BARCLAYS

Barclays Atlas 5 Index

As you plan for the future, selecting the right investments can make all the difference. You want to see your investments grow in value to meet your future financial needs, but you also want to control the amount of risk you take to limit potential losses. As market conditions evolve, it is also important to be able to adapt your investments to these changes on a timely basis.

We realize these goals can be difficult to achieve, and that is why Barclays has developed a multi-asset class dynamic index called the Barclays Atlas 5 Index (the "Index" or "Atlas").[1]

Atlas is designed to track a diversified portfolio of global financial assets. It follows a systematic asset allocation process that aims to optimize the portfolio's return potential for a given level of risk, as well as to accommodate short-term market trends. The Index has the ability to change its portfolio as often as daily to adapt to shifting market conditions.

[1] The Atlas strategy involves fees, costs and certain risks. You should consult with professional advisors before making any investment that is based on the performance of Atlas.

Atlas: the key features

Globally diversified underlying assets

Atlas provides exposure to a diversified range of equity and fixed income investments from global financial markets, by constructing a dynamic portfolio called the "Atlas Portfolio".

Controlling volatility for stable performance

The Index aims to limit its annual volatility[2] to a 5% target level, in order to control investment risk and provide more stable returns across different market environments.

Daily optimizations to enhance returns

On a daily basis, Atlas uses techniques from the Modern Portfolio Theory and Momentum Investing to find an optimal combination of its underlying components. It follows a 2-step process:

- First, the Index seeks to identify a combination that is expected to provide the highest long-term return potential subject to the 5% volatility target; the result is called the base combination.
- Then, adjustments are made to the base combination according to short-term market trends to determine the optimal combination.

Strategic and timely portfolio rebalances

Rebalancing decisions are also made on a daily basis. Once certain trigger conditions are met, rebalancing of the Atlas Portfolio is scheduled to commence as soon as the next trading day. This approach is designed to allow Atlas to adapt to market changes quickly in more volatile markets, while avoiding unnecessary adjustments in calmer markets.

[2] Volatility is a measure of the degree to which the price of an asset fluctuates. It is widely used as an indicator of investment risk.

