S&P Dow Jones Indices

A Division of S&P Global

S&P Intraday Edge Indices
Methodology

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Introduction

Index Objective and Highlights

S&P 500 Intraday Edge Indices. The indices use intraday volatility control strategies that adjust exposure to the S&P 500 Futures Index ER based on forward-looking and realized volatility estimates. The forward-looking volatility estimate is based on using PM-settled SPXW options. The indices feature a trend factor that assesses daily volatility and increases allocation during periods of heightened market movement to capitalize on stronger trends. In addition, the index incorporates an overnight signal that identifies when overnight returns fall below medium-term trends, introducing a contrarian component to mitigate adverse short-term moves.

S&P Multi-Asset Intraday Edge Macro Indices. The indices use a multi-asset strategy that adjusts exposure to an equity component (the S&P 500 Futures Intraday Edge Growth Index), a fixed income component (S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index), and a gold component (S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index). The index reweights each asset class monthly to predefined levels based on current growth and inflation signals, derived from market and macroeconomic indicators such as the Leading Economic Index (LEI) and Consumer Price Index (CPI), respectively. The index seeks to maintain 5% annualized volatility.

- **S&P Multi-Asset Intraday Edge Macro Adapt Indices**. The indices add a momentum signal to the S&P Multi-Asset Intraday Edge Macro Indices that decreases exposure if the index trends downwards.

For information on the S&P 500 Futures ER, please refer to the S&P Futures Indices Methodology, available at www.spglobal.com/spdji.

For information on the historical data used for calculating the indices, please refer to Appendix B.

Index Family

The index family includes the following:

S&P 500 Futures Intraday Edge Growth Indices

Index	Target Volatility	VolF	Leverage Cap	Decrement Factor	Transaction Cost	Replication Cost
S&P 500 Futures 10% Intraday Edge Growth (USD) ER	10%	Max	150%	0%	0%	0%
S&P 500 Futures 10% Intraday Edge Growth TCA (USD) ER	10%	Max	150%	0%	0.01%	0.05%
S&P 500 Futures 10% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	10%	Max	150%	1.5%	0.01%	0.05%
S&P 500 Futures 12% Intraday Edge Growth (USD) ER	12%	Max	180%	0%	0%	0%
S&P 500 Futures 12% Intraday Edge Growth TCA (USD) ER	12%	Max	180%	0%	0.01%	0.05%
S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	12%	Max	180%	1.5%	0.01%	0.05%

S&P 500 Futures Intraday Edge Volatility Indices

Index	Target Volatility	VolF	Leverage Cap	Decrement Factor	Max Weight Change	Transaction Cost	Replication Cost
S&P 500 Futures 7% Intraday Edge Volatility Index (USD) ER	7%	Max	100%	0%	30%	0%	0%
S&P 500 Futures 7% Intraday Edge Volatility TCA Index (USD) ER	7%	Max	100%	0%	30%	0.01%	0.05%
S&P 500 Futures 7% Intraday Edge Volatility TCA 2% Decrement Index (USD) ER	7%	Max	100%	2%	30%	0.01%	0.05%
S&P 500 Futures 10% Intraday Edge Volatility TCA Index (USD) ER	10%	Max	150%	0%	30%	0.01%	0.05%
S&P 500 Futures 35% Intraday Edge Volatility Index (USD) ER	35%	Min	500%	0%	60%	0	0
S&P 500 Futures 35% Intraday Edge Volatility TCA Index (USD) ER	35%	Min	500%	0%	60%	0.01%	0.05%
S&P 500 Futures 35% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	35%	Min	500%	6%	60%	0.01%	0.05%
S&P 500 Futures 40% Intraday Edge Volatility Index (USD) ER	40%	Min	500%	0%	60%	0%	0%
S&P 500 Futures 40% Intraday Edge Volatility TCA Index (USD) ER	40%	Min	500%	0%	60%	0.01%	0.05%
S&P 500 Futures 40% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	40%	Min	500%	6%	60%	0.01%	0.05%

Note that the target volatilities used to determine index leverage may be based on one-week implied volatilities. The actual index realized volatility may deviate from the target volatilities.

S&P Multi-Asset Intraday Edge Macro Indices

Index	Target Volatility	Leverage Cap	Decrement Factor	Max Weight Change	Transaction Cost	Underlying Equity Component
S&P Multi-Asset 5% Intraday Edge Macro TCA Index (USD) ER	5%	125%	0.00%	25%	0.02%	S&P 500 Futures 10% Intraday Edge Growth TCA
S&P Multi-Asset 5% Intraday Edge Macro TCA 0.5% Decrement Index (USD) ER	5%	125%	0.50%	25%	0.02%	S&P 500 Futures 10% Intraday Edge Growth TCA
S&P Multi-Asset 7% Intraday Edge Macro TCA Index (USD) ER	7%	200%	0.00%	25%	0.02%	S&P 500 Futures 10% Intraday Edge Volatility TCA Index (USD) ER

S&P Multi-Asset Intraday Edge Macro Adapt Indices

Index	Target Volatility	Leverage Cap	Decrement Factor	Transaction Cost
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA Index (USD) ER	5%	125%	0.00%	0.02%
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA 1% Decrement Index (USD) ER	5%	125%	1.00%	0.02%
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA Index (USD) ER	7%	200%	0.00%	0.02%
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA 2% Decrement Index (USD) ER	7%	200%	2.00%	0.02%

Supporting Documents

This methodology is meant to be read in conjunction with supporting documents providing greater detail with respect to the policies, procedures and calculations described herein. References throughout the methodology direct the reader to the relevant supporting document for further information on a specific topic. The list of the main supplemental documents for this methodology and the hyperlinks to those documents is as follows:

Supporting Document	URL
S&P Dow Jones Indices' Commodities Indices Policies & Practices Methodology	Commodities Indices Policies & Practices
S&P Dow Jones Indices' Options Indices Policies and Practices Methodology	Options Indices Policies & Practices Methodology
S&P Dow Jones Indices' Index Mathematics Methodology	Index Mathematics Methodology

This methodology was created by S&P Dow Jones Indices to achieve the aforementioned objective of measuring the underlying interest of each index governed by this methodology document. Any changes to or deviations from this methodology are made in the sole judgment and discretion of S&P Dow Jones Indices so that the index continues to achieve its objective.

