AKROS

Akros Index Calculation Methodology

Last Update: February 2026

Akros Technologies, Inc.

Contents

1 Introduction

Akros Technologies ("Akros") is dedicated to maintaining the highest standards of integrity through a transparent and replicable index design and calculation methodology. Driven by deep expertise in indexing, portfolio analytics, and data management, Akros seeks to bring an innovative and insightful perspective to the financial market. This dedication is reflected in the meticulous processes and standards that Akros adheres to in the creation and management of its indices.

Akros Index Calculation Methodology refers to the set of rules and processes used to determine the value of the financial index developed by Akros. Akros Indices typically represents the performance of a basket of assets, such as stocks, bonds, or other securities, and is used to gauge the overall performance of a specific market or segment. The calculation process involves applying mathematical formulae to aggregate the index value using selected index constituents and assigned weights according to the Individual Index Methodology. Adjustments for corporate actions are factored in to ensure the index reflects an accurate performance in the market. **Akros Index Calculation Methodology** seeks to provide a transparent set of calculation methodologies to facilitate investors to make informed investment decisions and understand the performance of the index.

Individual Index Methodology documents outline the specific details of each index, encompassing an introduction and the objectives of the index, the construction criteria for its constituents, the frequency of rebalancing, and additional relevant information. These documents are critical to maintaining the highest standards of integrity and precision in index management. The Individual Index Methodology often refers to the Akros Index Calculation Methodology, which serves as a comprehensive and holistic guideline for the development and maintenance of Akros indices.

2 Adherence to the IOSCO Principles

Akros Technologies remains steadfast in its mission to uphold the highest standards of integrity and professionalism. This commitment is reflected in every aspect of its operations, from the development and calculation of indices to their ongoing management and administration.

Akros adheres to the IOSCO Principles regarding the quality and integrity of indices and their methodologies by providing all relevant stakeholders with detailed information regarding the calculation and maintenance of the indices that that Akros provides. This commitment to transparency is a cornerstone of Akros's approach, ensuring that each index is managed according to the highest standards. Stakeholders have access to comprehensive details about index components, their selection criteria, and the overall methodology used in index calculation and maintenance. This level of professional detail ensures that users clearly understand how indices are constructed and maintained, fostering trust and confidence in the indices provided by Akros.

In light of the EU Benchmarks Regulation (Regulation (EU) 2016/1011), the Akros Index Calculation Methodology provides a comprehensive framework that aligns with all relevant regulatory standards. The regulation sets out stringent requirements for benchmark administrators, emphasizing the need for accuracy, reliability, and transparency.

By transparently disclosing index maintenance rules and general calculation methods, the Akros Index Calculation Methodology enables investors to effectively evaluate and utilize the indices developed by Akros. Detailed documentation and regular updates regarding the index methodologies ensure that users remain well-informed about any changes to index calculations. This transparency allows stakeholders to make informed decisions based on accurate and up-to-date information, enhancing their ability to use Akros indices for various investment and analytical purposes. Akros's commitment to clear and comprehensive communication ensures that all relevant parties fully understand and benefit from its index products.

For further information, please refer to the Akros's Statement of Adherence to IOSCO Principles.

3 General Calculation Methodology

This section outlines the general methodology for calculating index shares and net asset value (NAV). The approach ensures that the index accurately reflects changes in the underlying portfolio, aligning with actual market conditions and investment strategies.

3.1 Corporate Action Adjustment

Daily holdings from the previous day are systematically adjusted to account for corporate actions, ensuring an accurate reflection of any events impacting the securities. The adjustments are made in accordance with the established Akros Corporate Action Methodology, which is designed to standardize the handling of events such as stock splits, dividends, mergers, and other corporate actions. Akros Corporate Action Methodology ensures consistency, accuracy, and compliance with industry best practices, maintaining the integrity of the reported holdings and providing stakeholders with an accurate representation of portfolio changes. Please refer to the Akros Corporate Action Methodology for further details.

3.2 Dividend and Distribution Pre-Processing

In the event of an ex-dividend or ex-distribution occurrence, the corresponding dividend or distribution amounts are first converted to U.S. dollars (USD) using the prevailing exchange rates. The converted amounts are aggregated to reflect the total dividend or distribution value for the relevant holdings. The aggregated sum is then recorded in the portfolio as Cash (USD), ensuring accurate and consistent tracking of income generated from investments. This process aligns with industry standards, ensuring transparency and precision in reporting portfolio cash flows from dividends and distributions.

3.3 Cash (USD) Handling based on Calculation Type

The handling of the aggregated Cash (USD) is determined by the specific calculation type applied to the index. Each calculation type follows a distinct methodology for processing and allocating cash flows, ensuring that the treatment of dividends, distributions, or other income is aligned with the intended method.

3.3.1 Price Return Index

For a price return index, the aggregated Cash (USD) is excluded from the index calculation. This means that any cash generated from dividends or distributions is disregarded, as the price return index calculation focuses solely on the capital appreciation of the underlying securities. The index therefore reflects only the changes in prices of the underlying assets, without considering any income generated.