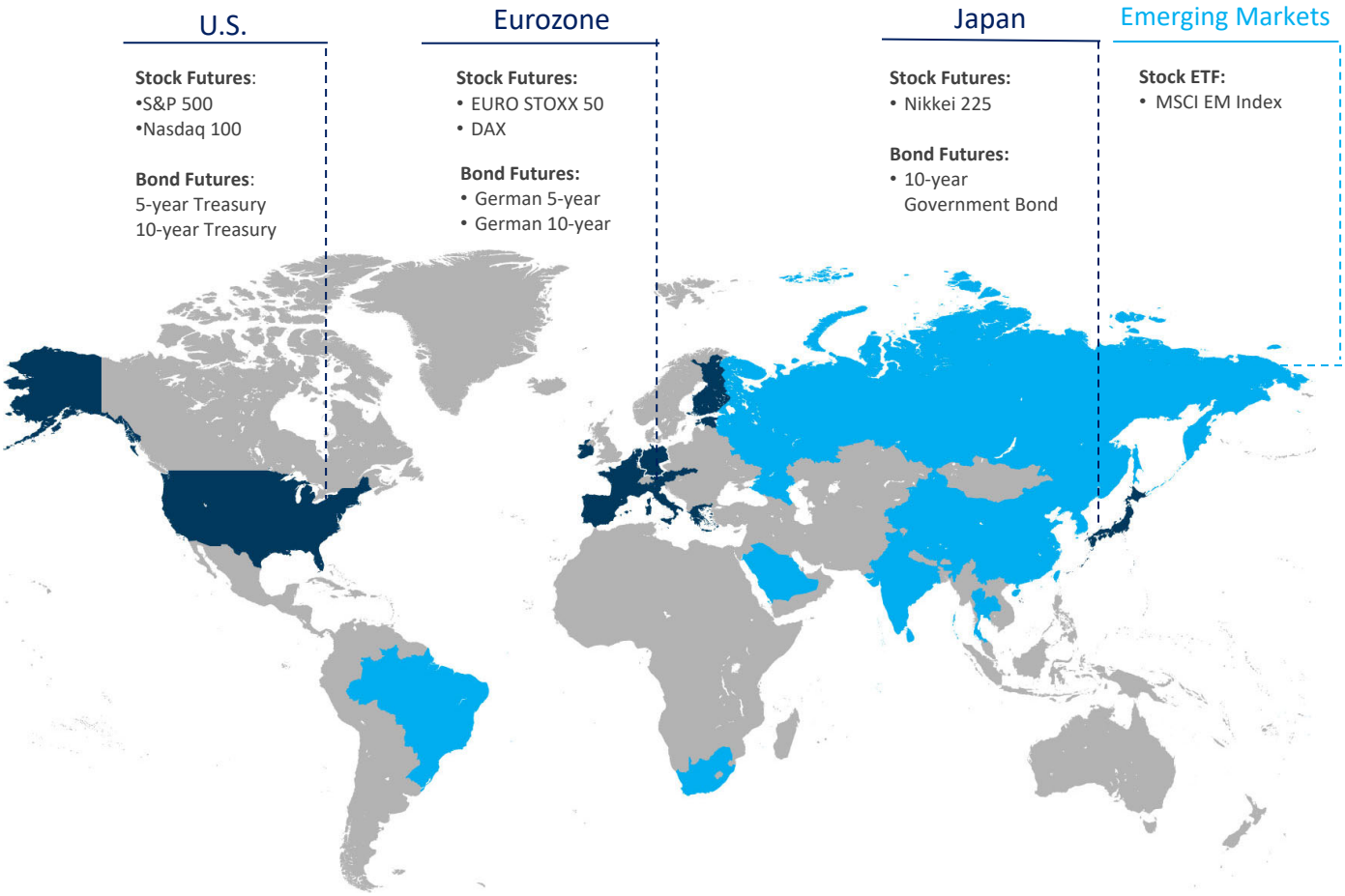
Globally diversified underlying assets

Atlas has eleven building blocks that are diversified across asset classes, geographical regions, as well as developed and emerging markets.

- For equities:
  - Five underlying indices that provide exposure to stock index futures performance in developed markets: two for the U.S., two for the Eurozone and one for Japan,

    and
  - An emerging markets stock ETF.
- For fixed income:
  - Five underlying indices that provide exposure to benchmark government bond futures performance in developed markets: two for the US, two for the Eurozone and one for Japan.

For further details, including costs associated with each index component, please see Appendix 1: Atlas Index Components (page 10) and Risk Factors (page 12).



Daily optimizations:

Step 1: Maximize long-term return potential

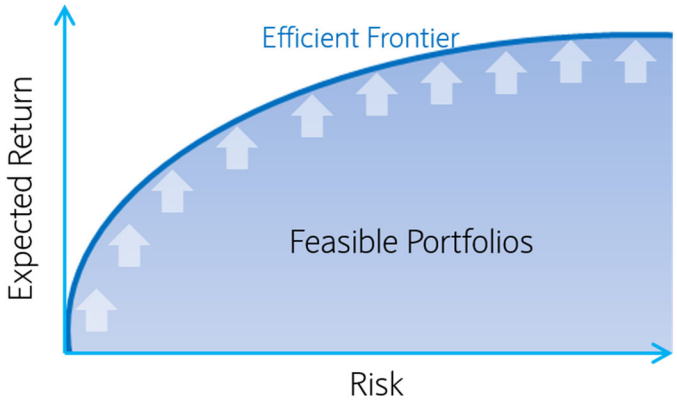
Each day, Atlas follows a 2-step process that aims to determine the optimal weight to be allocated to each of its underlying components.

The purpose of the first step is to identify a combination that provides the highest expected return potential over the long run, subject to the 5% volatility target. This step, called "mean-variance optimization", is designed by following two guiding principles:

I. Modern portfolio theory

The mean-variance optimization process is based on Harry Markowitz's Modern Portfolio Theory, which states that investors can maximize their expected return at any given risk level through diversification.

Mean-variance optimization, based on Modern Portfolio Theory



Hypothetical example is provided for illustrative purposes only and may not reflect actual weights or allocations.

II. The risk-return trade-off

Investors often face the trade-off between risk and return - namely, over the long term, higher risk tends to be associated with higher return potential, and lower risk with lower return potential.

For example, assets such as stock and bonds provide the potential for earning returns in the long run, but these assets also carry downside risks. On the other hand, cash carries no investment risk but does not earn returns.

