

**ivfprobit postestimation** — Postestimation tools for ivfprobit

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## Postestimation commands

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

Command	Description
<code>estat correlation</code>	report the correlation matrix of the errors of the dependent variable and the endogenous variables
<code>estat covariance</code>	report the covariance matrix of the errors of the dependent variable and the endogenous variables

These commands are not appropriate after the `svy` prefix.

The following standard postestimation commands are also available:

Command	Description
<code>contrast</code>	contrasts and ANOVA-style joint tests of estimates
<code>estat ic</code>	Akaike's, consistent Akaike's, corrected Akaike's, and Schwarz's Bayesian information criteria (AIC, CAIC, AICc, and BIC)
<code>estat summarize</code>	summary statistics for the estimation sample
<code>estat vce</code>	variance–covariance matrix of the estimators (VCE)
<code>estat (svy)</code>	postestimation statistics for survey data
<code>estimates</code>	cataloging estimation results
<code>etable</code>	table of estimation results
* <code>forecast</code>	dynamic forecasts and simulations
<code>lincom</code>	point estimates, standard errors, testing, and inference for linear combinations of coefficients
<code>margins</code>	marginal means, predictive margins, marginal effects, and average marginal effects
<code>marginsplot</code>	graph the results from margins (profile plots, interaction plots, etc.)
<code>nlcom</code>	point estimates, standard errors, testing, and inference for nonlinear combinations of coefficients
<code>predict</code>	conditional means, linear predictions, etc.
<code>predictnl</code>	point estimates, standard errors, testing, and inference for generalized predictions
<code>pwcompare</code>	pairwise comparisons of estimates
<code>test</code>	Wald tests of simple and composite linear hypotheses
<code>testnl</code>	Wald tests of nonlinear hypotheses

\*`forecast` is not appropriate with `svy` estimation results.

# predict

## Description for predict

`predict` creates a new variable containing predictions such as conditional means, linear predictions, and standard errors.

## Menu for predict

Statistics > Postestimation

## Syntax for predict

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

```
predict [type] { stub*|newvarlist } [if] [in], scores
```

<i>statistic</i>	Description
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Main

<code>cm</code>	conditional mean; the default
<code>xb</code>	linear prediction
<code>stdp</code>	standard error of the linear prediction

These statistics are available both in and out of sample; type `predict ... if e(sample) ...` if wanted only for the estimation sample.

<i>asfmethod</i>	Description
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Main

<code>asf</code>	average structural function; the default
<code>fixedasf</code>	fixed average structural function

## Options for predict

Main

`cm`, the default, calculates the conditional mean.

`xb` calculates the linear prediction.

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

`asf` and `fixedasf` determine how the average structural function (ASF) of the conditional mean is computed. These options are not allowed with `xb` or `stdp`.

`asf` is the default estimator when the `cm` statistic is specified. `asf` computes the ASF of the conditional mean. It is the prediction conditional on the errors of the endogenous variable equations. Put another way, it is the conditional mean accounting for the correlation of the endogenous covariates with the errors of the main equation. Derivatives and contrasts based on `asf` have a structural interpretation. See [margins](#) below for computing derivatives and contrasts.

`fixedasf` calculates a fixed ASF. It is the prediction using only the coefficients and variables of the outcome equation. `fixedasf` does not condition on the errors of the endogenous variable equations. Contrasts between two fixed counterfactuals averaged over the whole sample have a potential-outcome interpretation. Intuitively, it is as if the values of the covariates were fixed at a value exogenously by fiat. See `margins` below for computing derivatives and contrasts.

To be clear, derivatives and contrasts between two fixed counterfactuals using the default `asf` option also have a potential-outcome interpretation. And, unlike `fixedasf`, they retain that interpretation when computed over subpopulations for both linear and nonlinear models.

`scores` calculates the equation-level score variables.

For models with one endogenous regressor, four new variables are created.

The first new variable will contain  $\partial \ln L / \partial (z_i \delta)$ .

The second new variable will contain  $\partial \ln L / \partial (x_i \mathbf{\Pi})$ .

The third new variable will contain  $\partial \ln L / \partial \operatorname{atanh} \rho$ .

The fourth new variable will contain  $\partial \ln L / \partial \ln \sigma$ .

For models with  $p$  endogenous regressors,  $p + \{(p + 1)(p + 2)\}/2$  new variables are created.

The first new variable will contain  $\partial \ln L / \partial (z_i \delta)$ .

The second through  $(p + 1)$ th new variables will contain  $\partial \ln L / \partial (x_i \mathbf{\Pi}_k)$ ,  $k = 1, \dots, p$ , where  $\mathbf{\Pi}_k$  is the  $k$ th column of  $\mathbf{\Pi}$ .

The remaining score variables will contain the partial derivatives of  $\ln L$  with respect to  $s_{21}$ ,  $s_{31}$ ,  $\dots$ ,  $s_{p+1,1}$ ,  $s_{22}$ ,  $\dots$ ,  $s_{p+1,2}$ ,  $\dots$ ,  $s_{p+1,p+1}$ , where  $s_{m,n}$  denotes the  $(m, n)$  element of the Cholesky decomposition of the error covariance matrix.

