Title

stmc — Calculate rate ratios with the Mantel–Cox method

Description

`stmc` calculates rate ratios that are stratified finely by time by using the Mantel–Cox method. The corresponding significance test (the log-rank test) is also calculated.

You can also use `stmc` to carry out a trend test for a metric explanatory variable.

Quick start

Failure-rate ratio, stratified by time, comparing category 1 with 0 in binary variable `a`; computed using the Mantel–Cox method

```
stmc a
```

Same as above, but comparing 4 with 3 in multivalued `b`

```
stmc b, compare(4,3)
```

Same as above, but controlling for values of `catvar`

```
stmc b catvar, compare(4,3)
```

Test for a trend of failure rates with `x1` controlling for time and `catvar`

```
stmc x1 catvar
```

Menu

Statistics > Survival analysis > Summary statistics, tests, and tables > Tabulate Mantel–Cox rate ratios

Syntax

`stmc` *varname* [*varlist*] [*if*] [*in*] [, *options*]

options	Description
Main	
`by(`*varlist*`)`	tabulate rate ratio on *varlist*
`compare(`*num1*`,`*den2*`)`	compare categories of exposure variable
`missing`	include missing values as extra categories
`level(#)`	set confidence level; default is `level(95)`

You must `stset` your data before using `stmc`; see [ST] **stset**.
`by` and `collect` are allowed; see [U] **11.1.10 Prefix commands**.
`fweight`s, `iweight`s, and `pweight`s may be specified using `stset`; see [ST] **stset**.

Options

Main

`by(`*varlist*`)` specifies categorical variables by which the rate ratio is to be tabulated.

A separate rate ratio is produced for each category or combination of categories of *varlist*, and a test for unequal rate ratios (effect modification) is displayed.

`compare(`*num1*`,`*den2*`)` specifies the categories of the exposure variable to be compared. The first code defines the numerator categories, and the second code defines the denominator categories.

When `compare()` is not specified and there are only two categories, the larger category is compared with the smaller one; when `compare()` is not specified and there are more than two categories, `stmc` analyzes the log-linear trend.

`missing` specifies that missing values of the explanatory variables be treated as extra categories. The default is to exclude such observations.

`level(#)` specifies the confidence level, as a percentage, for confidence intervals. The default is `level(95)` or as set by `set level`; see [U] **20.8 Specifying the width of confidence intervals**.

Remarks and examples

stata.com

The `stmc` (Mantel–Cox) command is used to control for variation of rates on a time scale by breaking up time into short intervals, or *clicks*.

Usually, this approach is used only to calculate significance tests, but the rate ratio estimated remains just as useful as in the coarsely stratified analysis from [ST] **stmh**. The method may be viewed as an approximate form of Cox regression.

In its simplest specification, `stmc` *varname*, `stmc` will compute a failure-rate ratio, stratified by time, comparing the two categories of the explanatory variable *varname*. If *varname* has more than two categories, you can specify which two categories should be compared with the `compare()` option. If *varname* has more than two categories and you don't specify the `compare()` option, `stmc` will carry out a trend test. For trend tests, a one-step Newton approximation to the log-linear Poisson regression coefficient is also computed.

Any additional variables specified before the comma are categorical variables that are to be "controlled for" by using stratification. Strata are defined by cross-classification of these variables.

You can also specify categorical variables in the by() option. With this specification, the rate ratio is controlled for analysis time separately for each level of the variables specified with by() and then combined to give a rate ratio controlled for both time and the by() variables.

▷ Example 1

Below, we use the diet data (Clayton and Hills 1993) described in example 1 of [ST] **stsplit**. In this dataset, the presence of coronary heart disease (CHD) has been coded as fail = 1, 3, or 13. The variable hienergy is coded 1 if the total energy consumption is more than 2.75 Mcal and 0 otherwise. We want to obtain the effect of high energy controlled for age by stratifying finely. First, we stset the data, specifying the date of birth, dob, as the origin (so analysis time is age), and then we use stmc:

```
. use https://www.stata-press.com/data/r18/diet
(Diet data with dates)

. stset dox, origin(time dob) enter(time doe) id(id)
> scale(365.25) fail(fail==1 3 13)

Survival-time data settings

           ID variable: id
         Failure event: fail==1 3 13
Observed time interval: (dox[_n-1], dox]
     Enter on or after: time doe
     Exit on or before: failure
     Time for analysis: (time-origin)/365.25
                Origin: time dob

--------------------------------------------------------------------------
        337  total observations
          0  exclusions
--------------------------------------------------------------------------
        337  observations remaining, representing
        337  subjects
         46  failures in single-failure-per-subject data
  4,603.669  total analysis time at risk and under observation
                                                At risk from t =         0
                                     Earliest observed entry t =  30.07529
                                          Last observed exit t =  69.99863

. stmc hienergy

        Failure _d: fail==1 3 13
  Analysis time _t: (dox-origin)/365.25
            Origin: time dob
  Enter on or after: time doe
       ID variable: id

Mantel-Cox estimate of the rate ratio
  comparing hienergy==1 vs. hienergy==0
  controlling for time (clicks)
```

Rate ratio	chi2	P>chi2	[95% conf. interval]	
0.537	4.20	0.0403	0.293	0.982

The rate ratio of 0.537 is close to that obtained with stmh when controlling for age by using 10-year age bands; see example 1 of [ST] **stmh**.

◁

Stored results

stmc stores the following in r():

Scalars	
r(rratio)	overall rate ratio
r(chi2)	χ^2
r(p)	p-value
r(level)	confidence level
r(lb)	lower bound of confidence interval
r(ub)	upper bound of confidence interval
r(chi2_unequal)	χ^2 for test of unequal rate ratios with by()
r(p_unequal)	p-value for test of unequal rate ratios with by()
Macros	
r(expvar)	explanatory variable
r(explevels)	levels of binary explanatory variable
r(controlvars)	control variables
r(byvars)	by() variables
r(test)	type of test
Matrices	
r(table)	group-specific rate ratios

Acknowledgments

The original version of stmc was written by David Clayton (retired) of the Cambridge Institute for Medical Research and Michael Hills (1934–2021) of the London School of Hygiene and Tropical Medicine.

Reference

Clayton, D. G., and M. Hills. 1993. *Statistical Models in Epidemiology*. Oxford: Oxford University Press.

Also see

[ST] **stci** — Confidence intervals for means and percentiles of survival time

[ST] **stir** — Report incidence-rate comparison

[ST] **stmh** — Calculate rate ratios with the Mantel–Haenszel method

[ST] **stptime** — Calculate person-time, incidence rates, and SMR

[ST] **strate** — Tabulate failure rates and rate ratios

[ST] **stset** — Declare data to be survival-time data