ECON 3350/7350: Applied Econometrics for Macroeconomics and Finance

Tutorial 6: Cointegration

In this tutorial you will test for cointegration using the Engle-Granger method.

The data you use are a system of four Australian interest rates: the 5 year ($i5y$) and 3 year ($i3y$) Treasury Bond (Capital Market) rates, and the 180 day ($i180d$) and 90 ($i90d$) day Bank Accepted Bill (Money Market) rates. The data are annualized monthly rates for the period June 1992 - August 2010 ($T = 219$). You will find these data in the file `term_structure.csv` in Blackboard.

(a) Use the Engle-Granger method to test for cointegration among the four series with $i5y$ being the dependent variable. Hint: Install the `egranger` package and use its `egranger` command.

(b) Conduct the Engle-Granger test in Part (a) "manually". To do this, first regress $i5y$ on $i3y$, $i90d$, $i180d$, and a constant, then compute the residuals. Perform the ADF test (equation (3)) on the residual sequence and record the test statistic. Note that the critical values in the Dickey-Fuller tables are no longer valid as residuals are generated from a regression. You will need to use the Table C in Enders' supplementary manual.

(c) Repeat Part (a) three more times but each time change the dependent variable. Do you come to the same conclusion?

(d) Next we wish to test the *Expectations Theory* of the term structure of interest rates (ETT). Specifically, we would like to know if the spreads are stationary. To test this fully, you should perform unit root tests for the differences between all pairs of the interest rates. For example, $i5y - i3y$, $i5y - i180d$, and $i180d - i90d$. If all these differences are stationary ($I(0)$), then this lends support to the hypothesis. What are your conclusions to the following questions: Does ETT hold in the Capital Market? Does ETT hold in the Money Market? Does ETT hold across the Capital and Money Markets?

(e) Recall the data in the file `wealth.csv` which you used in Tutorial 4. Test for unit roots in consumption, asset wealth and labor income. Use the tests you have learned to test for cointegration among consumption, asset wealth and labour income. What do your results imply for the long-run relationship?

$$c^* = \mu + \pi a^* + \alpha y^*$$

among these variables?

(f) Lettau and Ludvigson (2004) estimate the following values $\pi = 0.30$ and $\alpha = 0.60$. Assuming these values are correct, impose this restriction and test using tests for cointegration whether this is a valid long-run relationship?