Abstract: The discrete time GARCH methodology which has had such a profound influence on the modelling of heteroscedasticity in time series is intuitively well motivated in capturing many “stylised facts” concerning financial series, and is now almost routinely used in a wide range of situations, often including some where the data are not observed at equally spaced intervals of time. But such data is more appropriately analysed with a continuous time model which preserves the essential features of the successful GARCH paradigm. One such possible extension is the diffusion limit of Nelson [22], but this is problematic in that the discrete time GARCH model and its continuous time diffusion limit are not statistically equivalent (Wang [28]). As an alternative, Klüppelberg et al. [14] recently introduced a continuous time version of the GARCH (the “COGARCH” process) which is constructed directly from a background driving Lévy process. The present paper shows how to fit this model to irregularly spaced time series data using discrete time GARCH methodology, by approximating the COGARCH with an embedded sequence of discrete time GARCH series which converges to the continuous time model in a
strong sense (in probability, in the Skorokhod metric), as the discrete approximating grid grows finer. This property is also especially useful in certain other applications such as options pricing. The way is then open to using, for the COGARCH, similar statistical techniques to those already worked out for GARCH models, and to illustrate this, an empirical investigation using stock index data is given.