Mean-variance optimization: How it works

On each business day, Atlas looks at every possible combination of its underlying components, and identifies a sub-universe of combinations eligible for further selection. The eligibility criteria, listed in Appendix 2, are designed to accommodate the different liquidity profiles of the global index components. The Index then runs the following process on the eligible combinations:

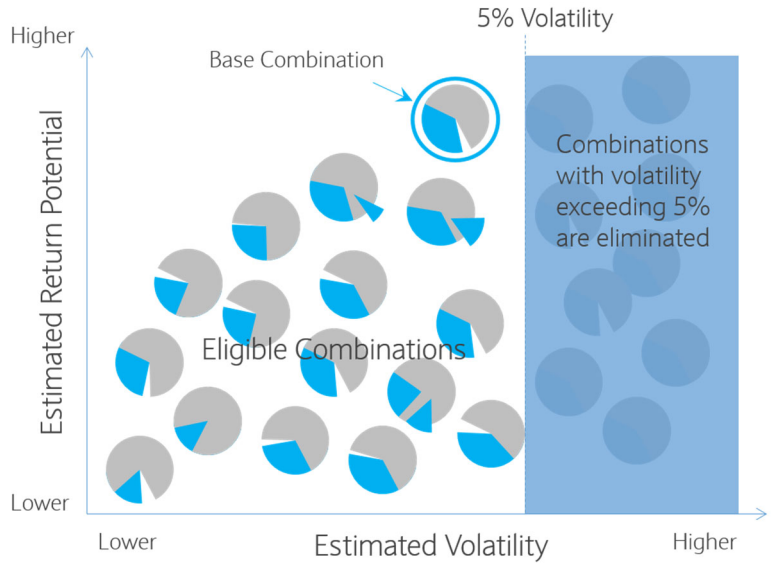
1. First, the Index calculates the volatility of each eligible portfolio combination based on how volatile each component has been and how the components have moved relative to each other.

2. Then, the Index eliminates all the combinations whose volatility exceeds the 5% target level.

3. Based on the trade-off between risk and return, the Index selects the combination that has the highest return potential by picking the combination of components with the highest weighted-average volatility[3].

The selected combination is called the base combination for that day. The total exposure allocated to index components in the base combination may range from 0% to 150%. This total exposure level tends to be higher if the performance of the index components have been less volatile and less correlated to each other, and vice versa.

Illustration of the Step 1 Optimization: Selection of the base combination



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[3] What is the link between return potential and weighted-average volatility?
The return potential, or "expected return", of a portfolio is the weighted average of its components' expected returns. Therefore, it is necessary to forecast the expected return of each individual component.
Using the principle of risk-return trade-off, Atlas assumes that there is a direct relationship between how volatile a component has been in the past and how high its return potential can be going forward.
Based on this premise, Atlas uses the weighted average of portfolio components' past volatility as an estimate for a portfolio's return potential.

Daily optimizations:

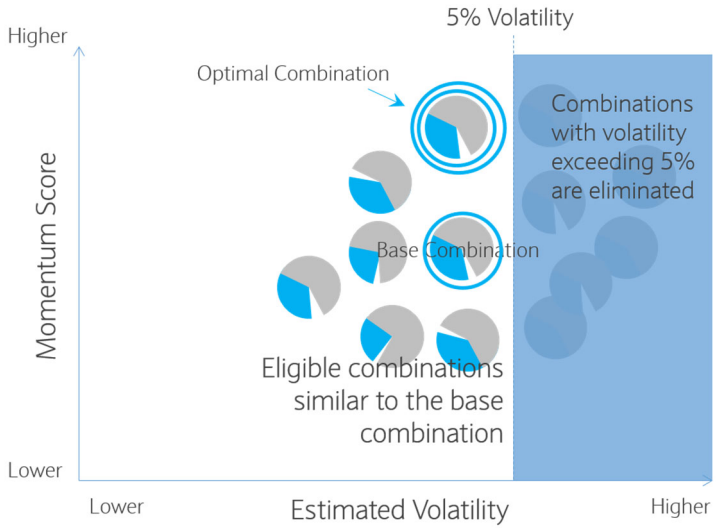
Step 2: Incorporate short-term momentum

After selecting the base combination with a focus on long-term returns, Atlas runs an additional optimization process that allows the Index to react to short-term market trends. This step is designed to reduce exposure to index components with weaker recent performance using techniques from momentum investing, in order to mitigate the risk of persistent underperformance.

To achieve this, Atlas considers the same universe of eligible portfolio combinations as in Step 1.

