Description

twoway function plots \( y = f(x) \), where \( f(x) \) is some function of \( x \). That is, you type

\[ \texttt{. twoway function y=sqrt(x)} \]

It makes no difference whether \( y \) and \( x \) are variables in your data.

Quick start

Graph the function \( \ln\{x/(1-x)\} \) from 0 to 1

\[ \texttt{twoway function y = ln(x/(1-x))} \]

Same as above

\[ \texttt{twoway function y = logit(x)} \]

Graph the function \( y = x^2 \) from \(-1\) to \(1\)

\[ \texttt{twoway function y = x^2, range(-1 1)} \]

As above, but as a horizontal graph

\[ \texttt{twoway function y = x^2, range(-1 1) horizontal} \]

Probability density function of Student’s \( t \) distribution with 4 degrees of freedom

\[ \texttt{twoway function y = tden(4,x), range(-4 4)} \]

As above, but add the normal probability density function

\[ \texttt{twoway function y = tden(4,x), range(-4 4) || \ Function y = normalden(x), range(-4 4)} \]

Add a legend

\[ \texttt{twoway function y = tden(4,x), range(-4 4) || \ Function y = normalden(x), range(-4 4) || \ Legend(label(1 "t density with 4 df"), label(2 "Normal density"))} \]

Normal probability density function with lines from the curve to 0 at \(-1.96\) and \(1.96\)

\[ \texttt{twoway function y = normalden(x), range(-4 4) dropline(-1.96 1.96)} \]

Menu

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

twoway function \[ y = f(x) \] \[ if \] \[ in \] \[ , options \]

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All explicit options are *rightmost*, except `horizontal`, which is *unique*; see [G-4] *Concept: repeated options*.

if \( \text{exp} \) and \( \text{in range} \) play no role unless option `range(varname)` is specified.

In the above syntax diagram, \( f(x) \) stands for an *expression* in terms of \( x \).

Options

`range(# #)` and `range(varname)` specify the range of values for \( x \). In the first syntax, `range()` is a pair of numbers identifying the minimum and maximum. In the second syntax, `range()` is a variable name, and the range used will be obtained from the minimum and maximum values of the variable. If `range()` is not specified, `range(0 1)` is assumed.

\( n(#) \) specifies the number of points at which \( f(x) \) is to be evaluated. The default is \( n(300) \).

`droplines(numlist)` adds dropped lines from the function down to, or up to, the axis (or \( y = \text{base()} \) if `base()` is specified) at each \( x \) value specified in `numlist`.

`base(#)` specifies the base for the `droplines()`. The default is `base(0)`. This option does not affect the range of the axes, so you may also want to specify the `axis_scale_option yscale(range(#))` as well; see [G-3] *axis_scale_options*.

`horizontal` specifies that the roles of \( y \) and \( x \) be interchanged and that the graph be plotted horizontally rather than vertically (that the plotted function be reflected along the identity line).

`yvarformat(\%fmt)` and `xvarformat(\%fmt)` specify the display format to be used for \( y \) and \( x \). These formats are used when labeling the axes; see [G-3] *axis_label_options*.

`cline_options` specify how the function line is rendered; 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:

- **Typical use**
- **Advanced use 1**
- **Advanced use 2**

#### Typical use

You wish to plot the function \( y = \exp(-x/6) \sin(x) \) over the range 0 to \( 4\pi \):

```stata
    . twoway function y=exp(-x/6)*sin(x), range(0 12.57)
```

![Graph of the function \( y = \exp(-x/6) \sin(x) \) over the range 0 to \( 4\pi \)]
A better rendition of the graph above is

```
    . twoway function y=exp(-x/6)*sin(x), range(0 12.57)
        yline(0, lstyle(foreground))
        xlabel(0 3.14 "\{\pi\}" 6.28 "2\{\pi\}" 9.42 "3\{\pi\}" 12.57 "4\{\pi\}"")
        plotregion(style(none))
        xsca(noline)
```

`yline(0, lstyle(foreground))` added a line at \( y = 0; \) `lstyle(foreground)` gave the line the same style as used for the axes. See [G-3] `added_line_options`.

`xlabel(0 3.14 "\{\pi\}" 6.28 "2\{\pi\}" 9.42 "3\{\pi\}" 12.57 "4\{\pi\}"")` labeled the \( x \) axis with the numeric values given; see [G-3] `axis_label_options`.

`plotregion(style(none))` suppressed the border around the plot region; see [G-3] `region_options`.

`xsca(noline)` suppressed the drawing of the \( x \)-axis line; see [G-3] `axis_scale_options`.

**Advanced use 1**

The following graph appears in many introductory textbooks:

```
    . twoway
        function y=normalden(x), range(-4 -1.96) color(gs12) recast(area)
        || function y=normalden(x), range(1.96 4) color(gs12) recast(area)
        || function y=normalden(x), range(-4 4) lstyle(foreground)
        ||,
        plotregion(style(none))
        ysca(off) xsca(noline)
        legend(off)
        xlabel(-4 "-4 sd" -3 "-3 sd" -2 "-2 sd" -1 "-1 sd" 0 "mean"
            1 "1 sd" 2 "2 sd" 3 "3 sd" 4 "4 sd"
            , grid gmin gmax)
        xtitle(""")
```
We drew the graph in three parts: the shaded area on the left, the shaded area on the right, and then the overall function. To obtain the shaded areas, we used the *advanced_option* `recast(area)` so that, rather than the function being plotted by *graph twoway line*, it was plotted by *graph twoway area*; see [G-3] *advanced_options* and [G-2] *graph twoway area*. Concerning the overall function, we drew it last so that its darker foreground-colored line would not get covered up by the shaded areas.

**Advanced use 2**

*function* plots may be overlaid with other *twoway* plots. For instance, *function* is one way to add \( y = x \) lines to a plot:

```stata
use https://www.stata-press.com/data/r16/sp500, clear
(S&P 500)
scatter open close, msize(*.25) mcolor(*.6) ||
function y=x, range(close) yvarlab("y=x") clwidth(*1.5)
```

In the above, we specified the *advanced_option* `yvarlab("y=x")` so that the variable label of \( y \) would be treated as “\( y=x \)” in the construction of the legend; see [G-3] *advanced_options*. We specified
msize(*.25) to make the marker symbols smaller, and we specified mcolor(*.6) to make them dimmer; see [G-4] size and [G-4] colorstyle.

Reference


Also see

[G-2] graph twoway line — Twoway line plots