Index Construction

S&P 500 Futures Intraday Edge Growth Indices

Index Calculation

For each index calculation day, the index calculates as:

$$Index_t = Index_{t-1} + U_{t-2} \times \left(Intra_{t,N} - Intra_{t-1,N}\right) - TCost \times |U_{t-2} - U_{t-3}| \times Intra_{t-1,N} - Decr_t$$

$$Decr_t = Index_{t-1} \times DF \times \frac{Act(t-1,t)}{360}$$

where:

$Index_t$	= Excess return index level for day t
$Intra_{t,e}$	= Intermediate index level for execution window *e* and day t
U_t	= Intermediate index units for day t
$TCost$	= Transaction Cost
$Act(t-1,t)$	= Day count between index calculation days t and $t-1$
DF	= Decrement factor
N	= 7

For information on index calculation, please refer to S&P Dow Jones Indices' Index Mathematics Methodology.

For each index calculation date t, the intermediate index units and weights calculate as:

$$U_t = W_t \times \frac{Index_t}{Intra_{t,N}}$$

$$W_t = \max\left(0, min\left(100\%, \frac{VolTarget}{\sqrt{\Sigma_{\mathrm{i=0}}^{\mathrm{VAF_{period}-1}} \ln\left(\frac{Intra_{t,N}}{Intra_{t-1,N}}\right)^2 \times \frac{252}{VAF_{period} + VAF_{adj}}}}\right)\right)$$

$$VAF_{adj} = \begin{cases} 10 \; if \; VolF = min \\ 0 \; if \; VolF = max \end{cases}$$

where:

$VolTarget$	= Target Volatility
VAF_{period}	= 40

For each index calculation day t, the intraday index calculates as:

For the first window of the day:

$$Intra_{t,open} = Intra_{t-1,N} + u_{t-1,N} \times (TWAP_{t,e} - TWAP_{t-1,N}) - IntraCosts_{t,e} - Replicost_t$$

For subsequent windows:

$$Intra_{t,e} = Intra_{t,e-1} + u_{t,e-1} \times \left(TWAP_{t,e} - TWAP_{t,e-1}\right) - IntraCosts_{t,e}$$

The intraday transaction cost for window e and day t calculates as:

For the first window of day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t-1,N} - u_{t-1,N-1}\right| \times TWAP_{t-1,N}$$

For the second window of day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t,e-1} - u_{t-1,N}\right| \times TWAP_{t,e-1}$$

For subsequent windows on day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t,e-1} - u_{t,e-2}\right| \times TWAP_{t,e-1}$$

The replication cost on day *t* calculates as:

$$Replicost_t = u_{t-1,N} \times TWAP_{t-1,N} \times RepCost \times \frac{Act(t-1,t)}{360}$$

where:

$Intra_{t,e}$	= Intermediate index value for execution window e and day t
$u_{t,e}$	= S&P 500 Futures Index units for execution window e and day t
$TWAP_{t,e}$	= S&P 500 Futures Index TWAP for execution window e on day t.
$RepCost$	= Replication Cost

For each index calculation day *t* and execution window *e*, the number of units calculates as follows

$$u_{t,e} = w_{t,o} \times \frac{Intra_{t-1,N}}{TWAP_{t-1,N}}$$

For the first observation windows on day *t:*

$$w_{t,o} = w_{t-1,N} + \begin{cases} min(40\%, max(-40\%, tw_{t,o} - w_{t-1,N})) & \left|tw_{t,o} - w_{t-1,N}\right| \geq 2\% \\ 0, & \text{otherwise} \end{cases}$$

For the second observation windows on day *t:*

$$w_{t,o} = w_{t,o-1} + \begin{cases} min(40\%, max(-40\%, tw_{t,o} - w_{t,o-1})) & \left|tw_{t,o} - w_{t,o-1}\right| \geq 2\% \\ 0, & \text{otherwise} \end{cases}$$

For subsequent observation windows during day *t*, excluding the final window:

$$w_{t,o} = w_{t,o-1} + \begin{cases} min(15\%, max(-15\%, tw_{t,o} - w_{t,o-1})) & \left|tw_{t,o} - w_{t,o-1}\right| \geq 2\% \\ 0, & otherwise \end{cases}$$

For the last observation window on day *t*:

$$w_{t,o} = w_{t,o-1} + \begin{cases} min(50\%, max(-50\%, tw_{t,o} - w_{t,o-1})) & \left|tw_{t,o} - w_{t,o-1}\right| \geq 2\% \\ 0, & otherwise \end{cases}$$

The target weight for each observation window *o* on day *t* calculates as:

$$tw_{t,o} = \begin{cases} min\left(MaxLev, Trend_{t,o} \times \frac{VolTarget}{s_{t,o}}\right), & for\ o < N \\ max\left(0, min\left(MaxLev, Trend_{t,o} \times \frac{VolTarget}{s_{t,o}} + Overnight_t\right)\right), & for\ o = N \end{cases}$$

where:

$MaxLev$	= Maximum Leverage
$Trend_{t,o}$	= Trend factor for observation window o and day t
$Overnight_t$	= Overnight factor for day t
$s_{t,o}$	= Annualized estimated volatility for observation window o and day t
$TWAP_{t,close}$	= S&P 500 Futures Index TWAP for last execution window e day t

The estimated volatility for observation window o and day t calculates as follows:

$$s_{t,o} = \begin{cases} min\left(\sigma_{t,o}^3, \sigma_{t,o}^5\right), & if\ VixSignal_{t-1} = 0\ and\ VolF = min \\ max\left(\sigma_{t,o}^3, \sigma_{t,o}^5\right), & if\ VixSignal_{t-1} = 0\ and\ VolF = max \\ IV_{t-1} \times \frac{\sigma_{t,o}^3}{\sigma_{t-1,3}^3}, & if\ VixSignal_{t-1} = 1\ and\ o \leq 4 \\ IV_t \times \frac{\sigma_{t,o}^3}{\sigma_{t,3}^3}, & if\ VixSignal_{t-1} = 1\ and\ o > 4 \end{cases}$$

where:

IV_t	= Weekly implied volatility on day t. For more information on the implied volatility calculation, please refer to Appendix A.
$\sigma_{t,o}^3$	= Annualized realized volatility with 3-day lookback period for observation period o and day t
$\sigma_{t,o}^5$	= Annualized realized volatility with 5-day lookback period for observation period o and day t

The volatility of the futures contract on observation window o and day t calculates as:

$$\sigma_{t,o}^D = \sqrt{\frac{\Sigma_{j=0}^{D}\Sigma_{k=0}^{N}\left|FutRet_{t-j,o-k} - \overline{FutRet_{t-j,o-k}}\right|^2}{D \times N - 1}} \times 252 \times N$$

$$\overline{FutRet_{t-j,i-k}} = \frac{\Sigma_{j=0}^{D}\Sigma_{k=0}^{N} FutRet_{t-j,i-k}}{D \times N}$$