1. First, the Index eliminates all the combinations whose component weights are materially different from the weights of the base combination[4]. The purpose is to maintain the overall long-term perspective of the previous optimization.
2. Second, the Index eliminates all the combinations whose volatility exceeds the 5% target level.
3. Then, Atlas calculates a "momentum score" for each remaining combination based on the weight and recent performance[5] of each component. Combinations that allocate more weights to better performing components will have higher momentum scores.
4. Finally, the Index selects the combination with the highest momentum score as the optimal combination for that day. Similar to the base combination, the optimal combination may provide 0% to 150% of total exposure to the index components.

Illustration of the Step 2 Optimization: Selection of the optimal combination



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[4] For any combination, the weighting difference in comparison to the base combination is measured by aggregating the square of differences in weights with respect all components and taking square root of the sum. The combination will be eliminated if this square root is greater than 10%.

[5] Recent performance is measured by the average of the most recent 3-month and 6-month returns.

Strategic and timely portfolio rebalances

As market conditions change, the optimal combination is also likely to change from day to day. How and when does the Atlas Portfolio rebalance to adapt to these changes?

Rather than following a monthly or quarterly schedule, Atlas uses the following criteria to determine at the end of each business day whether it needs to rebalance the portfolio:

How different is the current portfolio compared to the new optimal combination?

The Index compares the current weight and the optimal weight of each underlying component.

A rebalancing will be triggered if the absolute weight differences sum up to more than 10% for either the equities asset class or the fixed income asset class.

Once a rebalance is triggered, the Atlas Portfolio is adjusted to match the new optimal combination for that day. Index rebalancing will occur as soon as practical for each underlying component, as early as the next available trading day.

This dynamic rebalancing approach is designed to avoid unnecessary adjustments to the portfolio when the market is stable, but also allows the Index to rebalance as frequently as daily when market conditions are volatile.

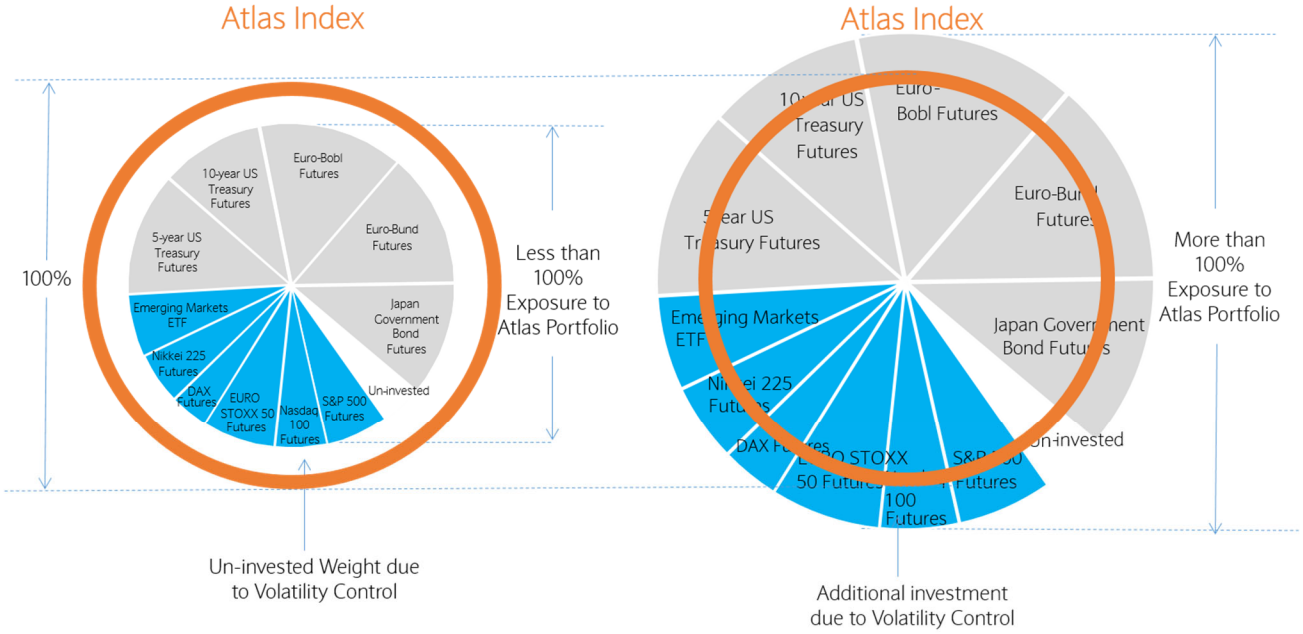
Controlling volatility for stable performance

In addition to dynamically rebalancing the Atlas Portfolio, the Index also adjusts its exposure to the portfolio up or down in an attempt to maintain the 5% volatility target. This is called "Volatility Control".

