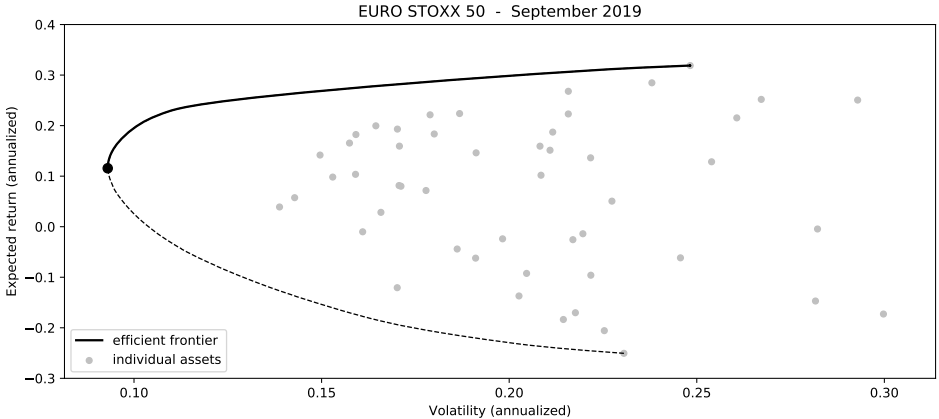
KU LEUVEN

ESG: A New Dimension in Portfolio Allocation

Sofie Reyners

Joint work with Jan De Spiegeleer, Stephan Höcht, Daniel Jakubowski and Wim Schoutens

Portfolio allocation: risk and return



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.

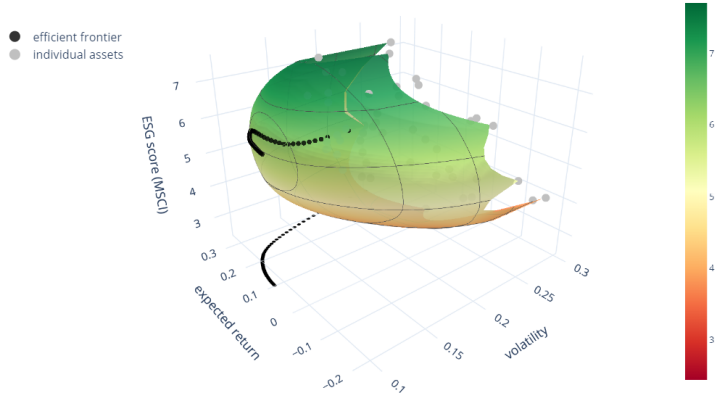
The ESG dimension

Why including ESG data?

1. Extra information might result in enhanced portfolio performance
2. Support the transition towards
   - a sustainable economy
     $\rightarrow$ UN Sustainable Development Goals
   - a low-carbon economy
     $\rightarrow$ 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?*

- Empirical analysis (2009 - 2019): STOXX Europe 600 universe
- Two sustainability measures:
  - ESG ratings
  - Greenhouse gas emission intensity

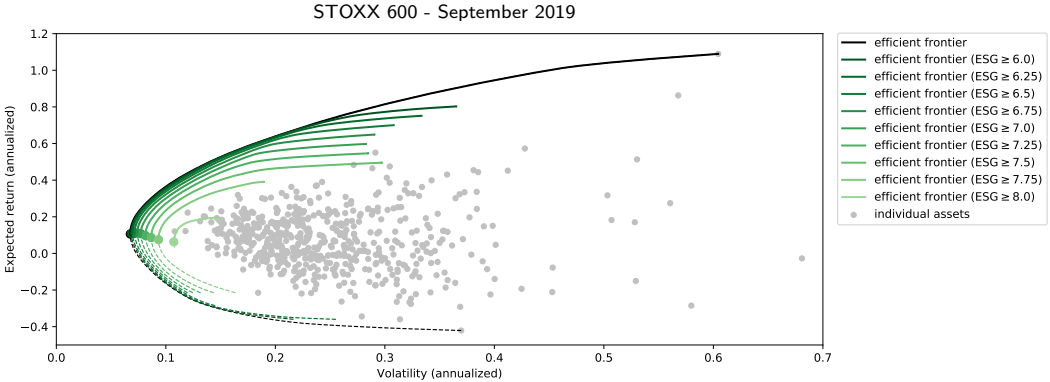
ESG rating data

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.
  $\rightarrow$ minimize risk, subject to ESG constraints

