Title

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

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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]

collect is allowed; see [U] **11.1.10 Prefix commands**.

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   stata.com

▷ 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 https://www.stata-press.com/data/r18/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
        Grouping information
```

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	Coefficient	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	-9.935904
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 kroger method is specified

If 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 kroger method is posted

Also see

[ME] **mixed** — Multilevel mixed-effects linear regression

[U] **20 Estimation and postestimation commands**