To achieve this, Atlas calculates a "target exposure" level on a daily basis, by dividing the 5% volatility target using the recent volatility of the current Atlas Portfolio[6], subject to a maximum level of 150%. As a result:

If the recent volatility of the current portfolio exceeds 5%, the target exposure to the portfolio will be less than 100%, and the residual weight will be un-invested.

If the recent volatility of the current portfolio is below 5%, the target exposure to the portfolio will be more than 100%, potentially up to 150%.



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If the target exposure level calculated on any day differs from the actual exposure level by 5 percentage points or more, the Index will adjust its actual exposure level to the Atlas Portfolio as soon as practical to match that target level.

Because the Atlas Portfolio may allocate up to 150% of exposure to the index components during the daily optimizations, and the volatility control process may further target up to 150% of exposure to the Atlas portfolio, Atlas may allocate up to 225% of total exposure to the index components after compounding.

[6] For purposes of calculating the portfolio's recent volatility in the volatility control procedure, the daily returns of the portfolio are calculated as the weighted average of component daily returns using weights determined during the most recent portfolio rebalance.

Index Component Name (Ticker)	Region - Asset Class	Minimum /Maximum Weight	Running Cost[7]	Rebalancing Cost[8]
Barclays US Tracker ER Index (BXIIUSER)	U.S. – Equities (S&P 500)	0% / 25%	0.25% p.a.	0.03%
Barclays US Tech Tracker ER Index (BXIITTER)	U.S. – Equities (NASDAQ 100)	0% / 20%	0.25% p.a.	0.05%
Barclays Europe Tracker USD ER Index (BXIIETUE)	Eurozone – Equities (EURO STOXX 50)	0% / 20%	0.25% p.a.	0.03%
Barclays GERMANY Tracker USD ER Index (BXIIDEUE)	Eurozone – Equities (DAX)	0% / 15%	0.25% p.a.	0.03%
Barclays Japan Tracker USD Index (BXIIJTUE)	Japan – Equities (Nikkei 225)	0% / 15%	0.30% p.a.	0.03%
iShares MSCI Emerging Markets ETF (EEM UP)	Emerging Markets – Equities (MSCI TR Emerging Markets)	0% / 10%	3-month USD LIBOR plus 0.50% p.a.	0.05%
Barclays US 5yr Treasury Futures Index (BXIIUS05)	U.S. - Fixed Income (5-year Treasury)	0% / 50%	0.20% p.a.	0.02%
Barclays US 10yr Note Futures Index (BXIIUS10)	U.S. - Fixed Income (10-year Treasury)	0% / 50%	0.20% p.a.	0.02%
Barclays Euro-Bobl Alt Roll Futures in USD (BXIIE05D)	Eurozone - Fixed Income (German 5-year)	0% / 50%	0.20% p.a.	0.02%
Barclays Euro-Bund Alt Roll Futures Index in USD (BXIIE10D)	Eurozone - Fixed Income (German 10-year)	0% / 50%	0.20% p.a.	0.02%
Barclays JGB Alt Roll 10yr Futures ER Index in USD (BXIIJTED)	Japan - Fixed Income (10-year Government Bond)	0% / 50%	0.20% p.a.	0.02%

