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## Description

twoway mspline calculates cross medians and then uses the cross medians as knots to fit a cubic spline. The resulting spline is graphed as a line plot.

## Quick start

Median-spline plot of $y$ versus $x$
twoway mspline $\mathrm{y} x$
Same as above, and overlay the median-spline plot on a scatterplot of the observed data
twoway scatter y x || mspline y x
Same as above, but specify 10 cross-median knots
twoway scatter y x || mspline y x, bands(10)
Specify 5 points between knots
twoway scatter y x || mspline y x, n(5)
Separate graph areas for each level of catvar
twoway scatter y x $|\mid$ mspline y x, $\mathrm{n}(5)$ by (catvar)
Label the $y$ axis from 0 to 10 in increments of 2
twoway scatter y x || mspline y x, n(5) ylabel(0(2) 10)
Specify "My X Variable" as the title for the $x$ axis
twoway scatter y x || mspline y x, xtitle("My X Variable")
Same as above, but suppress the legend

```
twoway scatter y x || mspline y x, xtitle("My X Variable") ///
    legend(off)
```


## Menu

Graphics > Twoway graph (scatter, line, etc.)

## Syntax

```
twoway mspline yvar xvar [if] [in] [,options]
```

| options | Description |
| :--- | :--- |
| bands (\#) <br> $\mathrm{n}(\#)$ | number of cross-median knots <br> number of points between knots |
| cline_options | change look of the line |
| axis_choice_options | associate plot with alternative axis |
| twoway_options | titles, legends, axes, added lines and text, by, regions, name, <br>  <br> aspect ratio, etc. |

All options are rightmost; see [G-4] Concept: repeated options.

## Options

bands(\#) specifies the number of bands for which cross medians should be calculated. The default is $\max \left\{\min \left(b_{1}, b_{2}\right), b_{3}\right\}$, where $b_{1}$ is round $\{10 * \log 10(N)\}, b_{2}$ is round $(\sqrt{N}), b_{3}$ is $\min (2, N)$, and $N$ is the number of observations.
The $x$ axis is divided into \# equal-width intervals and then the median of $y$ and the median of $x$ are calculated in each interval. It is these cross medians to which a cubic spline is then fit.
$\mathrm{n}(\#)$ specifies the number of points between the knots for which the cubic spline should be evaluated. $\mathrm{n}(10)$ is the default. n() does not affect the result that is calculated, but it does affect how smooth the result appears.
cline_options specify how the median-spline line is rendered and its appearance; see [G-3] cline_options. axis_choice_options associate the plot with a particular $y$ or $x$ axis on the graph; see [G-3] axis_choice_options.
twoway_options are a set of common options supported by all twoway graphs. These options allow you to title graphs, name graphs, control axes and legends, add lines and text, set aspect ratios, create graphs over by () groups, and change some advanced settings. See [G-3] twoway_options.

## Remarks and examples

Remarks are presented under the following headings:

[^0]
## Typical use

Median splines provide a convenient way to show the relationship between $y$ and $x$ :

```
. use https://www.stata-press.com/data/r18/auto
(1978 automobile data)
. scatter mpg weight, msize(*.5) || mspline mpg weight
```



The important part of the above command is mspline mpg weight. On the scatter, we specified msize (*.5) to make the marker symbols half their normal size; see [G-4] size.

## Cautions

The graph shown above illustrates a common problem with this technique: it tracks wiggles that may not be real and can introduce wiggles if too many bands are chosen. An improved version of the graph above would be

```
. scatter mpg weight, msize(*.5) || mspline mpg weight, bands(8)
```



## Use with by()

mspline may be used with by() (as can all the twoway plot commands):

```
. scatter mpg weight, msize(*.5) ||
mspline mpg weight, bands(8) ||, by(foreign, total row(1))
```



## Also see

[ R ] makespline - Spline generation
[G-2] graph twoway fpfit - Twoway fractional-polynomial prediction plots
[G-2] graph twoway lfit - Twoway linear prediction plots
[G-2] graph twoway line - Twoway line plots
[G-2] graph twoway mband - Twoway median-band plots
[G-2] graph twoway qfit - Twoway quadratic prediction plots

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[^0]:    Typical use
    Cautions
    Use with by()

