



PRINCIPIA

# Smart-beta portfolios

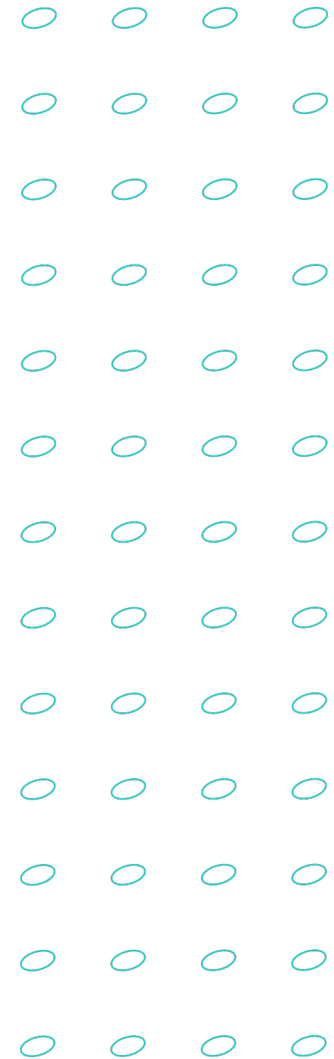
A machine learning approach

# FACTOR INVESTING

The seeds of factor investing were sown in the 1960s, when the capital asset pricing model (CAPM) was first introduced. The CAPM posited that every stock has some level of sensitivity to the movement of the broader market—measured as **beta**.

Stephen Ross introduced an extension of the CAPM called the arbitrage pricing theory (APT) in 1976.

Widely used factors: **Size, Value, Momentum, Growth, Quality, Volatility**.



