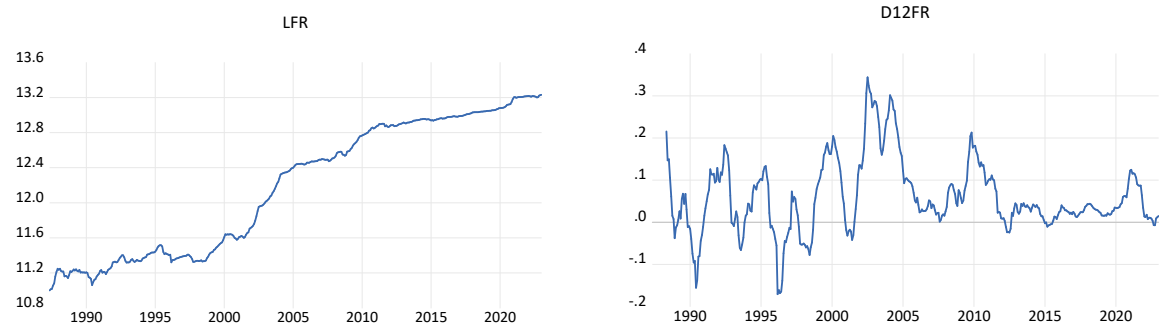
Applied Financial Econometrics, Spring Semester, 2023
Problem Set 1, March 22, 2023

1. [Ex. 1.4]
   Ans. By definition, $Y_{t1} \stackrel{d}{=} Y_{t2}$, $\forall t1, t2$. □

2. [Ex. 2.2]
   Ans.



   $\overline{DUM}_t = 0.812950$ □

3. [Ex. 3.1]
   Ans.

   (a)

$$\gamma(j) = \begin{cases} (1+\theta^2)\sigma^2 & \text{if } j = 0 \\ \theta\sigma^2 & \text{if } j = 1 \\ 0 & \text{if } j > 1 \end{cases}$$

   (b) Yes.

$$E(Y_t) = 0$$
$$Var(Y_t) = (1+\theta^2)\sigma^2 < \infty$$
$$\gamma(j)$$

   □

4. [Ex. 3.2]
   Ans.

   (a)

$$(1 - 1.2L + 0.2L^2)Y_t = \epsilon_t$$
$$(1 - 1.2L + 0.4L^2)Y_t = \epsilon_t$$
$$(1 - 1.2L - 1.2L^2)Y_t = \epsilon_t$$
$$(1 + 1.2L)Y_t = \epsilon_t$$
$$(1 - 0.7L - 0.25L^2 + 0.175L^3)Y_t = \epsilon_t$$

   □

(b)

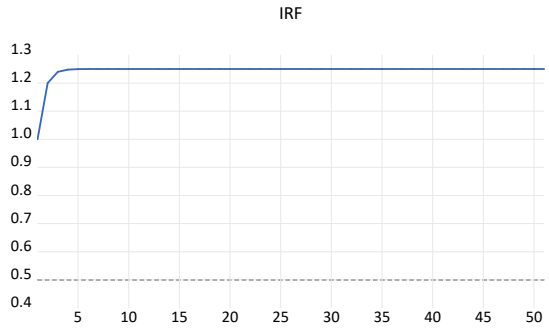
$\beta(z) = 1 - 1.2z + 0.2z^2 = 0,\ z = 1, 5 \Rightarrow$ nonstationary

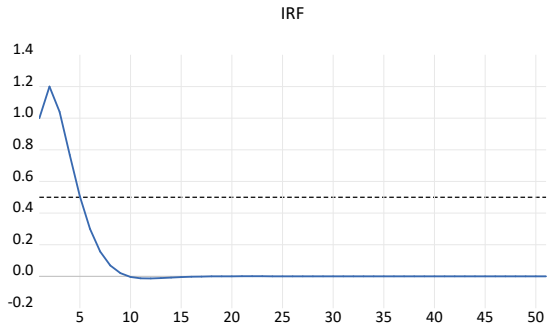
$\beta(z) = 1 - 1.2z + 0.4z^2 = 0,\ z = 1.5 + 0.5i, 1.5 - 0.5i \Rightarrow$ stationary