3.3.2 Total Return Index

For a total return index, the aggregated Cash (USD) from dividends and distributions is reinvested at the index level to reflect the compounding effect of income on the overall performance of the portfolio. This reinvestment process ensures that both capital appreciation and income are captured in the index, providing a comprehensive measure of total investment returns. Equation 1 shows the calculation involved with total return index that captures the overall performance.

$$\text{Index Shares Adjusted}_{i,D} = \text{Index Shares}_{i,D} \times \left(1.0 + \frac{\text{Cash (USD)}_{I,D}}{\text{NAV (USD)}_{I,D}}\right) \tag{1}$$

3.3.3 Excess Return Index

For an excess return index, the aggregated Cash (USD) from dividends and distributions is held in a separate cash account until the next rebalancing date.

3.3.4 Net Total Return Index and Net Excess Return Index

For net calculation types, such as net excess return and net total return, tax adjustments are applied to the aggregated Cash (USD) prior to its inclusion in the index calculation. These adjustments reflect the withholding of taxes on income generated by the index constituents, ensuring the results accurately represent after-tax returns. Unless otherwise mentioned, the following tax rates are applied:

- **Options**
  A tax rate of 0% is applied, as no taxes are withheld on options.
- **Dividends and Distribution**
  A standard tax rate of 15% is applied to account for withholding taxes on dividends and distributions.

It is important to note that the applicable tax rates may vary depending on the specific index methodology. Any deviations from the standard rates will be clearly outlined in the Individual Index Methodology, ensuring full transparency and compliance with the relevant tax regulations.

3.4 Net Asset Value (NAV) Calculation

The Index Net Asset Value (NAV) for the calculation day is determined using Equation 2. This equation aggregates the adjusted index shares of each constituent, multiplied by the respective price input for each asset class, ensuring an accurate representation of the index's value.

$$\text{Index NAV}_{I,D} = \sum_i \text{Index Shares Adjusted}_{i,D} \times \text{Price}_{i,D} \tag{2}$$

The price input varies depending on the type of asset.

- **Options**
  For Options, unless specified otherwise, the Mid Price (the average of the bid and ask prices) is used as the price input to reflect a fair market valuation.
  Expiration-Day Provision: Depending on each Individual Index Methodology, on the option's expiration date the option price input may instead be determined, per index-specific rules, as the intrinsic value using the official settlement underlying price; see Section 4.2.
- **Equities**
  For Equities, the Closing Price at the market close is used as the price, representing the final price at which the equity traded during the regular trading session.

For dissemination, the resulting Index NAV is rounded to three decimal places for readability, whereas holdings and intermediate calculations are maintained at full precision.

4 Option Pricing Methodology

This section outlines the comprehensive methodology for option pricing, including data sourcing, quality assurance, theoretical pricing models, and implied volatility estimation. The approach ensures accurate and reliable option valuations for index calculation purposes.

4.1 Data Sourcing and Quality Assurance

4.1.1 Primary Data Source

For options on U.S. securities, the methodology prioritizes trading data from listed markets to ensure the most accurate and directly observable market prices for index calculation.

4.1.2 Contingency for Data Errors

When end-of-day (EOD) data exhibits potential errors, alternative data sources or pricing methods are employed. Scenarios requiring contingency measures include:

- Missing liquidity provider (LP) quotes resulting in excessive bid-ask spreads
- Instances where bid price exceeds ask price
- Cases where both bid and ask prices are recorded as zero

In such cases, either pre-close order book data (15 minutes before market close) is utilized, or theoretical pricing is performed using an appropriate option model.

4.1.3 Anomaly Detection

Data quality is maintained through Akros' proprietary algorithm, which systematically identifies pricing anomalies that could impact index accuracy. The following methods represent the primary detection mechanisms that filter the majority of anomalous observations, but the framework is not limited to these approaches:

- **Intrinsic Value Violations**: In-the-money options reported with zero price are flagged as anomalies. Specifically, call options where $S > K$ with zero price, or put options where $S < K$ with zero price, may be excluded.
- **Stale Data Detection**: Five or more consecutive identical price observations (excluding near-zero values below a minimum tick threshold) are identified as potentially forward-filled data and may be excluded.
- **Bid-Ask Spread Anomalies**: Spread anomalies are detected using two complementary methods:
  - *Intraday Cross-Validation*: EOD spreads are compared against pre-close reference data. Observations exhibiting spread differences exceeding a rolling median plus one standard deviation threshold, with an absolute threshold of 50 basis points, are flagged.
  - *Time-Series Decomposition*: Seasonal-Trend decomposition using LOESS (STL) is applied to the spread series. Residuals are standardized using the median and standard deviation (i.e., $(r_t - \text{median}(r))/\text{std}(r)$) for robustness against outliers. Observations with standardized residuals exceeding three standard deviations, where neighboring observations show opposite-signed residuals and the spread exceeds 1%, are identified as point anomalies. Additionally, extreme outliers with standardized residuals exceeding four standard deviations and spreads exceeding 2% are flagged regardless of sign patterns.
- **Quote Integrity**: Crossed markets where bid prices exceed ask prices may be excluded.

In addition to the rule-based methods above, Akros employs internal statistical models and machine learning models to detect complex anomaly patterns that may not be captured by deterministic rules. Observations flagged by any detection method may be excluded from index calculation and replaced using the contingency pricing methods described above.

