

Abstract

The A-PARCH model is among most popular choices of a discrete time series that are attempting at capturing asymmetric responses of returns and volatility to positive and negative 'shocks' -- the leverage effect. Despite its popularity, there is not so much literature on discussing its mathematical properties. In this project, we discuss the model further, including the sufficient conditions on its existence in different metrics, analysis of the role of the parameters, dependence structure and statistical inference strategies. We also point that the model has difficulty to account entirely for non-Gaussian features of the residuals, which are apparent in financial data. Therefore, a new model has been proposed that accounts for the asymmetric response of volatility to positive ('good news') and negative ('bad news') shocks. Our model is using the gamma difference representation of the generalized Laplace distributions that efficiently models the asymmetry. It has one additional natural parameter, the shape, which is used instead of power in the asymmetric power models to capture the strength of a long-lasting effect of shocks. Relevant features of volatility models are illustrated using S&P 500 historical data.