

**nestreg** — Nested model statistics[Description](#)  
[Options](#)  
[References](#)[Quick start](#)  
[Remarks and examples](#)  
[Also see](#)[Menu](#)  
[Stored results](#)[Syntax](#)  
[Acknowledgment](#)

## Description

`nestreg` fits nested models by sequentially adding blocks of variables and then reports comparison tests between the nested models.

## Quick start

Fit nested (hierarchical) models sequentially, including covariates `x1` and `x2` first and then adding `x3` and `x4`

```
nestreg: regress y (x1 x2) (x3 x4)
```

Also fit third model including indicators for categorical variable `a`

```
nestreg: regress y (x1 x2) (x3 x4) (i.a)
```

Report table of likelihood-ratio tests instead of Wald tests comparing models

```
nestreg, lrtable: regress y (x1 x2) (x3 x4) (i.a)
```

Fit nested models and adjust for complex survey design using `svyset` data

```
nestreg: svy: regress y (x1 x2) (x3 x4) (i.a)
```

Note: In the above examples, `regress` could be replaced with any estimation command allowing the `nestreg` prefix.

## Menu

Statistics > Other > Nested model statistics

## Syntax

Standard estimation command syntax

```
nestreg [ , options ]: command_name depvar (varlist) [(varlist) ... ]
      [if] [in] [weight] [ , command_options ]
```

Survey estimation command syntax

```
nestreg [ , options ]: svy [vcetype] [ , svy_options ]: command_name depvar
      (varlist) [(varlist) ... ] [if] [in] [ , command_options ]
```

<i>options</i>	Description
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Reporting

<code>waldtable</code>	report Wald test results; the default
<code>lrtable</code>	report likelihood-ratio test results
<code>quietly</code>	suppress any output from <i>command_name</i>
<code>store(<i>stub</i>)</code>	store nested estimation results in <code>_est_#<i>stub</i>#</code>

`by` is allowed; see [U] 11.1.10 Prefix commands.

Weights are allowed if *command\_name* allows them; see [U] 11.1.6 weight.

A *varlist* in parentheses indicates that this list of variables is to be considered as a block. Each variable in a *varlist* not bound in parentheses will be treated as its own block.

All postestimation commands behave as they would after *command\_name* without the `nestreg` prefix; see the postestimation manual entry for *command\_name*.

## Options

Reporting

`waldtable` specifies that the table of Wald test results be reported. `waldtable` is the default.

`lrtable` specifies that the table of likelihood-ratio tests be reported. This option is not allowed if `pweights`, the `vce(robust)` option, or the `vce(cluster clustvar)` option is specified. `lrtable` is also not allowed with the `svy` prefix.

`quietly` suppresses the display of any output from *command\_name*.

`store(stub)` specifies that each model fit by `nestreg` be stored under the name `_est_#stub#`, where `#` is the nesting order from first to last.

## Remarks and examples

[stata.com](http://stata.com)

Remarks are presented under the following headings:

- [Estimation commands](#)
- [Wald tests](#)
- [Likelihood-ratio tests](#)
- [Programming for nestreg](#)

## Estimation commands

`nestreg` removes collinear predictors and observations with missing values from the estimation sample before calling `command_name`.

The following Stata commands are supported by `nestreg`:

`betareg`, `clogit`, `cloglog`, `glm`, `intreg`, `logistic`, `logit`, `nbreg`, `ologit`, `oprobit`, `poisson`, `probit`, `qreg`, `regress`, `scobit`, `stcox`, `stcrreg`, `stintreg`, `streg`, and `tobit`

You do not supply a `depvar` for `stcox`, `stintreg`, `stcrreg`, or `streg`; otherwise, `depvar` is required. You must supply two `depvars` for `intreg`.

## Wald tests

Use `nestreg` to test the significance of blocks of predictors, building the regression model one block at a time. Using the data from [example 1](#) of [\[R\] test](#), we wish to test the significance of the following predictors of birthrate: median age (`medage`), median age squared (`c.medage#c.medage`), and indicators of the census region (`i.region`).

```
. use https://www.stata-press.com/data/r18/census4
(Census data on birthrate, median age)
. nestreg: regress brate (medage) (c.medage#c.medage) (i.region)
note: 1.region omitted because of estimability.
```

Block 1: `medage`

Source	SS	df	MS	Number of obs	=	50
Model	32675.1044	1	32675.1044	F(1, 48)	=	164.72
Residual	9521.71561	48	198.369075	Prob > F	=	0.0000
				R-squared	=	0.7743
				Adj R-squared	=	0.7696
Total	42196.82	49	861.159592	Root MSE	=	14.084

