Quantitative Investment Strategies

Disciplined, rules-based investing to meet a range of client goals for efficient, risk-adjusted return
“We have been managing multifactor portfolios for over a decade, with demonstrable success. We believe that a systematic approach to investing, using quantitative techniques and leveraging the latest academic insights to efficiently combine factors, will generate attractive and persistent risk-adjusted returns relative to market-cap indexing.”

Sean Phayre,
Global Head of Quantitative Investments
Our Quantitative Investment Strategies

From market-cap indexation to enhanced indexation, smart beta and active quant using artificial intelligence, we look to provide clients with a range of robust and fully-tested strategies to allow them to target the appropriate level of risk-adjusted return for their needs.
Introduction

About Quantitative Investment Strategies

Our team of more than 30 dedicated quantitative investment professionals identifies sources of excess risk-adjusted return to create a diverse range of systematic strategies to meet client needs.

Our Quantitative Investment Strategies (QIS) team manages assets across a diverse range of systematic products and solutions. Our strategies include traditional passive indexation (equity and fixed income), enhanced indexation, smart beta, active quant using artificial intelligence (AI), and structured products using derivatives.

Experienced specialist team
Our stable, cohesive and highly experienced investment team of over 30 investment professionals was formed in 2005 and is based in London, Edinburgh and Shanghai. Using proprietary, rules-based approaches we manage quantitative equity, fixed income and derivative portfolios across all markets, providing clients with products and solutions that are customised to their needs.

Understanding sources of return
Our investment process is grounded in academic research and investment theory. We identify sources of excess risk-adjusted returns, test them throughout the business cycle and use them in our quantitative portfolios in a systematic, cost-effective and risk-controlled manner. Our in-depth understanding of the individual sources of returns allows us to combine them into effective solutions, leaving us well placed to meet our clients’ requirements.

Our quantitative products and customisable client solutions include:
• Indexation across equity and fixed income
• Enhanced indexation (BETTER\(^1\) Beta)
• Smart beta (SMARTER\(^2\) Beta)
• Active quant using AI (DISCOVER\(^3\) Alpha)
• Structured products using derivatives

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\(^1\) BETTER = Beta, Enhanced market cap, Tight tracking error, Transparent, ESG Inside and RIPE factors.
\(^2\) SMARTER = Systematic, Multifactor, Active Measures, Resilient, Transparent, ESG Inside and RIPE factors.
\(^3\) DISCOVER = Dynamic factor timing, Innovative, Systematic, Collaboratively developed, Optimised portfolio construction, Versatile, ESG Inside and RIPE factors.
Our partnerships

Innovation through collaboration

Our open-innovation approach focuses on collaboration with world-class partners, helping us to advance our investment thinking and ensuring that all our solutions draw on the highest-quality data and analytics.

We are partners with

<table>
<thead>
<tr>
<th>SMARTER Beta calculation agent</th>
<th>Artificial intelligence</th>
<th>Environmental, Social and Governance (ESG) data partner</th>
<th>ESG academic partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHS Markit</td>
<td>MTEC</td>
<td>Sustainalytics</td>
<td>SSEE</td>
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</table>

We have appointed IHS Markit, a world leader in critical information and analytics, as the index calculation agent for our SMARTER Beta range of multifactor equity indices and the funds tracking them.

A wholly-owned subsidiary of MUFG Trust Bank, MTEC is Japan’s first and most prestigious financial technology think tank. We have joined forces with MTEC to develop global equity active quantitative strategies employing AI.

Our environmental, social & governance (ESG) data partner, Sustainalytics, is an independent research, ratings and analysis firm. We use Sustainalytics data in all of our factor-based investing strategies.

We have produced ESG Smart Beta research in partnership with the University of Oxford’s Smith School of Enterprise and the Environment (SSEE), a global centre of excellence for research on climate change and sustainability.
Meeting client needs

Covering the full spectrum of client needs

Our solutions vary from strategies seeking to deliver robust risk-adjusted excess returns to those built to deliver excess return systematically by taking higher levels of active risk.

