

## ABSTRACT

Autoregressive Conditional Heteroscedasticity (ARCH) models have successfully been employed in order to predict asset return volatility. Predicting volatility is of great importance in pricing financial derivatives, selecting portfolios, measuring and managing investment risk more accurately.

Most of the methods used in the ARCH literature for selecting the appropriate model are based on evaluating the ability of the models to describe the data. In this thesis, the approach taken is based on evaluating the ability of the models to predict the conditional variance rather than on the ability of the models to describe the data. Based on a standardized prediction error criterion (SPEC), a model selection algorithm is developed. According to this algorithm, the ARCH model with the lowest sum of squared standardized forecasting errors as judged by the value of the ratio of two correlated gamma variables is selected for predicting future volatility. The proposed model selection method allows the use of a virtually different model for prediction at each of a sequence of points in time.

A number of evaluation criteria are used to examine whether the SPEC model selection procedure has a satisfactory performance in selecting that model that generates “better” volatility predictions. Moreover, we consider assessing model performance through computing real and simulated option prices based on the volatility forecasts of the underlying asset returns, devising trading rules to trade options on a daily basis and comparing the resulting profits. The results show that traders using the SPEC algorithm for deciding which model’s forecasts to use at any given point in time achieve the highest profits.

Finally, a multi-model selection procedure is proposed, which leads to the selection of the model with the lowest sum of squared standardized one-step-ahead prediction errors. The form of the exact distribution of the test statistic is explicitly derived and the procedure is illustrated in the case of three modes using real data on stock returns.