

**oprobit** — Ordered probit regression

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## Description

`oprobit` fits ordered probit models of ordinal variable *depvar* on the independent variables *indepvars*. The actual values taken on by the dependent variable are irrelevant, except that larger values are assumed to correspond to “higher” outcomes.

## Quick start

Ordinal probit model of *y* on *x1* and categorical variables *a* and *b*

```
oprobit y x1 i.a i.b
```

Model of *y* on *x1* and a one-period lagged value of *x1* using `tsset` data

```
oprobit y x1 L.x1
```

As above, but calculate results for each level of *catvar* and save statistics to `myfile.dta`

```
statsby, by(catvar) saving(myfile): oprobit y x1 L.x1
```

## Menu

Statistics > Ordinal outcomes > Ordered probit regression

## Syntax

```
oprobit devar [indepvars] [if] [in] [weight] [, options]
```

<i>options</i>	Description
Model	
<u>offset</u> ( <i>varname</i> )	include <i>varname</i> in model with coefficient constrained to 1
<u>constraints</u> ( <i>constraints</i> )	apply specified linear constraints
<u>collinear</u>	keep collinear variables
SE/Robust	
<u>vce</u> ( <i>vcetype</i> )	<i>vcetype</i> may be <u>oim</u> , <u>robust</u> , <u>cluster</u> <i>clustvar</i> , <u>bootstrap</u> , or <u>jackknife</u>
Reporting	
<u>level</u> (#)	set confidence level; default is <u>level</u> (95)
<u>nocnsreport</u>	do not display constraints
<u>display_options</u>	control columns and column formats, row spacing, line width, display of omitted variables and base and empty cells, and factor-variable labeling
Maximization	
<u>maximize_options</u>	control the maximization process; seldom used
<u>coeflegend</u>	display legend instead of statistics
<i>indepvars</i> may contain factor variables; see [U] 11.4.3 <b>Factor variables</b> .	
<i>devar</i> and <i>indepvars</i> may contain time-series operators; see [U] 11.4.4 <b>Time-series varlists</b> .	
<u>bayes</u> , <u>bootstrap</u> , <u>by</u> , <u>fmm</u> , <u>fp</u> , <u>jackknife</u> , <u>mfp</u> , <u>mi estimate</u> , <u>nestreg</u> , <u>rolling</u> , <u>statsby</u> , <u>stepwise</u> , and <u>svy</u> are allowed; see [U] 11.1.10 <b>Prefix commands</b> . For more details, see [BAYES] <b>bayes: oprobit</b> and [FMM] <b>fmm: oprobit</b> .	
<u>vce</u> ( <u>bootstrap</u> ) and <u>vce</u> ( <u>jackknife</u> ) are not allowed with the <u>mi estimate</u> prefix; see [MI] <b>mi estimate</b> .	
Weights are not allowed with the <u>bootstrap</u> prefix; see [R] <b>bootstrap</b> .	
<u>vce</u> () and weights are not allowed with the <u>svy</u> prefix; see [SVY] <b>svy</b> .	
<u>fweights</u> , <u>iweights</u> , and <u>pweights</u> are allowed; see [U] 11.1.6 <b>weight</b> .	
<u>coeflegend</u> does not appear in the dialog box.	
See [U] 20 <b>Estimation and postestimation commands</b> for more capabilities of estimation commands.	

## Options

### Model

offset(*varname*), constraints(*constraints*), collinear; see [R] **estimation options**.

### SE/Robust

vce(*vcetype*) specifies the type of standard error reported, which includes types that are derived from asymptotic theory (oim), that are robust to some kinds of misspecification (robust), that allow for intragroup correlation (cluster *clustvar*), and that use bootstrap or jackknife methods (bootstrap, jackknife); see [R] **vce\_option**.

## Reporting

`level(#)`; see [R] [estimation options](#).

`nocnsreport`; see [R] [estimation options](#).