4.2 Expiration-Date Pricing Provision

On an option's expiration date, the Individual Index Methodology may prescribe a deterministic pricing rule for index calculation. Unless otherwise specified, the option price is the intrinsic value computed from the official settlement underlying price:

$$\text{Call: } \max\left(S_{\text{settle}} - K, 0\right) \tag{3}$$

$$\text{Put: } \max\left(K - S_{\text{settle}}, 0\right) \tag{4}$$

where S_{settle} denotes the official exchange settlement price for the underlying (or other specified reference price) on the expiration date, and K is the option strike. If an exchange publishes an official settlement value for the option itself, that value prevails. Contract multipliers are applied as per contract specifications.

4.3 Option Theoretical Pricing Models

4.3.1 European Options

The Black-Scholes model serves as the primary framework for European option pricing. The model calculates option prices using the following formula:

$$C = SN(d_1) - Ke^{-r\tau}N(d_2) \tag{5}$$

$$P = Ke^{-r\tau}N(-d_2) - SN(-d_1) \tag{6}$$

where:

$$d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)\tau}{\sigma\sqrt{\tau}}$$

$$d_2 = d_1 - \sigma\sqrt{\tau}$$

and:

- S is the current price of the underlying asset
- K is the strike price
- r is the risk-free interest rate
- τ is the time to expiration
- σ is the implied volatility
- $N(\cdot)$ is the cumulative normal distribution function

4.3.2 American Options

The Binomial Options Pricing Model (BOPM) is employed for American options to account for early exercise possibilities. The model constructs a discrete-time framework where the underlying asset follows a multiplicative binomial process.

4.4 Implied Volatility Estimation Process

The implied volatility estimation process employs a sophisticated approach to match and interpolate volatility data from similar options, ensuring accurate estimation for any given strike price and expiration date.

4.4.1 Time-to-Expiry Filtering

Options with the closest expiry to the target are selected for each trade date. Formally, the process identifies options with similar time-to-expiry characteristics:

$$\Delta\tau_i = |\tau_i - \tau_{target}| \tag{7}$$

$$\tau_{min,d} = \min_{i \in \mathcal{I}_d} \Delta\tau_i \tag{8}$$

where:

- τ_i is the time-to-expiry of option i

- τ_{target} is the target time-to-expiry
- $\mathcal{I}_d$ is the set of options available on date d
- $\tau_{min,d}$ is the minimum time-to-expiry difference for date d

Options with zero time-to-expiry are explicitly excluded from consideration to avoid expiration-day effects, by replacing zero values with NaN before computing differences.

4.4.2 Date Selection and Temporal Matching

If the target date exists in the data, it is used directly; otherwise, the most recent available date is used. Formally, the methodology employs a hierarchical approach:

$$\mathcal{O}_{selected} = \begin{cases} \{o_i \in \mathcal{O}_t : \Delta\tau_i = \tau_{min,t}\} & \text{if } t_{target} \text{ exists in data} \\ \{o_i \in \mathcal{O}_{t_{max}} : \Delta\tau_i = \tau_{min,t_{max}}\} & \text{otherwise} \end{cases} \tag{9}$$

where:

- $\mathcal{O}_t$ is the set of options on target date t
- t_{max} is the most recent available date
- o_i represents an individual option contract

4.4.3 OTM Implied Volatility Blend

Rather than selecting exclusively call or put implied volatility, the methodology employs a smooth blending of out-of-the-money (OTM) call and put IVs near the at-the-money (ATM) region using a logistic weighting function:

$$w(m) = \frac{1}{1 + e^{-m/\epsilon}} \tag{10}$$

where:

- $m = \ln(K/S)$ is the log-moneyness
- $\epsilon = 0.03$ is the blending width parameter

The blended OTM implied volatility is computed as:

$$\sigma_{OTM}(m) = w(m) \cdot \sigma_{call} + (1 - w(m)) \cdot \sigma_{put} \tag{11}$$

where σ_{call} and σ_{put} are the implied volatilities of call and put options at each available strike K in the market data. Since calls are OTM when $K > S$ and puts are OTM when $K < S$, this weighting effectively selects the OTM option's IV at each strike: for $m > 0$, call IV dominates; for $m < 0$, put IV dominates; near $m = 0$ (ATM), both are smoothly blended. The blended IVs are then interpolated to the target strike. If only one side has valid IV data, that value is used directly. This approach:

- Eliminates discontinuity near ATM by smoothly transitioning between call and put IV
- Utilizes OTM options which typically exhibit higher liquidity

4.4.4 Total Variance Surface Fitting

Rather than interpolating implied volatility directly, the methodology interpolates total variance, which provides improved stability across expiries and is consistent with the financial principle that variance scales with time:

$$TV(m, \tau) = \sigma^2(m, \tau) \cdot \tau \tag{12}$$

where m is log-moneyness and τ is time-to-expiry. The estimated implied volatility is recovered as:

$$\hat{\sigma}(m, \tau) = \sqrt{\frac{\widehat{TV}(m, \tau)}{\tau}} \tag{13}$$

This approach prevents calendar arbitrage and improves stability for short-dated options.