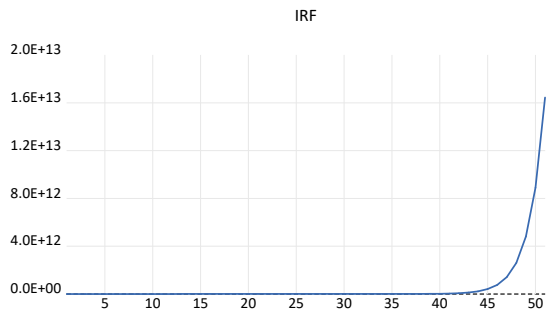
$\beta(z) = 1 - 1.2z - 1.2z^2 = 0,\ z = 0.540833, -1.540833 \Rightarrow$ nonstationary

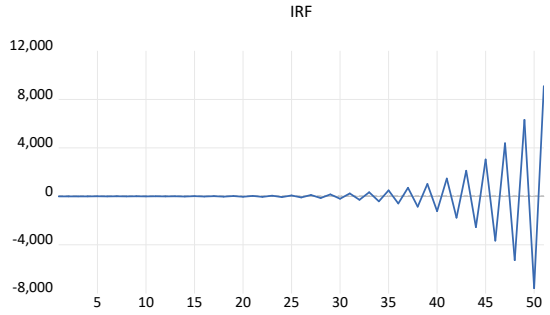
$\beta(z) = 1 + 1.2z = 0,\ z = -0.8333333 \Rightarrow$ nonstationary

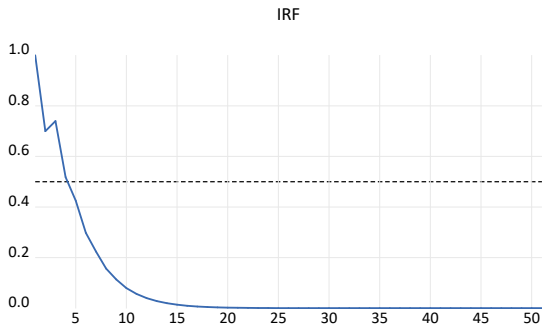
$\beta(z) = 1 - 0.7z - 0.25z^2 + 0.175z^3 = 0,\ z = 1.428571, -2.000000, 2.000000 \Rightarrow$ stationary











□

5. [Ex. 3.3]
Ans.

$$Cov(Y_1, Y_0) = 0 \neq \phi_1\sigma^2 = Cov(Y_2, Y_1)$$

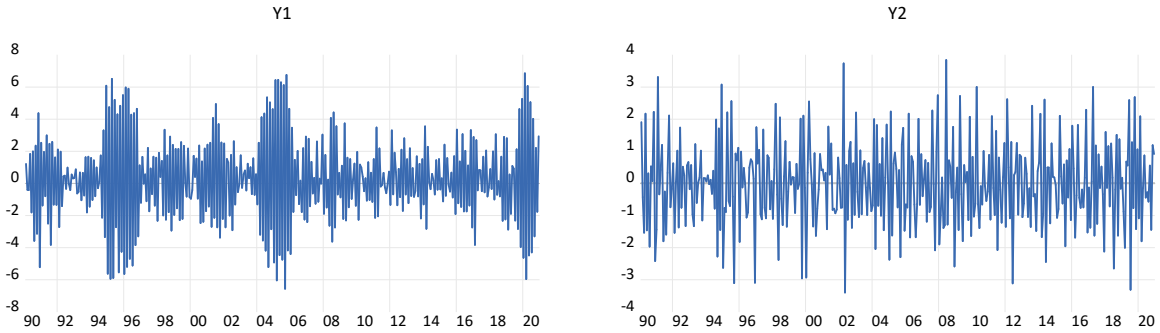
□

6. [Ex. 3.4]
Ans.

$$|\phi_1| < 1 \text{ (given)},\ E(Y_0) = \frac{\phi_0}{1-\phi_1},\ Var(Y_0) = \frac{\sigma^2}{1-\phi_1^2}$$

□

7. [Ex. 3.19]
Ans.


Y1
8
6
4
2
0
-2
-4
-6
-8
90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Y2
4
3
2
1
0
-1
-2
-3
-4
90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20

□