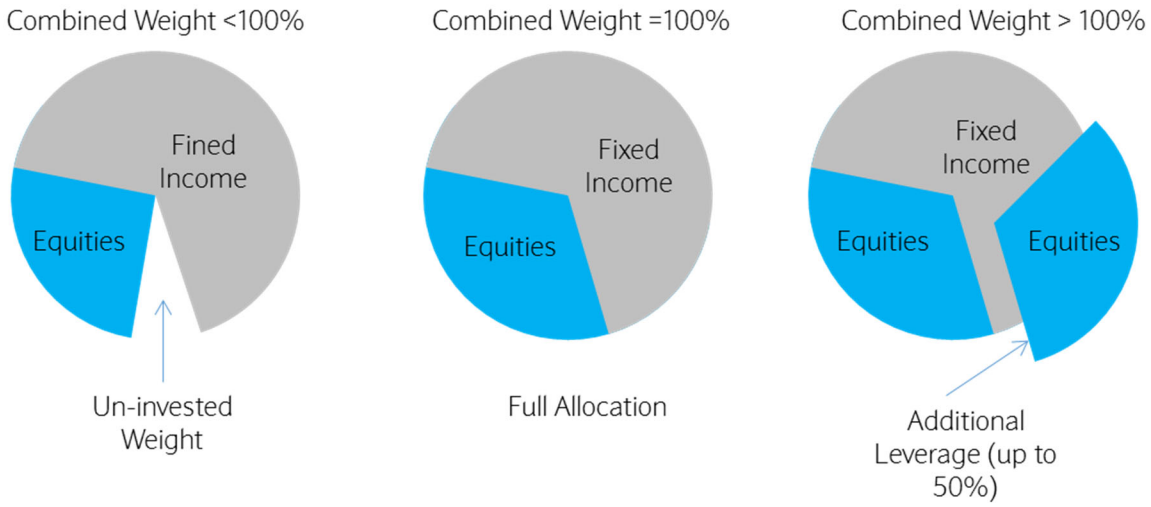
Source: Barclays.
Because Atlas is denominated in U.S. Dollars, profits and losses generated by underlying futures indices in foreign currencies are converted to dollars on a daily basis.

[7] Running cost is applicable to the existing notional exposure of the component and deducted daily on a pro-rated basis
[8] Rebalancing cost is applicable to the change in notional exposure to the component as a result of portfolio rebalancing as well as volatility control, and is deducted on the relevant trading day.

Appendix 2: Portfolio Eligibility Criteria

For both steps of daily optimizations, portfolio combinations of underlying index components must meet the following criteria to be eligible for consideration:

1. Weight of each component must be between the minimum and maximum weight for such component as specified in Appendix 1;
2. Weight of each component may not deviate from the component's weight in the current Atlas Portfolio by more than 10 percentage points;
3. Combined weight of all components must be between 0% and 150%. The combined weight reflects a portfolio's total exposure to the index components. Below are the implications of different levels of combined weight:
    - If the combined weight is equal to 100%, this means the portfolio is fully allocated to the components.
    - If the combined weight is less than 100%, the un-invested portion of the portfolio will not earn any return or carry any investment risk, similar to a cash position.
    - If the combined weight is more than 100% and up to 150%, this means the portfolio has used leverage to make additional investment in its components.



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Risk factors

An investment in Atlas also involves fees, costs and risks. The following is a summary of these fees and costs and certain risks associated with Atlas. You should consider the following, and consult with your advisers and read any product documentation carefully, before investing in any financial product based on the performance of Atlas.

- The Atlas strategy may be unsuccessful. Historical volatility may prove to be a poor measure of predicting future returns and future volatility. Similarly, recent performance momentum may be a poor measure of predicting future returns. If either of the above is true, the allocation of underlying index components in the Index may not be optimized and the Index may perform poorly. The volatility control mechanism may not achieve its intended goal, and the Index may not achieve its target volatility of 5%. In addition, Atlas may assign up to 225% of total exposure to its underlying assets, because relevant exposure levels determined by daily optimization and volatility control can both be up to 150%. When Atlas's exposure to its underlying index components is greater than 100%, any negative performance of the underlying assets will be magnified and the level of the Index may decrease significantly.

- Each of the index components carries two costs that are deducted from the performance of the Index. A running cost is applicable to the notional exposure of the Index to the component and is deducted daily. Additionally, a rebalancing cost is applicable to the change in notional exposure to the component as a result of portfolio rebalancing as well as volatility control, and is deducted on the relevant trading day. The costs applicable to each index component are set forth in Appendix 1. These deductions will reduce performance of the Index, and Atlas will underperform similar portfolios from which these fees and costs are not deducted.

- Atlas is subject to risks associated with rolling futures contracts, including the risk that its underlying indices will replace expiring contracts with higher-priced contracts, which may cause the index values to fall even if the spot levels of the bonds or equities underlying the relevant futures contracts are stable or increasing in value.

- Atlas may at any time be invested in only one or a small number of underlying assets, which produce lower returns than an investment in a more diversified pool of assets.

- The Index is subject to risks associated with movements in the exchange rates between the foreign currencies of the assets to which the Index provide exposure relative to the U.S. dollar and may underperform an index that is based on movements of futures contracts without taking currency conversion into account.

- Any un-invested weight in the portfolio will earn no return. In addition, if the volatility control mechanism causes exposure to the Atlas Portfolio to be less than 100%, the difference will be un-invested and will earn no return.

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