4.4.5 PCHIP Interpolation

The methodology employs Piecewise Cubic Hermite Interpolating Polynomial (PCHIP) interpolation for the volatility smile at each expiry. For a given expiry, the total variance is interpolated as a function of log-moneyness:

$$\widehat{TV}(m) = \begin{cases} p(m) & \text{if } m_{min} \leq m \leq m_{max} \\ p(m_{min}) & \text{if } m < m_{min} \\ p(m_{max}) & \text{if } m > m_{max} \end{cases} \tag{14}$$

where $p(m)$ is the PCHIP interpolant. PCHIP interpolation is preferred over cubic splines because it:

- Preserves monotonicity where present in the data
- Prevents overshooting and undershooting artifacts
- Eliminates oscillation at extreme moneyness levels

For multiple expiries, the methodology first interpolates total variance at the target log-moneyness for each available expiry, then interpolates linearly in the time-to-expiry direction to obtain the final estimate.

4.4.6 Multi-Date Median Estimation

To enhance robustness against single-day outliers, bad ticks, and illiquidity effects, the methodology estimates implied volatility for each available trade date within a 5-day lookback window and takes the median:

$$\hat{\sigma} = \text{median}\{\hat{\sigma}_{t-4}, \hat{\sigma}_{t-3}, \hat{\sigma}_{t-2}, \hat{\sigma}_{t-1}, \hat{\sigma}_t\} \tag{15}$$

where $\hat{\sigma}_{t-k}$ is the IV estimate using data from k business days prior. This approach:

- Filters market microstructure noise
- Reduces sensitivity to anomalous single-day price observations
- Provides more stable IV estimates over time

4.4.7 Duplicate Data Aggregation

Before interpolation, data points at the same log-moneyness and time-to-expiry coordinates are aggregated using median to ensure uniqueness of the interpolation function and minimize the impact of outliers:

$$TV_{agg}(m_i, \tau_j) = \text{median}\{TV_k : (m_k, \tau_k) = (m_i, \tau_j)\} \tag{16}$$

This ensures uniqueness of interpolation input and reduces outlier impact.

4.4.8 Volatility Bounds

To maintain realistic market conditions, the estimated implied volatility (σ) is bounded:

$$\sigma = \max(\min(IV_{mid}(LM), 3.00), 0.01) \tag{17}$$

This ensures:

- Minimum implied volatility of 1%
- Maximum implied volatility of 300%

4.5 Black-Scholes Implied Volatility Inversion

When implied volatility must be computed from observed market prices (e.g., for end-of-day data without pre-computed IV), the methodology employs a robust numerical inversion of the Black-Scholes pricing function.

4.5.1 Arbitrage Bounds Validation

Before attempting IV calculation, market prices are validated against no-arbitrage bounds. The IV calculation fails if the market price violates these fundamental constraints:

For call options:

$$\max\left(0, S - Ke^{-r\tau}\right) \leq C_{mkt} \leq S \tag{18}$$

For put options:

$$\max\left(0, Ke^{-r\tau} - S\right) \leq P_{mkt} \leq Ke^{-r\tau} \tag{19}$$

where:

- S is the underlying price
- K is the strike price
- r is the risk-free rate
- τ is time to expiration
- C_{mkt}, P_{mkt} are the observed market prices

Prices violating these bounds indicate data errors or illiquidity and result in a null IV value.

4.5.2 Brent's Method for IV Computation

The implied volatility is computed by numerically inverting the Black-Scholes pricing function using Brent's method, a robust root-finding algorithm:

$$\hat{\sigma} = \underset{\sigma}{\operatorname{argmin}} \left|BS(S, K, \tau, r, \sigma) - P_{mkt}\right| \tag{20}$$

where $BS(\cdot)$ denotes the Black-Scholes pricing function (Equations 5–6).

The numerical procedure uses the following parameters:

- Initial search range: $\sigma \in [0.0001, 5.0]$
- Convergence criterion: $|f(\sigma)| < 10^{-6}$
- Maximum iterations: 100

If convergence is not achieved within these bounds, the search range is dynamically expanded up to $\sigma = 20.0$ to accommodate extreme volatility scenarios.

4.6 FLEX Option Pricing and Bid-Ask Estimation

FLEX options are exchange-listed, customizable contracts that may exhibit limited liquidity and sparse end-of-day observations. Unless explicitly specified otherwise in the Individual Index Methodology, FLEX options are valued using theoretical prices (and, where required, a model-based bid-ask estimate). The objective of this framework is to estimate theoretical values in a way that is economically consistent with prevailing market conditions. Model inputs are anchored to market information whenever available: (i) mid-market implied volatility is inferred from listed option data and used as the primary volatility input, and (ii) bid-ask levels are derived by estimating spreads from comparable listed options. Fallback assumptions (e.g., realized-volatility proxies) are used only when market-derived inputs are not sufficiently robust.

4.6.1 Inputs and Preprocessing

For each valuation date t (a trading day prior to expiration), the following inputs are constructed:

- Underlying price S_t: the official close (or other methodology-specified reference) for the underlying on date t.
- Strike K_t: strike adjusted for applicable corporate actions (e.g., stock splits and qualifying special dividends) so that the strike remains economically consistent through time.

- Time to expiration τ_t: the day-count fraction to expiry, $\tau_t = \frac{(\text{ExpiryDate}-t)}{365}$.
- Risk-free rate r_t: a term-matched risk-free rate consistent with the maturity τ_t.
- Volatility input σ_t: the implied volatility estimated using the process in Section 4.4. If implied volatility cannot be robustly inferred, a realized-volatility fallback may be used:

$$\hat{\sigma}_t = \sqrt{252} \cdot \text{Std}\left(r_{t-1}, \ldots, r_{t-L}\right), \quad r_u = \frac{S_u}{S_{u-1}} - 1 \tag{21}$$

where L is a short rolling window of recent trading days.

