Financial Econometrics
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TP 11

Testing Stationarity

Computing Critical Values

Since the distribution of the test statistic for the Dickey-Fuller test is degenerate, critical values are obtained by Monte-Carlo simulations.

1. Perform $N = 10'000$ times the following experiment:

   (a) Simulate a series of $T = 100$ innovations $\varepsilon_t \sim$ i.i.d $\mathcal{N}(0, 1),\ t = 1, \ldots, T$.

   (b) Compute the processus defined as $Y_t = Y_{t-1} + \varepsilon_t,\ t = 1, \ldots, T$. (Assume $Y_0 = 0$.)

   (c) Estimate the regression of the Dickey-Fuller test, i.e. $\Delta Y_t = \alpha + \beta Y_{t-1} + u_t$. Compute the t-statistic for β.

2. Display the histogram of the N t-statistics. You may have expected a distribution symmetric around 0, as the data have been simulated under the null hypotesis $\beta = 0$.

3. Compute the critical values for the Dickey-Fuller test at the 1%, 5% and 10% level. They correspond to the quantiles of the t-statistics distribution.

   Remember that under the null of non-stationarity, $\beta = 0$, and that $\beta < 0$ under the alternative. Hence, this is a unilateral test.

   Compare your critical values with the quantiles of the Student distribution, and with the values provided by Fuller (1976): -3.51 at 1%, -2.89 at 5% and -2.58 at 10%.

Testing Non-stationarity

Test the stationarity of the series of monthly prices provided in the file *data_monthly.xls*. You need to simulate new critical values as there are more than $T = 100$ observations.