FINAL PUBLISHABLE SUMMARY REPORT

INDIVIDUAL FELLOWSHIPS

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Marie Curie Actions

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WEBSITE: http://uhfmmodelling.webs.com/

The aim of this EU funded Marie Curie project is the development of a volatility forecasting evaluation framework which combines the state-of-the-art findings in financial and statistical literature. We investigated the advantages and disadvantages of the proposed techniques for the construction of intra-day realized volatility measures. Our intention was to create a realized volatility measure which is accurate and does not suffer from problems such as biasness, mis-measurement, but on the other hand it is straightforward implemented, i.e. not extremely complicated in its construction, or too time consuming in its computation. We reviewed the most broadly used methods of volatility estimation and forecasting. Based on the daily log-returns, the ARCH, or Autoregressive Conditionally Heteroskedastic, process is a widely applied method in estimating and forecasting the *unobserved* asset's volatility. Based on the intra-day realized volatility, the ARFIMA, or Autoregressive Fractionally Integrated Moving Average, model is a broadly applied method in estimating and forecasting realized volatility. The programs on which the estimation and forecasting is based on have been constructed. Moreover, the most commonly used methods (*loss functions*) for comparing the foresting ability of the candidate models, were presented. A volatility forecasting evaluation framework which unites the usage of a well defined loss function with known statistical properties with the simultaneous evaluation of models' forecasting ability has been developed. A loss function is a measure of accuracy, constructed upon the goals of its particular appliance. However, in the majority of the cases, the statistical properties of the loss functions are unknown. In financial forecasting literature, the superiority of a loss function against others is not judged by a statistical-theoretical ground but just from their empirical motivations. The project proposed the usage of the Standardized Prediction Error Criterion, or SPEC, selection procedure, which is based on a loss function whose exact distribution is explicitly derived. The SPEC method is based on the Minimum Multivariate Gamma, or MMG, distribution. The MMG distribution is the cumulative distribution function of the minimum half sum of squared standardized one-step-ahead prediction errors. The realized volatility has been constructed based on ultra-high frequency data for 17 stock indices and 3 Euro exchange rates. The sampling frequency was selected according to the volatility signature plot, and the realized volatility was adjusted to changes in the prices during the hours that the markets are closed. Three models were estimated with the annualized inter-day adjusted realized daily logarithmic standard deviation as dependent variable. The models are re-estimated at each trading day based on a rolling sample of constant size of 1000 trading days. A dynamic evaluation of models' performance was conducted. We supplied empirical evidence that the model with the lowest half sum of squared standardized prediction errors does provide more adequate one-step-ahead forecasts of the dependent variable, i.e. in our case of the annualized inter-day adjusted realized daily logarithmic standard deviation. The majority of the studies about ultra high-frequency realized volatility modelling are conducted from research institutions in the USA. The proposed project increased the attractiveness of Europe for researchers who are specialized on the topic of volatility estimation and forecasting. The

findings of the project would be helpful in strengthening risk management techniques, i.e. regulatory capital requirements in Basel II, which now applies to all banks in Europe. The basic idea of the project is the construction of a robust framework for comparing various forecasting models. A long-term synergy could be the application of the proposed method to other scientific areas, where forecasting evaluation is significant.