xtfrontier postestimation — Postestimation tools for xtfrontier

Description

The following postestimation commands are available after `xtfrontier`:

Command	Description
`contrast`	contrasts and ANOVA-style joint tests of estimates
`estat ic`	Akaike's and Schwarz's Bayesian information criteria (AIC and BIC)
`estat summarize`	summary statistics for the estimation sample
`estat vce`	variance–covariance matrix of the estimators (VCE)
`estimates`	cataloging estimation results
`lincom`	point estimates, standard errors, testing, and inference for linear combinations of coefficients
`lrtest`	likelihood-ratio test
`margins`	marginal means, predictive margins, marginal effects, and average marginal effects
`marginsplot`	graph the results from margins (profile plots, interaction plots, etc.)
`nlcom`	point estimates, standard errors, testing, and inference for nonlinear combinations of coefficients
`predict`	predictions, residuals, influence statistics, and other diagnostic measures
`predictnl`	point estimates, standard errors, testing, and inference for generalized predictions
`pwcompare`	pairwise comparisons of estimates
`test`	Wald tests of simple and composite linear hypotheses
`testnl`	Wald tests of nonlinear hypotheses

Syntax for predict

`predict` [*type*] *newvar* [*if*] [*in*] [, *statistic*]

statistic	Description
Main	
`xb`	linear prediction; the default
`stdp`	standard error of the linear prediction
`u`	minus the natural log of the technical efficiency via $E\left(u_{it} \mid \epsilon_{it}\right)$
`m`	minus the natural log of the technical efficiency via $M\left(u_{it} \mid \epsilon_{it}\right)$
`te`	the technical efficiency via $E\left\{\exp(-su_{it}) \mid \epsilon_{it}\right\}$

where

$$s = \begin{cases} 1, & \text{for production functions} \\ -1, & \text{for cost functions} \end{cases}$$

Menu for predict

Statistics > Postestimation > Predictions, residuals, etc.

Options for predict

Main

`xb`, the default, calculates the linear prediction.

`stdp` calculates the standard error of the linear prediction.

`u` produces estimates of minus the natural log of the technical efficiency via $E(u_{it} \mid \epsilon_{it})$.

`m` produces estimates of minus the natural log of the technical efficiency via the mode, $M(u_{it} \mid \epsilon_{it})$.

`te` produces estimates of the technical efficiency via $E\{\exp(-su_{it}) \mid \epsilon_{it}\}$.

Remarks and examples

stata.com

▷ Example 1

A production function exhibits *constant returns to scale* if doubling the amount of each input results in a doubling in the quantity produced. When the production function is linear in logs, constant returns to scale implies that the sum of the coefficients on the inputs is one. In example 2 of [XT] **xtfrontier**, we fit a time-varying decay model. Here we test whether the estimated production function exhibits constant returns:

```
. use http://www.stata-press.com/data/r13/xtfrontier1
. xtfrontier lnwidgets lnmachines lnworkers, tvd
  (output omitted )
. test lnmachines + lnworkers = 1
 ( 1)  [lnwidgets]lnmachines + [lnwidgets]lnworkers = 1

           chi2(  1) =  331.55
         Prob > chi2 =    0.0000
```

The test statistic is highly significant, so we reject the null hypothesis and conclude that this production function does not exhibit constant returns to scale.

The previous Wald χ^2 test indicated that the sum of the coefficients does not equal one. An alternative is to use `lincom` to compute the sum explicitly:

```
. lincom lnmachines + lnworkers
 ( 1)  [lnwidgets]lnmachines + [lnwidgets]lnworkers = 0
```

lnwidgets	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
(1)	.5849967	.0227918	25.67	0.000	.5403256	.6296677

The sum of the coefficients is significantly less than one, so this production function exhibits *decreasing returns to scale*. If we doubled the number of machines and workers, we would obtain less than twice as much output.

◁

Methods and formulas

Continuing from the *Methods and formulas* section of [XT] **xtfrontier**, estimates for u_{it} can be obtained from the mean or the mode of the conditional distribution $f(u|\epsilon)$.

$$E\left(u_{it} \mid \epsilon_{it}\right) = \widetilde{\mu}_i + \widetilde{\sigma}_i \left\{ \frac{\phi\left(-\widetilde{\mu}_i/\widetilde{\sigma}_i\right)}{1-\Phi\left(-\widetilde{\mu}_i/\widetilde{\sigma}_i\right)} \right\}$$

$$M\left(u_{it} \mid \epsilon_{it}\right) = \begin{cases} -\widetilde{\mu}_i, & \text{if } \widetilde{\mu}_i >= 0 \\ 0, & \text{otherwise} \end{cases}$$

where

$$\widetilde{\mu}_i = \frac{\mu\sigma_v^2 - s\sum_{t=1}^{T_i} \eta_{it}\epsilon_{it}\sigma_u^2}{\sigma_v^2 + \sum_{t=1}^{T_i} \eta_{it}^2\sigma_u^2}$$

$$\widetilde{\sigma}_i^2 = \frac{\sigma_v^2\sigma_u^2}{\sigma_v^2 + \sum_{t=1}^{T_i} \eta_{it}^2\sigma_u^2}$$

These estimates can be obtained from `predict` *newvar*`, u` and `predict` *newvar*`, m`, respectively, and are calculated by plugging in the estimated parameters.

`predict` *newvar*`, te` produces estimates of the technical-efficiency term. These estimates are obtained from

$$E\left\{\exp(-su_{it}) \mid \epsilon_{it}\right\} = \left[\frac{1-\Phi\left\{s\eta_{it}\widetilde{\sigma}_i - (\widetilde{\mu}_i/\ \widetilde{\sigma}_i)\right\}}{1-\Phi\left(-\widetilde{\mu}_i/\ \widetilde{\sigma}_i\right)}\right] \exp\left(-s\eta_{it}\widetilde{\mu}_i + \frac{1}{2}\eta_{it}^2\widetilde{\sigma}_i^2\right)$$

Replacing $\eta_{it} = 1$ and $\eta = 0$ in these formulas produces the formulas for the time-invariant models.

Also see

[XT] **xtfrontier** — Stochastic frontier models for panel data

[U] 20 Estimation and postestimation commands