## What?

The Moving Average Convergence Divergence, MACD ("Mack-D"), is a momentum indicator commonly used by technical analysts. The MACD is equal to the difference between two exponential moving averages (EMAs) of different lengths: (1) a long-term EMA of usually 26 days, and (2) a short-term EMA of usually 12 days. The MACD is defined as the short-term EMA minus the long-term EMA. A third component is the so-called "signal line" which is, usually, a 9 day EMA of the MACD.

The convention is to plot the signal line over the MACD. If the signal line crosses above the MACD, this is considered a bullish indicator. If the signal line crosses below the MACD, this is a bearish sign. The MACD-Histogram is equal to the MACD less the signal line. As such, it oscillates above and below zero. When the histogram becomes positive, this is a bullish signal; when negative, a bearish signal. The histogram is used as an indicator of momentum. When the histogram is positive and increasing, the stock price is said to have increasing positive momentum. A negative and decreasing histogram implies steeper downside momentum.

If the actual stock price diverges significantly from the MACD, this is often viewed as signaling the end of a current trend. Finally, if the MACD rises steeply, this is because the short-term EMA (usually 12 days) is rising faster than the long-term EMA (usually 26 days). That is, prices have moved dramatically upward recently. Analysts sometimes infer that the current price has moved away from its equilibrium value and they expect a downward correction.

## Method

While many web sites offer free technical analysis tools, we will be using Stata.

The *tftools macd* command calculates the moving average convergence and divergence (MACD) for a single time-series variable. *tftools macd* creates three new variables: MACD_line, signal_line and MACD_histogram. The data must first be *tsset*.

## Syntax and options

*tftools macd* [*if*] [*in*], symbol(*variable*) generate(*newvar*)

- *symbol(variable)* is the variable that the MACD calculation is based upon (usually the stock symbol that contains the daily prices).
- *generate(newvar)* is the new variable prefix for the calculated MACD values.

## Example

```
net install http://researchbtn.com/stata/210/tftools.pkg, force
freduse SP500, clear
drop if SP500==.
drop date
rename daten date
gen obs=_n
tsset obs
tftools macd if year(date)>2015, symbol(SP500) generate(SP500)
twoway (line SP500_MACD_line date, lpattern(dash)) (line SP500_signal_line date) ///
     if year(date)>2015
```

Figure 1: Daily S&P-500 index Moving Average Convergence Divergence (MACD)

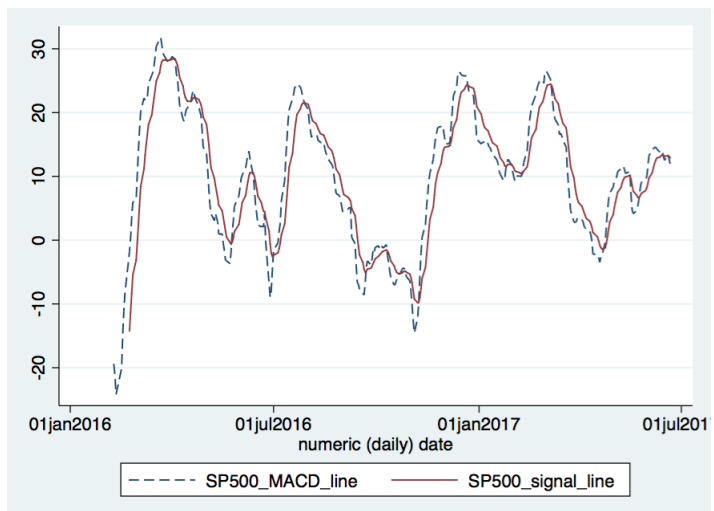


Figure 1 shows the daily S&P-500 index moving average convergence and divergence. The usual interpretation for this technical analysis took is based on the MACD line and the signal line. It is usually interpreted as down signal (bearish) if the MACD line falls below the signal line. Similarly, it is usually interpreted as up signal (bullish) if the MACD line goes above the signal line.