Machine Learning for Hedge Fund Selection

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Goals of Hedge Fund Portfolio Construction

- Achieve stable long-term performance, avoid large drawdowns
- Feasibility study to investigate if ML can add value to investment process
Identifying Similarities of Hedge Fund Managers

- **Diversify → Avoid concentrations**

- **Self-Organising Maps (SOM):** project objects on a map

- Inputs are managers’ returns of the last 48 months

- Similar objects are being projected closely together

- Managers with similar return profiles appear on the same unit: Managers M5 and M6 on the same unit
Portfolio Construction: Method SOM_REMOTE

- Pick hedge funds from remote units of the SOM, e.g., from the 4 units in the bottom left, bottom right, upper left and upper right corners
SOM_DISPERSION: Focus on Return Dispersion

- Diversification
- Unique Hedge Fund Strategies
- Heterogeneity of Managers
- High Return Dispersion

Dispersion within the Units on the SOM

Pick managers from this unit!!
Empirical Dispersion

- Orange: SOM_REMOTE, red: SOM_DISPERSION
Simulation Study: 4 Ways to Construct Portfolios

• **SOM_REMOTE**: Randomly pick 3 managers each from the 4 most remote units of the SOM, i.e., from the 4 units in the bottom left, bottom right, upper left and upper right corners, together 12 managers

• **SOM_DISPERSION**: Randomly pick 3 managers from the 4 units with highest dispersion, together 12 managers

• **Free**: Randomly pick 12 managers from the universe. No constraints

• **Style**: Each of the 12 managers needs to come from a different style. The styles are taken from Barclay Hedge [e.g., Equity Long/Short, Macro, Event Driven etc.]
Simulation Study

- Barclay Hedge Database
- Filter managers by size, age, etc.: ca. 1,000 remain for analysis each year
- We assume a 3 month implementation gap
- For Vintage Year 2008, we estimate [5 x 5] SOM with data from 10/03 to 9/07 [48 months]

1) Pick 12 managers according to the 4 construction methods (Free, Style, SOM_REMOTE, SOM_DISPERSION)
2) Invest in 1/08 and hold the hedge fund investments until 12/08. No rebalancing, just buy & hold
3) Measure out-of-sample performance: 1/08 to 12/08
   • Repeat 10,000 times from step 1), then move time window 1 year ahead and do this again
Simulation Study: Rolling Windows

In sample: estimate SOM

10/03 - 9/07

Out-of-sample

1/08 - 12/08

Vintage Year

2008

In sample: estimate SOM

10/04 - 9/08

Out-of-sample

1/09 - 12/09

2009
Results: Out-Of-Sample Equity Lines

SPX
Barclay Hedge Fund Index
Free
Style
SOM_REMOTE
SOM DISPERSION
Results: Out-Of-Sample Percentiles

- Percentiles measured over 10,000 simulation runs for each year
- SOM:
  - Reduce negative returns (2008, 2011)
  - But: upside in times of rising equity markets reduced
- In total: more even performance
Results: Out-Of-Sample Return / Risk

- Risk measures enhanced: lower vol and drawdowns
- However, also returns reduced

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<thead>
<tr>
<th></th>
<th>Style</th>
<th>SOM_DISPERSION</th>
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<tbody>
<tr>
<td>Mean Return</td>
<td>4.4%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Vol</td>
<td>6.5%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Return / Vol</td>
<td>0.69</td>
<td>0.86</td>
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</tbody>
</table>
• SOM methods reduce drawdowns → enhanced risk/return

• In our simulation experiment, managers were picked randomly

• More intelligence can be applied → focus on managers with the capability to generate alpha over a set of risk factors

• Run SOM as an initial step to identify managers with unique strategies
  – purchase in a stand-alone portfolio
  – add as a sub-portfolio to an existing portfolio
• SOM can be applied to many problems to identify similarities in data, e.g., fraud detection, benchmarking

• SOM can deal with non-linear & noisy data

• SOM for risk analysis: If managers of an existing portfolio come all from the same part of the SOM, there is little diversification to expect in times of crisis

• Commercial product received seed commitment $ 100 mln
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