Morningstar ESG Preferences Portfolio Construction Tool

Methodology

Introduction
As awareness around environmental and social issues has grown, more investors than ever have incorporated an environmental, social, and governance focus into their investment processes. Because of global initiatives like the United Nations Sustainable Development Goals,[1] client demand, and changing regional disclosure requirements,[2] investors now face increasing calls for transparency on the real-world social and environmental impacts of their ESG-focused strategies. To meet these needs, the Morningstar Quantitative Research team has developed a portfolio construction tool to incorporate investors’ ESG-related preferences into the portfolio construction process and produce a portfolio well balanced between matching the asset class policy and one’s ESG preference.

The Morningstar ESG Preferences Portfolio Construction Tool constructs fund-level portfolios to facilitate the advisor-led models and lineups. A flexible optimization framework is created that allows for a wide variety of optimization problem formulations. Its most notable features are a rich collection of objective function bases and an ease-of-application for specific use cases, such as ESG-preferences optimization.

Key Takeaways:
The tool:
► Allows individual-level customization via a preferences utility vector obtained from the Morningstar ESG Preferences Survey.[3]
► Supports targeting investment policy models by way of asset-allocation targets.
► Dynamically calibrates internal parameters to produce effective results for a wide variety of lineups.
Model Highlights
Several features make the Morningstar ESG Preferences Portfolio Construction Tool flexible and robust:

► To allow for flexibility of user-specific optimization, minimum constraints are imposed to ensure the constructed portfolio aligns with asset class policy and avoids concentration in one fund. The trade-offs expressed by users between ESG themes and market portfolio are directly used as the importance weighting to balance the two components in the objective function.

► Instead of using one aggregated ESG score for each fund, the optimizer considers 15 underlying ESG metrics divided into two main categories:
  ▶ Product Involvement. Metrics that represent percentage of revenue earned from negative ESG themes including thermal coal, fossil fuel, palm oil, pesticides, tobacco, gambling, alcohol, small arms, controversial weapons, and military contracting.[4]
  ▶ Impact Metrics: Metrics that represent percentage of revenue devoted to positive ESG themes including climate action, healthy ecosystems, resource security, human development, and basic needs.[5]

Optimizer Input
The optimizer minimally requires four sets of inputs: a set of user preferences from one single user, the asset class policy that is predetermined for the user, a covariance matrix, and an investment opportunity set.

1. User Preferences
Investor-specific preferences for ESG and pecuniary topics; generated from an efficacious preference measurement tool.

2. Asset Class Policy
An investment policy portfolio with allocations to six broad asset classes. The six broad asset classes include U.S. stocks, developed-markets ex-U.S. stocks, emerging-markets stocks, U.S. bonds, ex-U.S. bonds, and cash. The asset class policy is determined based on investor responses to the risk-tolerance questionnaire administered by Morningstar Advisor Workstation.

3. Covariance Matrix
A covariance matrix is a square symmetric matrix to estimate the extent to which assets move together. The tool takes in the exposures of funds to asset classes and combines with the asset class covariance matrix to construct a fund level covariance matrix. This setup ensures the optimizer is agnostic to the source of the covariance matrix.

4. Investment Opportunity Set
A collection of open-end funds and exchange-traded funds to optimize within. These are provided by the advisor.
Optimizer Multiple Objective Formula

The objective to maximize in the optimizer is defined as the aggregated Impact Metrics with user-defined preferences with TE penalty

\[ \max P_{\text{Impact Metrics}} \lambda_I \mathbf{w}^T - P_{\text{Market}} \lambda_T E(\mathbf{w} - \mathbf{w}_P)^T \Sigma (\mathbf{w} - \mathbf{w}_P) \]  

where:
- \( \mathbf{w} \): vector of fund weights
- \( \mathbf{w}_P \): vector of asset class policy weights
- \( I \): Impact Metrics scores vector normalized to \([0,1]\) scale
- \( P \): user preference(s)
- \( \lambda \): multiplier assigned to each component
- \( \Sigma \): covariance matrix

Optimizer Constraints

The optimizer is further configured with four areas of constraints to uphold a disciplined optimization process. The constraints ensure the final portfolio maintains a minimum diversification, fits within the investment policy, and has no deterioration for ESG metrics with strong user preference compared with the benchmark portfolio.

