Unit Roots: Problems

1 and 2. This turned out to be trickier than I planned. The first two may be answered together. here, we need to deifference first in order to de-trend.

$$\Delta y_t = .5t + u_t \tag{1}$$

Now define $x_t = \Delta y_t - .5t$.

$$x_t = u_t \tag{2}$$

which is white noise and thus stationary.

. 3. Subtract off x_{t-1} from both sides.

$$\Delta x_t = u_t - u_{t-1} \tag{3}$$

By over-differencing, we have added autocorelation to the process.

4. We would run an augmented Dickey-Fuller test that includes a trend.

5. False. The mechanics of conducting a Dickey-Fuller test are similar to those of just running an ordinary t-test. But the critical value for the DF test are not the same as for a t-test. Using the latter would cause you to too often reject the null of a unit root when one actually does exist.

6. $\tilde{r}_t = r_t - 0.03t$.

7. Suppose you have two variables that are entirely unrelated to each other but which both display a strong upward trend. Regressing one on the other would result in a positive regression coefficient that entirely spurious..

8. Here is one. Stock prices often change significantly before the FOMC announces changes to monetary policy. It seems clear, however, that expectation changes about future monetary policy are causing stock price fluctuations. These fluctuations, however, Granger Cause monetary policy.