

GOLDMAN SACHS ACTIVEBETA[®] LOW VOL PLUS EQUITY INDEXES METHODOLOGY

INTRODUCTION

Index Overview

This document describes the methodology for the following indexes: **Goldman Sachs ActiveBeta[®] World Low Vol Plus Equity Index**

The Goldman Sachs ActiveBeta[®] Low Vol Plus Equity Indexes are owned by Goldman Sachs Asset Management (the Index Sponsor) and were developed to capture the performance of the low volatility equity common factor, enhanced with secondary exposure to other common factors: value, momentum, and quality.

Using a patented portfolio construction methodology and patent-pending turnover minimization technique, each Index aims to deliver higher returns than a market capitalization-weighted index for the same geographical region at similar or lower levels of total risk, as measured by volatility and drawdown. The Goldman Sachs ActiveBeta[®] Low Vol Plus Equity Indexes also seek to mitigate the magnitude and duration of potential market underperformance.

Index Details

The Goldman Sachs ActiveBeta[®] Low Vol Plus Indexes are distributed under the following identifiers.

Name	Ticker
Goldman Sachs ActiveBeta [®] World Low Vol Plus Equity Index (TR)	GSWLVNR

INDEX CONSTRUCTION METHODOLOGY

Eligible Securities

The eligible securities for each of the Goldman Sachs ActiveBeta® Low Vol Plus Equity Indexes are defined as the constituents of these corresponding Index Universes.

Goldman Sachs ActiveBeta® Low Vol Plus Equity Index	Index Universe
World Equity	Solactive GBS Developed Markets Large & Mid Cap USD Index

More information about the Solactive Index available from www.solactive.com.

Index Construction

The construction of each ActiveBeta® Low Vol Plus Equity Index involves three steps:

- Construct the low volatility factor core index
- Construct three low volatility factor tilt subindexes:
 - ActiveBeta® Value Factor Tilt Subindex
 - ActiveBeta® Momentum Factor Tilt Subindex
 - ActiveBeta® Quality Factor Tilt Subindex
- combine the three subindexes with equal weights to form the Goldman Sachs ActiveBeta® Low Vol Plus Equity Index.

1. Constructing the low volatility factor core index

The ActiveBeta® low volatility factor core index is constructed according to a patented portfolio construction methodology¹, as described in steps 1.0 through 1.4.

1.0 Assigning a factor score

For the ActiveBeta® low volatility factor core index, constituents in the Index Universe are ranked on the basis of a factor score.

The cut-off date for data used in calculating the factor scores is four US trading days prior to the effective rebalance date for the corresponding ActiveBeta® Low Vol Plus Equity index (the Selection Date).

Values are calculated for every stock in the Index Universe as the inverse of the standard deviation of daily total stock returns over the past 12 months, up to and including the Selection Date.

The values are used to rank the stocks. Ranks are converted to fractional factor scores ranging from -1 to +1, inclusive.

1.1 Reweighting the Index Universe

For the ActiveBeta® low volatility factor core index, stocks in the Index Universe are reweighted using 50% cap-weight and 50% equal-weight within sectors, countries and/or regions before calculating the overweights and underweights.

1. Methods and Systems for Building and Maintaining Portfolios based on Ordinal Ranks of Securities, U.S. Patent Numbers 8,285,620 and 8,473,398.

1.2 Cut-off Score and Maximum Stock Underweight

Two parameters are used in the construction process for the ActiveBeta® low volatility factor core index:

- Cut-off Score
- Maximum Stock Underweight

The Cut-off Score determines the proportion of underweights to overweights, and the Maximum Stock Underweight the magnitude of stock weight differences relative to their weights in the reweighted Index Universe. The appropriate parameter values are determined based on historical simulations and are fixed for each ActiveBeta® Low Vol Plus Equity Index.

1.3 Determining target underweights and overweights

Stocks whose low volatility factor scores are above the Cut-off Score are overweighted relative to the reweighted Index Universe. Those whose factor scores are below the Cut-off Score are underweighted.

Because the index is subject to a long-only constraint, the smallest weight of any stock is zero.

For all stocks:

- For factor scores less than the Cut-off Score, rescale the factor scores to range from -1 to 0
- For factor scores greater than or equal to the Cut-off Score, rescale the factor score to range from 0 to +1

Once the factor scores are rescaled, stocks with factor scores greater than 0 are overweighted relative to the reweighted Index Universe. Stocks with factor scores less than or equal to 0 are underweighted relative to the reweighted Index Universe.