4.6.2 Theoretical Pricing Model Selection

Akros prices FLEX options using a model consistent with the contract's exercise style:

- European-style: Black-Scholes, as in Equations 5–6.
- American-style: a binomial lattice model to account for early exercise.

When the exercise style is not explicitly provided, a practical default is applied: index options are treated as European-style and single-stock options as American-style.

4.6.3 Bid-Ask Estimation for FLEX Options

If the index calculation requires a bid or ask (rather than a mid) for a FLEX option, Akros estimates a bid-ask spread from listed option market data on the same underlying and applies it to the theoretical value.

Define, for each comparable listed option i on date t, the mid price and spread percentage:

$$M_{i,t} = \frac{A_{i,t} + B_{i,t}}{2}, \tag{22}$$

$$\text{SpreadPct}_{i,t} = \frac{A_{i,t} - B_{i,t}}{M_{i,t}}, \tag{23}$$

where $A_{i,t}$ and $B_{i,t}$ denote the ask and bid. Comparable options are selected by matching option type (call/put) and selecting contracts with time-to-expiration closest to τ_t within a reasonable tolerance window. Observations with non-positive spreads and extremely small premiums are excluded to reduce minimum-tick distortions.

A natural cubic spline is fitted to the median spread percentage as a function of log-moneyness $LM = \ln(K/S)$, and the spread percentage for the FLEX contract is interpolated (or linearly extrapolated at the boundaries):

$$\widehat{\text{SpreadPct}}_t = \widehat{\text{SpreadPct}}(LM_t), \quad LM_t = \ln\left(\frac{K_t}{S_t}\right). \tag{24}$$

To avoid unrealistic outcomes, $\widehat{\text{SpreadPct}}_t$ is bounded within a conservative range (e.g., 0.5% to 50%). The half-spread percentage is then:

$$h_t = \frac{1}{2}\,\widehat{\text{SpreadPct}}_t. \tag{25}$$

Let V_t^{theo} be the theoretical mid value obtained from the selected option model. The FLEX bid and ask are then estimated as:

$$V_t^{ask} = V_t^{theo}\left(1 + h_t\right), \tag{26}$$

$$V_t^{bid} = \max\left(V_t^{theo}\left(1 - h_t\right), 0\right). \tag{27}$$

No spread adjustment is applied at expiration ($\tau_t = 0$), for which the deterministic expiration-date rule in Section 4.2 applies.

5 Corporate Action Methodology

This section describes the methodology for processing corporate actions that affect index constituents. Corporate actions are applied prior to rebalancing events to ensure accurate reflection of market changes in the index.

5.1 Corporate Action Event Types

The following corporate action events are monitored and processed by Akros:

Event Type	**Description**
Cash Dividend	Regular cash dividend distributions to shareholders
Special Cash Dividend	Non-recurring special cash distributions
Stock Dividend	Distribution of additional shares to existing shareholders
Stock Split	Increase in shares outstanding with proportional price adjustment
Acquisition	Takeover of a constituent by another company
Spin-Off	Separation of a subsidiary into an independent company
Stock Distribution	Distribution of shares of another company to shareholders
Merger	Combination of two companies into a single entity
Identifier Change	Change in security identifier (ticker symbol, ISIN, etc.)
Rights Issue	Offering of additional shares to existing shareholders at a subscription price

Table 1: Corporate Action Event Types

5.2 Instrument-Level Adjustments

The following corporate actions affect only the specific instrument undergoing the event. These adjustments modify the index shares and/or price of the individual instrument without affecting other index constituents.

5.2.1 Stock Split

When a stock split occurs, the index shares of the affected constituent are adjusted by the split ratio:

$$\text{Index Shares}_{i,D} = \text{Index Shares}_{i,D-1} \times \text{Split Ratio}_i \tag{28}$$

For example, a 2-for-1 stock split doubles the index shares while the market price is halved, maintaining the same market value.

5.2.2 Stock Dividend

When a stock dividend is distributed, additional shares are added to the affected constituent:

$$\text{Index Shares}_{i,D} = \text{Index Shares}_{i,D-1} \times (1 + \text{Stock Dividend Rate}_i) \tag{29}$$

For example, a 5% stock dividend increases the index shares by a factor of 1.05.

5.2.3 Rights Issue

When a rights issue occurs, the index shares of the affected constituent are adjusted based on the theoretical value of the subscription rights:

$$\text{Rights Value}_i = \max\left(\frac{\text{Close Price}_{i,D-1} - \text{Subscription Price}_i}{\frac{1}{\text{Issue Ratio}_i} + 1}, 0\right) \tag{30}$$

$$\text{Increase Ratio}_i = \frac{\text{Rights Value}_i}{\text{Close Price}_{i,D-1}} \tag{31}$$

$$\text{Index Shares}_{i,D} = \text{Index Shares}_{i,D-1} \times (1 + \text{Increase Ratio}_i) \tag{32}$$

5.2.4 Spin-Off

When a spin-off occurs, both the parent company and the newly created child company are affected:

1. The parent company's index shares may be adjusted according to the spin-off ratio
2. Shares of the spun-off (child) company are added to the index holdings based on the distribution ratio:

$$\text{Child Index Shares}_D = \text{Parent Index Shares}_{D-1} \times \text{Distribution Ratio} \tag{33}$$

3. If the child company's market price is not yet available on the effective date, a theoretical price is calculated:

$$\text{Child Price}_D = \text{Parent Price}_D \times \frac{1 - \text{Parent Ratio}}{\text{Distribution Ratio}} \tag{34}$$

4. The spun-off company remains in the index until the next scheduled rebalancing, at which point its continued inclusion is evaluated according to the Individual Index Methodology

5.2.5 Stock Distribution

When a stock distribution occurs, shares of another company are added to the index holdings based on the distribution ratio:

$$\text{Distributed Shares}_{j,D} = \text{Index Shares}_{i,D-1} \times \text{Distribution Ratio}_{i \to j} \tag{35}$$

Where i is the distributing constituent and j is the distributed company.

5.2.6 Identifier Change

When a constituent's identifier changes (e.g., ticker symbol or ISIN), the index holdings are updated to reflect the new identifier. The index shares and market value remain unchanged.

5.3 Index-Level Adjustments

The following corporate actions generate proceeds that are reinvested proportionally across all index constituents. This maintains the total index value while distributing the proceeds according to each constituent's weight in the index.

5.3.1 Cash Dividend Reinvestment

Cash dividend processing varies based on the calculation type of the index:

- **Price Return Index**: Dividend amounts are excluded from the index calculation. The index reflects only capital appreciation.
- **Total Return Index**: Dividend amounts are reinvested proportionally across all index constituents at the closing of the ex-dividend date.
- **Net Total Return Index**: Applicable withholding taxes are deducted before reinvestment:

$$\text{Net Dividend}_{i,D} = \text{Gross Dividend}_{i,D} \times (1 - \text{Tax Rate}) \tag{36}$$

- **Excess Return and Net Excess Return Index**: Dividend amounts are held in a separate cash account until the next rebalancing date.

For Total Return and Net Total Return indices, the dividend reinvestment is applied to all constituents:

$$\text{Reinvestment Factor}_D = 1 + \frac{\text{Total Dividend Amount}_D}{\text{Index NAV}_D} \tag{37}$$

$$\text{Index Shares}_{i,D}^{\text{adjusted}} = \text{Index Shares}_{i,D} \times \text{Reinvestment Factor}_D \quad \forall i \in \text{Index} \tag{38}$$

5.3.2 Acquisition and Merger

When a constituent is acquired or merged:

1. The acquired constituent is removed from the index (index shares set to zero)
2. The proceeds from the acquisition are processed as follows:
   - **Cash Terms**: Cash proceeds are reinvested across all remaining constituents
   - **Stock Terms**:
     - If the acquiring company is already an index constituent, the stock is added to that constituent's position only (exception: instrument-level adjustment applies)
     - If the acquiring company is not an index constituent, the equivalent value is reinvested proportionally across all remaining constituents

When proceeds are reinvested across all constituents, the reinvestment is applied as follows:

$$\text{Reinvestment Factor}_D = 1 + \frac{\text{Total Proceeds}_D}{\text{Index NAV After Removal}_D} \tag{39}$$

$$\text{Index Shares}_{i,D}^{\text{adjusted}} = \text{Index Shares}_{i,D} \times \text{Reinvestment Factor}_D \quad \forall i \in \text{Remaining Constituents} \tag{40}$$

5.4 Price Adjustment for Opening Holdings

On the effective date of a corporate action, the opening price of the affected constituent is adjusted to reflect the event. This ensures continuity in the index value across the corporate action date.

$$\text{Adjusted Price}_{i,D} = \frac{\text{Previous Close Price}_{i,D-1} - \text{Dividend Amount}_i}{\text{Adjustment Factor}_i} \tag{41}$$

Where:

- Dividend Amount_i is the cash dividend per share (zero if no dividend)
- $\text{Adjustment Factor}_i$ is the cumulative factor from stock splits and stock dividends (1.0 if no such events)

5.5 Dividend Estimation for Korean Securities

For Korean securities where the final dividend amount is not confirmed by the ex-dividend date, an estimated dividend amount is applied based on historical dividend patterns. When the actual dividend amount is subsequently confirmed, a correction adjustment is applied on the business day following the confirmation:

$$\text{Dividend Correction}_i = \text{Actual Dividend}_i - \text{Estimated Dividend}_i \tag{42}$$

The correction amount is then processed as a dividend and reinvested according to the index calculation type (Total Return, Net Total Return, etc.).

6 Rebalancing Calculation Methodology

In the process of rebalancing the index and its constituents, Akros coins three key terms to clarify the stages: *Determination Date*, *Implementation Date*, and *Effective Date*. These terms help outline the timeline and actions required to adjust the index constituents, ensuring transparency and minimizing tracking errors for portfolio managers. The steps below elaborate on the details of each stage involved with the rebalancing process. Please take care to differentiate between the usage of previous constituents prior to rebalancing and

Date	**Description**
[D] Determination Date	The date when the weights of the next index constituents are calculated. The determination date is usually set as the last trading day of the month.
[D+1] Pro-Forma Date	The date when the weights of the next index constituents are published.
[T] Implementation Interval	The interval between the determination date and the implementation date. The implementation interval is usually set as three trading days.
[D+T] Implementation Date	The day when the index is rebalanced at the closing hours.
[D+T+1] Effective Date	The day when the rebalancing becomes effective at the opening hours.