The return of the futures contract calculates as:

$$FutRet_{t,o} = \begin{cases} ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right), & for\ o = 1 \\ ln\left(\frac{Fix_{t,o}}{Fix_{t,o-1}}\right), & for\ o > 1 \end{cases}$$

where:

D	= Number of days

$Fix_{t,o}$ = The first tick of the S&P 500 Futures Index within the observation window o on date t

$F_{t,close}$ = S&P 500 Futures Index close price on date t

The Trend is calculated for observation window o and date t calculates as:

$$Trend_{t,o} = \begin{cases} \min\left(200\%, \max\left(0\%, \dfrac{\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right) \times 50 \times \mathbb{1}\left(\left|\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \dfrac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + 100\%\right)\right), & for\ o = 1 \\ \min\left(200\%, \max\left(0\%, \dfrac{\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right) \times 50 \times \mathbb{1}\left(\left|\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \dfrac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + Trend_{t,o-1}\right)\right), & for\ o = 2\ to\ 6 \\ \min\left(200\%, \max\left(0\%, \dfrac{\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right) \times 10 \times \mathbb{1}\left(\left|\ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \dfrac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + Trend_{t,o-1}\right)\right), & for\ o = 7 \end{cases}$$

The Overnight position on date t calculate as:

$$Overnight_t = -Reversion_t \times ReversionSignal_t$$

$$Reversion_t = tanh(Skew_t)$$

$$ReversionSignal_t = \begin{cases} 1, & if\ Avg(ONReturn_t^3) < min\left(Avg(ONReturn_t^{10}), Avg(ONReturn_t^{22})\right) \\ 0, & otherwise \end{cases}$$

$$Skew_t = \frac{\frac{1}{15}\sum_{i=0}^{14}\left(\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right) - Avg(ONReturn_t^{15})\right)^3}{Var(ONReturn_t^{15})^{\frac{3}{2}}}$$

$$Var(ONReturn_t^n) = \frac{1}{n}\sum_{i=0}^{n-1}\left(\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right) - Avg(ONReturn_t^n)\right)^2$$

$$Avg(ONReturn_t^n) = \frac{1}{n}\sum_{i=0}^{n-1}\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right)$$

where:

$ONReturn_t^n$ = Time series of the past *n* overnight returns up to and including day t, where the overnight return for day t is $\ln\left(\frac{Fix_{t,1}}{F_{t-1,close}}\right)$

The VIX Signal on date t calculates as:

$$VixSignal_t = \begin{cases} 1, & if\ UpCount_t > 6 \\ 0, & if\ UpCount_t \leq 6\ AND\ DownCount > 3 \\ VixSignal_{t-1}, & otherwise \end{cases}$$

$$UpCount_t = \begin{cases} UpCount_{t-1} + 1, & if\ MASignal_t = 1 \\ 0, & otherwise \end{cases}$$

$$DownCount_t = \begin{cases} DownCount_{t-1} + 1, & if\ MASignal_t = 0 \\ 0, & otherwise \end{cases}$$

$$MASignal_t = \begin{cases} 1, & if\ VIX_t > VIX200DMA_t \\ 0, & otherwise \end{cases}$$

$$VIX200DMA_t = \frac{\Sigma_{i=0}^{199} VIX_{t-i}}{200}$$

where:

VIX_t = VIX index value on day t

S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (AUD) ER. The index calculates using the Price-Level (PL) currency conversion method.

For information on PL currency conversions, please refer to the Price-Level Currency Adjusted Index section of S&P Dow Jones Indices' Index Mathematics Methodology.

S&P 500 Futures Intraday Edge Volatility Indices

Index Calculation:

For each index calculation day, the index calculates as follows:

$$Index_t = Index_{t-1} + U_{t-2} \times \left(Intra_{t,close} - Intra_{t-1,close}\right) - TCost \times |U_{t-2} - U_{t-3}| \times Intra_{t-1,close} - Decr_t$$

$$Decr_t = Index_{t-1} \times DF \times \frac{Act(t-1,t)}{360}$$

where:

$Index_t$	= Excess return index level for day t
$Intra_{t,close}$	= Closing intermediate index level for day t
U_t	= Intermediate index units for day t
$TCost$	= Transaction Cost
DF	= Decrement Factor

For each index calculation date t, the intermediate index units and weights calculate as follows:

$$U_t = W_t \times \frac{Index_t}{Intra_{t,close}}$$

$$W_t = \max\left(0, min\left(100\%, \frac{VolTarget}{\sqrt{\Sigma_{i=0}^{\mathrm{VAF_{period}}-1} \ln\left(\frac{Intra_{t,close}}{Intra_{t-1,close}}\right)^2 \times \frac{252}{VAF_{period} + VAF_{adj}}}}\right)\right)$$

$$VAF_{adj} = \begin{cases} 10 \; if \; VolF = min \\ 0 \; if \; VolF = max \end{cases}$$

where:

$VolTarget$	= Target Volatility
VAF_{period}	= 40

For each index calculation day t, the intraday index calculates as:

For the first window of the day:

$$Intra_{t,open} = Intra_{t-1,close} + u_{t-1,N} \times (TWAP_{t,e} - F_{t-1,close}) - IntraCosts_{t,e} - Replicost_t$$

For intermediate windows:

$$Intra_{t,e} = Intra_{t,e-1} + u_{t,e-1} \times \left(TWAP_{t,e} - TWAP_{t,e-1}\right) - IntraCosts_{t,e}$$

At market close:

$$Intra_{t,close} = Intra_{t,N} + u_{t,N} \times \left(F_{t,close} - TWAP_{t,N}\right)$$

The intraday transaction cost for window e and day t is calculated as:

For the first window of day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t-1,N} - u_{t-1,N-1}\right| \times TWAP_{t-1,N}$$

For the second window of day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t,e-1} - u_{t-1,N}\right| \times TWAP_{t,e-1}$$

For subsequent windows on day t:

$$IntraCosts_{t,e} = TCost \times \left|u_{t,e-1} - u_{t,e-2}\right| \times TWAP_{t,e-1}$$

The replication cost on day t is calculated as:

$$Replicost_t = u_{t-1,N} \times TWAP_{t-1,N} \times RepCost \times \frac{Act(t-1,t)}{360}$$

where:

$Intra_{t,e}$	= Intermediate index value for execution window e and day t
$u_{t,e}$	= S&P 500 Futures Index units for execution window e and day t
$F_{t,close}$	= S&P 500 Futures Index close price on date t
$TWAP_{t,e}$	= S&P 500 Futures Index TWAP for execution window e on day t. (*Appendix B*)
$RepCost$	= Replication Cost
$Act(t-1,t)$	= Day Count between index calculation days t and $t-1$
N	= 4

