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## Description

`tssmooth nl` uses nonlinear smoothers to identify the underlying trend in a series.

## Quick start

Create `nly` as a running median smoother of `y` of span 5 using `tsset` data

```
tssmooth nl nly=y, smoother(3)
```

Same as above, but use a Hanning linear smoother

```
tssmooth nl nly=y, smoother(H)
```

Same as above, but smooth over `y` and then over the part of `y` that is not smooth and add the smooth components of the two steps

```
tssmooth nl nly=y, smoother(H, twice)
```

Note: The above commands can also be used to apply the smoother separately to each panel of a panel dataset when a *panelvar* has been specified using `tsset` or `xtset`.

## Menu

Statistics > Time series > Smoothers/univariate forecasters > Nonlinear filter

## Syntax

```
tssmooth nl [type] newvar = exp [if] [in] , smoother(smoother[ , twice])
[replace]
```

where *smoother* is specified as *Sm*[*Sm*[...]] and *Sm* is one of

```
{ 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 } [R]
3[R]S[S|R][S|R]...
E
H
```

The numbers specified in *smoother* represent the span of a running median smoother. For example, a number 3 specifies that each value be replaced by the median of the point and the two adjacent data values. The letter H indicates that a Hanning linear smoother, which is a span-3 smoother with binomial weights, be applied.

The letters E, S, and R are three refinements that can be combined with the running median and Hanning smoothers. First, the end points of a smooth can be given special treatment. This is specified by the E operator. Second, smoothing by 3, the span-3 running median, tends to produce flat-topped hills and valleys. The splitting operator, S, “splits” these repeated values, applies the end-point operator to them, and then “rejoins” the series. Third, it is sometimes useful to repeat an odd-span median smoother or the splitting operator until the smooth no longer changes. Following a digit or an S with an R specifies this type of repetition.

Finally, the *twice* operator specifies that after smoothing, the smoother be reapplied to the resulting rough, and any recovered signal be added back to the original smooth.

Letters may be specified in lowercase, if preferred. Examples of *smoother*[ , *twice*] include

3RSSH	3RSSH,twice	4253H	4253H,twice	43RSR2H,twice
3rssh	3rssh,twice	4253h	4253h,twice	43rsr2h,twice

You must `tsset` your data before using `tssmooth nl`; see [TS] [tsset](#).

*exp* may contain time-series operators; see [U] [11.4.4 Time-series varlists](#).

`collect` is allowed; see [U] [11.1.10 Prefix commands](#).

## Options

Main

*smoother*(*smoother*[ , *twice*]) is required; it specifies the nonlinear smoother to be used.

*replace* replaces *newvar* if it already exists.

## Remarks and examples

`tssmooth nl` works as a front end to `smooth`. See [R] [smooth](#) for details.

## Stored results

`tssmooth nl` stores the following in `r()`:

### Scalars

`r(N)`                      number of observations

### Macros

`r(method)`                `nl`  
`r(smoother)`            specified smoother  
`r(timevar)`            time variable specified in `tsset`  
`r(panelvar)`            panel variable specified in `tsset`

## Methods and formulas

The methods are documented in [\[R\] smooth](#).

A truncated description of the specified nonlinear filter labels the new variable. See [\[D\] label](#) for more information on labels.

An untruncated description of the specified nonlinear filter is saved in the characteristic `tssmooth` for the new variable. See [\[P\] char](#) for more information on characteristics.

## Also see

[\[TS\] tsset](#) — Declare data to be time-series data

[\[TS\] tssmooth](#) — Smooth and forecast univariate time-series data

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