ESG: A New Dimension in Portfolio Allocation

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Joint work with Jan De Spiegeleer, Stephan Höcht, Daniel Jakubowski and Wim Schoutens
Portfolio allocation: risk and return

**EURO STOXX 50 - September 2019**

- Expected return (annualized)
- Volatility (annualized)

- Efficient frontier
- Individual assets

ESG Portfolio Allocation
The ESG dimension

▶ Each company can be evaluated on its environmental, social and governance (ESG) performance.

▶ ESG indicators:
  - ESG rating
  - Greenhouse gas emissions intensity
  - Employee turnover rate
  - ...

▶ 3 dimensions: risk, return and ESG performance.
The ESG dimension

Why including ESG data?

1. Extra information might result in enhanced portfolio performance

2. Support the transition towards
   - a sustainable economy → UN Sustainable Development Goals
   - a low-carbon economy → mitigate climate change (EU Green Deal, EU climate benchmarks)
The minimum variance surface

ESG ratings example.

Portfolio ESG score = weighted average of company ESG scores.
Objective of this talk

What is the impact of including environmental, social and governance (ESG) criteria in the allocation of equity portfolios?


- Two sustainability measures:
  - ESG ratings
  - Greenhouse gas emission intensity
ESG rating data

ESG scores:
- weighted average key issue scores - reported by MSCI
- overall company sustainability grade between 0 (poor) and 10 (good)
Green constrained efficient frontier

- optimize risk-return trade-off, subject to ESG constraints
- green portfolio has a minimum required ESG score
ESG investment strategy

- Invest in the minimum variance portfolio satisfying ESG targets.
  → minimize risk, subject to ESG constraints

- **4 levels of greenness:**
  
  - Dark green: $\text{ESG} \geq \text{ESG}_{MV} + 20\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}})$
  
  - Green: $\text{ESG} \geq \text{ESG}_{MV} + 10\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}})$
  
  - Brown: $\text{ESG} \leq \text{ESG}_{MV} - 10\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}})$
  
  - Dark brown: $\text{ESG} \leq \text{ESG}_{MV} - 20\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}})$

  with $\text{ESG}_{MV}$ the ESG score of the minimum variance portfolio.
Strategy performance

- quarterly portfolio rebalancing
Brown ESG strategies yield higher returns

Yearly return
MV 11.03%
Brown 11.48%
Dark brown 12.58%

Volatility
MV 10.45%
Brown 10.56%
Dark brown 11.15%

Maximum drawdown
MV 16.29%
Brown 15.57%
Dark brown 15.04%
Green ESG constraints have little impact

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum variance (MV)</th>
<th>Green MV</th>
<th>Dark green MV</th>
<th>Brown MV</th>
<th>Dark brown MV</th>
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<tbody>
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<td>2020</td>
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<td>620</td>
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</tbody>
</table>

**Yearly return**
- MV: 11.03%
- Green: 11.00%
- Dark green: 11.52%

**Volatility**
- MV: 10.45%
- Green: 10.57%
- Dark green: 10.82%

**Maximum drawdown**
- MV: 16.29%
- Green: 16.35%
- Dark green: 15.95%
No significant difference in risk behavior

6-months realized volatility

6-months maximum drawdown
Comparing returns: timing is crucial

Investment period:
Dec 2009 - Dec 2015

Investment period:
Dec 2015 - Dec 2019
Dependence on the choice of ESG rating agency?

- Rating agencies do not agree: (Berg et al., 2019), (Chatterji et al., 2016),
  (Dorfleitner et al., 2015), etc.

- Empirical study on the EURO STOXX 50 universe
  - **MSCI**: ESG score between 0 (poor) and 10 (good).
    \[\rightarrow\] weighted average key issue scores
  - **Sustainalytics**: ESG score between 0 (poor) and 100 (good).
    \[\rightarrow\] traditional ESG scores \(\neq\) ESG Risk Ratings
The impact of including Sustainalytics’ ESG scores is larger - both for green and brown ESG targets.
Greenhouse gas emissions
GHG intensity

- Greenhouse gas (GHG) intensity:

\[
\text{GHG intensity} = \frac{t\text{CO}_2\text{e}}{\text{MCap}}
\]

- \(t\text{CO}_2\text{e}\) = scope 1 and 2 CO\(_2\)-equivalent emissions of the company (in tonnes/year)
- \(\text{MCap}\) = the company’s market capitalization (in million EUR)

- Why this measure?
  - Motivate companies to reduce emissions
  - TEG report on climate benchmarks
GHG investment strategy

- Invest in the minimum variance portfolio satisfying GHG targets.
  → minimize risk, subject to GHG intensity constraints

- **3 levels of greenness:**
  
<table>
<thead>
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<th>Level</th>
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<td>Green</td>
<td>30% GHG reduction</td>
</tr>
<tr>
<td>Dark green</td>
<td>50% GHG reduction</td>
</tr>
<tr>
<td>Brown</td>
<td>150% GHG increase</td>
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- TEG report on climate benchmarks:
  - Climate Transition Benchmark (CTB): 30% reduction
  - Paris-Aligned Benchmark (PAB): 50% reduction
GHG investment strategy

- Invest in the minimum variance portfolio satisfying GHG targets.

- **3 levels of greenness:**
  
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<tr>
<td>Brown</td>
<td>150%</td>
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  w.r.t. minvar portfolio

- **Sector constraints:**
  
  - Equal GICS sector exposure
  - Higher exposure to high-climate impact sectors (NACE)
Strategy performance

- Yearly rebalancing (in June)

Yearly return
- MV 12.64%
- CTB 12.65%
- PAB 12.15%

Volatility
- MV 10.58%
- CTB 10.61%
- PAB 11.29%

Max. drawdown
- MV 16.28%
- CTB 16.35%
- PAB 15.78%
No significant difference in risk behavior

6-months realized volatility

6-months maximum drawdown
How large is the volatility gap exactly?

- volatility difference \( = \sigma_{\text{GHG}} - \sigma_{\text{MV}} \)
- negative difference: GHG strategies have lower risk

```
Maximum overshoot
CTB  0.15%
PAB  0.31%
Brown 0.12%
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Volatility difference (annualized)

- Green - CTB
- Dark green - PAB
- Brown

Conclusion

- Environmental, social and governance (ESG) factors: extra dimension in portfolio allocation

- ESG investment strategies - based on minimum variance portfolio

- STOXX 600 study:
  - **ESG ratings**: no clear-cut evidence for enhanced performance
  - **GHG intensity**: emission reductions do not require increased risk or diminished returns
Thank you.

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