



Invesco QQQ Growth Index Methodology

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Table of Contents

Index Overview	Pg 3
Index Details	Pg 3
Updates	Pg 7
Index Calculation and the Role of the Calculation Agent	Pg 8
Corporate Events	Pg 9
Index Policy	Pg 9
Governance	Pg 9
Index Methodology Update and Cessation Policy	Pg 9
Return Types and Tickers	Pg 10
Index Information and Data Dissemination	Pg 11
Definitions of Key Terms	Pg 12

Index Overview

Description

The Invesco QQQ Growth Index ("the Index") is a multi-asset index that combines equity exposure via Invesco QQQ along with dynamic bond exposure that adjusts between short and intermediate US Treasury bond futures trackers as interest rate conditions change. The index aims to maintain a 12.5% volatility level by utilizing Salt Financial's truVol methodology.

Index Universe

The Invesco QQQ Growth Index is composed of the following:

Ticker	Name
QQQ	INVESCO QQQ TRUST SERIES 1
SMR10YUS	Solactive Munich Re FIVE US 10Y T-Note Futures Index
SMR2YUS	Solactive Munich Re FIVE US 2Y T-Note Futures Index

SMR10YUS Index and the SMR2YUS Index will henceforth be referred to as '10Y' and '2Y', respectively. 10Y, 2Y, Cash, or any combination of the three are collectively referred to as "Fixed Income".

Security Selection

The initial Fixed Income weight either will be comprised entirely of 10Y, 2Y, Cash, or a blend of 10Y, 2Y, Cash. To determine the allocation, 10Y and 2Y percentage change is measured against its historical levels.

Details on the security selection criteria for the Invesco QQQ Trust Series 1 can be found in its methodology document at <https://www.invesco.com/qqq-etf/en/home.html>

Security Weighting

The proportional weightings for the Equity and Fixed Income components are established using the following:

An initial weight is established for Equity as the minimum of 100%, or larger of the quadratic root derived from the truVol® estimated market volatility and the Index minimum allocation (25%). An initial Fixed Income portfolio weight is then established as one less the initial Equity weight.

The Index also requires the following three truVol® inputs for covariance and weight calculations. truVol is proprietary information designated as trade secrets by Salt Financial LLC. This information is made available to a more limited group of authorized individuals only.

Underlying Data	Notation
truVol QQQ Equity Variance	\hat{y}_t^{QQQ}
truVol Smoothed Risk Scalar	$SmoothedRiskScalar_t$
truVol Risk Model	$RiskModel_t$

Using the combined Equity and Fixed income allocations based on their initial weightings, the multi-asset historic volatility is then calculated, with truVol data incorporated in the variance covariance matrix calculation. While keeping the proportionate weights between the Equity and Fixed Income components constant, their aggregate weighting is then raised or lowered to achieve the Index volatility target of 12.5%. The maximum weight of the final combined allocation to Equity and Fixed Income is 175%.

All security weighting criteria are applied on the Reference Date of an Index update.

Index Details

Calculating Universe Component Returns and Excess Return Levels:

Each component making up the Index Universe has a daily total return measured as:

$$R_t^i = \frac{(Close_t^i + D_{t,ex}^i)}{(Close_{t-1}^i + D_{t-1,ex}^i)} - 1 \quad i \in \{QQQ\}$$

Where:

$Close_t^i$: The closing value of Underlying Component i on Index Calculation Day t

$D_{t,ex}^i$: Dividend amount for Underlying Component i with an ex-dividend date on Index Calculation Day t

Dividend Ex-Date: Dividends are included in the total return calculation based on their ex-dividend date, not the payable date.

Underlying Component Holidays: In the event of a holiday, the calculation includes all dividends declared with an ex-dividend date between the previous trading day ($t-1$) and the current trading day (t). Similarly, for the previous day's calculation, dividends declared with an ex-dividend date between the day before the previous trading day ($t-2$) and the previous trading day ($t-1$) are included.

The daily returns of each component can then be converted into a series of daily excess returns as represented below.

$$ER_t^i = \begin{cases} R_t^i - \frac{RFR_{t-1}}{360} * \text{days}(t, t-1), & i \in \{QQQ\} \\ R_t^i, & \text{else} \end{cases}$$

Where:

ER_t^i : Excess return of Underlying Component i on Index Calculation Day t

RFR_t : Fed Funds on Index Calculation Day t

$\text{days}(t, t-1)$: Actual day count between day t (inclusive) and day $t-1$ (exclusive)

