HSBC Quants Academy

Project 1 – Market Risk

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Project Description

The purpose of this project is to present basic quantitative tools used for VaR risk projections. In particular, this involves definitions and comments on the most common VaR estimation methods like:

- Historical VaR
- Filtered Historical VaR
- Gaussian VaR

The estimators should be applied to recent market data, i.e. daily (close price) returns for selected four major stock index returns (e.g. DAX, FTSE, WIG, S&P, NIKKEI). VaR at level 1% should be computed using different lookback/estimation periods (e.g. n=250,500) for multiple days in 2020. The performance of each estimator should be assessed in reference to COVID-19 induced market shocks. Evaluation should include backtesting results, i.e. 1-day rolling-window backtest that is aligned with regulatory backtest concept.

Data

Data should be downloaded from a publically available data sources (e.g. finance.yahoo). We recommend to download daily closing prices and use this to create daily relative returns. The data period should be the last full 5 years.

Questions / Requirements

Student is required to complete the following steps:

- Download and describe the downloaded data. Compute and graphically present return rated for the considered period and comment on the outcome taking into account COVID-19 turmoils. I.I.D. data property (or lack of it) should be discussed and tested.
- Propose a couple of daily VaR (at level 1%) estimators, discuss related mathematical background, and estimation methods pros and cons. In particular, different lookback (learning) periods should be used and different estimation techniques should be proposed.
- Using the introduced VaR models the risk for all business days in the period should be computed and graphically presented.
- Backtesting should be used to evaluate each model performance. The performance should be assessed in reference to COVID-19 data and differences should be commented (e.g. resulting from size of lookback period or the used methodology). One could also consider different performance metrics based e.g. on PIT-based backtests or mean quantile score evaluation.
- The best estimator should be selected and discussed in details. In particular, potential flows should be outlined and potential enhancements could be proposed

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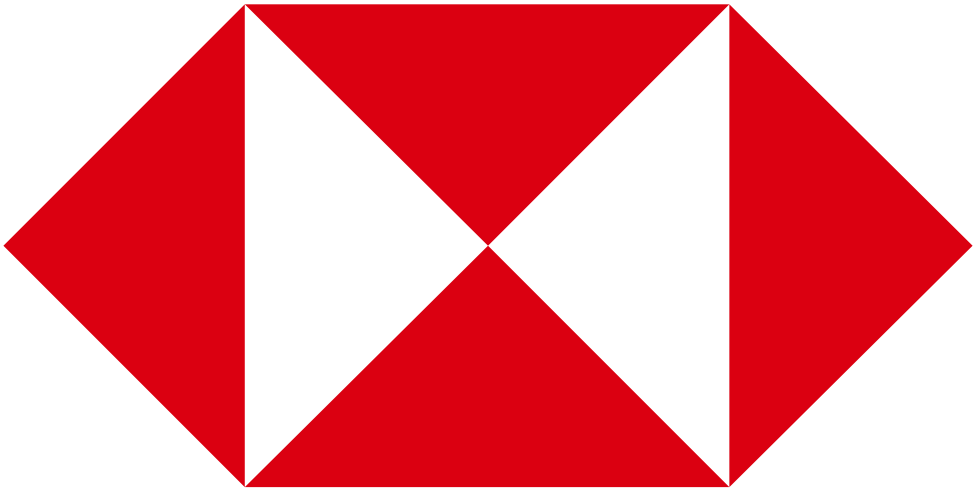

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