# FACTOR INVESTING



## Historical Performance of Factor Strategies

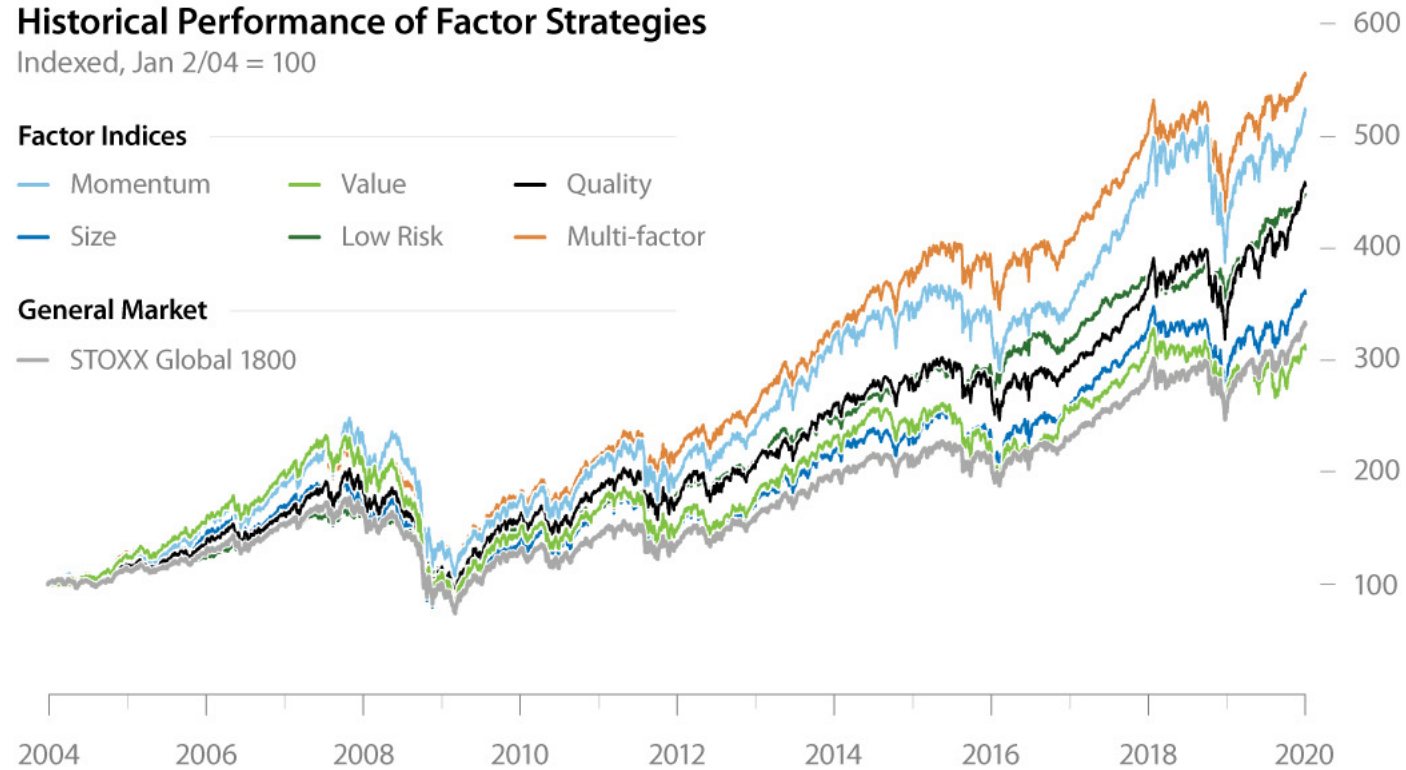
Indexed, Jan 2/04 = 100

### Factor Indices

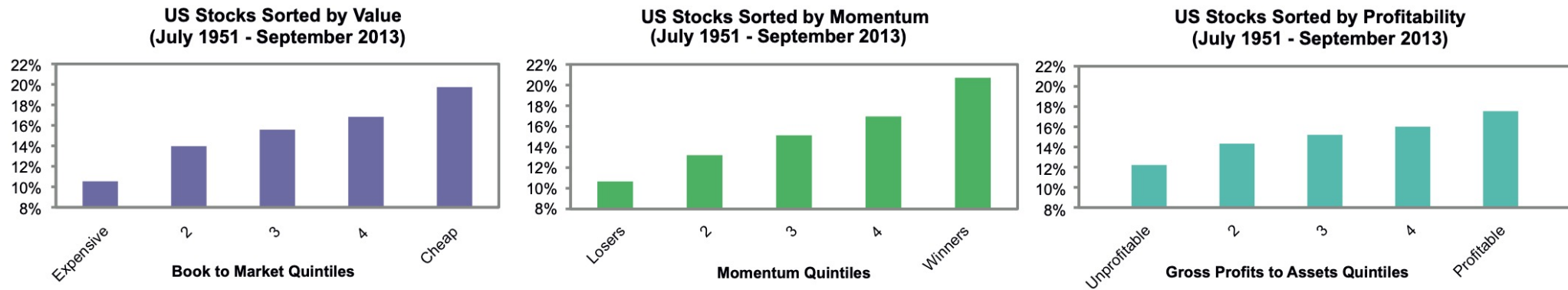
Momentum Value Quality  
Size Low Risk Multi-factor

