

AUXILIARY VARIABLE SAMPLER FOR ARCH AND GARCH MODELS

Stefanos G. Giakoumatos

Technological Educational Institute of Kalamata
Department of Local Government
Antikalamos 24100, Kalamata
Greece
stefanos.giakoumatos@ta-teikal.gr

ABSTRACT

In financial time series such as stock returns and exchange rates, it is often met the phenomenon of "volatility clustering". To model this financial phenomenon the Autoregressive Conditional Heteroskedasticity (ARCH) model (Engle, 1982) and the Stochastic Volatility model (Taylor 1986) have been proposed. For the case of ARCH type model, a variety of extensions have been proposed such as the GARCH model (Bollerslev (1986)), EGARCH (Nelson, (1991)), etc.; see Francq and Zakoian (2010).

From the Bayesian perspective, a number of MCMC algorithms have been proposed (Vrontos et al 2001) that produce sample from the posterior distribution of the parameters of the models. However, these algorithms are not easily applied, mainly because the full conditional densities of the parameters are not of the known forms.

In this paper we adopt the methodology of Auxiliary Variable Sampler (Neal (2003), Giakoumatos (2010, 2005), Damien et al. (1999)) and we propose MCMC algorithms for the ARCH and GARCH model where all the full conditionals are of known form. This has as a result that the proposed algorithms to be easily applied by financial practitioners.

The proposed algorithms are also applied to real world data

REFERENCES

- Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics* 31: 307-327.
- Damien, P., Wakefield, J. and Walker, S. (1999). Gibbs sampling for Bayesian non-conjugate and hierarchical models by using auxiliary variables. *Journal of Royal Society, series B*, 61: 331-344.
- Francq, C., Zakoian, J. (2010). *GARCH Models: Structure, Statistical Inference and Financial Applications*. Wiley
- Giakoumatos, S.G., (2010). *Bayesian Stochastic Volatility Models: AUXILIARY VARIABLE METHODS FOR STOCHASTIC VOLATILITY AND OTHER TIME-VARYING VOLATILITY MODELS*. LAP LAMBERT Academic Publishing. ISBN-13: 978-3838386331
- Giakoumatos S.G., Dellaportas P., and Politis D.M. (2005). Bayesian Analysis of the Unobserved ARCH Model. *Statistics and Computing* 15:103-111.
- Neal, R.M. (2003). Slice sampling. *Annals of Statistics* 31:705-767.
- Vrontos, I.D., Giakoumatos, S.G., Dellaportas, P., and Politis, D.N.(2001). An application of three bivariate time varying volatility models. *Applied stochastic models in business and industry* 17:121-133.