

*axis\_choice\_options* — Options for specifying the axes on which a plot appears

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## Description

The *axis\_choice\_options* determine the *y* and *x* axis (or axes) on which the plot is to appear.

## Syntax

<i>axis_choice_options</i>	Description
<u>y</u> axis(# [# ... ])	which <i>y</i> axis to use, $1 \leq \# \leq 9$
<u>x</u> axis(# [# ... ])	which <i>x</i> axis to use, $1 \leq \# \leq 9$

`yaxis()` and `xaxis()` are *unique*; see [G-4] **Concept: repeated options**.

These options are allowed with any of the *plottypes* (`scatter`, `line`, etc.) allowed by `graph twoway`; see [G-2] **graph twoway**.

## Options

`yaxis(# [# ... ])` and `xaxis(# [# ... ])` specify the *y* or *x* axis to be used. The default is `yaxis(1)` and `xaxis(1)`.

Typically, `yaxis()` and `xaxis()` are treated as if their syntax is `yaxis(#)` and `xaxis(#)`—that is, just one number is specified. In fact, however, more than one number may be specified, and specifying a second is sometimes useful with `yaxis()`. The first *y* axis appears on the left, and the second (if there is a second) appears on the right. Specifying `yaxis(1 2)` allows you to force there to be two identical *y* axes. You could use the one on the left in the usual way and the one on the right to label special values.

## Remarks and examples

Options `yaxis()` and `xaxis()` are used when you wish to create one graph with multiple axes. These options are specified with `twoway's` `scatter`, `line`, etc., to specify which axis is to be used for each individual plot.

Remarks are presented under the following headings:

*Usual case: one set of axes*  
*Special case: multiple axes due to multiple scales*  
*yaxis(1) and xaxis(1) are the defaults*  
*Notation style is irrelevant*  
*yaxis() and xaxis() are plot options*  
*Specifying the other axes options with multiple axes*  
*Each plot may have at most one x scale and one y scale*  
*Special case: Multiple axes with a shared scale*

## Usual case: one set of axes

Normally, when you construct a `twoway` graph with more than one plot, as in

```
. scatter y1 y2 x
```

or equivalently,

```
. twoway (scatter y1 x) (scatter y2 x)
```

the two plots share common axes for  $y$  and for  $x$ .

## Special case: multiple axes due to multiple scales

Sometimes you want the two  $y$  plots graphed on separate scales. Then you type

```
. twoway (scatter gnp year, c(1) yaxis(1))  
        (scatter r year, c(1) yaxis(2))
```

`yaxis(1)` specified on the first `scatter` says, “This scatter is to appear on the first  $y$  axis.” `yaxis(2)` specified on the second `scatter` says, “This scatter is to appear on the second  $y$  axis.”

The result is that two  $y$  axes will be constructed. The one on the left will correspond to `gnp` and the one on the right to `r`. If we had two  $x$  axes instead, one would appear on the bottom and one on the top:

```
. twoway (scatter year gnp, c(1) xaxis(1))  
        (scatter year r, c(1) xaxis(2))
```

You are not limited to having just two  $y$  axes or two  $x$  axes. You could have two of each:

```
. twoway (scatter y1var x1var, c(1) yaxis(1) xaxis(1))  
        (scatter y2var x2var, c(1) yaxis(2) xaxis(2))
```

You may have up to nine  $y$  axes and nine  $x$  axes, although graphs become pretty well unreadable by that point. When there are three or more  $y$  axes (or  $x$  axes), the axes are stacked up on the left (on the bottom). In any case, you specify `yaxis(#)` and `xaxis(#)` to specify which axis applies to which plot.

Also, you may reuse axes:

```
. twoway (scatter gnp year, c(1) yaxis(1))  
        (scatter nnp year, c(1) yaxis(1))  
        (scatter r year, c(1) yaxis(2))  
        (scatter r2 year, c(1) yaxis(2))
```

The above graph has two  $y$  axes, one on the left and one on the right. The left axis is used for `gnp` and `nnp`; the right axis is used for `r` and `r2`.

The order in which we type the plots is not significant; the following would result in the same graph,

```
. twoway (scatter gnp year, c(1) yaxis(1))  
        (scatter r year, c(1) yaxis(2))  
        (scatter nnp year, c(1) yaxis(1))  
        (scatter r2 year, c(1) yaxis(2))
```

except that the symbols, colors, and *linestyles* associated with each plot would change.

## yaxis(1) and xaxis(1) are the defaults

In the first multiple-axis example,

```
. twoway (scatter gnp year, c(1) yaxis(1))
         (scatter r   year, c(1) yaxis(2))
```

`yaxis(1)` is assumed because we did not specify otherwise. The command is interpreted as if we had typed

```
. twoway (scatter gnp year, c(1) yaxis(1) xaxis(1))
         (scatter r   year, c(1) yaxis(2) xaxis(1))
```

Because `yaxis(1)` is the default, you need not bother to type it. Similarly, because `xaxis(1)` is the default, you could omit typing it, too:

```
. twoway (scatter gnp year, c(1))
         (scatter r   year, c(1) yaxis(2))
```

## Notation style is irrelevant

Whether you use the `()`-binding notation or the `||`-separator notation never matters. You could just as well type

```
. scatter gnp year, c(1) || scatter r year, c(1) yaxis(2)
```

## yaxis() and xaxis() are plot options

Unlike all the other axis options, `yaxis()` and `xaxis()` are options of the individual plots and not of `twoway` itself. You may not type

```
. scatter gnp year, c(1) || scatter r year, c(1) ||, yaxis(2)
```

because `twoway` would have no way of knowing whether you wanted `yaxis(2)` to apply to the first or to the second `scatter`. Although it is true that how the axes appear is a property of `twoway`—see [\[G-3\] axis\\_options](#)—which axes are used for which plots is a property of the plots themselves.

