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Performance of ARMA-GARCH models in Value at Risk estimation

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Abstract

Value at Risk (VaR) measures the maximal possible loss that may occur under normal market conditions and is the most widely used measure of risk in financial institutions and risk management practices today. In a statistical sense, VaR can be formulated as a quantile of the lower tail of the return distribution, i.e. the loss tail, given a certain confidence level and a time period. In this thesis we introduce how conditional volatility for a log return time series can be modelled by implementing the conditional heteroskedastic GARCH models. The aim of this thesis is to compare the performances of the GARCH models in estimating daily Value at Risk by making distributional assumptions regarding the residuals of the GARCH models. The performance of the models are evaluated using backtesting methods. We apply the ARMA(1,1)-GARCH(1,1) model on the OMXS30 index log return series with Normal and Student's t distributed error terms. In order to forecast the one step ahead VaR we use the ARMA(1,1)-GARCH(1,1) models in a rolling window estimation on an out-of-sample window of one thousand observations. The backtesting results reveal that the Student's t distributed model outperforms the Normal model in estimating daily VaR over the forecasting period. However, rejecting the Normal model is not justified since the evaluation tests disclose that both models are specified adequately enough to predict the volatility process of our forecast period, and do not underestimate the Value at Risk.

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