  

brate	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-15.24893	1.188141	-12.83	0.000	-17.63785	-12.86002
_cons	618.3935	35.15416	17.59	0.000	547.7113	689.0756

Block 2: `c.medage#c.medage`

Source	SS	df	MS	Number of obs	=	50
Model	36755.8566	2	18377.9283	F(2, 47)	=	158.75
Residual	5440.96342	47	115.765179	Prob > F	=	0.0000
				R-squared	=	0.8711
				Adj R-squared	=	0.8656
Total	42196.82	49	861.159592	Root MSE	=	10.759

  

brate	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-109.8926	15.96663	-6.88	0.000	-142.0133	-77.77189
c.medage# c.medage	1.607334	.2707229	5.94	0.000	1.06271	2.151958
_cons	2007.073	235.4316	8.53	0.000	1533.445	2480.7

#### 4 nestreg — Nested model statistics

Block 3: 2.region 3.region 4.region

Source	SS	df	MS	Number of obs	=	50
Model	38803.4208	5	7760.68416	F(5, 44)	=	100.63
Residual	3393.39921	44	77.1227094	Prob > F	=	0.0000
				R-squared	=	0.9196
				Adj R-squared	=	0.9104
Total	42196.82	49	861.159592	Root MSE	=	8.782

  

brat	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-109.0958	13.52452	-8.07	0.000	-136.3527	-81.83892
c.medage#						
c.medage	1.635209	.2290536	7.14	0.000	1.173582	2.096836
region						
N Cntrl	15.00283	4.252067	3.53	0.001	6.433353	23.57231
South	7.366445	3.953335	1.86	0.069	-1.6009775	15.33387
West	21.39679	4.650601	4.60	0.000	12.02412	30.76946
_cons	1947.611	199.8405	9.75	0.000	1544.859	2350.363

Block	F	Block df	Residual df	Pr > F	R2	Change in R2
1	164.72	1	48	0.0000	0.7743	
2	35.25	1	47	0.0000	0.8711	0.0967
3	8.85	3	44	0.0001	0.9196	0.0485

This single call to nestreg ran regress three times, adding a block of predictors to the model for each run as in

```
. regress brate medage
```

Source	SS	df	MS	Number of obs	=	50
Model	32675.1044	1	32675.1044	F(1, 48)	=	164.72
Residual	9521.71561	48	198.369075	Prob > F	=	0.0000
				R-squared	=	0.7743
				Adj R-squared	=	0.7696
Total	42196.82	49	861.159592	Root MSE	=	14.084

  

brat	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-15.24893	1.188141	-12.83	0.000	-17.63785	-12.86002
_cons	618.3935	35.15416	17.59	0.000	547.7113	689.0756

```
. regress brate medage c.medage#c.medage
```

Source	SS	df	MS	Number of obs	=	50
Model	36755.8566	2	18377.9283	F(2, 47)	=	158.75
Residual	5440.96342	47	115.765179	Prob > F	=	0.0000
				R-squared	=	0.8711
				Adj R-squared	=	0.8656
Total	42196.82	49	861.159592	Root MSE	=	10.759

brate	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-109.8926	15.96663	-6.88	0.000	-142.0133	-77.77189
c.medage#c.medage	1.607334	.2707229	5.94	0.000	1.06271	2.151958
_cons	2007.073	235.4316	8.53	0.000	1533.445	2480.7

```
. regress brate medage c.medage#c.medage i.region
```

Source	SS	df	MS	Number of obs	=	50
Model	38803.4208	5	7760.68416	F(5, 44)	=	100.63
Residual	3393.39921	44	77.1227094	Prob > F	=	0.0000
				R-squared	=	0.9196
				Adj R-squared	=	0.9104
Total	42196.82	49	861.159592	Root MSE	=	8.782

brate	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
medage	-109.0958	13.52452	-8.07	0.000	-136.3527	-81.83892
c.medage#c.medage	1.635209	.2290536	7.14	0.000	1.173582	2.096836
region						
N Cntrl	15.00283	4.252067	3.53	0.001	6.433353	23.57231
South	7.366445	3.953335	1.86	0.069	-1.6009775	15.33387
West	21.39679	4.650601	4.60	0.000	12.02412	30.76946
_cons	1947.611	199.8405	9.75	0.000	1544.859	2350.363

nestreg collected the  $F$  statistic for the corresponding block of predictors and the model  $R^2$  statistic from each model fit.