To meet the needs of our clients, our quantitative investment strategies span the spectrum of market risk to active risk. Our beta strategies include market-cap indexation and enhanced indexation (BETTER Beta).

Non-market-cap solutions are provided by our smart beta range of multifactor equity indices and funds. Finally, our DISCOVER Alpha strategy employs artificial intelligence to systematically take active risk and generate return.
Our approach

Experts in multifactor investing

For over a decade, we have been taking a factor-based approach to investing – enabling our clients to achieve attractive risk-adjusted return and mitigate the impact of market drawdowns on their portfolio performance.

We have been managing multifactor portfolios since 2007, with demonstrable success. We believe that a systematic approach to investing, using quantitative techniques and leveraging the latest academic insights to efficiently combine factors, will generate attractive and persistent risk-adjusted returns relative to market-cap indexing.

We believe that a multifactor approach helps to mitigate the effects of drawdowns relative to equivalent market-capitalisation weighted indices. And in our view, exposure to RIPE (Robust, Intuitive, Persistent and Empirical) factors within equities provides potential to increase risk-adjusted excess returns by reaping the full benefits of factor diversification.

Our proprietary, rules-based approach to factor-investing has been developed over more than a decade and has been shaped by our multifactor mindset.
Harvesting RIPE factors
Factors are attributes or characteristics applying to a group of stocks that may help to explain their risk and return prospects. Factor premia are company characteristics that have been empirically proven to be persistent drivers of excess risk-adjusted returns.

Our proprietary, rules-based approach to factor-investing has been developed over more than a decade and has been shaped by our multifactor mindset. All of our factor-investing strategies harvest those factors that meet our RIPE – Robust, Intuitive, Persistent and Empirical – criteria. In equities, the resulting RIPE factors include value, quality, momentum, small size, low volatility and options volatility.

Why factors arise
These factors arise in financial markets due to behavioural and structural anomalies. From a behavioural (non risk-based) perspective, a mispricing arises because investors have mistaken beliefs, incomplete information, or non-rational preferences. From a structural (risk-based) perspective, the mispricing arises and persists because there are limits or costs to arbitrage that prevent it from being bid away.

Our RIPE factors

<table>
<thead>
<tr>
<th>Value</th>
<th>Buying cheap companies and selling expensive ones.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Investing in prudently managed companies that maximise value creation and return capital to shareholders. Buying financially robust companies with strong balance sheets and increasing profitability.</td>
</tr>
<tr>
<td>Momentum</td>
<td>Investing based on improving trend (positive price momentum and improving earnings) and sentiment (positive changes in investors' perceptions).</td>
</tr>
<tr>
<td>Small size</td>
<td>Investing in small companies (based on market capitalisation).</td>
</tr>
<tr>
<td>Low volatility</td>
<td>Buying companies displaying low volatility.</td>
</tr>
<tr>
<td>Options volatility</td>
<td>Capturing the spread between implied and realised volatility via index options.</td>
</tr>
</tbody>
</table>
ESG Inside

Investing responsibly for our clients

We look to embed environmental, social and governance (ESG) considerations into our investment process – delivering more value for our clients.

As a responsible investor, we incorporate ESG in all of our systematic investment strategies in such a way that it adds value for our clients. Our ESG Inside methodology excludes those companies producing controversial weapons (CW) and those experiencing ‘category 5’ (C5) severe controversies as rated by our ESG data partner Sustainalytics. Where applicable, we also optimise portfolios on ESG scores.

