1   Background

The Dickey-Fuller test is a standard method for testing whether or not a time-series is stationary. This note gives a brief description of what the test does, and a bit about our implementation of it.

1.1   Matlab's implementation

The Matlab command **adftest** provides an augmented Dickey-Fuller test for a unit root.
The models are:

- AR (autoregressive)

$$H_0 : y_t = y_{t-1} + b_1 \Delta y_{t-1} + \cdots + b_p \Delta y_{t-p} + e_t.$$

$$H_1 : y_t = a y_{t-1} + b_1 \Delta y_{t-1} + \cdots + b_p \Delta y_{t-p} + e_t.$$

  with AR(1) coefficient $a < 1$.

- ARD (autoregressive with drift) tests AR null model against

$$H_1 : y_t = c + a y_{t-1} + b_1 \Delta y_{t-1} + b_2 \Delta y_{t-2} + \cdots + b_p \Delta y_{t-p} + e_t.$$

  with drift coefficient c and AR(1) coefficient $a < 1$.

- TS (trend stationary)

$$H_0 : y_t = c + y_{t-1} + b_1 \Delta y_{t-1} + \cdots + b_p \Delta y_{t-p} + e_t.$$

$$H_1 : y_t = c + dt + a y_{t-1} + b_1 \Delta y_{t-1} + \cdots + b_p \Delta y_{t-p} + e_t.$$

  with drift coefficient c, deterministic trend coefficient d, and AR(1) coefficient $a < 1$.

The default model is AR.

We need to have options for at least three different models, depending on our assumptions about the series in question, as these different models will lead to different conclusions about stationarity. For example, when I used the Matlab routine on a five macroeconomic time-series, I found that, when the model is AR we could reject the null for all variables except inflation. Whereas, when the model is ARD, we fail to reject the null for all variables except inflation.

William DeMeo <williamdemeo@gmail.com>