For each index calculation day t and execution window e, the number of units calculates as follows

$$u_{t,e} = w_{t,o} \times \frac{Intra_{t-1,close}}{F_{t-1,close}}$$

For the first observation window on day *t:*

$$w_{t,o} = w_{t-1,N} + \begin{cases} min(maxChange, max(-maxChange, tw_{t,o} - w_{t-1,N})) & \left|tw_{t,o} - w_{t-1,N}\right| \geq 2\% \\ 0, & \text{otherwise} \end{cases}$$

For the subsequent observation windows on day *t*:

$$w_{t,o} = w_{t,o-1} + \begin{cases} min(maxChange, max(-maxChange, tw_{t,o} - w_{t,o-1})) & \left|tw_{t,o} - w_{t,o-1}\right| \geq 2\% \\ 0, & otherwise \end{cases}$$

The target weight for each observation window *o* on day *t* calculates as:

$$tw_{t,o} = \begin{cases} min\left(MaxLev, Trend_{t,o} \times \frac{VolTarget}{s_{t,o}}\right), & for\ o < N \\ max\left(0, min\left(MaxLev, Trend_{t,o} \times \frac{VolTarget}{s_{t,o}} + Overnight_t\right)\right), & for\ o = N \end{cases}$$

where:

$MaxLev$ = Maximum Leverage

$Trend_{t,o}$ = Trend factor for observation window o and day t

$Overnight_t$ = Overnight factor for day t

$s_{t,o}$ = Annualized estimated volatility for observation window o and day t

$TWAP_{t,close}$ = S&P 500 Futures Index TWAP for last execution window e day t

The estimated volatility for observation window o and day t calculates as follows:

$$s_{t,o} = \begin{cases} min\left(\sigma_{t,o}^5, \sigma_{t,o}^9\right), & if\ VixSignal_{t-1} = 0\ and\ VolF = min \\ max\left(\sigma_{t,o}^5, \sigma_{t,o}^9\right), & if\ VixSignal_{t-1} = 0\ and\ VolF = max \\ IV_{t-1} \times \dfrac{\sigma_{t,o}^5}{\sigma_{t-1,2}^5}, & if\ VixSignal_{t-1} = 1\ and\ o \leq 2 \\ IV_t \times \dfrac{\sigma_{t,o}^5}{\sigma_{t,2}^5}, & if\ VixSignal_{t-1} = 1\ and\ o > 2 \end{cases}$$

where:

IV_t = Weekly implied volatility on day t. For more information on the implied volatility calculation, please refer to Appendix A.

$\sigma_{t,o}^5$ = Annualized realized volatility with 5-day lookback period for observation period o and day t

$\sigma_{t,o}^9$ = Annualized realized volatility with 9-day lookback period for observation period o and day t

The volatility of the futures contract on observation window o and day t calculates as:

$$\sigma_{t,o}^D = \sqrt{\frac{\Sigma_{j=0}^{D}\Sigma_{k=0}^{N}\left|FutRet_{t-j,o-k} - \overline{FutRet_{t-j,o-k}}\right|^2}{D \times N - 1}} \times 252 \times N$$

$$\overline{FutRet_{t-j,i-k}} = \frac{\Sigma_{j=0}^{D}\Sigma_{k=0}^{N} FutRet_{t-j,i-k}}{D \times N}$$

The return of the futures contract calculates as:

$$FutRet_{t,o} = \begin{cases} \ln\left(\dfrac{Fix_{t,o}}{F_{t-1,close}}\right), & for\ o = 1 \\ \ln\left(\dfrac{Fix_{t,o}}{Fix_{t,o-1}}\right), & for\ o > 1 \end{cases}$$

where:

D = Number of Days

$Fix_{t,o}$ = The first tick of the S&P 500 Futures Index within the observation window o on date t

The Trend is calculated for observation window o and date t calculates as:

$$Trend_{t,o} = \begin{cases} \min\left(200\%, \max\left(0\%, \dfrac{ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right) \times 50 \times \mathbb{1}\left(\left|ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \frac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + 100\%\right)\right), & for\ o = 1 \\ \min\left(200\%, \max\left(0\%, \dfrac{ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right) \times 50 \times \mathbb{1}\left(\left|ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \frac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + Trend_{t,o-1}\right)\right), & for\ o = 2,3 \\ \min\left(200\%, \max\left(0\%, \dfrac{ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right) \times 10 \times \mathbb{1}\left(\left|ln\left(\frac{Fix_{t,o}}{F_{t-1,close}}\right)\right| \geq \frac{\sigma_{t,o}^{252}}{\sqrt{252}}\right)}{N} + Trend_{t,o-1}\right)\right), & for\ o = 4 \end{cases}$$

The Overnight position on date t is calculated as:

$$Overnight_t = -Reversion_t \times ReversionSignal_t$$

$$Reversion_t = tanh(Skew_t)$$

$$ReversionSignal_t = \begin{cases} 1, & if\ Avg(ONReturn_t^3) < min\left(Avg(ONReturn_t^{10}), Avg(ONReturn_t^{22})\right) \\ 0, & otherwise \end{cases}$$

$$Skew_t = \frac{\frac{1}{15}\sum_{i=0}^{14}\left(\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right) - Avg(ONReturn_t^{15})\right)^3}{Var(ONReturn_t^{15})^{\frac{3}{2}}}$$

$$Var(ONReturn_t^n) = \frac{1}{n}\sum_{i=0}^{n-1}\left(\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right) - Avg(ONReturn_t^n)\right)^2$$

$$Avg(ONReturn_t^n) = \frac{1}{n}\sum_{i=0}^{n-1}\ln\left(\frac{Fix_{t-i,1}}{F_{t-i-1,close}}\right)$$

where:

$ONReturn_t^n$ = Time series of the past n overnight returns up to and including day t, where the overnight return for day t is $\ln\left(\frac{Fix_{t,1}}{F_{t-1,close}}\right)$

The VIX Signal on date t calculates as:

$$VixSignal_t = \begin{cases} 1, & if\ UpCount_t > 6 \\ 0, & if\ UpCount_t \leq 6\ AND\ DownCount > 3 \\ VixSignal_{t-1}, & otherwise \end{cases}$$

$$UpCount_t = \begin{cases} UpCount_{t-1} + 1, & if\ MASignal_t = 1 \\ 0, & otherwise \end{cases}$$

$$DownCount_t = \begin{cases} DownCount_{t-1} + 1, & if\ MASignal_t = 0 \\ 0, & otherwise \end{cases}$$

$$MASignal_t = \begin{cases} 1, & if\ VIX_t > VIX200DMA_t \\ 0, & otherwise \end{cases}$$

$$VIX200DMA_t = \frac{\Sigma_{i=0}^{199} VIX_{t-i}}{200}$$

where:

VIX_t = VIX index value on day t

S&P Multi-Asset Intraday Edge Macro Indices

For each index calculation day[1], the S&P Multi-Asset Intraday Edge Macro Index calculates as follows:

$$Macro\ Index_t = Macro\ Index_{t-1} + Core\ Units_{t-2} \times (CoreLevel_t - CoreLevel_{t-1}) - TC_t - Decr_t$$

$$TC_t = CoreLevel_{t-1} \times TCost \times |Core\ Unit_{t-2} - GF\ Unit_{t-3}|$$

$$Decr_t = Macro\ Index_{t-1} \times DF \times \frac{Act(t-1,t)}{360}$$

where:

$Macro\ Index_t$	= S&P Multi-Asset Intraday Edge Macro TCA Index on day *t*
$Core\ Units_t$	= Units of the S&P Multi-Asset Intraday Edge Macro Index on day *t*
$CoreLevel_t$	= Closing price of the S&P Multi-Asset Intraday Edge Macro Index on day *t*
$TCost$	= Transaction Cost
DF	= Decrement Factor

For each index calculation day, the number of units held calculates as follows:

$$Units_t = W_t \times \frac{Macro\ Index_t}{CoreLevel_t}$$

where:

W_t	= Weight allocated to the S&P Multi-Asset Intraday Edge Macro Index on day *t*

The Weight W_t calculates as follows:

$$W_t = W_{t-1} + Max(-25\%, \text{Min}(25\%, \text{TW}_t - W_{t-1})$$

where:

TW_t	= S&P Multi-Asset Intraday Edge Macro Index Target Weight

The S&P Multi-Asset Intraday Edge Macro Index Target Weight TW_t calculates as follows:

$$TW_t = Min\left(125\%, \frac{Macro\ VT}{\sigma_t}\right)$$

where:

σ_t	= Daily Volatility of the S&P Multi-Asset Intraday Edge Macro Index
$Macro\ VT$	= Volatility Target, set to 5%

The Daily Volatility σ_t calculates as follows:

$$\sigma_t = max(\sigma_{short,t}, \sigma_{long,t})$$

$$\sigma^2_{short,t} = \lambda_{macro\ short} \times \sigma^2_{short,t-1} + 252 \times (1 - \lambda_{macro\ short}) \times ln\left(\frac{Core\ Level_t}{Core\ Level_{t-1}}\right)^2$$

$$\sigma^2_{long,t} = \lambda_{macro\ long} \cdot \sigma^2_{long,t-1} + 252 \times (1 - \lambda_{macro\ long}) \times ln\left(\frac{Core\ Level_t}{Core\ Level_{t-1}}\right)^2$$

where:

$\sigma_{short,t}$	= Short-term standard deviation of S&P Multi-Asset Intraday Edge Macro Index for day t
$\sigma_{long,t}$	= Long-term standard deviation of S&P Multi-Asset Intraday Edge Macro Index for day t

[1] The S&P Multi-Asset 5% Intraday Edge Macro TCA Index (USD) ER follows the S&P 500 Futures 10% Intraday Edge Growth TCA Return Calendar.

$\lambda_{macro\ short} = 0.5^{\frac{1}{10}}$

$\lambda_{macro\ long} = 0.5^{\frac{1}{20}}$

Core Index

The S&P Multi-Asset Intraday Edge Macro Index on day *t* $CoreLevel_t$ calculates as follows:

$$CoreLevel_t = CoreLevel_{t-1} + \sum\left(CoreUnit_{asset,t-2} * \left(SubIndex_{asset,t} - SubIndex_{asset,t-1}\right)\right) - TCCore_{t-1}$$

$$TCCore_t = Tcost * \sum SubIndex_{asset,t} * Abs(CoreUnit_{asset,t-1} - CoreUnit_{asset,t-2})$$

where:

$CoreLevel_t$	= Closing price of the S&P Multi-Asset Intraday Edge Macro Index on day *t*
$CoreUnit_{equity,t}$	= Units held of the S&P 500 Futures 10% Intraday Edge TCA Index on day *t*
$CoreUnit_{FI,t}$	= Units held of the S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index on day *t*
$CoreUnit_{GF,t}$	= Units held of the S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index on day *t*
$SubIndex_{equity,t}$	= Closing price of the S&P 500 Futures 10% Intraday Edge TCA Index on day *t*
$SubIndex_{FI,t}$	= Closing price of the S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index on day *t*
$SubIndex_{GF,t}$	= Closing price of the S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index on day *t*
$TCost$	= Transaction Cost, set to 0.02%

For each index calculation day, the number of units held calculates as follows:

$$CoreUnit_{asset,t} = W_{asset,t} \times \frac{Core\ Level_t}{SubIndex_{asset,t}}$$

where:

$W_{asset,t}$	= Weight allocated to the underlying asset on day *t*

The Asset Weight $W_{asset,t}$ is determined according to the following table:

Regime Signal	Equity Weight	Fixed Income Weight	Gold Weight
1	33.33%	33.33%	33.33%
2	60%	20%	20%
3	10%	50%	40%
4	33.33%	33.33%	33.33%

The Regime Signal $RegimeSignal_t$ calculates as of the last trading day of the month as follows:

$$RegimeSignal_t = \begin{cases} 1\ if\ GrowthSignal_t = 1\ and\ \ InflaSignal_t = 1 \\ 2\ \ if\ GrowthSignal_t = 1\ and\ \ InflaSignal_t = 0 \\ 3\ if\ GrowthSignal_t = 0\ and\ \ InflaSignal_t = 1 \\ 4\ if\ GrowthSignal_t = 0\ and\ \ InflaSignal_t = 0 \end{cases}$$

The Growth Signal G$rowthSignal_t$ calculates as follows:

$$GrowthSignal_t = \begin{cases} 1\ if\ LEI3MCHNG_t > 0 \\ 0\ Otherwise \end{cases}$$

$$LEI3MCHNG_t = \lambda_{growth} * LEI3MCHNG_{t-1} + (1 - \lambda_{growth}) * LEICHNG_t$$

$$LEICHNG_t = LEI_t - LEI_{t-1}$$

where:

$LEI3MCHNG_t$	= Moving Average of $LEICHNG_t$
λ_{growth}	= 80%
LEI_t	= The Conference Board Leading Economic Index® (LEI) for U.S. for the month *t*[2]

