Smoothing methods for histogram-valued time series. An application to Value-at-Risk

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Abstract-

We adapt smoothing methods to histogram-valued time series (HTS) by introducing a barycentric histogram that emulates the “average” operation, which is the key to any smoothing filter. We show that, due to its linear properties, only the Mallows-barycenter is acceptable if we wish to preserve the essence of any smoothing mechanism. We implement a barycentric exponential smoothing to forecast the HTS of daily histograms of intradaily returns to both the SP500 and the IBEX 35 indexes. We construct a one-step-ahead histogram forecast, from which we retrieve a desired ? -value-at-risk (VaR) forecast. In the casse of the SP500 index, a barycentric exponential smoothing delivers a better forecast, in the MSE sense, than those derived from vector autoregression models, especially for the 5% VaR. In the case of IBEX35, the forecasts from both methods are equally good.

Index Terms- symbolic data; exponential smoothing; barycenter; high-frequency data; value-at-risk

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