

**estat acplot** — Plot parametric autocorrelation and autocovariance functions

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## Description

`estat acplot` plots the estimated autocorrelation and autocovariance functions of a stationary process using the parameters of a previously fit parametric model.

`estat acplot` is available after `arima` and `arfima`; see [\[TS\] arima](#) and [\[TS\] arfima](#).

## Quick start

Autocorrelation function using estimates from `arima` or `arfima`

```
estat acplot
```

Autocovariance function using estimates from `arima` or `arfima`

```
estat acplot, covariance
```

Same as above, and save results in `mydata.dta`

```
estat acplot, covariance saving(mydata)
```

## Menu for estat

Statistics > Postestimation

## Syntax

```
estat acplot [ , options ]
```

<i>options</i>	Description
<a href="#">saving(filename [ , ... ])</a>	save results to <i>filename</i> ; save variables in double precision; save variables with prefix <i>stubname</i>
<a href="#">level(#)</a>	set confidence level; default is level(95)
<a href="#">lags(#)</a>	use # autocorrelations
<a href="#">covariance</a>	calculate autocovariances; the default is to calculate autocorrelations
<a href="#">smemory</a>	report short-memory ACF; only allowed after <code>arfima</code>
CI plot	
<a href="#">ciopts(rcap_options)</a>	affect rendition of the confidence bands
Plot	
<a href="#">marker_options</a>	change look of markers (color, size, etc.)
<a href="#">marker_label_options</a>	add marker labels; change look or position
<a href="#">cline_options</a>	affect rendition of the plotted points
Y axis, X axis, Titles, Legend, Overall	
<a href="#">twoway_options</a>	any options other than <code>by()</code> documented in [G-3] <a href="#">twoway_options</a>

## Options

`saving(filename [ , suboptions ])` creates a Stata data file (.dta file) consisting of the autocorrelation estimates, standard errors, and confidence bounds.

Five variables are saved: `lag` (lag number), `ac` (autocorrelation estimate), `se` (standard error), `ci_l` (lower confidence bound), and `ci_u` (upper confidence bound).

`double` specifies that the variables be saved as doubles, meaning 8-byte reals. By default, they are saved as floats, meaning 4-byte reals.

`name(stubname)` specifies that variables be saved with prefix *stubname*.

`replace` indicates that *filename* be overwritten if it exists.

`level(#)` specifies the confidence level, as a percentage, for confidence intervals. The default is `level(95)` or as set by `set level`; see [R] [level](#).

`lags(#)` specifies the number of autocorrelations to calculate. The default is to use  $\min\{\text{floor}(n/2) - 2, 40\}$ , where  $\text{floor}(n/2)$  is the greatest integer less than or equal to  $n/2$  and  $n$  is the number of observations.

`covariance` specifies the calculation of autocovariances instead of the default autocorrelations.

`smemory` specifies that the ARFIMA fractional integration parameter be ignored. The computed autocorrelations are for the short-memory ARMA component of the model. This option is allowed only after `arfima`.

CI plot

`ciopts(rcap_options)` affects the rendition of the confidence bands; see [G-3] [rcap\\_options](#).

## Plot

*marker\_options* affect the rendition of markers drawn at the plotted points, including their shape, size, color, and outline; see [G-3] *marker\_options*.

*marker\_label\_options* specify if and how the markers are to be labeled; see [G-3] *marker\_label\_options*.

*cline\_options* affect whether lines connect the plotted points and the rendition of those lines; see [G-3] *cline\_options*.

## Y axis, X axis, Titles, Legend, Overall

*twoway\_options* are any of the options documented in [G-3] *twoway\_options*, except by(). These include options for titling the graph (see [G-3] *title\_options*) and for saving the graph to disk (see [G-3] *saving\_option*).

## Remarks and examples

[stata.com](http://stata.com)

The dependent variable evolves over time because of random shocks in the time domain representation. The autocovariances  $\gamma_j$ ,  $j \in \{0, 1, \dots, \infty\}$ , of a covariance-stationary process  $y_t$  specify its variance and dependence structure, and the autocorrelations  $\rho_j$ ,  $j \in \{1, 2, \dots, \infty\}$ , provide a scale-free measure of  $y_t$ 's dependence structure. The autocorrelation at lag  $j$  specifies whether realizations at time  $t$  and realizations at time  $t - j$  are positively related, unrelated, or negatively related. `estat acplot` uses the estimated parameters of a parametric model to estimate and plot the autocorrelations and autocovariances of a stationary process.