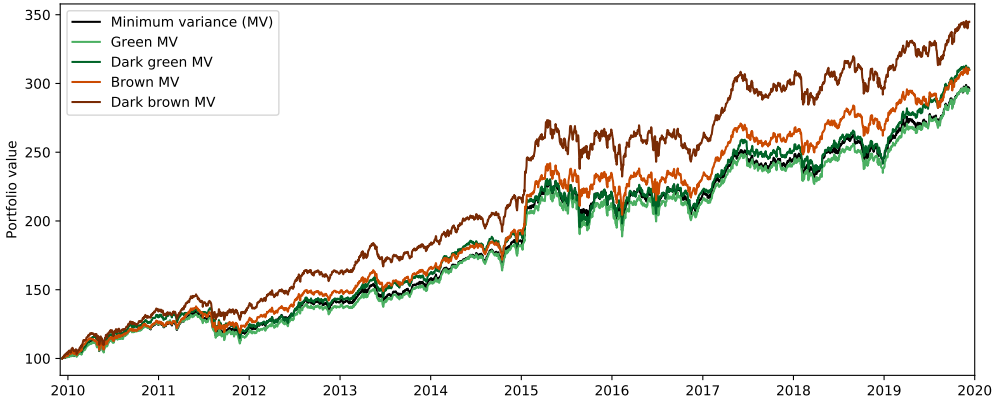
- **4 levels of greenness**:

$$
\begin{array}{lllll}
\text{Dark green:} & \text{ESG} & \geq & \text{ESG}_{\text{MV}} + 20\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}}) \\
\text{Green:} & \text{ESG} & \geq & \text{ESG}_{\text{MV}} + 10\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}}) \\
\text{Brown:} & \text{ESG} & \leq & \text{ESG}_{\text{MV}} - 10\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}}) \\
\text{Dark brown:} & \text{ESG} & \leq & \text{ESG}_{\text{MV}} - 20\% \cdot (\text{ESG}_{\text{max}} - \text{ESG}_{\text{min}})
\end{array}
$$

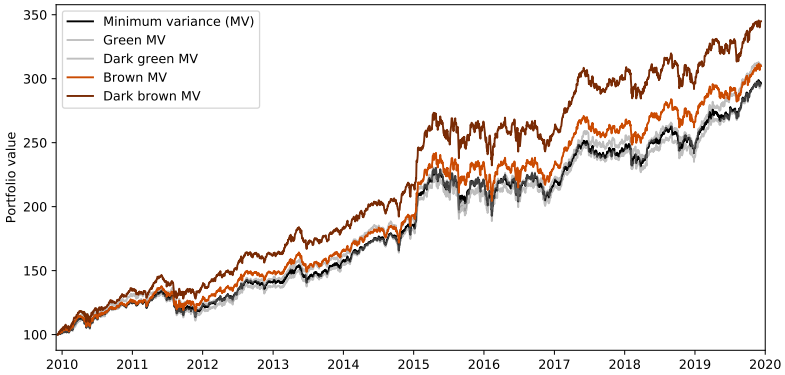
with ESG_{MV} the ESG score of the minimum variance portfolio.