Table 2: Dates involved with Rebalancing Event

the usage of next constituents post rebalancing. Note that Variables i and I are used to indicate previous components prior to rebalancing and the values evaluated using them, and variables j and J refer to next constituents post rebalancing and the corresponding values.

Note: For option constituents, the Price variable already includes the Option Contract Multiplier. For US equity and index options, this multiplier is typically 100. Therefore, there is no need to multiply option prices by 100 in the formulas.

6.1 Index Shares Calculation as at Determination

The weight of each index constituent i is determined according to the corresponding Individual Index Methodology.

For computational accuracy, Index $\text{NAV}_{I,D}$ is derived directly from the underlying holdings without rounding, preventing the accumulation of errors across rebalancing cycles. Note that the Index NAV disseminated to stakeholders is rounded to three decimal places for readability.

If i is an equity constituent, the index shares is given by:

$$\text{Index Shares}_{i,D} = \frac{\text{Index NAV}_{I,D} \times \text{Notional Weight}_i}{\text{Price}_{i,D}} \tag{43}$$

If i is an option constituent, the equation to calculate the index shares depends on the weight type (either notional weight or NAV weight, where this is equal to notional weight unless otherwise specified).

For *notional weight*, the index shares is given by

$$\text{Index Shares}_{i,D} = \frac{\text{Index NAV}_{I,D} \times \text{Notional Weight}_i}{\text{Underlying Price}_{i,D}} \tag{44}$$

and for *NAV weight*, the index shares is given by

$$\text{Index Shares}_{i,D} = \frac{\text{Index NAV}_{I,D} \times \text{NAV Weight}_i}{\text{Price}_{i,D}} \tag{45}$$

Note that the definition of $\text{Price}_{i,D}$ is the same as Section 3.4.

The calculated index shares are made available on the Pro-Forma Date. This is because the index shares can only be calculated after the market closes on the determination date.

6.2 Index Shares Calculation as at Implementation

In contrast to the traditional divisor calculation methods used by other index providers, Akros' approach utilizes a standard calculation method to directly adjust the index shares. The adjustment reflects changes in the index NAV to accurately align with the value outlook of the underlying constituents.

As a result, index shares calculated as at determination date may change during the implementation interval due to fluctuations in the index NAV prior to the rebalancing on the implementation date. The index NAV prior to the rebalancing is influenced by the fluctuations in the prices of the positions of the previous index constituent.

Consequently:

- If the index NAV as at implementation date increases more than the index NAV as at determination date [as provided in Pro-Forma]: **Index Shares increases**
- If the Index NAV as at implementation date decreases more than the index NAV as at determination date [as provided in Pro-Forma]: **Index Shares decreases**

The adjustment is analogous to how portfolio managers recalibrate the index constituents based on the index shares provided on the pro-forma. Portfolio managers invest proportionally to the provided index shares while ensuring the index NAV is fully utilized by calculating and placing orders accordingly.

6.3 Conversion: Index Shares from Determination to Implementation

Several steps are involved in converting index shares calculated as at Determination Date to index shares calculated as at Implementation Date.

6.3.1 Projected Index NAV of Next Constituents on Determination as at Implementation

The projected index NAV of next index constituents on determination date as at implementation date can be calculated using index shares calculated as at determination date, and the price of the next index constituents as at implementation date using Equation 46.

$$\text{Projected Index NAV}_{J,D+T} = \sum_j \text{Index Shares}_{j,D} \times \text{Price}_{j,D+T} \tag{46}$$

6.3.2 Projected Option NAV of Next Constituents on Determination as at Implementation

The projected option NAV of next index option constituents on determination date as at implementation date can be calculated using number of contracts calculated as at determination date, and the mid price of the option as at implementation date using Equation 47.

$$\text{Projected Option NAV}_{J,D+T} = \sum_j \text{Number of Option Contracts}_{j,D} \times \text{Mid Price}_{j,D+T} \tag{47}$$

6.3.3 Index NAV of Previous Constituents on Implementation

The index NAV of previous index constituents on implementation date can be calculated using index shares calculated as at implementation date, and the price of the previous index constituents as at implementation date using Equation 48.

$$\text{Index NAV}_{I,D+T} = \sum_i \text{Index Shares}_{i,D+T} \times \text{Price}_{i,D+T} \tag{48}$$

6.3.4 Cash Received from Next Option Positions Sold

Cash received is determined based on Equation 49, which calculates the sum of the product of the number of option contracts and the option price on the implementation date for all option positions sold as next index constituent j. Unless otherwise specified, the bid price is used for the option price.

$$\text{Cash Received}_{D+T} = \sum_j \text{Number of Option Contracts Sold}_{j,D} \times \text{Bid Price}_{j,D+T} \tag{49}$$

6.3.5 Transaction Cost from Options Rebalancing

The transaction cost for options rebalancing is calculated using Equation 50, which accounts for the cost of selling or buying option positions for the rebalancing portfolio J.

$$\begin{aligned}\text{Transaction Cost}_{D+T} = &\sum_j \text{Number of Option Contracts Sold}_{j,D} \times (\text{Mid Price}_{j,D+T} - \text{Bid Price}_{j,D+T}) \\ &+ \sum_j \text{Number of Option Contracts Bought}_{j,D} \times (\text{Ask Price}_{j,D+T} - \text{Mid Price}_{j,D+T})\end{aligned} \tag{50}$$

6.3.6 Projection Factor

The projection factor is a factor that adjusts the index shares of next constituents post rebalancing as at determination date to the index shares of next constituents as at implementation date. There are two possible scenarios: the first is where either the sold option positions are not projected or no option positions are involved, and the second is where the sold option positions are projected.

