

**Package Name: Sysmbreak<sup>1</sup>**

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**Date: 2022.01.28**

**Add-in Type: Global**

**Default Proc Name: sysmbreak**

**Default Menu Text: Qu & Perron structural changes testing**

**Interface: Dialog and command line**

## Description

Bai et al. (1998) consider a Sup-Wald test for a single common change in a multivariate system. Qu and Perron (2007) extend the analysis to multiple structural changes that occur at unknown dates in a system of equations. The method of estimation is quasi-maximum likelihood based on Normal errors. Since the method is QMLE method, they apply an iterative Feasible Generalized Least Squares (FGLS) procedure to obtain the estimates. Specifically, the results by Tobing and McGilchrist (1992) is used to construct the recursive residuals from each FGLS iteration needed to apply the dynamic programming algorithm to search for the optimal partition.

Qu and Perron (2007) consider the case where only a subset of the coefficients is allowed to change, whether in the parameters of the conditional mean, the covariance matrix of the errors, or both. The tests are based on the maximized likelihood ratio over permissible partitions assuming i.i.d. errors. Their test can be corrected for serial correlation and heteroskedasticity when testing for changes in the parameters of the conditional mean assuming no change in the covariance matrix of the errors. Their results are, however, only valid in the case of normally distributed errors when testing for changes in variances (or covariances).

## Dialog

Upon running the add-in from the menus, a dialog will appear:

Qu-Perron structural changes testing

Dependent variables (Y) | Trimming parameter

1 | 0.20

Regressors (Z) | Significance level (%)

| 5

Selection matrix (S\_) | Confidence interval (%)

| 95

Restriction matrix, R (optional) |  Breaks in regression coefficient

|  Breaks in the covariance matrix

Maximum breaks (M) |  Correction for serial correlation

2 |  AR(1) pre-whitening

|  Distribution of the regressors to change across regimes

Reference: Qu, Z. and P. Perron (2007): "Estimating and Testing for Structural Changes in Multivariate Regressions", *Econometrica*.

OK Cancel

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<sup>1</sup> I would like to thank Prof. Zhongjun Qu for kindly providing me with the GAUSS codes. This is a direct translation of the Gauss codes of Qu and Perron (2007). Whenever you use this add-in, you should cite the seminal paper (Qu and Perron 2007, "Estimating and testing multiple structural changes in multivariate regressions" *Econometrica*, 75, 459-502).

**Command line:**

sysmbreak(options) y\_variables z\_variables s\_matrix

**For example:**

sysmbreak(rmat=Rm, breaks=2, trim=3(1,2,4,5), sig=2(1,3,4), ci=1(2), brbeta=1(0), brv=0(1), vauto=0(1), prewhit=0(1), hetq=0(1)) "y1 y2" "z1 z2 z3" smat

**References:**

- Bai, J., Lumsdaine, R. L., Stock, J. H. (1998). Testing for and dating breaks in multivariate time series. *Review of Economic Studies*, 65, 395-432.
- Qu, Z., & Perron, P. (2007). Estimating and testing multiple structural changes in multivariate regressions. *Econometrica*, 75, 459-502.
- Tobing, H. and C.A. McGilchrist (1992): "Recursive Residuals for Multivariate Regression Models," *Australian Journal of Statistics*, 34, 217-232.