### General Market

STOXX Global 1800



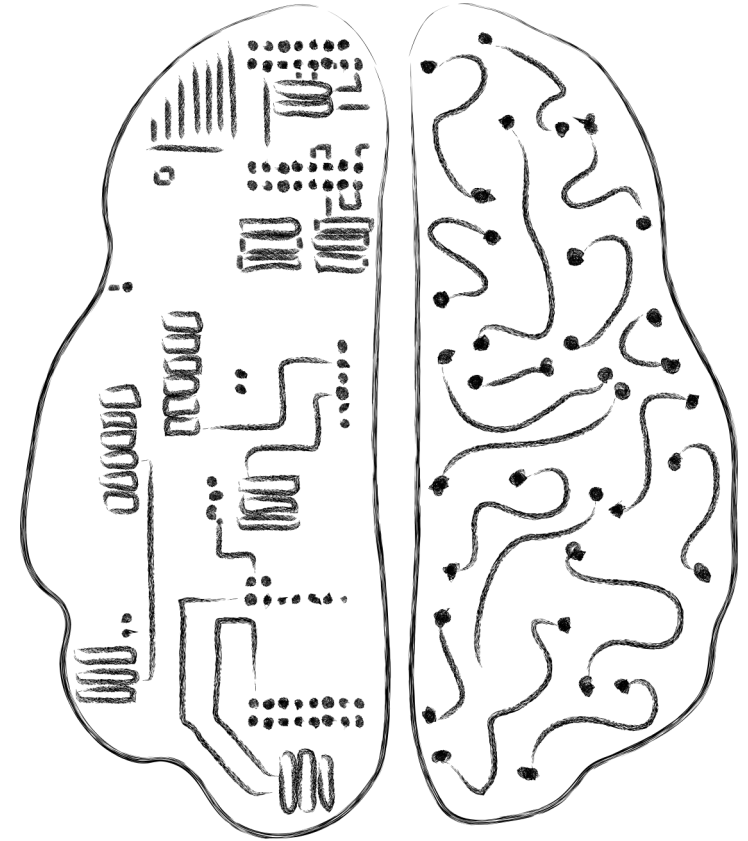
# AD-HOC APPROACH

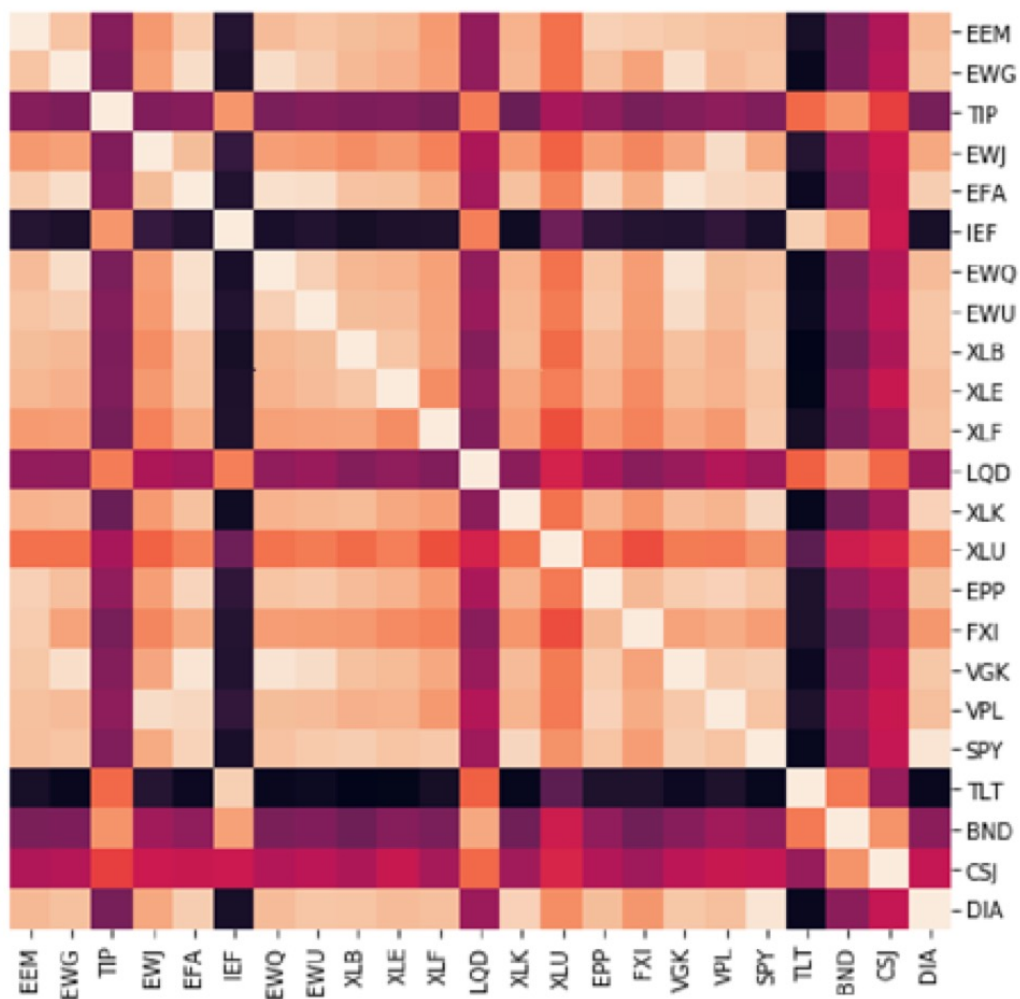


Sources: Ken French Data Library, AQR. Value and Momentum quintiles based on decile-level information provided by Ken French. Profitability quintiles are based on CRSP/Compustat data, using the same universe as the Ken French Value and Momentum series. The profitability quintiles are based on a single factor – Gross Profits over Assets (GPOA). Returns are gross of transaction costs.

