

07_DOLS

QuantFit Estimator Standard Operating Procedure

SOP: Dynamic OLS (DOLS)

Stock-Watson cointegration estimator with leads and lags of DeltaX

=> DOLS is a parametric alternative to FMOLS - augment OLS with leads/lags of differenced regressors.

1. Purpose

DOLS removes the long-run correlation between regressors and errors by augmenting the cointegrating regression with leads and lags of DeltaX. The OLS estimate on this augmented regression is asymptotically equivalent to FMOLS but parametrically simpler.

2. When to use this estimator

Cointegrated I(1) variables, single long-run relationship.

Smaller samples where FMOLS kernel choice is sensitive.

Robustness check against FMOLS.

3. Required data structure

All Y and X I(1); cointegration confirmed.

Sample large enough to spare $2(p_{\text{lead}} + p_{\text{lag}})$ observations to the augmentation block.

4. Mathematical formulation

Augmented regression with q leads and p lags of DeltaX:

$$Y_t = \alpha + \beta'X_t + \sum_{j=-p}^q \gamma_j \Delta X_{t-j} + \epsilon_t$$

β_{DOLS} = OLS slopes on X_t

Newey-West HAC SE for inference

5. Pre-estimation diagnostics

I(1) confirmation per variable.

Cointegration test.

Choose lead/lag order via AIC/BIC across a small grid.

6. Estimation procedure

Form DeltaX leads ($j=1..q$) and lags ($j=1..p$).

Augment the cointegrating regression with these leads/lags.

Run OLS and extract β_{DOLS} on contemporaneous X.

Newey-West HAC SE with appropriate bandwidth.

7. Output produced

8. Output interpretation

beta? is the long-run elasticity (same interpretation as FMOLS).
Compare to FMOLS - large discrepancy suggests misspecification.

9. Post-estimation diagnostics

Residual unit-root test.
CUSUM / CUSUMSQ stability.
Compare to FMOLS estimates.

10. Common pitfalls

Too many leads/lags consume degrees of freedom; pick parsimoniously.
Sensitive to outliers in DeltaX leads/lags.
Same I(1)+cointegration prerequisites as FMOLS.

11. Reporting checklist

Lead and lag orders chosen and selection criterion.
HAC bandwidth.
FMOLS comparison column.

12. References

Stock, J. H., Watson, M. W. (1993). A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. *Econometrica*.

Field | Meaning

coefficients | Long-run coefficients

standardErrors | HAC SE

metadata['leads'] / lags | Augmentation orders chosen

residuals / fitted | Cointegrating residuals