`display_options`: [noci](#), [nopvalues](#), [noomitted](#), [vsquish](#), [noemptycells](#), [baselevels](#), [allbaselevels](#), [nofvlabel](#), [fvwrap\(#\)](#), [fvwrapon\(style\)](#), [cformat\(%fmt\)](#), [pformat\(%fmt\)](#), [sformat\(%fmt\)](#), and [nolstretch](#); see [R] [estimation options](#).

## Maximization

`maximize_options`: [difficult](#), [technique\(algorithm\\_spec\)](#), [iterate\(#\)](#), [\[no\]log](#), [trace](#), [gradient](#), [showstep](#), [hessian](#), [showtolerance](#), [tolerance\(#\)](#), [ltolerance\(#\)](#), [nrtolerance\(#\)](#), [nonrntolerance](#), and [from\(init\\_specs\)](#); see [R] [maximize](#). These options are seldom used.

The following option is available with `oprobit` but is not shown in the dialog box:

`coeflegend`; see [R] [estimation options](#).

## Remarks and examples

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

An ordered probit model is used to estimate relationships between an ordinal dependent variable and a set of independent variables. An *ordinal* variable is a variable that is categorical and ordered, for instance, “poor”, “good”, and “excellent”, which might indicate a person’s current health status or the repair record of a car. If there are only two outcomes, see [R] [logistic](#), [R] [logit](#), and [R] [probit](#). This entry is concerned only with more than two outcomes. If the outcomes cannot be ordered (for example, residency in the north, east, south, or west), see [R] [mlogit](#). This entry is concerned only with models in which the outcomes can be ordered. See [R] [logistic](#) for a list of related estimation commands.

In ordered probit, an underlying score is estimated as a linear function of the independent variables and a set of cutpoints. The probability of observing outcome  $i$  corresponds to the probability that the estimated linear function, plus random error, is within the range of the cutpoints estimated for the outcome:

$$\Pr(\text{outcome}_j = i) = \Pr(\kappa_{i-1} < \beta_1 x_{1j} + \beta_2 x_{2j} + \cdots + \beta_k x_{kj} + u_j \leq \kappa_i)$$

$u_j$  is assumed to be normally distributed. In either case, we estimate the coefficients  $\beta_1, \beta_2, \dots, \beta_k$  together with the cutpoints  $\kappa_1, \kappa_2, \dots, \kappa_{I-1}$ , where  $I$  is the number of possible outcomes.  $\kappa_0$  is taken as  $-\infty$ , and  $\kappa_I$  is taken as  $+\infty$ . All of this is a direct generalization of the ordinary two-outcome probit model.

### ► Example 1

In [example 2](#) of [R] [ologit](#), we use a variation of the automobile dataset (see [U] [1.2.2 Example datasets](#)) to analyze the 1977 repair records of 66 foreign and domestic cars. We use ordered logit to explore the relationship of `rep77` in terms of `foreign` (origin of manufacture), `length` (a proxy for size), and `mpg`. Here we fit the same model using ordered probit rather than ordered logit:

```

. use http://www.stata-press.com/data/r15/fullauto
(Automobile Models)

. oprobit rep77 foreign length mpg
Iteration 0:  log likelihood = -89.895098
Iteration 1:  log likelihood = -78.106316
Iteration 2:  log likelihood = -78.020086
Iteration 3:  log likelihood = -78.020025
Iteration 4:  log likelihood = -78.020025

Ordered probit regression
Log likelihood = -78.020025
Number of obs      =          66
LR chi2(3)         =          23.75
Prob > chi2        =          0.0000
Pseudo R2          =          0.1321

```

rep77	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
foreign	1.704861	.4246796	4.01	0.000	.8725037	2.537217
length	.0468675	.012648	3.71	0.000	.022078	.0716571
mpg	.1304559	.0378628	3.45	0.001	.0562463	.2046656
/cut1	10.1589	3.076754			4.128577	16.18923
/cut2	11.21003	3.107527			5.119389	17.30067
/cut3	12.54561	3.155233			6.361467	18.72975
/cut4	13.98059	3.218793			7.671874	20.28931

We find that foreign cars have better repair records, as do larger cars and cars with better mileage ratings.

