

Exercise 7

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1. Until 1971, as part of the Bretton-Woods system of fixed exchange rates, the US dollar was convertible to gold, i.e., it was possible for foreign central banks to redeem US dollars for gold at a fixed rate of 35\$ per troy ounce, so that the price of gold was fixed. In 1971, US president Nixon unilaterally cancelled the direct convertibility, ultimately ending the Bretton-Woods agreement. Gold became a floating asset, and its price increased sharply; in other words, the US\$ was massively devalued. In this exercise, we will analyze the hypothesis that the increasing price (in US\$) of oil is not a consequence of an increased demand for (or a reduced supply of) oil, but rather of a continued devaluation of the US\$. We have at our disposal monthly data from April 1968 to January 2017 (586 observations) on the following variables:

- GOLD, the spot price of one troy ounce of gold in US\$;
 - OIL, the spot price of one barrel of WTI crude oil in US\$.
- (a) Assuming that GOLD is integrated of order one, explain why the hypothesis that the relative price of oil (in troy ounces of gold per barrel) is stationary implies cointegration between $\log(\text{OIL})$ and $\log(\text{GOLD})$.
- (b) Using the file `oil_gold_2017.wfl`, analyze whether this cointegrating relationship can be found in the data, based on the Engle-Granger procedure.
- (c) Same, but using the Johansen procedure.

2. Consider the model

$$\begin{aligned} Y_t &= \beta_1 + \beta_2 X_t + U_{1,t} \\ X_t &= X_{t-1} + U_{2,t} \end{aligned}$$

where $\beta_2 \neq 0$, $U_{1,t}, U_{2,t} \stackrel{\text{iid}}{\sim} (0, \sigma^2)$ independently of each other.

- (a) Is X_t stationary?
- (b) Is Y_t stationary?
- (c) Are X_t and Y_t cointegrated? If yes, what is the cointegrating vector?
- (d) Derive the bivariate VECM for Y_t and X_t .