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Abstract

Essays on the modelling and prediction of financial volatility and trading volumes

Doctor of Philosophy

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Aim of this thesis is to propose and discuss novel model specifications for predicting financial volatility and trading volumes using intra-daily information. *Chapter 1* provides a literature overview on modelling financial volatility and volumes and introduces the most important contributions and findings of the thesis. *Chapter 2* presents an extension of the Realized GARCH model by Hansen et al. (2012) along three different directions. First, we allow for heteroskedasticity of the noise term in the measurement equation, since it is assumed to be time-varying as a function of an estimator of the integrated quarticity of intra-daily returns. Second, in order to account for attenuation bias effects, we let the volatility dynamics to depend on the accuracy of the realized measure. This is achieved by leaving the response coefficient of the lagged realized measure, to depend on the time-varying variance of the volatility measurement error, giving more weight to lagged volatilities when they are more accurately measured. Finally, we account for jumps by introducing in the measurement equation an additional explanatory variable aimed at quantify the bias due to the effect of jumps. *Chapter 3* develops a further extension of the Realized GARCH model of Hansen et al. (2012) for forecasting daily volatility incorporating information from multiple realized volatility measures computed at different sampling frequencies in order to achieve the optimal trade-off between bias and efficiency. Namely, future volatility forecasts are determined by a weighted average of the considered realized measures, where the weights are time-varying and adaptively determined according to the estimated amount of noise and jumps. This specification aims to reduce, in an adaptive fashion, bias effects related to the different sampling frequency at which the realized measure are computed. *Chapter 4* proposes a novel approach for modelling and forecasting high-frequency trading volumes, extending the logic of the Component Multiplicative Error Model of Brownlees et al. (2011), by a more flexible specification of the long-run component, since it is based on a MIDAS polynomial structure through an additive cascade of linear filters adopting heterogeneous components which can take on multiple frequencies, in order to reproduce the strong persistent autocorrelation structure featuring intra-daily trading volumes. Finally, *Appendix A* presents an empirical application on tick-by-tick data filtering and highlights the main features and issues surrounding ultra high-frequency datasets.