For all stocks and factors with an $RScore_i \leq 0$,

$$TgtWgt_i = \max(IUWgt_i + RScore_i \times MaxUnderWgt, 0)$$

The total of the stock underweights is calculated.

$$TotalUnderWgt = \sum (IUWgt_i - TgtWgt_i)$$

For all stocks with an $RScore_i > 0$, a $TgtWgt_i'$ is determined by proportionately reweighting all constituents such that $TotalUnderWgt = TotalOverWgt$

$$TgtWgt_i' = IUWgt_i + RScore_i / \sum RScore_i \times TotalUnderWgt$$

Any $TgtWgt_i'$ that exceeds 20 times its $IUWgt_i$ is capped at 20 times its $IUWgt_i$.

where,

$RScore_i$ = rescaled factor score for each stock

$TgtWgt_i$ = the target weight of each stock prior to any capping or turnover minimization

$IUWgt_i$ = the weight of each stock in the reweighted Index Universe

$MaxUnderWgt$ = the maximum stock underweight

$TotalUnderWgt$ = the sum of all the stock underweights relative to the reweighted Index Universe

$TgtWgt_i'$ = the target weight of each stock prior to any capping or turnover minimization, normalized to ensure that $TotalUnderWgt = TotalOverWgt$

1.4 Controlling for country and sector biases

Weight constraints are applied to control unwanted biases by constraining sectors to +/- 5% of weights in the Index Universe for the ActiveBeta® U.S. low volatility factor core index, and by constraining sectors to +/- 7.5% of weights in the Index Universe and countries to be within a band around the Index Universe country weights as defined by $\pm 5\% * \frac{\sqrt{\# \text{ stocks in each Country}}}{\text{Max}(\sqrt{\# \text{ stocks in a Country}})}$ for the ActiveBeta® World low volatility factor core index.

2. Constructing the factor tilt subindexes

The ActiveBeta® factor tilt subindexes are constructed according to the same patented portfolio construction methodology, as described in step 1 above, with the differences noted below in steps 2.0 to 2.3 below.

2.0 Assigning a factor score

For each ActiveBeta® factor tilt subindex, constituents in the low volatility factor core index are ranked on the basis of a factor score.

Values are calculated for each factor for every stock, as described below.

- **Value** – A composite of three valuation measures: book value-to-price, sales-to-price, and free cash flow-to-price. The earnings-to-price ratio is used instead of free cash flow-to-price for financial stocks.
- **Momentum** – Beta- and volatility-adjusted daily total returns over an 11-month period ending one month before the Rebalance Date
- **Quality** – Gross profit divided by total assets, or return on equity for financial stocks or when gross profit is not available

The values are used to rank the stocks by each factor. Ranks are converted to fractional factor scores ranging from -1 to +1, inclusive.

2.1 Cut-off Score and Maximum Stock Underweight

Same as 1.2 above with the exception that weights are relative to the low volatility factor core index instead of the reweighted Index Universe.

2.2 Determining target underweights and overweights

Same as 1.3 above with the exception that weights are relative to the low volatility factor core index instead of the reweighted Index Universe.

2.3 Controlling for country and sector biases

For each ActiveBeta® factor tilt subindex, the sector weights are constrained to +/- 5% relative to the Index Universe for ActiveBeta® U.S., and the sector weights are constrained to +/- 7.5% relative to the Index Universe and country weights are constrained to be within a band around the Index Universe country weights as defined by $\pm 5\% * \frac{\sqrt{\# \text{ stocks in each Country}}}{\text{Max}(\sqrt{\# \text{ stocks in a Country}})}$ for ActiveBeta® World.

3. Combining the factor tilt subindexes

The ActiveBeta® Low Vol Plus Equity Indexes are created by equally weighting the three ActiveBeta® factor tilt subindexes. As part of this combination, offsetting security positions are calculated and netted across the ActiveBeta® factor tilt subindexes.

A minimum weight of 2 bps per stock is applied to constituents of the ActiveBeta® Low Vol Plus Equity Index. Constituents whose weight falls below the minimums are eliminated at rebalance.