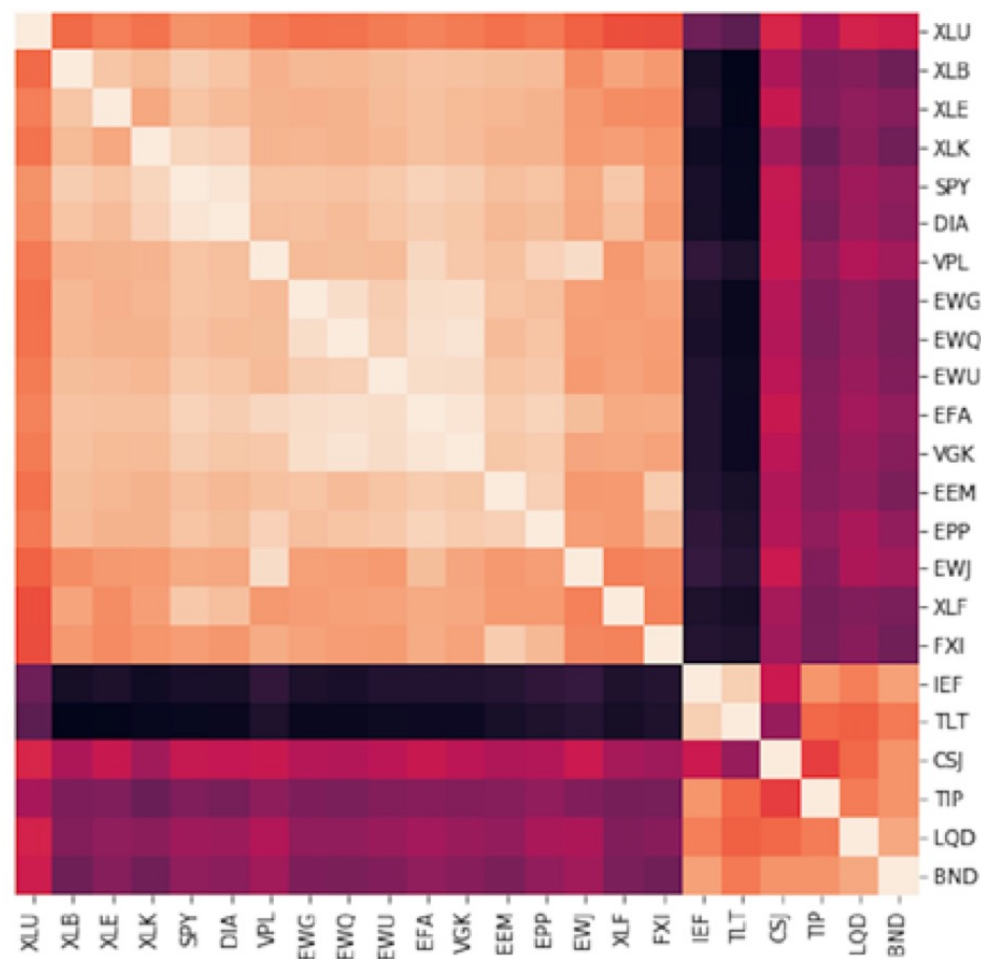
WHAT CAN GO WRONG?

# HIERARCHICAL RISK PARITY ALGORITHM





**Unclustered Correlations**



**Clustered Correlations**

# ML APPROACH

We can use fundamental data screening to get exposure to a specific factor(s) combined with unsupervised machine learning portfolio optimization.



## Create fundamental screener

Using various financial ratios (Book to Price, PE, Sales Growth, etc) generate a set of screeners which give exposure to a specific factor.



## Apply HRP algorithm

Find optimized portfolio out of a universe filtered by a fundamental screener.