Strategy performance

- quarterly portfolio rebalancing



Brown ESG strategies yield higher returns



Yearly return

MV	11.03%
Brown	11.48%
Dark brown	12.58%

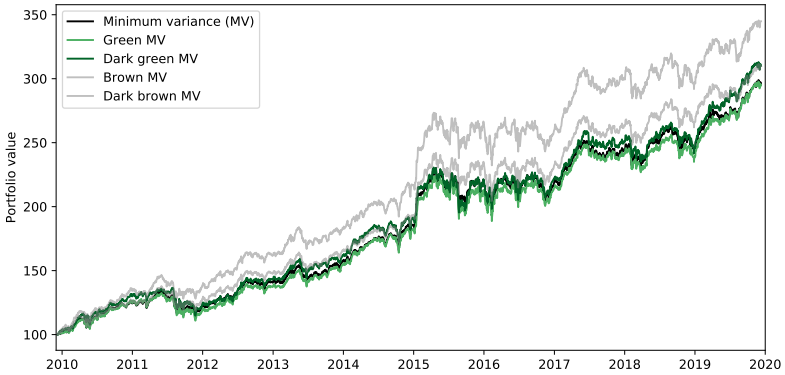
Volatility

MV	10.45%
Brown	10.56%
Dark brown	11.15%

Maximum drawdown

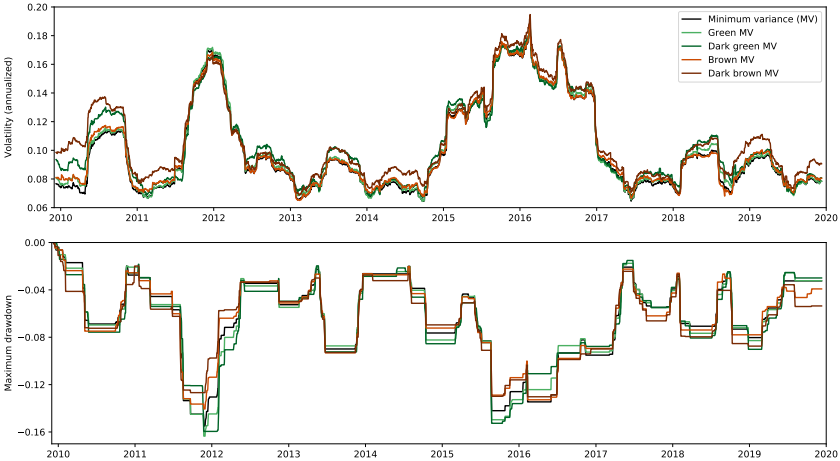
MV	16.29%
Brown	15.57%
Dark brown	15.04%

Green ESG constraints have little impact



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

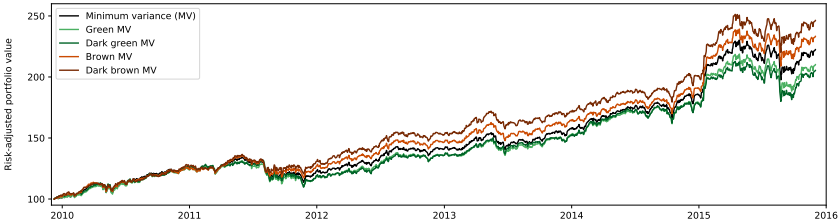


6-months realized volatility

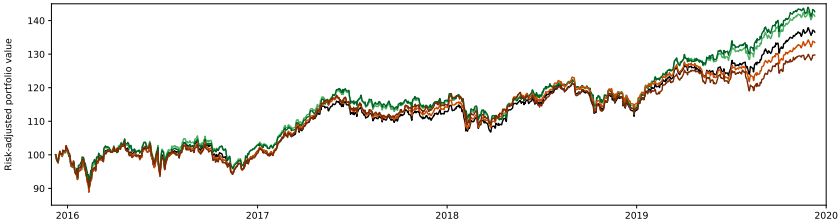
6-months maximum drawdown

KU LEUVEN

Comparing returns: timing is crucial



Investment period:
Dec 2009 - Dec 2015



Investment period:
Dec 2015 - Dec 2019

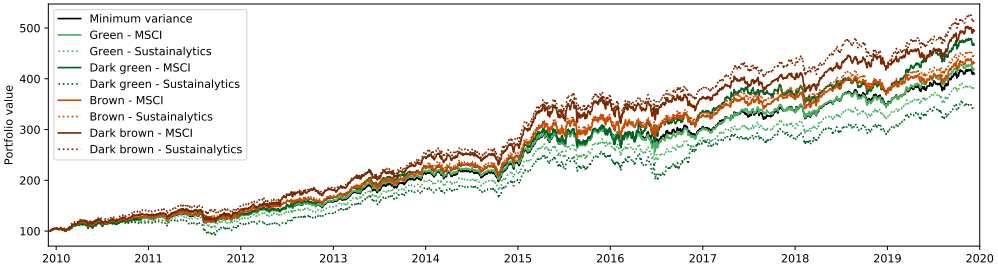
Dependence on the choice of ESG rating agency?

- 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).

    $\longrightarrow$ weighted average key issue scores
  - **Sustainalytics**: ESG score between 0 (poor) and 100 (good).