The Inflation Signal $InflaSignal_t$ calculates as follows:

$$InflaSignal_t = \begin{cases} 1 \; if \; BreakevenDiff_{t-1} > 0 \; and \; CPIYoY_t > 2.5 \\ 0 \; Otherwise \end{cases}$$

$$BreakevenDiff_t = Breakeven\ 3m_t - Breakeven\ 36m_t$$

$$Breakeven\ 36m_t = \lambda_{36m} * Breakeven\ 36m_{t-1} + (1 - \lambda_{36m}) * Breakeven_t$$

$$Breakeven\ 3m_t = \lambda_{3m} * Breakeven\ 3m_{t-1} + (1 - \lambda_{3m}) * Breakeven_t$$

where:

$Breakeven_t$	= Daily difference between the Inflation Indexed Market Yield on U.S. Treasury Securities at 10-Year and the Market Yield on U.S. Treasury Securities at 10-Year[3]
$CPIYoY_t$	= Annual percentage change in the Consumer Price Index for All Urban Consumers (CPI Index)[4]

$$\lambda_{3m} = 0.99$$

$$\lambda_{36m} = 0.999$$

Fixed Income Component

For each index calculation day[5], the S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index calculates as follows:

$$FI\ Comp_t = FI\ Comp_{t-1} + \sum_{i=1}^{2}\left(FI\ Unit_{i,t-2} \times \left(Treasur\ Index_{i,t} - Treasury\ Index_{i,t-1}\right)\right) - RC_t - TC_t$$

$$RC_t = RepCost \times \frac{Act(t-1,t)}{360} \times \sum_{i=1}^{2}\left(Treasury\ Index_{i,t-1} \times |FI\ Unit_{i,t-2}|\right)$$

$$TC_t = \sum_{i=1}^{2}\left(Treasury\ Index_{i,t-1} \times TCost \times |FI\ Unit_{i,t-2} - FI\ Unit_{i,t-3}|\right)$$

where:

$FI\ Comp_t$	= S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index level on day *t*
$Treasury\ Index_{1,t}$	= Closing price of the S&P 10-Year U.S. Treasury Note Futures Excess Return Index on day *t*

[2] The index calculates using the latest available monthly release of the LEI values as of the time of index calculation.
[3] H15T10Y, H15T10YR : Board of Governors of the Federal Reserve System (US) retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org
[4] CPI YoY: The inflation value is the year-over-year change (YoY) in CPI for all urban consumers before seasonal adjustment, using data released each month. Board of Governors of the Federal Reserve System (US) retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org
[5] The S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index follows the S&P 10-Year U.S. Treasury Note Futures ER calendar.

$Treasury\ Index_{2,t}$ = Closing price of the S&P 2-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$FI\ Units_{1,t}$ = Units of S&P 10-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$FI\ Units_{2,t}$ = Units of S&P 2-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$TCost$ = 0.02%

$RepCost$ = 0.10%

$Act(t-1,t)$ = Day count between index calculation days t and $t-1$

For each index calculation day, the number of units held calculates as follows:

$$FI\ Units_{i,t} = FI\ W_{i,t} \times \frac{FI\ Comp_t}{Treasury\ Index_{i,t}}$$

where:

$FI\ W_{1,t}$ = Weight allocated to the S&P 10-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$FI\ W_{2,t}$ = Weight allocated to the S&P 2-Year U.S. Treasury Note Futures Excess Return Index on day *t*

The Weight $FI\ W_{i,t}$ calculates as follows:

$$FI\ W_{i,t} = FI\ W_{i,t-1} + Max(-25\%, \text{Min}(25\%, \quad \text{FI TW}_{i,t} - FI\ W_{i,t-1})$$

where:

$FI\ TW_{i,t}$ = S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index Target Weight

The S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index Weight $FI\ TW_{i,t}$ calculates as follows:

$$FI\ TW_{1,t} = \text{Max}\left(-75\%, Min\left(200\%, LS_{1,t} \times \frac{VT}{\sigma_{1,t}}\right)\right)$$

$$FI\ TW_{2,t} = \text{Max}\left(-300\%, Min\left(0, LS_{2,t} \times \frac{VT}{\sigma_{2,t}}\right)\right)$$

where:

$LS_{1,t}$ = Long-Short indicator on the S&P 10-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$LS_{2,t}$ = Long-Short indicator on the S&P 2-Year U.S. Treasury Note Futures Excess Return Index on day *t*

$\sigma_{1,t}$ = Daily Volatility of the S&P 10-Year U.S. Treasury Note Futures Excess Return Index

$\sigma_{2,t}$ = Daily Volatility of the S&P 2-Year U.S. Treasury Note Futures Excess Return Index

VT = Volatility Target, equal to 10%

The Daily Volatility σ_t^i calculates as follows:

$$\sigma^2_{short,i,t} = \lambda_{short} \times \sigma^2_{short,i,t-1} + 252 \times (1-\lambda_{short}) \times ln\left(\frac{Treasury\ Index_{i,t}}{Treasury\ Index_{i,t-1}}\right)^2$$

$$\sigma^2_{long,i,t} = \lambda_{long} \cdot \sigma^2_{long,i,t-1} + 252 \times (1 - \lambda_{long}) \times ln\left(\frac{Treasury\ Index_{i,t}}{Treasury\ Index_{i,t-1}}\right)^2$$

$$\sigma_{i,t} = max(\sigma_{short,i,t}, \sigma_{long,i,t})$$

where:

$\lambda_{short} = 0.5^{\frac{1}{20}}$

$\lambda_{long} = 0.5^{\frac{1}{40}}$

$\sigma_{short,i,t}$ = Short-term standard deviation of asset i for day t

$\sigma_{long,i,t}$ = Long-term standard deviation of asset i for day t

The Long-Short indicator $LS_{i,t}$ calculates as follows:

$$LS_{10ytsy,t} = \begin{cases} 1\ if\ PriceMom_t = 1 \\ -1\ if\ PriceMom_t = 0\ and\ CurveMom_t = 1 \\ 0\ Otherwise \end{cases}$$

$$LS_{2ytsy,t} = \begin{cases} -1\ if\ PriceMom_t = 0\ and\ CurveMom_t = 0 \\ 0\ Otherwise \end{cases}$$

where:

$PriceMom_t$ = Price Momentum Signal

$CurveMom_t$ = Curve Momentum Signal

The Price Momentum Signal $PriceMom_t$ calculates as follows:

$$PriceMom_t = \begin{cases} 1\ if\ PriceUpCount_t > 10 \\ 0\ if\ PiceDownCount_t > 10 \\ PriceMom_{t-1}\ Otherwise \end{cases}$$

$$PriceUpCount_t = \begin{cases} PriceUpCount_{t-1} + 1\ if\ Treasury\ Index_{1,t} > 252DLevelMA_{1,t} \\ 0 \end{cases}$$

$$PriceDownCount_t = \begin{cases} PriceDownCount_{t-1} + 1\ if\ Treasury\ Index_{1,t} < 252DLevelMA_{1,t} \\ 0 \end{cases}$$

where:

$252DLevelMA_{1,t}$ = 252-day moving average of the S&P 10-Year U.S. Treasury Note Futures Excess Return Index

The Curve Momentum Signal $CurveMom_t$ calculates as follows:

$$CurveMom_t = \begin{cases} 1\ if\ CurveUpCount_t > 10 \\ 0\ if\ CurveDownCount_t > 10 \\ CurveMom_{t-1}\ Otherwise \end{cases}$$

$$CurveUpCount_t = \begin{cases} CurveUpCount_{t-1} + 1\ if\ Curve_t > 252DCurveMA_t \\ 0\ Otherwise \end{cases}$$

$$CurveDownCount_t = \begin{cases} CurveDownCount_{t-1} + 1\ if\ Curve_t < 252DCurveMA_t \\ 0\ Otherwise \end{cases}$$

where:

$252DCurveMA_t$ = 100-day moving average of the US 10y Treasury Yield minus the US 2Y Treasury Yield[6]

[6] Treasury Yields: Board of Governors of the Federal Reserve System (US) retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org

Commodity Component

For each index calculation day[7], the S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index calculates as follows:

$$GF\ Compt_t = GF\ Compt_{t-1} + GF\ Units_{t-2} \times (\ GF\ Index_t\ - GF\ Index_{\ t-1}) - GF\ RC_t - GF\ TC_t$$

$$GF\ TC_t = \ GF\ Index_{t-1} \times GF\ TCost \times |GF\ Unit_{i,t-2} - GF\ Unit_{i,t-3}|$$

$$RC_t = \ GF\ \ Index_{t-1} \times RepCost \times \frac{Act(t-1,t)}{360} \times |GF\ Units_{t-2}|$$

where:

$GF\ Compt_t$	= S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index level on day *t*
$GF\ Units_t$	= Units of S&P GSCI Gold Excess Return Index on day *t*
$GF\ Index_t$	= Closing price of the S&P GSCI Gold ER Futures Excess Return Index on day *t*
$GF\ TCost$	= 0.01%
$GF\ RepCost$	= 0.10%

For each index calculation day, the number of units held calculates as follows:

$$GF\ Units_t = GF\ W_t \times \frac{GF\ Comp_t}{GF\ Index_t}$$

where:

$GF\ W_t$	= Weight allocated to the S&P GSCI Gold Excess Return Index on day *t*

The Weight $GF\ W_t$ calculates as follows:

$$GF\ W_t = GF\ W_{t-1} + Max(-25\%, \mathrm{Min}(25\%, \quad \mathrm{GF\ TW}_t - GF\ W_{t-1})$$

where:

$GF\ TW_t$	= S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index Target Weight

The S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index Target Weight $GF\ TW_t$ calculates as follows:

$$GF\ TW_t = \ Min\left(150\%, \frac{VT}{GF\ \sigma_t}\right)$$

where:

$GF\ \sigma_t$	= Daily Volatility of the S&P GSCI Gold Excess Return Index
VT	= Volatility Target, equal to 10%

The Daily Volatility $GF\ \sigma_t$ calculates as follows:

$$GF\ \sigma_t = \ max\left(GF\ \sigma_{short,t}, GF\ \sigma_{long,t}\ \right)$$

$$GF\ \sigma^2_{short,t} = \ \lambda_{short} \times GF\ \sigma^2_{short,t-1} \ + \ 252 \times (1 - \lambda_{short}) \times ln\left(\frac{GF\ Index_t}{GF\ Index_{t-1}}\right)^2$$

$$GF\ \sigma^2_{long,i,t} = \ \lambda_{long} \cdot GF\ \sigma^2_{long,i,t-1} \ + \ 252 \times \left(1 - \lambda_{long}\right) \times ln\left(\frac{GF\ Index_t}{GF\ Index_{t-1}}\right)^2$$

where:

$GF\ \sigma_{short,t}$ = Short-term standard deviation of S&P GSCI Gold Excess Return Index for day t

[7] The S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index follows the S&P GSCI Gold ER calendar.

$GF\ \sigma_{long,t}$ = Long-term standard deviation of S&P GSCI Gold Excess Return Index for day t

$\lambda_{short} = 0.5^{\frac{1}{20}}$

$\lambda_{long} = 0.5^{\frac{1}{40}}$

S&P Multi-Asset Intraday Edge Macro Adapt Indices

For each index calculation day, the S&P Multi-Asset Intraday Edge Macro Adapt Index calculates as follows:

$$Mom\ Index_t = Mom\ Index_{t-1} + Mom\ Units_{t-2} \times (Macro\ Index_t - Macro\ Index_{t-1}) - TC_{t-1} - Decr_t$$

$$TC_t = Mom\ Index_t \times TCost \times |Mom\ Units_{t-2} - Mom\ Units_{t-3}|$$

$$Decr_t = Mom\ Index_{t-1} \times DF \times \frac{Act(t-1,t)}{360}$$

where:

$Mom\ Index_t$	= S&P Multi-Asset Intraday Edge Macro Adapt Index on day *t*
$Mom\ Units_t$	= Units of the S&P Multi-Asset Intraday Edge Macro Adapt Index on day *t*
$Macro\ Index_t$	= Closing price of the S&P Multi-Asset 7% Intraday Edge Macro TCA Index (USD) ER on day *t*
$TCost$	= Transaction Cost
DF	= Decrement Factor

For each index calculation day, the number of units held calculates as follows:

$$Mom\ Units_t = L_t * \frac{Mom\ Index_t}{Macro\ Index_t}$$

$$L_t = max\ (25\%, min(100\%, LL_t)$$

$$LL_t = 100\% + \sum_{t-20}^{t} (-5\% * 1\left\{\frac{Macro\ Index_t}{Macro\ Index_{t-100}} < 1\right\})$$

where:

L_t	= Momentum Overlay on day *t*

Index Maintenance

Rebalancing

S&P 500 Intraday Edge Indices. The indices rebalance daily, using observation periods for signal calculation and TWAP periods for rebalancing execution, as defined in the tables below. The observation and execution windows both begin at (and include) the start time and end at (but exclude) the end time.

S&P Multi-Asset Intraday Edge Macro and S&P Multi-Asset Intraday Edge Macro Adapt Indices. The indices rebalance daily when all component indices are open for trading.