1. Diversification Constraints

The individual fund weight upper-bound is dynamically defined based on the number of equity and fixed-income funds available from the feasible set and the policy asset-class allocation

\[ w_{p,i} \leq \max \left( 20\%, \frac{A_b}{U_{EB(b)}} \times 1.5 \right) \]  

where \( A_b \) is the weight of broad asset class \( b \) in the asset-allocation policy \( A \) and \( U_{EB(b)} \) is the set of eligible funds in the lineup that belongs to broad asset class \( b \). \( B \) is the set of all broad asset classes.

2. Benchmark-Aware Constraints

A maximum deviation of 5% is allowed between the optimal portfolio's realized asset class exposure and the provided investment policy allocation.

\[ A_b - 5\% \leq \sum w_{p,i} \leq A_b + 5\% \]  

3. ESG Constraints

- Security-Level Product Involvement Exclusion Constraints

Fund candidates with significant Product Involvement scores are excluded from the final portfolio

\[ w_{p,i}^{PI,j > \text{thresh}_j} = 0 \]
where $PL_{i,j}$ is the Product Involvement score of fund $i$ in theme $j$ and $thresh_{j}$ is the Product Involvement threshold in theme $j$, which targets exclusions on non-zero Product Involvement scores in theme $j$ of all funds in the investment sample.

For example, all funds with a positive Product Involvement score in theme $j$ will be excluded from the final portfolio if its exclusion ratio is set to 100%. Exclusion ratios are defined as preference weights.

**Portfolio-Level ESG Constraints**
This set of constraints enforces no-deterioration of Product Involvement and Impact Metric scores relative to a benchmark such as the average of the investment opportunity set or a tracking error minimized portfolio that doesn't make any ESG considerations.

\[
PL_{p,j} \leq PL_{bmk,j},
\]
\[
IM_{p,j} \geq IM_{bmk,j}
\]

where $PL_{p,j}$ and $PL_{bmk,j}$ are Product Involvement scores in theme $j$ of the final ESG portfolio and benchmark and $IM_{p,j}$ and $IM_{bmk,j}$ are Impact Metrics scores in theme $j$ of the final ESG portfolio and benchmark.

This set of constraints is only turned on for topics for which users express a high preference level.

**4. Additional Constraints**
Long-only constraints and capital fully invested constraints are applied. Additional constraints such as turnover constraint and cardinality constraint can be activated at the investors' request.

\[
\sum w_{p,i} = 1
\]
\[
w_{p,i} \geq 0
\]

**Multiplier Derivation**
To allow the user’s preference to directly control the trade-off between tracking error improvement and Impact Metrics improvement in the optimization process, multipliers, specified as lambdas in equation (1) are applied to both terms in the objective function. Because the search ranges for the two components can vary drastically, a multiplier is required to bring both terms to a similar scale before applying the importance weighting.

There were several possible methods for defining a multiplier. After experimenting with a set of methods, a runtime efficient method that tested empirically well across lineups was adopted.

**Impact Metrics Midpoint**
First, calculate the median metric of Impact Metrics for two optimized portfolios with a single objective, and then take that Impact Metric as the budget to calculate the corresponding tracking error. The average of Impact Metrics and the calculated tracking error are the used as the denominator in the following formulation, respectively.
\[ \lambda_{\text{Impact Metric}} = \frac{1}{\text{Midpoint of Impact Metric}} \]
\[ \lambda_{\text{Tracking error}} = \frac{1}{\text{Calculated Corresponding Tracking error}} \]

By calculating the midpoint of two optimized portfolios, the process ensures the realized Impact Metrics and ex-ante tracking component are at similar scale.

### Exhibit 1 Multiplier Derivation

![Multiplier Derivation Diagram](image)

Source: Morningstar Quantitative Research Team.

### Conclusion

ESG Preferences Portfolio Construction Tool achieves four high-level goals that are deemed desirable from both product and user perspectives:

1. The tool can produce an efficient trade-off curve between portfolio ESG metrics and ex-ante tracking error with an asset class policy portfolio.
2. The tool offers flexible adjustment of the importance weighting for portfolio ESG metrics and ex-ante tracking error based on the user-preference setting.
3. The tool produces reasonable well-balanced portfolios across investment pools and various user-preference inputs.
4. The tool achieves parsimonious parameter setting, and the user inputs are directly applied in the optimization process.
References


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