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# Advanced Asset Management

Master 203
Project Assigment

# 1 Introduction

This report presents a study of the backtesting of a cluster-based long/short momentum strategy, based on the returns of the Eurostoxx 50's constituents. The aim of this report is twofold. First, it aims to study the evolution of the 2 clusters' composition over time. Then, it seeks to describe the statistical tests performed on the strategy to assess if the performance is only attributable to luck or not.

# 2 The Strategy

## 2.1 Clusters

The clusters are built based on the correlation between returns as a distance and the Ward linkage methodology. Doing so, when constructing a long/short portfolio on each cluster based on an inverse volatility scheme, we should be able to obtain a smaller residual beta (in absolute value) than we would get without clusters. Thus, this methodology helps to be exposed to the momentum and less to the market. In Figure 1 we can observe the number of stocks by cluster over time.

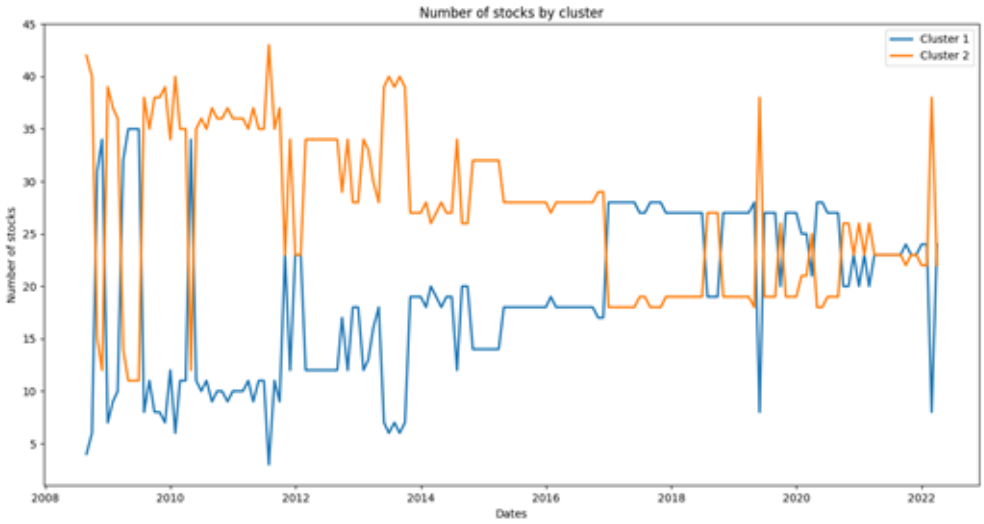


Figure 1: Cluster composition through time

## 2.2 Statistical test of luck

In order to assess if the statistics of our strategy are due to some particular asset management skills or luck, we implement a simple test whose null hypothesis ($H_0$) is that the statistics observed are due to luck.

First of all, we construct a number N of random portfolios. Those portfolios still have to respect some constraints:

- They have to be long/short portfolios with weights summing to 0.
- The portfolio should short as many stocks as it longs
- Once the selections of which stock has to be bought and which has to be sold, they are weighted using inverse volatility.

The randomness appears in the long/short selection. Instead of creating clusters and selecting using momentum, 23 (the number of stocks divided by 2) stocks are randomly selected to be shorted.

Once we have those N random portfolios, we can compute different metrics (return, Sharpe ratio, etc..). This gives us our metrics' distributions under the null hypothesis of luck.

Finally, we obtain our confidence intervals taking the $ConfidenceLevel - \frac{100-ConfidenceLevel}{2}$ and $ConfidenceLevel + \frac{(100-ConfidenceLevel)}{2}$ percentiles of the different distributions. Here are our results with a 95% confidence interval:

| Key Statistics | | | |
|---|---|---|---|
| Statistic tool | MLNH EMVW | Benchmark | Random 95% |
| Annualized Returns | 2.96% | 3.9% | [-3.38,2.8]% |
| Annualized Volatility | 11.3% | 20.44% | [5.23,7.01]% |
| Sharpe Ratio | 0.26 | 0.19 | [-0.54,0.44] |
| Max Drawdown | -25.62% | 54.21% | [-33.88,-10.64]% |
| 95% CVaR | -4.06% | -7.37% | [-3.14,-2.09]% |

One can notice that the strategy shows a better annualized return than a "lucky" one. On the other hand, while having a lower volatility than the market, it is still outside the confidence interval but not on the good side... Same observation for the CVaR. Finally, according to this test, the Sharpe ratio, as well as the maximum drawdown, can be attributed to luck.