    $\longrightarrow$ traditional ESG scores ($\neq$ ESG Risk Ratings)

Strategy performance: MSCI vs. Sustainalytics



- 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:

$$\text{GHG intensity} = \frac{\text{tCO}_2\text{e}}{\text{MCap}}$$

  - tCO_2e = scope 1 and 2 CO_2-equivalent emissions of the company (in tonnes/year)
  - 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.
  $\rightarrow$ minimize risk, subject to GHG intensity constraints

- **3 levels of greenness**:

Green:	30% GHG reduction	w.r.t. minvar portfolio
Dark green:	50% GHG reduction	
Brown:	150% GHG increase	

- TEG report on climate benchmarks:
  - Climate Transition Benchmark (CTB): 30% reduction
  - Paris-Aligned Benchmark (PAB): 50% reduction

GHG investment strategy

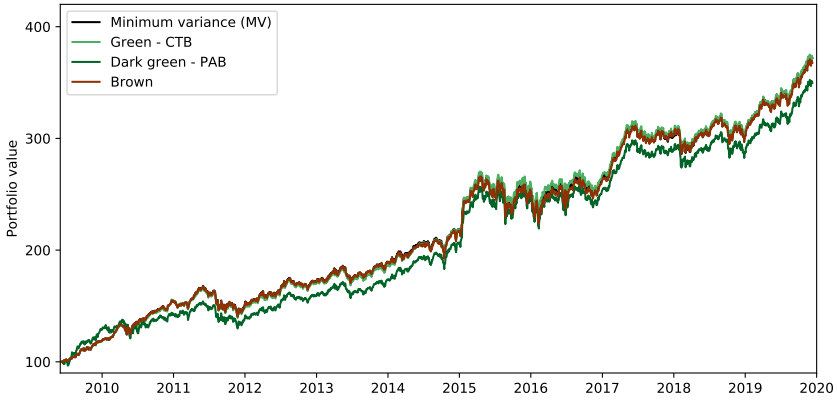
- Invest in the minimum variance portfolio satisfying GHG targets.
- **3 levels of greenness**:

Green:	30% GHG reduction	w.r.t. minvar portfolio
Dark green:	50% GHG reduction	
Brown:	150% GHG increase	

- 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%

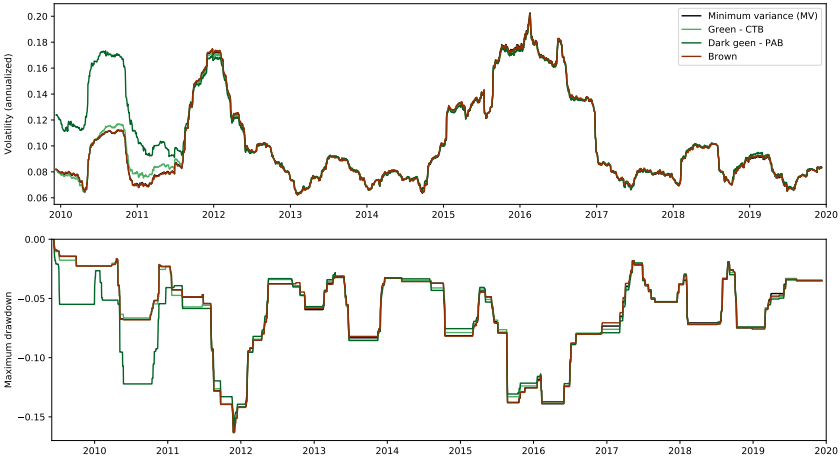
Volatility

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

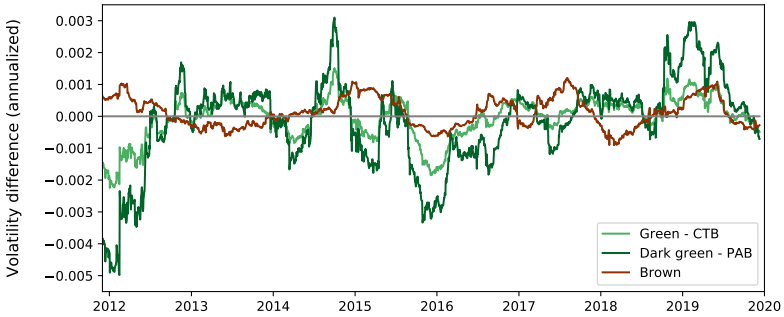


6-months realized volatility

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%

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.

Contact: sofie.reyners@kuleuven.be