INDEX REBALANCING

Rebalancing Schedule

Each ActiveBeta® Low Vol Plus Equity Index is rebalanced quarterly according to the published rebalancing schedule of its Index Universe, on the close of the first Wednesday of February, May, August, and November or, if that day is a US exchange holiday, the next trading day.

Each ActiveBeta® Low Volatility Plus Equity Index is rebalanced according to the Index Construction Methodology described in Section II, subject to the ActiveBeta® Turnover Minimization Technique², described under III B and C below.

Target Weight Buffers

To minimize turnover, buffers are applied to the weights which result from the Index Construction Methodology. Buffers are determined using the following process:

- Each stock is assigned its target weight, $TgtWgt_i'$ according to the Index Construction Methodology in Section II.
- A buffer is assigned to a stock relative to each factor index's maximum underweight.

$$Buffer_i = \min(0.20 \times MaxUnderWgt, 0.30\%)$$

The lower and upper trading bounds on constituent i are then defined as:

$$LowerWgt_i = \min(\max(TgtWgt_i - Buffer, 0), MaxWgt_i)$$

$$UpperWgt_i = \min(\max(TgtWgt_i + Buffer, 0), MaxWgt_i)$$

where,

$TgtWgt_i'$ = the target weight of each stock in its factor tilt subindex prior to any capping or turnover minimization, normalized to ensure that $TotalUnderWgt = TotalOverWgt$

$MaxUnderWgt$ = the maximum stock under-weight that applies for each factor tilt subindex

$$MaxWgt = 20 \times IUWgt_i$$

$IUWgt_i$ = the weight of each stock in its Index Universe

Turnover Minimization

The ActiveBeta® Turnover Minimization Technique reduces the turnover in the ActiveBeta® Low Vol Plus Equity Index by calculating offsetting pair trades in the individual factor tilt subindexes and allowing constituent weights to float inside the upper and lower weight bounds, as defined above.

A trade weight is calculated for each stock from the difference between the stock's weight before rebalancing and the weight determined by the Index Construction Methodology described in Section II. The lower and upper trading bounds allow a stock's weight to deviate from its target weight, either positively or negatively, before a trade or rebalancing is triggered. Iterative pair-wise trades are netted until the minimum amount of trading is determined which maintains each stock within its upper and lower weight bounds. The trade size is further constrained to 15% of median daily trade volume over the prior 60 trading days.

² Methods and Systems for Reducing Turnover in Multi-Portfolio Structures, U.S. Patent Application Number 14/208,865.

INDEX CALCULATION AND ON-GOING MAINTENANCE

Daily Calculation

The index is calculated by Solactive AG (the Calculation Agent).

The Index Calculation Agent is responsible for calculating index levels based on weights and stocks as determined by the Index Sponsor on a quarterly basis using the steps described in Section II, Index Construction Methodology, and Section III, Index Rebalancing.

The Index Calculation Agent applies corporate action adjustments and calculates the indexes as described in the Solactive Index Calculation Guideline, Version 1.1 dated July 8th, 2013 <http://www.solactive.com/wp-content/uploads/2012/06/Index-Calculation-Guideline-Solactive1.pdf>

Both price and total return indexes are calculated for each ActiveBeta® Low Vol Plus Equity Index in US dollars. The total return index assumes reinvestment of cash dividends across the full index at the open on the ex-date. The total return index for the ActiveBeta® World Low Vol Plus Equity Index is calculated using net dividends.

The compositions of the ActiveBeta® Low Vol Plus Equity Indexes are available on the Goldman Sachs Asset Management website (www.gsamfunds.com) and Solactive website (www.solactive.com) on a daily basis. Results of the latest rebalancing are available on the Solactive website prior to the effective date (www.solactive.com) and are adjusted for corporate actions between the Selection date and Rebalance dates in accordance with the rules for Daily Calculation.

Inception Date & Value

The ActiveBeta® Low Vol Plus Equity Indexes have the following inception dates. Index data prior to the inception date are based on backtests (pre-inception performance).

Name	Date
Goldman Sachs ActiveBeta® World Low Vol Plus Equity Index (NTR)	2/2/2022

AMENDMENTS AND EXCEPTIONS TO THIS METHODOLOGY

The Index Committee, comprised of Goldman Sachs Asset Management employees, is responsible for approving changes to the methodology for the Goldman Sachs ActiveBeta[®] Low Vol Plus Equity Indexes. This document is updated to reflect any changes approved by the Index Committee.

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