LOCAL STRUCTURAL CHANGES DETECTION IN RETURNS DYNAMICS

JULIA BONDARENKO

Helmut-Schmidt-University Hamburg
(University of the Federal Armed Forces Hamburg)
Holstenhofweg 85, 22043 Hamburg, Germany
bonda@hsu-hh.de

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Structural breaks and jumps of returns dynamics in financial markets can be motivated by some measure, policy or program realization. Detection of such structural changes has two basic particularities. Firstly, the reaction to measure can start not at the moment of measure implementation, but with lags and even leaps (due to announcement of some measures, like law modification). Really, if we know the exact date of measure realization, we can not know the date when the measure effect starts to appear. Thus, including dummy variables to capture this effect, and also application of the Chow-type tests [4] for known breakpoint, may be inappropriate. On the other hand, neglecting the information about the date of measure implementation (and consequently applying the tests for unknown date like CUSUM- or MOSUM-tests, [3], [5]) seems to be too improvidently. Secondly, the reaction can have only provisional, possibly short-term, inconspicuous and local "real-time" character, that still can break the general trends. This hampers to use of above-mentioned statistics in structural change detection problems as well. In this context, the known tests for structural change, both for specified and unspecified change points, are difficult to apply. In this paper we present a new test which allow to join available information about a measure time/date and some uncertainty related to the response timing in the multivariate linear regression model. For design of the test the recursive CUSUM-test is employed as an underlying statistic. We compared the proposed test with congenerous recursive residuals based CUSUM- and MOSUM-tests and also with supF-test (see [1]) used the most extreme result from Chow tests sequence. Simulation results indicate that the new test has the highest power and all tests have approximately correct sizes. Presented empirical results were obtained using R 2.9.2 software, packages *strucchange()* [6] and *sn()*. It's also proved that the test statistic has a standard distribution [2] that makes the proposed test easy to implement.

References

[1] Andrews D.W.K. (1993). Tests for Parameter Instability and Structural Change with Unknown Change Point. *Econometrica* **61**, 821-856.

[2] Azzaliani A. (1985). A Class of Distributions which Includes the Normal Ones. *Scand. J. Statist.* **12**, 171-178.

[3] Brown R.L., Durbin J., Evans J.M. (1975). Techniques for Testing the Constancy of Regression Relationships over Time. *J. of Royal Statist. Soc. B* **27**, 149-163.

[4] Chow G. (1960). Test of Equality between Sets of Coefficients in Two Linear Regressions. *Econometrika* **28**, 591–605.

[5] Chu C.-S. J., Hornik K., Kuan C.-M. (1995a). Mosum Tests for Parameter Constancy. *Biometrika* **82**, 603–617.

[6] Zeileis A., Leisch F., Hornik K., Kleiber C. (2002). strrucchange: An R Package for Testing for Structural Change in Linear Regression Models. *J. of Statist. Software* **7**, 1–38.