Econometrics test

PhD in Economics (XXVIth cycle)

2024, January 8th — 3 hours

Name: _____ Surname: _____

1. **(Esame PhD del 08/01/2024 - Es. 1)** A researcher aims to investigate the relationships between the "geopolitical risk" (hereinafter, GPR) indices of the United States, Russia, China, and the EU using a sample containing $T = 887$ monthly observations over a period starting from January 1950 in November, 2023. The following table reports the test statistics obtained by running the main unit root tests on all GPRs.

tests	y_t^{USA}	y_t^{RUS}	y_t^{CHN}	y_t^{EUR}
ADF with constant	-6.817	-4.908	-4.918	-8.254
ADF with constant & lin. trend	-9.220	-6.748	-5.041	-9.080
PP with costant	-11.471	-9.882	-9.504	-13.312
PP with trend	-12.038	-10.912	-9.852	-14.586
KPSS	1.391	2.508	1.871	2.580
KPSS with trend	0.165	0.399	1.222	0.403

Hint — KPSS critical values: 0.348 (10%), 0.462 (5%), 0.743 (1%)
— KPSS with trend critical values: 0.119 (10%), 0.148 (5%), 0.218 (1%)

(a) Select the right statements from the following.

- ◯ all GPR time series are stationary
- ◯ only $y_t^{\text{USA}} \sim I(0)$, others GPRs are $I(1)$
- ◯ at least one GPR is nonstationary
- ◯ ADF tests always reject the null
- ◯ according to most tests all GPRs are nonstationary
- ◯ for ADF and PP tests the result is the same if a trend is included
- ◯ some information is missing, it is impossible to conclude
- ◯ the KPSS is inconclusive

(b) According the ADF test with constant, y_t^{USA} is stationary?

◯ YES ◯ NO

Test: ADF (with constant) Distribution: _____ Test statistic: _____
Decisione: DON'T REJECT ◯ REJECT ◯

(c) According the KPSS test with trend, y_t^{CHN} is stationary?

◯ YES ◯ NO

Test: KPSS (with trend) Distribution: _____ Test statistic: _____
Decisione: DON'T REJECT ◯ REJECT ◯

(d) By estimating a dynamic ADL(2,1) model, it can be noticed that the Chinese GPR can be predicted through the equation

$$\hat{y}_t^{\text{CHN}} = -0.013 + 0.724 y_{t-1}^{\text{CHN}} + 0.091 y_{t-2}^{\text{CHN}} + 0.152 y_t^{\text{USA}} - 0.117 y_{t-1}^{\text{USA}}.$$

Is it possible to estabilish a steady state equilibrium between y_t^{CHN} and y_t^{USA} from the above equation?

◯ YES, the equation is _____;

◯ NO, because _____

_____

_____

(e) The researcher also estimated the VAR(1) model

$$\begin{bmatrix} y_t^{\text{USA}} \\ y_t^{\text{RUS}} \\ y_t^{\text{CHN}} \\ y_t^{\text{EUR}} \end{bmatrix} = \begin{bmatrix} 0.826 \\ (0.075) \\ 0.344 \\ (0.042) \\ 0.125 \\ (0.025) \\ 0.089 \\ (0.011) \end{bmatrix} + \begin{bmatrix} 0.703 & 0.068 & 0.033 & -0.011 \\ (0.035) & (0.061) & (0.070) & (0.295) \\ -0.069 & 0.801 & -0.018 & 0.354 \\ (0.019) & (0.034) & (0.039) & (0.164) \\ -0.010 & 0.016 & 0.801 & -0.030 \\ (0.012) & (0.020) & (0.023) & (0.098) \\ -0.001 & 0.052 & -0.004 & 0.501 \\ (0.005) & (0.009) & (0.010) & (0.042) \end{bmatrix} \begin{bmatrix} y_{t-1}^{\text{USA}} \\ y_{t-1}^{\text{RUS}} \\ y_{t-1}^{\text{CHN}} \\ y_{t-1}^{\text{EUR}} \end{bmatrix},$$

where the standard errors are in parentheses. Compute all the unconditional expectations

$$E(y_t^{\text{USA}}) = \_\_\_\_\_, \qquad E(y_t^{\text{RUS}}) = \_\_\_\_\_,$$

$$E(y_t^{\text{CHN}}) = \_\_\_\_\_, \qquad E(y_t^{\text{EUR}}) = \_\_\_\_\_.$$

(f) Is the above VAR(1) stationary?

◯ YES ◯ NO ◯ CAN'T SAY

because _____

_____

_____

(g) Does y_t^{USA} 'Granger-causes' y_t^{EUR}?

◯ YES ◯ NO

Test: _____ Distribution: _____ Test statistic: _____

Decisione: DON'T REJECT ◯ REJECT ◯

(h) Does y_t^{EUR} 'Granger-causes' y_t^{USA}?

◯ YES ◯ NO

Test: _____ Distribution: _____ Test statistic: _____

Decisione: DON'T REJECT ◯ REJECT ◯