ECONOMETRICS II, FALL 2016

Homework 10. Due Monday November 21th.

1. Use the program `ADFtest.txt` to simulate an AR process and test for unit roots. We almost always estimate the mode

$$\Delta y_t = \mu + \alpha_1 * y_{t-1} + \alpha_2 t + \text{lags of } \delta Y_t + u_1, \quad (*)$$

and test for $\alpha_1 = 0$. What I could have made more clear in class is the following (which is potentially confusing). If α_1 is positive, α_2 is the coefficient to the trend, while if $\alpha_1 = 0$, μ is the coefficient to the trend. So what you normally do is to estimate (*) and test the null of a unit root ($\alpha_1 = 0$) and use critical values simulated under the constraints that $\alpha_1 = 0$ AND $\alpha_2 = 0$ because if $\alpha_1 = 0$ and α_2 is different from 0, there would be quadratic trend. The critical value for a 5 percent one-sided test is -3.41, see Figure 14.2 in Davidson and MacKinnon. This value does not depend on the number of lags asymptotically, but in small sample you dilute the power of the test if you have too many lags.
1) The program is set up with a unit root (the coefficient sum to unity). Run the program and read of the size of the test.
2) Change the coefficient so that the sum is 0.9. What is the size of the test?

2. Prove that

$$\int_0^1 B(s)dB(s) \;=\; \frac{1}{2}(B(1)^2 - 1) \; .$$

Hint: Use Ito's Lemma on $B(t)^2$ (I.e., start from the right-hand side.)