This paper presents a Markov chain Monte Carlo based estimation procedure for the COGARCH(1,1) model driven by a compound Poisson process. The COGARCH model is a continuous-time analogue to the discrete-time GARCH model and captures many of the stylized facts of financial time series, as has been shown in various papers. Principles for the estimation of point processes by MCMC are adapted to the special structure of the COGARCH(1,1) model. The algorithm uses discrete GARCH-type equations on a random grid which changes in each iteration of the MCMC sampler. Moreover, exact solutions of the volatility SDE of the COGARCH(1,1) model are available on this grid, so that no approximations of the COGARCH equations are necessary. The method is also applicable to irregularly spaced observations. A simulation study illustrates the quality of the MCMC estimates. Finally we fit the COGARCH(1,1) model to high-frequency data of the S&P500.