CI plot	
`ciopts(`*area_options*`)`	affect rendition of the confidence interval
Y axis, X axis, Titles, Legend, Overall	
twoway_options	any options other than by() documented in [G-3] ***twoway_options***

Options for estat

Options for `estat` are presented under the following headings:

Options for estat atetplot
Options for estat aggregation
Option for estat moderation

Options for estat atetplot

`level(#)` specifies the confidence level, as a percentage, for CIs. The default is `level(95)` or as set by `set level`; see **[U] 20.8 Specifying the width of confidence intervals**.

Main

`noci` removes plots of the CIs. The default is to plot the CIs.

`posttreopts(`*scatter_opts*`)` affects the rendition of the scatterplot for posttreatment periods. *scatter_opts* may be the following:

connect_options specify how points on a graph are to be connected; see [G-3] ***connect_options***.

marker_options affect the rendition of markers drawn at the plotted points, including their shape, size, color, and outline; see [G-3] ***marker_options***.

`nocohortline` suppresses the x-axis reference line passing through the time when the treatment began for each cohort. The default is to plot this reference line.

`cohortlineopts(`*refline_opts*`)` affects the rendition of the reference line passing through the time when the treatment began for each cohort. *refline_opts* may be the following:

`style(`*addedlinestyle*`)` specifies the overall style of the added line, which includes [`no`]`extend` and `lstyle(`*linestyle*`)`, documented below. See [G-4] ***addedlinestyle***. The [`no`]`extend` and `lstyle()` options allow you to change the added line's attributes individually, but `style()` is the starting point.

You need not specify `style()` just because there is something that you want to change, and in fact, most people seldom specify the `style()` option. You specify `style()` when another style exists that is exactly what you desire or when another style would allow you to specify fewer changes to obtain what you want.

`extend` and `noextend` specify whether the line should extend through the plot region's margin and touch the axis; see [G-3] ***region_options***. Usually, `noextend` is the default, and `extend` is the option, but that is determined by the overall `style()` and, of course, the scheme; see [G-4] **Schemes intro**.

`lstyle(`*linestyle*`)`, `lpattern(`*linepatternstyle*`)`, `lwidth(`*linewidthstyle*`)`, `lalign(`*linealignmentstyle*`)`, and `lcolor(`*colorstyle*`)` specify the look of the line; see [G-2] **graph twoway line**.

CI plot

`ciopts(`*area_options*`)` affects the rendition of the CIs; see [G-3] ***area_options***.

Y axis, X axis, Titles, Legend, Overall

`byopts(`*byopts*`)` affects the rendition of the graph combined by cohorts. For *byopts*, see [G-3] ***by_option***.

twoway_options are any of the options documented in [G-3] ***twoway_options***, excluding `by()`. These include options for titling the graph (see [G-3] ***title_options***) and for saving the graph to disk (see [G-3] ***saving_option***).

Options for estat aggregation

`overall` aggregates ATETs within all the cohorts and time periods; it is the default.

`dynamic` or `dynamic(`*event_list*`)` aggregates ATETs within exposure to the treatment. For example, two periods of exposure to the treatment means two periods after the treatment started. `dynamic` implies aggregating ATETs within all the estimable exposures to the treatment.

`dynamic(`*event_list*`)` aggregates ATETs within the exposure to the treatment specified by *event_list*. *event_list* is a numlist specifying length of exposures to the treatment.

`time` or `time(`*time_list*`)` aggregates ATETs within time periods. `time` implies aggregating ATETs within all the estimable time periods.

`time(`*time_list*`)` aggregates ATETs within the time specified by *time_list*. *time_list* is a numlist specifying time periods.

`cohort` or `cohort(`*cohort_list*`)` aggregates ATETs within cohort. `cohort` implies aggregating ATETs within all the estimable cohorts.

`cohort(`*cohort_list*`)` aggregates ATETs within the cohorts specified by *cohort_list*. *cohort_list* is a numlist specifying cohorts.

`nograph` or `graph` specifies whether to suppress or display the plot of aggregation of ATETs. `nograph` is the default.

`graph(`*graph_opts*`)` affects the rendition of the aggregation plot. *graph_opts* may be the following:

`noci` removes plots of the CIs. The default is to plot the CIs.

connect_options specify how points on a graph are to be connected; see [G-3] ***connect_options***.

marker_options affect the rendition of markers drawn at the plotted points, including their shape, size, color, and outline; see [G-3] ***marker_options***.

`ciopts(`*area_options*`)` affects the rendition of the CIs; see [G-3] ***area_options***.

twoway_options are any of the options documented in [G-3] ***twoway_options***, excluding `by()`. These include options for titling the graph (see [G-3] ***title_options***) and for saving the graph to disk (see [G-3] ***saving_option***).

`level(#)` specifies the confidence level, as a percentage, for CIs. The default is `level(95)` or as set by `set level`; see **[U] 20.8 Specifying the width of confidence intervals**.

By default, `estat aggregation` plots the pointwise CIs if the `graph()` option is specified.