ESG Inside
Specifically excluded companies

<table>
<thead>
<tr>
<th>Sustainalytics’ Category 5 ‘severe controversies’</th>
<th>Controversial weapons*</th>
</tr>
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<tbody>
<tr>
<td>• Impact and risk are severe and irreversible</td>
<td>Cluster bombs</td>
</tr>
<tr>
<td>• The case is highly exceptional in the peer group</td>
<td>• Public companies that are involved in the production of cluster bombs and munitions, or the essential components of these products</td>
</tr>
<tr>
<td>• Impact of the misconduct is on a broad range of stakeholders over a long duration and imposes a clear cost on society</td>
<td>Landmines</td>
</tr>
<tr>
<td>• There are serious ongoing risks posed to the company</td>
<td>• Public companies that are involved in the production of anti-personnel landmines, anti-vehicle landmines, or the essential components of these products</td>
</tr>
<tr>
<td>• The company is directly responsible for the misconduct.</td>
<td>Depleted uranium weapons</td>
</tr>
<tr>
<td>• The level of involvement is exceptional among peers in numerous respects</td>
<td>• Public companies that are involved in the production of depleted uranium weapons and armour</td>
</tr>
<tr>
<td>• Cases are recurring and have not been addressed adequately or at all</td>
<td>Chemical and biological weapons</td>
</tr>
<tr>
<td>• The company has failed to demonstrate the ability to remediate the issue</td>
<td>• Public companies that are involved in the production of chemical and biological weapons, or the essential components of these products</td>
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<tr>
<td>• The company has refused to address the issue and/or has tried to conceal the wrongdoing and/or its involvement</td>
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*Source: Aberdeen Standard Investments and Sustainalytics.
Our strategies

Our factor-investing strategies

Drawing on our RIPE factors, we’ve developed a range of strategies that target different levels of excess return relative to market-cap indices.

Each of these strategies employs RIPE factors and our ESG Inside methodology:

**BETTER Beta**
Uses factor premia tilts to be better than the substitute market-cap index and acts as a substitute for market-cap indexing (passive management).

**SMARTER Beta**
Uses factor premia to be smarter than the equivalent market-cap index and acts as a third approach to investing that combines the best of both passive management and active management.

**DISCOVER Alpha**
Uses machine learning to discover alpha through dynamic factor timing and acts as a complement to active fundamental approaches (active management).

How our factor-based strategies compare to traditional beta

<table>
<thead>
<tr>
<th>Traditional Beta</th>
<th>BETTER Beta</th>
<th>SMARTER Beta</th>
<th>DISCOVER Alpha</th>
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<tbody>
<tr>
<td><strong>Target return</strong></td>
<td><strong>Target return</strong></td>
<td><strong>Target return</strong></td>
<td><strong>Target return</strong></td>
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<tr>
<td>Market-cap index</td>
<td>Market-cap index +0.75%</td>
<td>Market-cap index +2% to 4%</td>
<td>Market-cap index +4% to 6%</td>
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<tr>
<td>Market-cap index</td>
<td>Value</td>
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<td>Value</td>
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<td>Small size</td>
<td>Options volatility</td>
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<td>Options volatility</td>
<td>Low volatility</td>
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<tr>
<td>Low volatility</td>
<td>Market-cap index</td>
<td>Market-cap index</td>
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</tr>
</tbody>
</table>
Value
Inexpensive companies

Options volatility
Options premium

Quality
Financially healthy companies

Low volatility
Lower risk companies

Momentum
Trending companies

Small size
Smaller companies

6 RIPE factors
Our strategies

Our factor-based strategies compared

Key differences between the three factor-investing strategies:

<table>
<thead>
<tr>
<th>BETTER Beta</th>
<th>SMATER Beta</th>
<th>DISCOVER Alpha</th>
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<tbody>
<tr>
<td>Enhanced indexation</td>
<td>Multifactor smart beta</td>
<td>Active quant using AI</td>
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</table>

**Investment approach**

- **BETTER Beta**
  - A market-capitalisation, ‘multifactor’ equity strategy, designed to maximise the information ratio.
  - The starting universe is the constituent stocks of the applicable market-capitalisation weighted index, which is then subjected to socially responsible investment (SRI) exclusions (‘controversial weapons’ only).
  - Factors are strategically weighted towards delivering consistent low-risk outperformance of the applicable market-capitalisation weighted index.