## margins

### Description for margins

`margins` estimates margins of response for linear predictions and probabilities.

### Menu for margins

Statistics > Postestimation

### Syntax for margins

```
margins [marginlist] [, options]
```

```
margins [marginlist] , predict(statistic ...) [predict(statistic ...) ...] [options]
```

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<i>statistic</i>	Description
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Main

<code>cm</code>	conditional mean; the default
<code>xb</code>	linear prediction
<code>stdp</code>	not allowed with <code>margins</code>

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Statistics not allowed with `margins` are functions of stochastic quantities other than  $e(b)$ .

For the full syntax, see [\[R\] margins](#).

## estat

### Description for estat

`estat correlation` displays the correlation matrix of the errors of the dependent variable and the endogenous variables.

`estat covariance` displays the covariance matrix of the errors of the dependent variable and the endogenous variables.

### Menu for estat

Statistics > Postestimation

### Syntax for estat

*Correlation matrix*

```
estat correlation [ , border(bspec) left(#) format(%fmt) ]
```

*Covariance matrix*

```
estat covariance [ , border(bspec) left(#) format(%fmt) ]
```

### Options for estat

Main

`border`(*bspec*) sets the border style of the matrix display. The default is `border(all)`.

`left`(#) sets the left indent of the matrix display. The default is `left(2)`.

`format`(%*fmt*) specifies the format for displaying the individual elements of the matrix. The default is `format(%9.0g)`.

## Remarks and examples

Remarks are presented under the following headings:

*Marginal effects*  
*Obtaining predicted values*

### Marginal effects

#### ▷ Example 1

We can obtain marginal effects by using the `margins` command after `ivfprobit`. We will calculate average marginal effects by using the 401(k) participation model of [example 1](#) in [\[R\] ivfprobit](#).

```
. use https://www.stata-press.com/data/r18/401k
(Firm-level data on 401k participation)
. ivfprobit prate c.ltotemp##c.ltotemp i.sole (mrate = c.age##c.age)
(output omitted)
. margins, dydx(mrate) predict(cm)

Average marginal effects                Number of obs = 4,075
Model VCE: Robust
Expression: Conditional mean of prate, predict(cm)
dy/dx wrt:  mrate
```

	Delta-method		z	P> z	[95% conf. interval]	
	dy/dx	std. err.				
mrate	.5288314	.0442438	11.95	0.000	.4421152	.6155477

The marginal effect from `ivfprobit` suggests that a \$1 increase in the matching rate (per dollar) given by employers can increase participation by approximately 50%.

◀

### Obtaining predicted values

After fitting your model with `ivfprobit`, you can obtain the conditional mean, or the linear prediction and its standard error for both the estimation sample and other samples, by using the `predict` command; see [\[U\] 20 Estimation and postestimation commands](#) and [\[R\] predict](#).

### Stored results

`estat correlation` stores the following results in `r()`:

Matrices  
`r(corr)`      correlation matrix of the errors

`estat covariance` stores the following results in `r()`:

Matrices  
`r(cov)`      covariance matrix of the errors

## Methods and formulas

Recall that the model fit by `ivfprobit` is given by two equations:

$$E[y_{1i} | \mathbf{x}_{1i}, \mathbf{x}_{2i}, y_{2i}, u_i] = \Phi(\mathbf{y}_{2i}\boldsymbol{\beta} + \mathbf{x}_{1i}\boldsymbol{\gamma} + u_i)$$

$$y_{2i} = \mathbf{x}_{i1}\boldsymbol{\Pi}_1 + \mathbf{x}_{i2}\boldsymbol{\Pi}_2 + v_i$$

The linear prediction for observation  $i$  is calculated as  $\mathbf{y}_{2i}\widehat{\boldsymbol{\beta}} + \mathbf{x}_{1i}\widehat{\boldsymbol{\gamma}}$ . The predicted conditional mean is given by  $\Phi(\widehat{m}_i)$ , where  $\Phi(\cdot)$  is the standard normal distribution function and  $\widehat{m}_i$  is the plugin estimator of

$$m_i = \frac{\mathbf{y}_{2i}\boldsymbol{\beta} + \mathbf{x}_{1i}\boldsymbol{\gamma} + \rho v_i / \sigma}{\sqrt{1 - \rho^2}}$$

where  $\sigma$  is the standard deviation of  $v_i$  and  $\rho$  is the correlation coefficient between  $u_i$  and  $v_i$ . The ASF uses  $\widehat{m}_i$  instead of  $\mathbf{y}_{2i}\widehat{\boldsymbol{\beta}} + \mathbf{x}_{1i}\widehat{\boldsymbol{\gamma}}$  to evaluate  $\Phi(\cdot)$  and account for endogeneity in the model. The fixed ASF is evaluated at  $\mathbf{y}_{2i}\widehat{\boldsymbol{\beta}} + \mathbf{x}_{1i}\widehat{\boldsymbol{\gamma}}$ .

## Also see

[R] [ivfprobit](#) — Fractional probit model with continuous endogenous covariates

[U] [20 Estimation and postestimation commands](#)