Evaluating the effect of intra-daily sampling frequency on Value-at-Risk predictions: Empirical evidence from high-frequency ICE oil futures

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Abstract

In this paper we examine sensitivities in realized volatility estimates by using various intra-daily sampling frequencies and interpolation methods for Brent crude oil futures traded at the Intercontinental Exchange (ICE). The various realized volatility estimates are subsequently modeled and forecasted to predict day-ahead Value-at-Risk. Our results show that the frequency at which the intra-daily returns are sampled, and the choice of interpolation method, is of crucial importance when estimating and predicting day-ahead Value-at-Risk for Brent crude oil futures. When applying the simplest interpolation method, i.e., just using the last available ticker price prior to the minute of interest, the use of prices sampled at the very highest frequency (1-minute) result in severe violations at all significance levels. We find that the 'optimal' sampling frequency when using raw previous tick data is at five minutes.

Interpolating the high-frequency prices using a simple linear interpolation technique result in an 'optimal' sampling frequency of 1 minute. The main conclusion is thus that practitioners can choose to use the simplest method sampled at a somewhat coarser frequency (five minutes instead of one minute), and obtain very good VaR predictions when using high-frequency intra-daily data for ICE Brent crude oil futures.