◀

## Stored results

oprobit stores the following in `e()`:

### Scalars

```

e(N)                number of observations
e(N_cd)             number of completely determined observations
e(k_cat)            number of categories
e(k)                number of parameters
e(k_aux)            number of auxiliary parameters
e(k_eq)             number of equations in e(b)
e(k_eq_model)      number of equations in overall model test
e(k_dv)             number of dependent variables
e(df_m)             model degrees of freedom
e(r2_p)             pseudo-R-squared
e(ll)              log likelihood
e(ll_0)             log likelihood, constant-only model
e(N_clust)          number of clusters
e(chi2)              $\chi^2$ 
e(p)                significance of model test
e(rank)             rank of e(V)
e(ic)              number of iterations
e(rc)              return code
e(converged)        1 if converged, 0 otherwise

```

### Macros

```

e(cmd)              oprobit
e(cmdline)          command as typed
e(depvar)           name of dependent variable
e(wtype)            weight type

```

<code>e(wexp)</code>	weight expression
<code>e(title)</code>	title in estimation output
<code>e(clustvar)</code>	name of cluster variable
<code>e(offset)</code>	linear offset variable
<code>e(chi2type)</code>	Wald or LR; type of model $\chi^2$ test
<code>e(vce)</code>	<i>vce</i> type specified in <code>vce()</code>
<code>e(vcetype)</code>	title used to label Std. Err.
<code>e(opt)</code>	type of optimization
<code>e(which)</code>	max or min; whether optimizer is to perform maximization or minimization
<code>e(ml_method)</code>	type of ml method
<code>e(user)</code>	name of likelihood-evaluator program
<code>e(technique)</code>	maximization technique
<code>e(properties)</code>	<code>b V</code>
<code>e(predict)</code>	program used to implement <code>predict</code>
<code>e(marginsdefault)</code>	default <code>predict()</code> specification for <code>margins</code>
<code>e(asbalanced)</code>	factor variables <code>fvset</code> as <code>asbalanced</code>
<code>e(asobserved)</code>	factor variables <code>fvset</code> as <code>asobserved</code>
Matrices	
<code>e(b)</code>	coefficient vector
<code>e(Cns)</code>	constraints matrix
<code>e(ilog)</code>	iteration log (up to 20 iterations)
<code>e(gradient)</code>	gradient vector
<code>e(cat)</code>	category values
<code>e(V)</code>	variance–covariance matrix of the estimators
<code>e(V_modelbased)</code>	model-based variance
Functions	
<code>e(sample)</code>	marks estimation sample

## Methods and formulas

See *Methods and formulas* of [R] [ologit](#).

## References

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### Also see

- [R] **oprobit postestimation** — Postestimation tools for oprobit
- [R] **heckoprobit** — Ordered probit model with sample selection
- [R] **logistic** — Logistic regression, reporting odds ratios
- [R] **mlogit** — Multinomial (polytomous) logistic regression
- [R] **mprobit** — Multinomial probit regression
- [R] **ologit** — Ordered logistic regression
- [R] **probit** — Probit regression
- [R] **zioprobit** — Zero-inflated ordered probit regression
- [BAYES] **bayes: oprobit** — Bayesian ordered probit regression
- [FMM] **fmm: oprobit** — Finite mixtures of ordered probit regression models
- [ME] **meoprobit** — Multilevel mixed-effects ordered probit regression
- [MI] **estimation** — Estimation commands for use with mi estimate
- [SVY] **svy estimation** — Estimation commands for survey data
- [XT] **xtoprobit** — Random-effects ordered probit models
- [U] **20 Estimation and postestimation commands**