THE EMPIRICAL DISTRIBUTION FUNCTION AND PARTIAL SUM PROCESS OF RESIDUALS FROM A STATIONARY ARCH WITH DRIFT PROCESS

Janusz Kawczak[1], Reg Kulperger[2] and Hao Yu[2]

[1] *Department of Mathematics and Statistics, University of North Carolina, Charlotte, NC 28223, U.S.A.*
[2] *Department of Statistical and Actuarial Sciences, University of Western Ontario, London, Canada N6A 5B7*

Abstract. The weak convergence of the empirical process and partial sum process of the residuals from a stationary ARCH-M model is studied. It is obtained for any $\sqrt{n}$ consistent estimate of the ARCH-M parameters. We find that the limiting Gaussian processes are no longer distribution free and hence residuals cannot be treated as i.i.d. In fact the limiting Gaussian process for the empirical process is a standard Brownian bridge plus an additional term, while the one for partial sum process is a standard Brownian motion plus an additional term. In the special case of a standard ARCH process, that is an ARCH process with no drift, the additional term disappears. We also study a sub-sampling technique which yields the limiting Gaussian processes for the empirical process and partial sum process as a standard Brownian bridge and a standard Brownian motion respectively.

Key words and phrases: Weak convergence, residuals, ARCH, drift, empirical distribution.