Tsay, Ruey S.

Conditional heteroscedastic time series models. (English) Zbl 0636.62092

J. Am. Stat. Assoc. 82, 590-604 (1987).

The paper investigates models for time series $Y_1, Y_2, ...$ with time varying conditional variances. The author proposes the new class of conditional heteroscedastic moving average models, CHARMA(p,q,r,s), defined by the observation equation $\Phi(B)(Y_t - \mu) = \vartheta(B)a_t$ and the equation

$$\delta_t(B)a_t = \omega_t[\hat{Y}_{t-1}(1) - \mu] + \omega_t^*(B)(Y_t - \mu) + e_t$$

for the innovation process $a_1, a_2, ...$ Here $\Phi(B)$, $\vartheta(B)$, $\delta_t(B)$, $\omega_t^*(B)$ are polynomials of the backshift operator B (the two latter ones with random coefficients), e_t is a white noise and $\hat{Y}_{t-1}(1)$ is the optimum predictor of Y_t based on the past up to time t-1.

The relation between CHARMA and two formerly proposed models (special cases) ARCH(p,q) and RCA(p) is established. The invertibility of the Y_t process and the (moment and covariance) properties of the innovation process $\{a_t\}$ are investigated. Ordinary least squares estimates for the process parameters are shown to be consistent and asymptotically normally distributed. Model building and an F test for heteroscedasticity are considered. Finally, two applications are given.

Reviewer: H.H.Bock

MSC:

62M10 Time series, auto-correlation, regression, etc. in statistics (GARCH)
91B84 Economic time series analysis

Keywords:

information criterion; transfer function; consistency; asymptotic normality; AIC model building; ARCH models; RCA models; time series; time varying conditional variances; conditional heteroscedastic moving average models; innovation process; polynomials of the backshift operator; random coefficients; white noise; optimum predictor; CHARMA; invertibility; Ordinary least squares estimates; F test for heteroscedasticity

Full Text: DOI