Econometrics TESTS

Dickey-Fuller test

- Test for non-stationarity (unit root test)
- H_0 → non-stationary

H_1 → stationary

- $\Delta y_t = c + (\alpha - 1) y_{t-1} + \varepsilon_t$

ε_t – W.N.

Augmented Dickey-Fuller test

- Test for non-stationarity (unit root)
- H_0 → non-stationary
- Used in case if ε_t is not W.N (autocorrelated)
- $\Delta y_t = c + (\alpha - 1) y_{t-1} + \sum_{j=1}^{p} \phi_j \Delta y_{t-j} + \varepsilon_t$
- lag order p is chosen automatically by AIC, BIC

LR-test

- Test for Granger causality
- $y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_p y_{t-p} + \beta_1 x_{t-1} + \ldots + \beta_q x_{t-q} + \varepsilon_t$
- X Granger-causes Y, if $\exists \beta_j \neq 0$
- $H_0: \beta_1 = \ldots = \beta_q = 0$ [no effect]
- $n \log\left(\frac{S_0^2}{S_1^2}\right) \sim \chi^2(q)$

Wald F-statistic test

- Test for Granger causality (as LR)
- $H_0: \beta_1 = \ldots = \beta_q = 0$ [no effect]
- $\frac{(RSS_0 - RSS_1)/q}{RSS_1/(n-p-q)} \sim F(q, n-p-q)$
- Model 0 – all $\beta_j = 0$,

Model 1 – model with $\beta_1 \ldots \beta_q$

- $RSS = \sum_i \varepsilon_i^2$

Ljung-Box autocorr. test

- Used as a test for WN
- H_0: no autocorrelation up to lag p

Hausman endogeneity test

- $\begin{cases} y = X\beta_{LS} + \varepsilon_{LS} \rightarrow \text{ordinary} \\ y = \hat{X}\beta_{IV} + \varepsilon_{IV} \rightarrow \hat{x} \text{ estimated via instrumental} \end{cases}$
- $H_0: E(\beta_{LS} - \beta_{IV}) = 0$ [Good] The same coefficients

Variance ratio test

- Test for W.N.
- Test compares daily returns variance σ_d^2 with monthly return per day variance σ_m^2
- $H_0: \sigma_d^2 = \sigma_m^2$ [series is WN]

Hausman-Wu endogeneity test

- You need to find two models:

1) $y = X\beta + \varepsilon$
2) $y = X\beta + \hat{x}^* j + \varepsilon^*$ where $\hat{x}$ suspicious factors which could be endogeneous. These factors are estimated using OLS by others (instrumental exogenious ~~factors~~)

- Then check: $\frac{(RSS_0 - RSS_A)/k^*}{RSS_A/(n-k-k^*)} \sim F(k^*, n-k-k^*)$
- $H_0: j = 0$ [GOOD!] = no endogeneity