

**estat df** — Calculate degrees of freedom for fixed effects

Description

Remarks and examples

Menu for estat

Stored results

Syntax

Also see

Options

## Description

`estat df` is for use after estimation with `mixed`.

`estat df` calculates and displays the degrees of freedom (DF) for each fixed effect using the specified methods. This allows for a comparison of different DF methods. `estat df` can also be used to continue with postestimation using a different DF method without rerunning the model.

## Menu for estat

Statistics > Postestimation

## Syntax

```
estat df [ , method(df_methods) post[ (df_method) ] eim oim]
```

## Options

`method(df_methods)` specifies a list of methods to compute DF. The supported methods are `residual`, `repeated`, `anova`, `satterthwaite`, and `kroger`; more than one method may be specified. Methods `satterthwaite` and `kroger` are only available with REML estimation. If option `dfmethod()` was not specified in the most recently fit `mixed` model, then option `method()` is required. See [Small-sample inference for fixed effects](#) under *Remarks and examples* in [ME] `mixed` for more details.

`post` causes `estat df` to behave like a Stata estimation command. When `post` is specified, `estat df` will post the DF for each fixed effect as well as everything related to the DF computation to `e()` for the method specified in `method()`. Thus, after posting, you could continue to use this DF for other postestimation commands. For example, you could use `test`, `small` to perform Wald  $F$  tests on linear combination of the fixed effects.

`post` may also be specified using the syntax `post(df_method)`. You must use this syntax if you specify multiple `df_methods` in option `method()`. With this syntax, `estat df` computes the DF using the method specified in `post()` and stores the results in `e()`. Only one computation method may be specified using the syntax `post()`.

The `df_method` specified in `post()` must be one of the DF methods specified in option `method()`. If only one method is specified in option `method()`, then one can simply use `post` to make this DF method active for postestimation and for `mixed` replay.

`eim` specifies that the expected information matrix be used in the DF computation. It can be used only when `method()` contains `kroger` or `satterthwaite`. `eim` is the default.

oim specifies that the observed information matrix be used in the DF computation. It can be used only when method() contains kroger or satterthwaite.

## Remarks and examples

### ► Example 1: Changing the degrees of freedom method

To illustrate the use of estat df, we refit the dental veneer data from [example 14](#) of [\[ME\] mixed](#) using the Kenward–Roger method (option dfmethod(kroger)) to compute the DF for fixed effects.

```
. use http://www.stata-press.com/data/r15/veneer
(Dental veneer data)
. mixed gcf followup base_gcf cda age || patient: followup,
> covariance(unstructured) || tooth:, reml nolog dfmethod(kroger)
Mixed-effects REML regression                Number of obs    =        110
```

Group Variable	No. of Groups	Observations per Group		
		Minimum	Average	Maximum
patient	12	2	9.2	12
tooth	55	2	2.0	2

```
DF method: Kenward-Roger                    DF:                min =        10.41
                                                avg =         28.96
                                                max =         50.71
                                                F(4, 27.96) =        1.47
Log restricted-likelihood = -420.92761      Prob > F           =        0.2370
```

gcf	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
followup	.3009815	1.938641	0.16	0.879	-3.96767	4.569633
base_gcf	-.0183127	.1466261	-0.12	0.901	-.3132419	.2766164
cda	-.329303	.5533506	-0.60	0.554	-1.440355	.7817493
age	-.5773932	.2350491	-2.46	0.033	-1.098324	-.056462
_cons	45.73862	13.21824	3.46	0.002	18.53866	72.93858

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
patient: Unstructured				
var(followup)	41.88772	18.79997	17.38009	100.9535
var(_cons)	524.9851	253.0205	204.1287	1350.175
cov(followup,_cons)	-140.4229	66.57623	-270.9099	-9.935907
tooth: Identity				
var(_cons)	47.45738	16.63034	23.8792	94.3165
var(Residual)	48.86704	10.50523	32.06479	74.47382

```
LR test vs. linear model: chi2(4) = 91.12                Prob > chi2 = 0.0000
Note: LR test is conservative and provided only for reference.
```

Rather than specifying option `dftable(pvalue)` or `dftable(ci)` at estimation, we can display the covariate-specific DFs during postestimation by typing

```
. estat df
Degrees of freedom
```

	Kenward-Roger
gcf	
followup	10.96355
base_gcf	47.2708
cda	50.70932
age	10.41127
_cons	25.43377

`estat df` can also compare different DF methods using the `method()` option. For example, we can compare the Kenward–Roger method with the Satterthwaite method by typing

```
. estat df, method(kroger satterthwaite)
Degrees of freedom
```

	Kenward-Roger	Satterthwaite
gcf		
followup	10.96355	10.96355
base_gcf	47.2708	47.2708
cda	50.70932	50.70932
age	10.41127	10.41127
_cons	25.43377	25.43377

The two methods produce the same estimates of DFs for single-hypothesis tests, but the results differ for multiple-hypotheses tests; see [example 4](#) of [\[ME\] mixed postestimation](#) for details.

Suppose that we decide to proceed with the Satterthwaite method in subsequent analysis. Rather than retyping our `mixed` command with the `dfmethod(satterthwaite)` option, we can post the Satterthwaite DFs using the `post` option of `estat df`.

```
. estat df, method(satterthwaite) post
Degrees of freedom
```

	Satterthwaite
gcf	
followup	10.96355
base_gcf	47.2708
cda	50.70932
age	10.41127
_cons	25.43377

The returned values associated with `dfmethod(kroger)` from the `mixed` command will be replaced with those of `dfmethod(satterthwaite)`.

## Stored results

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

Macros

`r(dfmethods)` DF methods

Matrices

`r(df)` parameter-specific DFs for each method specified in `method()`

`r(V_df)` variance-covariance matrix of the estimators when `kröger` method is specified

If option `post()` is specified, `estat df` also stores the following in `e()`:

Scalars

`e(F)` overall  $F$  test statistic for the method specified in `post()`

`e(ddf_m)` model DDF for the method specified in `post()`

`e(df_max)` maximum DF for the method specified in `post()`

`e(df_avg)` average DF for the method specified in `post()`

`e(df_min)` minimum DF for the method specified in `post()`

Macros

`e(dfmethod)` DF method specified in `post()`

`e(dftitle)` title for DF method

Matrices

`e(df)` parameter-specific DFs for the method specified in `post()`

`e(V_df)` variance-covariance matrix of the estimators when `kröger` method is posted

## Also see

[ME] [mixed](#) — Multilevel mixed-effects linear regression

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