

Tutorial 3: Nonstationary Time Series

Empirical Exercises

1. Use the `adftest` built-in function provided by the Econometrics Toolbox of Matlab to perform unit root tests using data on exchange rates. The data set `Exchange_Rates.xlsx` contains quarterly data on nominal exchange rates between the British Pound and the US dollar ($E_{UK/US}$) and between the Chinese Yuan and the US dollar ($E_{CH/US}$), and CPI (index 2015=100) in the US, UK and China from 1993Q1 to 2022Q4.
 - (a) Load the data set `Exchange_Rates.xlsx`, generate the dates sequence and plot the nominal exchange rates.
 - (b) The efficient market hypothesis states that changes in asset prices such as exchange rates are unpredictable. A natural way to test this hypothesis is to check whether the log of the nominal exchange rate is a random walk. Use the `adftest` built-in function to test all unit root hypotheses for both nominal exchange rates. Discuss the results.
 - (c) The law of one price states that price differences across countries are offset by movements in the nominal exchange rate (due to arbitrage opportunities). A strong version of the law of one price thus predicts that real exchange rates always equals 1, where the real exchange rate between the British Pound and the US dollar is defined as

$$RER_{UK/US} = E_{UK/US} \times CPI_{US}/CPI_{UK}$$

A weaker form requires the log of the real exchange rate to be stationary. Discuss which pair of ADF hypotheses are more appropriate to test the law of one price for the $RER_{UK/US}$ and $RER_{CH/US}$ real exchange rates.