Case 1: **Option Positions Sold are not Projected** or **No Option Positions are Involved**

The projection factor is calculated using Equation 51 by substituting the values obtained from Equation 46, Equation 47, Equation 48, Equation 49, and Equation 50.

$$\begin{aligned}\text{Projection Factor}_{D+T} = &\frac{\text{Index NAV}_{I,D+T} - \text{Projected Option NAV}_{J,D+T}}{\text{Projected Index NAV}_{J,D+T} - \text{Projected Option NAV}_{J,D+T}} \\ &- \frac{\text{Cash Received}_{D+T} + \text{Transaction Cost}_{D+T}}{\text{Projected Index NAV}_{J,D+T} - \text{Projected Option NAV}_{J,D+T}}\end{aligned} \tag{51}$$

Case 2: **Option Positions are Projected**

When option positions are projected, portfolio managers may adjust the contract count on the Implementation Date to maintain the target notional exposure and cover ratio relative to the Index NAV. Accordingly, transaction costs must reflect the implemented portfolio rather than the pro-forma portfolio calculated on the Determination Date. The implemented transaction cost is defined in Equation 52.

$$\text{Implemented Transaction Cost}_{D+T} = \text{Transaction Cost}_{D+T} \times \left(\frac{\text{Index NAV}_{I,D+T}}{\text{Projected Index NAV}_{J,D+T} + \text{Cash Received}_{D+T}} \right) \tag{52}$$

The projection factor is evaluated using Equation 53 by substituting the values obtained from Equation 46, Equation 48, Equation 49, and Equation 52.

$$\text{Projection Factor}_{D+T} = \frac{\text{Index NAV}_{I,D+T} - \text{Implemented Transaction Cost}_{D+T}}{\text{Projected Index NAV}_{J,D+T} + \text{Cash Received}_{D+T}} \tag{53}$$

6.3.7 Projected Index Shares of Next Constituents on Determination as at Implementation

The projected index shares of next index constituents post rebalancing on determination date as at implementation date is calculated using the projection factor using either Equation 50 or Equation 53.

$$\text{Projected Index Shares}_{J,D+T} = \text{Index Shares}_{J,D} \times \text{Projection Factor}_{D+T} \tag{54}$$

6.3.8 Reinvestment Factor

The reinvestment factor is determined using either Equation 55 or 56, depending on the scenario. When option positions are reinvested, received cash is immediately re-injected into the investment. This calculation applies only to the Total Return (TR) and Net Total Return (NTR) indices. Otherwise, the reinvestment factor considers the effect of holding both the existing equity index shares and the cash received without reinvestment. Depending on each index methodology, one of Case 1 or Case 2 applies.

Case 1: Option Positions are Reinvested

$$\text{Reinvestment Factor}_{D+T} = 1.0 + \frac{\text{Cash Received}_{D+T}}{\sum_j \left(\text{Projected Index Shares}_{j,D+T} \times \text{Price}_{j,D+T}\right)} \tag{55}$$

Case 2: Option Positions are Not Reinvested

In this scenario, the reinvestment factor for *option index shares* remains at:

$$\text{Reinvestment Factor}^{(\text{option})}_{D+T} = 1.0$$

For *equity index shares*, since the received cash is reinvested into the existing holdings, the reinvestment factor is calculated as:

$$\text{Reinvestment Factor}^{(\text{equity})}_{D+T} = 1.0 + \frac{\text{Cash Received}_{D+T}}{\sum_j \left(\text{Projected Equity Index Shares}_{j,D+T} \times \text{Price}_{j,D+T}\right)}. \tag{56}$$

6.3.9 Index Shares of Next Constituents as at Implementation

Equation 55 and Equation 56 show the calculation of the index shares of next index constituents post rebalancing as at implementation date using the projected index shares of next constituents on determination date as at implementation date, and the reinvestment factor.

$$\text{Index Shares}_{J,D+T} = \text{Projected Index Shares}_{J,D+T} \times \text{Reinvestment Factor}_{D+T} \tag{57}$$

6.3.10 Index NAV of Next Constituents as at Implementation

Equation 58 shows the calculation of the final index NAV of next constituents post rebalancing as at implementation date. The final index NAV is rounded to three decimal places.

$$\text{Index NAV}_{J,D+T} = \sum_j \text{Index Shares}_{j,D+T} \times \text{Price}_{j,D+T} \tag{58}$$

7 Conclusion

The Akros Index Calculation Methodology provides a systematic approach to calculating the Net Asset Value of the index and adjusting index shares during rebalancing events. By directly reflecting changes in the index NAV and market prices, it ensures that the index remains aligned with the actual performance and composition of the underlying portfolio. The Akros Index Calculation Methodology thereby promotes transparency and accuracy, to facilitate investors and portfolio managers to make informed investment decisions.