## ▷ Example 1

In [example 1](#) of [TS] [arima](#), we fit an ARIMA(1,1,1) model of the U.S. Wholesale Price Index (WPI) using quarterly data over the period 1960q1 through 1990q4.

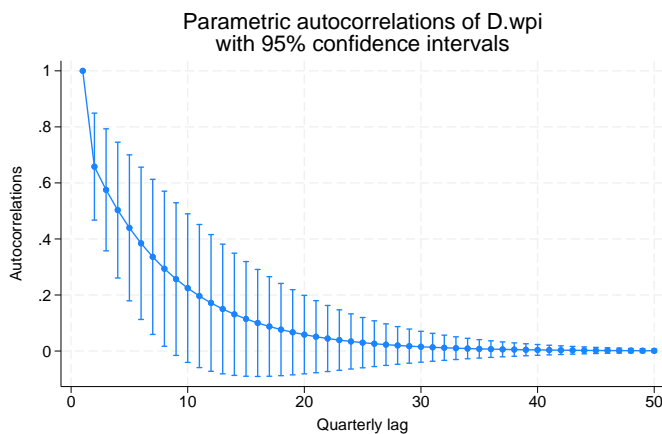
```
. use https://www.stata-press.com/data/r18/wpi1
. arima wpi, arima(1,1,1)
(setting optimization to BHHH)
Iteration 0: Log likelihood = -139.80133
Iteration 1: Log likelihood = -135.6278
Iteration 2: Log likelihood = -135.41838
Iteration 3: Log likelihood = -135.36691
Iteration 4: Log likelihood = -135.35892
(switiching optimization to BFGS)
Iteration 5: Log likelihood = -135.35471
Iteration 6: Log likelihood = -135.35135
Iteration 7: Log likelihood = -135.35132
Iteration 8: Log likelihood = -135.35131
ARIMA regression
Sample: 1960q2 thru 1990q4                Number of obs   =       123
Log likelihood = -135.3513                 Wald chi2(2)    =       310.64
                                           Prob > chi2     =        0.0000
```

D.wpi	OPG		z	P> z	[95% conf. interval]	
	Coefficient	std. err.				
wpi						
_cons	.7498197	.3340968	2.24	0.025	.0950019	1.404637
ARMA						
ar						
L1.	.8742288	.0545435	16.03	0.000	.7673256	.981132
ma						
L1.	-.4120458	.1000284	-4.12	0.000	-.6080979	-.2159938
/sigma	.7250436	.0368065	19.70	0.000	.6529042	.7971829

Note: The test of the variance against zero is one sided, and the two-sided confidence interval is truncated at zero.

Now we use `estat acplot` to estimate the autocorrelations implied by the estimated ARMA parameters. We include `lags(50)` to indicate that autocorrelations be computed for 50 lags. By default, a 95% confidence interval is provided for each autocorrelation.

```
. estat acplot, lags(50)
```



The graph is similar to a typical autocorrelation function of an AR(1) process with a positive coefficient. The autocorrelations of a stationary AR(1) process decay exponentially toward zero.

◀

## Methods and formulas

The autocovariance function for ARFIMA models is described in *Methods and formulas* of [TS] [arfima](#). The autocovariance function for ARIMA models is obtained by setting the fractional difference parameter to zero.

[Box et al. \(2016\)](#) provide excellent descriptions of the autocovariance function for ARIMA and seasonal ARIMA models. [Palma \(2007\)](#) provides an excellent summary of the autocovariance function for ARFIMA models.

## References

- Box, G. E. P., G. M. Jenkins, G. C. Reinsel, and G. M. Ljung. 2016. *Time Series Analysis: Forecasting and Control*. 5th ed. Hoboken, NJ: Wiley.
- Palma, W. 2007. *Long-Memory Time Series: Theory and Methods*. Hoboken, NJ: Wiley.

## Also see

[TS] [arfima](#) — Autoregressive fractionally integrated moving-average models

[TS] [arima](#) — ARIMA, ARMAX, and other dynamic regression models

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