10_PMG

QuantFit Estimator Standard Operating Procedure

SOP: Pooled Mean Group (PMG)

Pesaran-Shin-Smith heterogeneous panel ARDL with common long-run

=> PMG pools the long-run coefficients across countries while letting short-run dynamics differ.

1. Purpose

PMG estimates a panel ARDL where the long-run coefficients are constrained to be equal across countries (consistent with theory) while the speed of adjustment, intercepts, and short-run dynamics are allowed to differ. Maximum likelihood is used because the long-run constraint is non-linear.

2. When to use this estimator

Panel ARDL where theory says LR effects are common but SR adjustment differs.

Hausman test fails to reject pooling of LR coefficients (PMG vs MG).

T sufficient per country (typically T >= 20).

3. Required data structure

Balanced or near-balanced panel.

Per-country lag orders selectable; pooled lag default supported.

Same I(0)/I(1) conditions as ARDL.

4. Mathematical formulation

Per-country UECM with pooled long-run vector:

DeltaY_{i,t} = alpha_i + phi_i (Y_{i,t-1} - lambda’ X_{i,t-1}) + Sum ?_i DeltaY_{i,t-j} + Sum ?_{i,jl} DeltaX_{i,j,t-l} + epsilon_{i,t}

lambda same across countries; phi_i, ?_i, ?_{i,jl} country-specific

Estimated by Newton-Raphson MLE; convergence tolerance 1e-5.

5. Pre-estimation diagnostics

Stationarity, slope homogeneity (Pesaran-Yamagata), CSD diagnostics.

Determine maxP and maxQ for the panel lag search (typical maxP=1, maxQ=3).

Decide deterministic case (Case 2 / 3 / 4 per PSS).

6. Estimation procedure

Per-country: select ARDL order by AIC up to maxLag.

Stack per-country UECMs imposing common lambda.

Newton-Raphson MLE on the concentrated likelihood.

Iterate until |Deltalog L| < 1e-5 or 3000 iterations.

Compute long-run SE via the information matrix.

Hausman MG-vs-PMG to validate the pooling restriction.

7. Output produced

8. Output interpretation

lambda? is the long-run elasticity common to all countries.

Per-country phi?_i allows heterogeneous speeds of return to equilibrium.

Hausman p >= 0.05 => PMG pooling is consistent and more efficient than MG.

Hausman p < 0.05 => heterogeneity in lambda; switch to MG.

Variability across phi?_i highlights structural differences in adjustment.

9. Post-estimation diagnostics

Hausman MG-vs-PMG.

Per-country diagnostics where T permits.

Cross-section dependence check on residuals.

10. Common pitfalls

Imposing pooled lambda when heterogeneity exists biases the estimate severely.

Newton-Raphson can fail to converge with poor starting values.

Per-country lag selection: ensure each country has T > 2(p+q) observations.

11. Reporting checklist

Per-country selected ARDL orders.

Pooled long-run table with stars.

Mean ECT and per-country ECT distribution.

Hausman MG-vs-PMG.

Convergence and iteration count.

12. References

Pesaran, M. H., Shin, Y., Smith, R. P. (1999). Pooled Mean Group estimation of dynamic heterogeneous panels.

Pesaran, M. H., Smith, R. P. (1995). Estimating long-run relationships from dynamic heterogeneous panels.

Field | Meaning

longRunCoefficients | Pooled lambda? across countries

longRunSE / longRunTStats / longRunPValues | LR inference

ect | Mean of phi?_i across countries

shortRunCoefficients | Average per-country ?? at lag 0

unitResults | Per-country ARDL fit (lag order, ECT, RECM)

speedOfAdjustmentTable | Per-country half-life and adjustment %

converged | Convergence flag