- **SMATER Beta**
  - A non-market capitalisation, systematic, ‘multifactor’ equity strategy, aiming to maximise the Sharpe ratio.
  - Starting universe is a much broader range of stocks from the IHS Markit universe which is then subjected to SRI exclusions (both ‘controversial weapons’ and Sustainalytics’ Category 5 ‘severe controversies’).
  - Targets multiple enhanced RIPE factors – value, quality, momentum, small size and low volatility. The factor designs differ from those used for BETTER and SMARTER Beta.
  - Factor weightings are timed dynamically, both inside and across the five factor premia, aiming to deliver outperformance relative to the applicable market-capitalisation weighted index.

- **DISCOVER Alpha**
  - A non-market capitalisation, systematic, ‘multifactor’ equity strategy, aiming to maximise the Sharpe ratio through dynamic factor timing.
  - Starting universe is subject to SRI exclusions (both ‘controversial weapons’ and Sustainalytics’ Category 5 ‘severe controversies’).
  - Targets multiple enhanced RIPE factors – value, quality, momentum, small size and low volatility. The factor designs differ from those used for BETTER and SMARTER Beta.
  - Factor weightings are timed dynamically, both inside and across the five factor premia, aiming to deliver outperformance relative to the applicable market-capitalisation weighted index.
  - Artificial intelligence (AI), particularly machine learning, is used to analyse constantly evolving financial markets data and identify and recall patterns in markets. Based on those similar patterns, it dynamically times factor exposures with the aim of generating alpha.

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1 A measure of a stock or portfolio’s risk-adjusted excess returns. Calculated as the return in excess of the benchmark index, divided by the relevant tracking error. The higher the information ratio, the more an investor is compensated for bearing relative risk.

2 Sharpe ratio: also known as the ‘reward-to-variability ratio’, is a measure of a stock or portfolio’s risk-adjusted performance relative to the risk-free rate. Calculated as the return in excess of cash (total return less risk-free return) divided by the standard deviation (or volatility) of the stock or portfolio’s returns. The higher the Sharpe ratio, the more an investor is compensated for bearing absolute risk.

3 RIPE = Robust, Intuitive, Persistent and Empirical.
By systematically harvesting the persistent drivers of excess return in markets, we can create quantitative investment strategies that enable clients to target outperformance of traditional market-cap indices in a repeatable and reliable way.
Our strategies

**Client benefits of our factor-investing strategies**

We have devised our proprietary factor-investing strategies to be deliberately different from those of our competitors. As a result, our strategies offer clear tangible benefits to our clients.

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1. AI powered dynamic factor timing
2. Concentrated/differentiated portfolios
3. Proprietary investment approach
4. Diversified factor premia (RIPE factors)
5. Fully integrated ESG and active V&E*
6. Smarter factor design
7. Optimised portfolio construction
8. Monthly rebalances with limited turnover

*Voting and Engagement
“We cover the full spectrum of systematic products and customisable client solutions: from market-cap indexation to enhanced indexation, smart beta, active quant using artificial intelligence, and structured products using derivatives.

As responsible investors, and in recognition of the increasing importance of ESG to our clients, we have also fully integrated ESG inside all of our factor-investing strategies.”

David Wickham,
Global Head of Quantitative Solutions
Important information

Investment involves risk. The value of investments, and the income from them, can go down as well as up and an investor may get back less than the amount invested. Past performance is not a guide to future results.

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Risks of investing:

**Equities**: securities in certain markets may be more volatile, harder to price and less liquid than securities in other markets. They may be subject to different accounting and regulatory standards, and political and economic risks. These risks may be enhanced in emerging markets countries.

**Fixed Income**: Fixed income securities are subject to certain risks including, but not limited to: interest rate, credit, prepayment, and extension.

**Real estate**: Investments in property may carry additional risk of loss due to the nature and volatility of the underlying investments. Real estate investments are relatively illiquid and the ability to vary investments in response to changes in economic and other conditions is limited. Property values can be affected by a number of factors including, inter alia, economic climate, property market conditions, interest rates, and regulation.

**Alternative investments**: Alternative investments may engage in speculative investment practices; involve a high degree of risk; and are generally considered to be illiquid due to restrictions on transferring interests. An investor could lose all or a substantial portion of their investment. Investors must have the financial ability, sophistication / experience and willingness to bear the risks of such an investment.

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