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A note on GARCH model identification

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Abstract

Financial returns are often modeled as autoregressive time series with innovations having conditional heteroscedastic variances, especially with GARCH processes. The conditional distribution in GARCH models is assumed to follow a parametric distribution. Typically, this error distribution is selected without justification. In this paper, we have applied the results of Thavaneswaran and Ghahramani [A. Thavaneswaran, M. Ghahramani, Applications of combining estimating functions, in: Proceedings of the International Sri Lankan Conference: Visions of Futuristic Methodologies, University of Peradeniya and Royal Melbourne Institute of Technology (RMIT), 2004, pp. 515–532] on identification of GARCH models to a number of financial data sets.

Keywords: GARCH; Model identification; Least absolute deviation; Least squares; Estimating functions

1. Introduction

The ARIMA time series model suggested by Box and Jenkins [1], has enjoyed fruitful applications in forecasting social, economic, engineering, foreign exchange, and stock problems. This model assumes that the future values of a time series have a clear and definite functional relationship with current, past values and white noise.

Recently there has been growing interest in using nonlinear time series models in finance and economics (see Granger [2] and Thavaneswaran et al. [3]). Many financial series, such as returns on stocks and foreign exchange rates, exhibit leptokurtosis and time-varying volatility. These two features have been the subject of extensive studies ever since Nicholls and Quinn [4], Engle [5], and Engle and Gonzalez-Rivera [6] reported them. Random coefficient autoregressive (RCA) models, (Nicholls and Quinn [4]), the autoregressive conditional heteroscedastic (ARCH) model, (Engle [5], Engle and Gonzalez-Rivera [6]) and its generalization, the GARCH model, (Bollerslev [7]) provide a convenient framework to study time-varying volatility in financial markets. Financial time series models for intra-day trading are typical example of random coefficient GARCH models.

In practice, a common assumption in applying GARCH models to financial data is that the return series is conditionally normally distributed. We shall refer to this as the normal GARCH model. It is well known that the normal GARCH model is part of the volatility clustering patterns typically exhibited in financial and economic time

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