Is GARCH as good a model as the Nobel prize accolades would imply?

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Abstract

The talk discusses the relevance of the stationary, conditional, parametric modeling paradigm embodied by the Garch(1,1) process to describing and forecasting the dynamics of returns of the Standard & Poors 500 (S&P 500) stock market index.

A detailed analysis of the series of S&P returns featured in the illustration of the use of the Garch(1,1) model in estimating and forecasting volatility given in Section 3.2 of the Advanced Information note on the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel reveals that the Garch(1,1) model severely over-estimated the unconditional variance of returns during the period under study.

For example, the annualized implied Garch(1,1) unconditional sd of the sample is 35% while the sample sd estimate is a mere 19%. Over-estimation of the unconditional variance leads to poor volatility forecasts during the period under discussion with the MSE of Garch(1,1) 1-year ahead volatility more than 4 times bigger than the MSE of a forecast based on historic volatility.

We test and reject the hypothesis that a Garch(1,1) process is the true data generating process of the longer sample of returns on the S&P 500 stock market index between March

4, 1957 and October 9, 2003. We investigate then the alternative use of the Garch(1,1) process as a local, stationary approximation of the data and find that the Garch(1,1) model fails during significantly long periods to provide a good local description to the time series of returns on the S&P 500 and Dow Jones Industrial Average indexes.

Since the estimated coefficients of the Garch model change significantly through time, it is not clear how the Garch(1,1) model can be used for volatility forecasting over longer horizons. A comparison between the Garch(1,1) volatility forecasts and a simple approach based on historical volatility questions the relevance of the Garch(1,1) dynamics for longer horizon volatility forecasting for the S&P 500 and Dow Jones Industrial Average index.

JEL classification: C14, C16, C32.

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