The  $F$  statistic for the first block, 164.72, is for a test of the joint significance of the first block of variables; it is simply the  $F$  statistic from the regression of `brate` on `medage`. The  $F$  statistic for the second block, 35.25, is for a test of the joint significance of the second block of variables in a regression of both the first and second blocks of variables. In our example, it is an  $F$  test of `c.medage#c.medage` in the regression of `brate` on `medage` and `c.medage#c.medage`. Similarly, the third block's  $F$  statistic of 8.85 corresponds to a joint test of the indicators for the `N Cntrl`, `South`, and `West` regions in the final regression.

## Likelihood-ratio tests

The `nestreg` command provides a simple syntax for performing likelihood-ratio tests for nested model specifications; also see `lrtest`. Using the data from [example 1](#) of [\[R\] lrtest](#), we wish to jointly test the significance of the following predictors of low birthweight: `age`, `lwt`, `ptl`, and `ht`.

```
. use https://www.stata-press.com/data/r18/lbw
(Hosmer & Lemeshow data)
. nestreg, lr: logistic low (i.race smoke ui) (age lwt ptl ht)
note: 1.race omitted because of estimability.
Block 1: 2.race 3.race smoke ui
Logistic regression
Log likelihood = -107.93404
```

Number of obs =	189
LR chi2(4) =	18.80
Prob > chi2 =	0.0009
Pseudo R2 =	0.0801

low	Odds ratio	Std. err.	z	P> z	[95% conf. interval]	
race						
Black	3.052746	1.498087	2.27	0.023	1.166747	7.987382
Other	2.922593	1.189229	2.64	0.008	1.316457	6.488285
smoke						
ui	2.945742	1.101838	2.89	0.004	1.415167	6.131715
_cons	2.419131	1.047359	2.04	0.041	1.035459	5.651788
_cons	.1402209	.0512295	-5.38	0.000	.0685216	.2869447

Note: `_cons` estimates baseline odds.

```
Block 2: age lwt ptl ht
Logistic regression
Log likelihood = -100.724
```

Number of obs =	189
LR chi2(8) =	33.22
Prob > chi2 =	0.0001
Pseudo R2 =	0.1416

low	Odds ratio	Std. err.	z	P> z	[95% conf. interval]	
race						
Black	3.534767	1.860737	2.40	0.016	1.259736	9.918406
Other	2.368079	1.039949	1.96	0.050	1.001356	5.600207
smoke						
ui	2.517698	1.00916	2.30	0.021	1.1477676	5.523162
age	2.1351	.9808153	1.65	0.099	.8677528	5.2534
lwt	.9732636	.0354759	-0.74	0.457	.9061578	1.045339
ptl	.9849634	.0068217	-2.19	0.029	.9716834	.9984249
ht	1.719161	.5952579	1.56	0.118	.8721455	3.388787
ht	6.249602	4.322408	2.65	0.008	1.611152	24.24199
_cons	1.586014	1.910496	0.38	0.702	.1496092	16.8134

Note: `_cons` estimates baseline odds.

Block	LL	LR	df	Pr > LR	AIC	BIC
1	-107.934	18.80	4	0.0009	225.8681	242.0768
2	-100.724	14.42	4	0.0061	219.448	248.6237

The estimation results from the full model are left in `e()`, so we can later use `estat` and other postestimation commands.

```
. estat gof
Goodness-of-fit test after logistic model
Variable: low
      Number of observations =    189
      Number of covariate patterns =   182
      Pearson chi2(173) = 179.24
      Prob > chi2 = 0.3567
```

## Programming for nestreg

If you want your community-contributed command (*command\_name*) to work with `nestreg`, it must follow standard Stata syntax and allow the `if` qualifier. Furthermore, *command\_name* must have `sw` or `swml` as a program property; see [P] [program properties](#). If *command\_name* has `swml` as a property, *command\_name* must store the log-likelihood value in `e(l1)` and the model degrees of freedom in `e(df_m)`.

## Stored results

`nestreg` stores the following in `r()`:

```
Matrices
      r(wald)      matrix corresponding to the Wald table
      r(lr)       matrix corresponding to the likelihood-ratio table
```

## Acknowledgment

We thank Paul H. Bern of Syracuse University for developing the hierarchical regression command that inspired `nestreg`.

## References

- Acock, A. C. 2023. *A Gentle Introduction to Stata*. Rev. 6th ed. College Station, TX: Stata Press.
- Lindsey, C., and S. J. Sheather. 2015. [Best subsets variable selection in nonnormal regression models](#). *Stata Journal* 15: 1046–1059.

## Also see

[P] [program properties](#) — Properties of user-defined programs

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