VAR

(P1) Cointegrated TS:

1. The order of integration $I(d)$, $\underline{d \geq 1}$
   ↳ ADF test
2. $\exists$ lin. com that is stationary

$$y_t = \alpha_1 + \alpha_2 X_t + \alpha_3 Z_t + u_t$$

$$u_t = y_t - \alpha_1 - \alpha_2 X_t - \alpha_3 Z_t$$

↳ ADF stationary

(P2) ECM

$$y_t = \alpha_1 + \alpha_2 X_t + \varepsilon_t$$

y_t, X_t – $I(1)$ (*)

↳ spurious regression

$$\Delta y_t = \beta_1 + \beta_2 \Delta X_t + \varepsilon_t$$

↳ only SR dynamics

$$\Delta y_t = \beta_1 + \beta_2 \Delta X_t + \underbrace{+ \pi \cdot u_{t-1}}_{\text{LR dynamics}} + \varepsilon_t$$

$$\text{LR dynamics} = [y_{t-1} - \alpha_1 - \alpha_2 \cdot X_{t-1}]$$

Aux. reg.: $y_t | X_t \Rightarrow L(\hat{u}_t)$

π – adjustment rate

P2 Granger Causality

$$y_t = \alpha_0 + \alpha_1 \cdot y_{t-1} + \dots + \alpha_m y_{t-m} +$$
$$+ \beta_1 \cdot X_{t-1} + \dots + \beta_m X_{t-m} + \varepsilon_t$$

$H_0: \beta_1 = \dots = \beta_m = 0$

X doesnot Granger cause y

$$X_t = \alpha_0 + \alpha_1 \cdot y_{t-1} + \dots + \alpha_m y_{t-m} +$$
$$+ \beta_1 \cdot X_{t-1} + \dots + \beta_m X_{t-m} + \varepsilon_t$$

$H_0: \alpha_1 = \dots = \alpha_m = 0$

P3 VAR(p) : VAR(5) for y_t, X_t

↳ 2×11 coefs

$$\text{VAR(1)}: \begin{pmatrix} y_t \\ x_t \end{pmatrix} = \begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix} + \begin{pmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{pmatrix} \begin{pmatrix} y_{t-1} \\ x_{t-1} \end{pmatrix} + \begin{pmatrix} u_t \\ v_t \end{pmatrix}$$

Akaike

$$AIC = \overbrace{-2 \log L(\hat{\Theta})}^{\text{Goodness-of-fit}} + \overbrace{2p}^{\text{complexity}}$$

$p\uparrow \; \log L \uparrow \Rightarrow$ $\qquad p\uparrow \Rightarrow 2p\uparrow$

$-\log L \downarrow$

$$AIC = \ln \frac{RSS}{T} + \frac{2p}{T}$$

$$BIC = -2 \log L(\hat{\theta}) + \log(T) \cdot p$$

P14

LR elasticity (Analyse LR Dynamics)

$$\frac{\alpha_4 + \alpha_5}{1 - \alpha_2 - \alpha_3}$$

LR equilibrium:

$$\tilde{y} = \frac{\alpha_1}{1-\alpha_2-\alpha_3} + \frac{\alpha_4+\alpha_3}{1-\alpha_2-\alpha_3} \cdot \tilde{x}$$