For instance, options `ylabel()` and `xlabel()` are options that specify the major ticking and labeling of an axis (see [\[G-3\] axis\\_Label\\_options](#)). If you want the  $x$  axis to have 10 ticks with labels, you can type

```
. scatter gnp year, c(1) ||
   scatter r   year, c(1) yaxis(2) ||, xlabel(#10)
```

and indeed you are “supposed” to type it that way to illustrate your deep understanding that `xlabel()` is a `twoway` option. Nonetheless, you may type

```
. scatter gnp year, c(1) ||
   scatter r   year, c(1) yaxis(2) xlabel(#10)
```

or

```
. scatter gnp year, c(1) xlabel(#10) ||
   scatter r   year, c(1) yaxis(2)
```

because `twoway` can reach inside the individual plots and pull out options intended for it. What `twoway` cannot do is redistribute options specified explicitly as `twoway` back to the individual plots.

## Specifying the other axes options with multiple axes

Continuing with our example,

```
. scatter gnp year, c(1) ||
  scatter r   year, c(1) yaxis(2) ||
    , xlabel(#10)
```

say that you also wanted 10 ticks with labels on the first *y* axis and 8 ticks with labels on the second *y* axis. You type

```
. scatter gnp year, c(1) ||
  scatter r   year, c(1) yaxis(2) ||
    , xlabel(#10) ylabel(#10, axis(1)) ylabel(#8, axis(2))
```

Each of the other axis options (see [G-3] *axis\_options*) has an `axis(#)` suboption that specifies to which axis the option applies. When you do not specify the suboption, `axis(1)` is assumed.

As always, even though the other axis options are options of `twoway`, you can let them run together with the options of individual plots:

```
. scatter gnp year, c(1) ||
  scatter r   year, c(1) yaxis(2) xlabel(#10) ylabel(#10, axis(1))
    ylabel(#8, axis(2))
```

## Each plot may have at most one x scale and one y scale

Each `scatter`, `line`, `connected`, etc.—that is, each plot—may have only one *y* scale and one *x* scale, so you may not type the shorthand

```
. scatter gnp r year, c(1 1) yaxis(1 2)
```

to put `gnp` on one axis and `r` on another. In fact, `yaxis(1 2)` is not an error—we will get to that in the next section—but it will not put `gnp` on one axis and `r` on another. To do that, you must type

```
. twoway (scatter gnp year, c(1) yaxis(1))
  (scatter r   year, c(1) yaxis(2))
```

which, of course, you may type as

```
. scatter gnp year, c(1) yaxis(1) || scatter r year, c(1) yaxis(2)
```

The overall graph may have multiple scales, but the individual plots that appear in it may not.

## Special case: Multiple axes with a shared scale

It is sometimes useful to have multiple axes just so that you have extra places to label special values. Consider graphing blood pressure versus concentration of some drug:

```
. scatter bp concentration
```

Perhaps you would like to add a line at `bp = 120` and label that value specially. One thing you might do is

```
. scatter bp concentration, yaxis(1 2) ylabel(120, axis(2))
```

The `ylabel(120, axis(2))` part is explained in [G-3] *axis\_Label\_options*; it caused the second axis to have the value 120 labeled. The option `yaxis(1 2)` caused there to be a second axis, which you could label. When you specify `yaxis()` (or `xaxis()`) with more than one number, you are specifying that the axes be created sharing the same scale.

To better understand what `yaxis(1 2)` does, compare the results of

```
. scatter bp concentration
```

with

```
. scatter bp concentration, yaxis(1 2)
```

In the first graph, there is one  $y$  axis on the left. In the second graph, there are two  $y$  axes, one on the left and one on the right, and they are labeled identically.

Now compare

```
. scatter bp concentration
```

with

```
. scatter bp concentration, xaxis(1 2)
```

In the first graph, there is one  $x$  axis on the bottom. In the second graph, there are two  $x$  axes, one on the bottom and one on the top, and they are labeled identically.

Finally, try

```
. scatter bp concentration, yaxis(1 2) xaxis(1 2)
```

In this graph, there are two  $y$  axes and two  $x$  axes: left and right, and top and bottom.

## Reference

Wiggins, V. L. 2010. *Stata tip 93: Handling multiple y axes on twoway graphs*. *Stata Journal* 10: 689–690.

## Also see

[G-3] [axis\\_label\\_options](#) — Options for specifying axis labels

[G-3] [axis\\_options](#) — Options for specifying numeric axes

[G-3] [axis\\_scale\\_options](#) — Options for specifying axis scale, range, and look

[G-3] [axis\\_title\\_options](#) — Options for specifying axis titles

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