$t-1$: Index Calculation Day immediately preceding Index Calculation Day t

Finally, to calculate each Component's Excess Return Level, we apply the following formula:

$$ERL_t^i = ERL_{t-1}^i * (1 + ER_t^i)$$

Where:

$$ERL_0^i = Close_0^i$$

Index Calculation

The Index Value, denoted as $Index_0 = 1000$, is established as of the Index Start Date. Subsequently, on each specified Index Calculation Day, the Index Value will be calculated using the following formula:

$$Index_t = Index_{t-1} + \sum_{i \in \{QQQ, 10Y, 2Y\}} Units_{t-1}^i * (ERL_t^i - ERL_{t-1}^i) - IndexCosts_t$$

Where $IndexCosts_t$ are calculated as follows, subject to whether $t=1$ or $t>1$.

$$IndexCosts_t = \begin{cases} HoldingCost_t + IndexDecrement_t, & t = 1 \\ TransactionCost_t + HoldingCost_t + IndexDecrement_t, & t > 1 \end{cases}$$

$$TransactionCost_t = \sum_{i \in \{QQQ, 10Y, 2Y\}} Abs(Units_{t-1}^i - Units_{t-2}^i) * TC^i * ERL_{t-1}^i$$

$$HoldingCost_t = \frac{days(t, t-1)}{360} \sum_{i \in \{QQQ, 10Y, 2Y\}} Abs(Units_{t-1}^i) * HC^i * ERL_{t-1}^i$$

$$IndexDecrement_t = Index_{t-1} * \frac{days(t, t-1)}{360} * 0.005$$

$$Units_t^i = \frac{FinalWeight_{t-1}^i * Index_{t-1}}{ERL_{t-1}^i}$$

And with the respective transaction and holding costs defined as

Component (i)	TC^i	HC^i
QQQ	0.0002	0.0050
10Y	0.0003	0.0015
2Y	0.0002	0.0010

Updates

The Index is rebalanced daily.

Index Rebalance

During the daily Index Rebalance, the Index Universe is selected, Index constituents are refreshed, and the new Index constituents are weighted according to the security weighting methodology described in the Index Overview section.

Index Key Dates

The key dates are as follows. The Index Review Team (see Governance section) may change these dates for reasons including market holidays. Any such changes will be publicly announced with as much advance notice as possible under the circumstances. All events take place after the close.

Event	Day	Description
Reference Date	Each business day	Data is captured for Index construction
Effective Date	Each business day	Rebalanced Index weights are finalized

Index Calculation and the Role of the Calculation Agent

The calculation agent for the Index ("the Calculator") is Invesco Indexing LLC. The Calculator evaluates the closing value of the Index, updates the Index each business day based on constituent selections and weightings determined by Invesco Indexing LLC.

Calculator Input Data Used and Hierarchy of Input Data

The Index is calculated using closing prices or last transacted prices of underlying constituent securities from exchanges or exchange equivalents. Should this type of data be unavailable, the Index may be calculated using quotes or evaluated data or, in case when continued availability of transacted security prices from security exchanges is suspended, the Calculator reserves the right to exercise a judgement call, including carrying forward the latest available closing price.

Use of Discretion and/or Expert Judgement

No discretion or expert judgement is exercised by Invesco Indexing LLC in the determination of daily index pricing. Rules-based index methodologies, which cover index construction, maintenance and calculation, provide that discretion is not used in the daily pricing of the indexes except in unusual cases not effectively addressed by the methodology, which could be exercised by the Calculator. These include, but may not be limited to:

- Corporate events not previously encountered,
- Structural changes to the underlying markets,
- Operational issues at security exchanges,
- Geo-political events,
- Technological problems / failures, or
- Natural disaster or other business continuity process-related event.

In such circumstances, the calculating agent will inform Invesco Indexing LLC of any discretion being used.

Potential Limitations of the Methodology and Benchmark Calculation

The potential limitations of daily Index calculation include circumstances where the prices of constituent elements of the Index are not available, either because there are insufficient participants or because the exchange(s) / exchange equivalent(s) suffers an unexpected outage or closure or Invesco and/or the Calculator is denied permission to use such data for determining the Index. In such circumstances an announcement will be made to notify clients, including whether the Index will not be published or delayed in publication.

Corporate Events

The securities in the NASDAQ 100® are monitored every day by NASDAQ OMX with respect to changes in total shares outstanding arising from corporate events.

Index Policy

All Index constituents are evaluated daily for data needed to calculate Index levels and returns. The Index follows the general Index policies of the Calculator as described below.

Holiday Schedule

The Index is calculated daily, throughout the calendar year. The only days the Index is not calculated are on days when any exchanges on which the Index's constituents are listed are officially closed.

Governance

The Index is managed by the Index Review Team (IRT). The IRT consists solely of members of Invesco Indexing. The IRT meets at least annually to review and revise Index methodology described in this document as appropriate. The IRT meets at least annually to review additions and deletions to the Index. All daily changes to the Index are subject to the approval of the IRT, and the IRT may make adjustments to the Index at its discretion when such changes are reasonable.