Option for estat moderation

`level(#)` specifies the confidence level, as a percentage, for CIs. The default is `level(95)` or as set by `set level`; see **[U] 20.8 Specifying the width of confidence intervals**.

Remarks and examples

For examples of the `estat` commands above, see [CAUSAL] **xthdidregress**. The entry has examples that illustrate how the estimation and postestimation commands work together for the linear model, but the syntax and intuition translates to all nonlinear DID models.

Stored results

`estat ptrends` stores the following in `r()`:

Scalars

`r(chi2)`	χ^2
`r(df)`	test constraints degrees of freedom
`r(p)`	two-sided p-value
`r(drop)`	`1` if constraints were dropped, `0` otherwise
`r(dropped_i)`	index of ith constraint dropped

`estat atetplot` stores the following in `r()`:

Matrices

`r(table)`	matrix containing test statistics and critical values

estat aggregation stores the following in r():

Macros
- r(agg_type) — aggregation type

Matrices
- r(b) — coefficient vector
- r(V) — variance–covariance matrix of the estimators
- r(table) — matrix containing test statistics and critical values

estat moderation stores the following in r():

Macros
- r(covariates) — covariates for which moderating effects were computed

Matrices
- r(b) — coefficient vector
- r(V) — variance–covariance matrix of the estimators
- r(table) — matrix containing test statistics and critical values

Methods and formulas

Methods and formulas are presented under the following headings:

Test for all pretreatment period ATETs being zero
Aggregating the ATET parameters
Moderating effects

Test for all pretreatment period ATETs being zero

estat ptrends tests that all pretreatment period ATETs are zero. This should be satisfied if both parallel trends and no anticipation of treatment hold for the pretreatment period.

Below, we will use the notation from *Methods and formulas* in [CAUSAL] **xthdidfracreg**. We estimate the parameters of the model using fractional logit or fractional probit (see [R] **fracreg**) to compute

$$E\left(y_{it}|\mathbf{x}_{it}, d_{it}, G_{ig}, f_s\right) = \Lambda\Big(\eta + \sum_{g=q}^{T} G_{ig}\alpha_g + \sum_{s=q}^{T} f_s\gamma_s + \sum_{g=2}^{q-1}\sum_{s=g}^{q-1} d_{it}G_{ig}f_s\omega_{gs} + \sum_{g=q}^{T}\sum_{s=g}^{T} d_{it}G_{ig}f_s\delta_{gs}\Big)$$

We then compute the ATETs using the methods defined in [CAUSAL] **xthdidfracreg** and test that the effects in the preintervention period are all zeros using test.

Note that estat ptrends is applicable only when hettype(timecohort) has been specified.

Aggregating the ATET parameters

Aggregation after xthdidfracreg uses margins. Let treat denote the observation-level treatment, cohort the variable that contains treat-time cohorts, and exposure a variable that indicates the time exposed to treatment.

For estat aggregation, overall:

```
. margins r.treat, subpop(if treat==1) vce(unconditional)
```

For estat aggregation, cohort:

```
. margins, subpop(if treat==1) dydx(treat) over(cohort) vce(unconditional)
```

For estat aggregation, time:

```
. margins, subpop(if treat==1) dydx(treat) over(time) vce(unconditional)
```

For estat aggregation, dynamic:

```
. margins, subpop(if treat==1) dydx(treat) over(exposure) vce(unconditional)
```

Moderating effects

After using xthdidfracreg to model the outcome using a set of covariates, estat moderation reports estimates of moderating effects, which can be interpreted as the marginal changes in the ATET with respect to each covariate. For factor variables, the marginal effect is the difference between the margin for the specified level and the margin for the base level.

Estimation of moderating effects uses margins after the fractional logit or probit estimation. Let treat denote the observation-level treatment, cohort the variable that contains treat-time cohorts, time the time variable, and x1 and x2 covariates that appear in the model.

When hettype(timecohort) and over(cohort) are specified, the moderating effects are computed as follows:

```
. margins r.treat, dydx(x1 x2) over(cohort) at(time=q ... time=T)
vce(unconditional)
```

When hettype(timecohort) and over(timecohort) are specified:

```
. margins r.treat, dydx(x1 x2) over(cohort time) vce(unconditional)
```

When hettype(cohort) is specified:

```
. margins r.treat, dydx(x1 x2) over(cohort) vce(unconditional)
```

When hettype(time) is specified:

```
. margins r.treat, dydx(x1 x2) over(time) vce(unconditional)
```

By default, estimates are returned for each covariate that appears in the model. If *varlist* is specified with estat moderation, effects are returned only for the specified covariates. Note that if a covariate appears as both a factor variable and a continuous variable in the model, moderating effects for the covariate cannot be computed. estat moderation is not allowed after estimation with the noxinteract option.

Also see

[CAUSAL] **xthdidfracreg** — Heterogeneous difference-in-differences panel-data fractional regression+

[CAUSAL] **DID intro** — Introduction to difference-in-differences estimation

[U] 20 Estimation and postestimation commands

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