

New Trends in Financial Engineering: Stochastic Approaches and Computational Intelligent Methodologies

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Summary

The purpose of this thesis is to introduce a semi-parametric financial forecasting model that combines an intelligent learning technique, artificial neural networks, with common econometric GARCH models of volatility. We show how this flexible modeling framework can accommodate most of the stylised facts reported about financial prices or rates of return (nonlinear corrections, asymmetric GARCH effects and nongaussian errors). We analytically discuss several strategies for the specification of the mean and variance components of the model by means of sequential statistical tests and propose variations of the standard testing framework that are robust to model misspecification, i.e. they preserve their asymptotic validity when the model is not correctly specified for the true conditional distribution. The finite-sample performance of testing procedures is investigated by means of Monte-Carlo simulations. To demonstrate various aspects of the model-building strategy, we present two empirical studies. In the first one, we apply NN-GARCH models to forecasting the conditional distribution of daily returns on three major international stock indexes (DAX, FTSE 100, S&P 500) and in the second one we compare the performance of the sequential testing procedure with other statistical and heuristic neural network model-selection strategies in accurately pricing options on the S&P 500 index.