Index Methodology Update and Cessation Policy

Invesco Indexing periodically, at least annually, reviews each Index and its accompanying methodology, in addition to periodic rebalancing (if applicable), in an effort to ensure the Index continues to accurately represent that portion of the market it was originally intended to, and delivers the outcomes one would expect from the Index's exposures.

The procedures for the internal review of the methodologies, changes to the methodologies and procedures performed when the Index administered is ceasing publication are described in detail in the Changes to Benchmark Methodology and Cessation Policy.

Return Types and Tickers

The Calculator computes one return type for the Index on a daily basis: excess return. The excess return reflects the contribution from QQQ and Fixed Income

Return Type	Ticker
Excess Return	IIQQQG

Index Information and Data Dissemination

Data Vendors

Daily Index levels for all return types are available from major quote vendors and at www.InvescoIndexing.com.

FTP

Daily constituent data and Index level data are available via the Invesco Indexing secure FTP site for Index subscribers. Please contact Invesco Indexing customer service at IndexSupport@invesco.com for more information.

File Types

The Invesco Indexing secure FTP site for Index subscribers will distribute the standard overnight Index files from the Calculator. These include:

File Description	File Extension
Index Levels	.CSV
Constituent Weights	.CSV

The data on these files is provided directly by the Calculator, and no descriptive information contained in these files is used by Invesco Indexing at any stage of the Index creation process. In addition, security characteristics are available upon request. The characteristics are created by Invesco Indexing periodically and are updated as necessary. The characteristics data contribute to the creation of the Index or otherwise help to describe the Index constituents. Please contact Invesco Indexing customer service at IndexSupport@invesco.com for more information.

Website

Index information is available on the Invesco Indexing website at www.InvescoIndexing.com.

Definitions of Key Terms

Terms used in this document but not otherwise defined are defined in the following table. Definitions, that are marked with a (*) are sourced from Regulation (EU) 2016/1011 (“EU Benchmark Regulation”) Article 3. Definitions, that are marked with a (**) are sourced from IOSCO Principles for Financial Benchmarks¹.

Term	Definition
Administrator *	‘Administrator’ means a natural or legal person that has control over the provision of a benchmark;
Benchmark *	‘Benchmark’ means any index by reference to which the amount payable under a financial instrument or a financial contract, or the value of a financial instrument, is determined, or an index that is used to measure the performance of an investment fund with the purpose of tracking the return of such index or of defining the asset allocation of a portfolio or of computing the performance fees;
Calculation Agent **	A legal entity with delegated responsibility for determining a Benchmark through the application of a formula or other method of calculating the information or expressions of opinions provided for that purpose, in accordance with the Methodology set out by the Administrator;
Contribution of Input Data *	‘Contribution of input data’ means providing any input data not readily available to an administrator, or to another person for the purposes of passing to an administrator, that is required in connection with the determination of a benchmark, and is provided for that purpose.
Corporate Action	A Corporate Action occurs when there is a change to a company’s capital structure. Unlike Corporate Events, Corporate Actions have a prescribed ex-date. The share price will be subject to an adjustment on the ex-date and Invesco Indexing and/or the calculating agent will adjust the index to counteract the effect that the price change would otherwise have on the index. Examples of corporate actions include rights or entitlement issues, consolidations, stock splits and capital repayments.
Expert Judgment *	‘Expert judgement’ means the exercise of discretion by an administrator or a contributor with respect to the use of data in determining a benchmark, including extrapolating values from prior or related transactions, adjusting values for factors that might influence the quality of data such as market events or impairment of a buyer or seller’s credit quality, and weighting firm bids or offers greater than a particular concluded transaction;
Index*	‘Index’ means any figure: (a) that is published or made available to the public; (b) that is regularly determined: (i) entirely or partially by the application of a formula or any other method of calculation, or by an assessment; and (ii) on the basis of the value of one or more underlying assets or prices, including estimated prices, actual or estimated interest rates, quotes and committed quotes, or other values or surveys;
Input Data *	‘Input data’ means the data in respect of the value of one or more underlying assets, or prices, including estimated prices, quotes, committed quotes or other values, used by an administrator to determine a benchmark;
Material Change to Methodology	In determining whether a change to an Index is material, the following factors shall be taken into account: <ul style="list-style-type: none"> • Economic impact of the change; • Whether the change affects the original purpose of the Index.
Methodology **	The written rules and procedures according to which information is collected and the Benchmark is determined;
Rebalance	The regular process (typically quarterly, semi-annually or annually) in which the eligibility and weights of constituent elements of indexes are reassessed;
Subscriber **	A person or entity that purchases Benchmark determination services from an Administrator;
Transaction Data *	‘Transaction data’ means observable prices, rates, indices or values representing transactions between unaffiliated counterparties in an active market subject to competitive supply and demand forces;

¹ <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf>

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