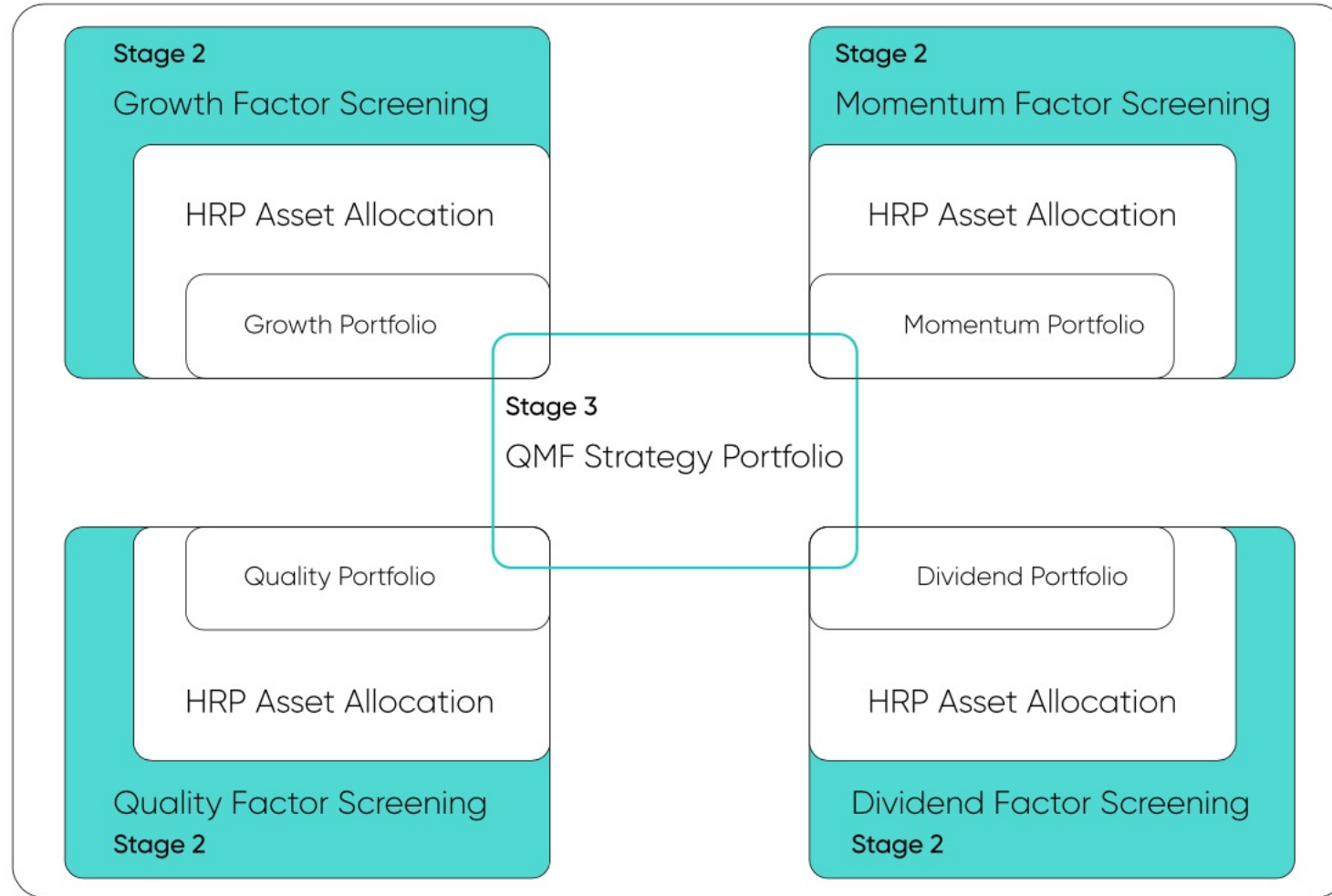
## Mix factors!

Get allocation for each factor-portfolio (screener) using HRP algorithm.



Stage 1

Identifying Equity Universe



# FRAMEWORKS



**Bloomberg**



**PORTFOLIO LAB**

BY HUDSON & THAMES





**THANK YOU**



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