Modelling and forecasting realised volatility[1]

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This paper provides a general framework for integration of high-frequency intraday data into the measurement, modelling and forecasting of daily and lower-frequency volatility and return distributions. Most procedures for modelling and forecasting financial asset return volatilities, correlations and distributions rely on restrictive and complicated parametric multivariate ARCH or stochastic volatility models, which often perform poorly at intraday frequencies. Use of realised volatility constructed from high-frequency intraday returns, in contrast, permits the use of traditional time series procedures for modelling and forecasting. Building on the theory of continuous-time arbitrage-free price processes and the theory of quadratic variation, we formally develop the links between the conditional covariance matrix and the concept of realised volatility. Next, using continuously recorded observations for the Deutsche mark/dollar and yen/dollar spot exchange rates covering more than a decade, we find that forecasts from a simple long-memory Gaussian vector autoregression for the logarithmic daily realised volatilities perform admirably compared to popular daily ARCH and related models. Moreover, the vector autoregressive volatility forecast, coupled with a parametric lognormal-normal mixture distribution implied by the theoretically and empirically grounded assumption of normally distributed standardised returns, gives rise to well calibrated density forecasts of future returns and correspondingly accurate quantile estimates. Our results hold promise for practical modelling and forecasting of the large covariance matrices relevant in asset pricing, asset allocation and financial risk management applications.

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