S&P Multi-Asset Intraday Edge Macro Index (Core Index). The index rebalances monthly, on the last trading day of each month.

- If any macroeconomic indicators (LEI Signal and CPI) are not published before the rebalancing date, the corresponding growth and inflation signal remains unchanged from the previous rebalancing.
- Once publication resumes, index values are not revised; the index incorporates the new available values for going forward calculations.
- Newly available values are incorporated from that month's signal onward, with historical LEI values not revised.
- The LEI level applied does not reflect past revisions unless publication has been delayed, with the newly released level incorporated going forward.
- If a significant LEI change materially affects index calculations, the Index Committee determines the appropriate course of action and notifies clients accordingly.

Rebalancing and Implied Volatility Calculation Time

The TWAP calculation windows are:

S&P 500 Futures Intraday Edge Growth Index

Window ID	Observation Window	Execution Window
1	09:30:00 to 09:33:00	10:00:00 to 10:30:00
2	10:30:00 to 10:33:00	11:00:00 to 11:30:00
3	11:30:00 to 11:33:00	12:00:00 to 12:30:00
4	12:30:00 to 12:33:00	13:00:00 to 13:30:00
5	13:30:00 to 13:33:00	14:00:00 to 14:30:00
6	14:30:00 to 14:33:00	15:00:00 to 15:30:00
7	15:00:00 to 15:03:00	15:30:00 to 16:00:00

S&P 500 Futures Intraday Edge Volatility Index

Window ID	Fixing Observation Window	TWAP Execution Window
1	09:30:00 to 09:33:00	10:00:00 to 10:30:00
2	11:30:00 to 11:33:00	12:00:00 to 12:30:00
3	13:30:00 to 13:33:00	14:00:00 to 14:30:00
4	14:30:00 to 14:33:00	15:00:00 to 15:15:00

The Implied Volatility calculation windows are:

Index	Implied Volatility Calculation
S&P 500 Futures Intraday Edge Growth Index[8]	11:30 - 11:35 ET
S&P 500 Futures Intraday Edge Volatility Indices[9]	11:30 - 11:35 ET

For any regularly scheduled early market closure, the indices do not rebalance and the Index Intraday Level calculates using the last futures intraday units of the prior day (u_{t-1}^{N}) for all execution windows. The Index Top Level calculates using the units used in the prior day's index level calculation.

If there are no available SPXFP index levels in an observation window, the index does not rebalance and the previous futures intraday units are used for the corresponding execution window.

For any date where a market disruption event occurs during an execution window *i* and $u_t^i \neq u_t^{i-1}$, the futures intraday units used for the disrupted execution period *i* calculates as:

$$\tilde{u}_t^i = u_t^{i-1} + \frac{ActualN}{ExpectedN} \times \left(u_t^i - u_t^{i-1}\right)$$

where:

$ActualN$ = The number of 15-second intervals in the execution window during which an SPXFP TWAP Level is available.

$ExpectedN$ = The number of 15-second intervals in the execution window.

If the realized volatility calculation includes an early market closure day, the calculation excludes the futures returns from the early market closure day.

Currency of Calculation and Additional Index Return Series

In addition to the indices detailed in this methodology, additional return series versions of the indices may be available, including, but not limited to the following: currency, currency hedged, decrement, fair value, inverse, leveraged, and risk control versions. For a list of available indices, please refer to the *S&P DJI Methodology & Regulatory Status Database*.

For the inputs necessary to calculate certain types of indices, including decrement, dynamic hedged, fair value, and risk control indices, please refer to the Parameters documents available at www.spglobal.com/spdji.

Base Date and History Availability

The index history availability, base dates, and base values are shown in the table below.

Index	Launch Date	First Value Date	Base Date	Base Value
S&P 500 Futures 10% Intraday Edge Growth (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 10% Intraday Edge Growth TCA (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 10% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 12% Intraday Edge Growth (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 12% Intraday Edge Growth TCA (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	08/01/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (AUD) ER	02/13/2026	08/31/2007	08/31/2007	100

[8] For more information on historical calculations for back-test extensions, please see *Appendix C.*
[9] For more information on historical calculations for back-test extensions, please see *Appendix C.*

Index	Launch Date	First Value Date	Base Date	Base Value
S&P 500 Futures 7% Intraday Edge Volatility Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 7% Intraday Edge Volatility TCA Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 10% Intraday Edge Volatility TCA Index (USD) ER	03/20/2026	01/04/2007	01/04/2007	100
S&P 500 Futures 7% Intraday Edge Volatility TCA 2% Decrement Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 35% Intraday Edge Volatility Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 35% Intraday Edge Volatility TCA Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 35% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 40% Intraday Edge Volatility Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 40% Intraday Edge Volatility TCA Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P 500 Futures 40% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	08/14/2025	01/04/2007	01/04/2007	100
S&P Multi-Asset 5% Intraday Edge Macro TCA Index (USD) ER	10/24/2025	12/29/2006	12/29/2006	100
S&P Multi-Asset 5% Intraday Edge Macro TCA 0.5% Decrement Index (USD) ER	10/24/2025	12/29/2006	12/29/2006	100
S&P Multi-Asset 7% Intraday Edge Macro TCA Index (USD) ER	03/20/2026	12/29/2006	12/29/2006	100
S&P Multi-Asset Intraday Edge - Fixed Income 10% VT TCA Index (USD) ER	10/24/2025	12/29/2006	12/29/2006	100
S&P Multi-Asset Intraday Edge - Gold 10% VT TCA Index (USD) ER	10/24/2025	12/29/2006	12/29/2006	100
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA Index (USD) ER	03/20/2026	7/3/2007	7/3/2007	100
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA 1% Decrement Index (USD) ER	03/20/2026	7/3/2007	7/3/2007	100
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA Index (USD) ER	03/20/2026	7/3/2007	7/3/2007	100
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA 2% Decrement Index (USD) ER	03/20/2026	7/3/2007	7/3/2007	100

Index Governance

Index Committee

An Index Committee maintains the index. All committee members are full-time professional members of S&P Dow Jones Indices' staff. The Index Committee meets regularly. At each meeting, the Committee reviews pending corporate actions that may affect index constituents, statistics comparing the composition of the indices to the market, companies that are being considered as candidates for addition to the indices, and any significant market events. In addition, the Index Committee may revise index policy covering rules for selecting companies, treatment of dividends, share counts or other matters.

S&P Dow Jones Indices considers information about changes to its indices and related matters to be potentially market moving and material. Therefore, all Index Committee discussions are confidential.

S&P Dow Jones Indices' Index Committees reserve the right to make exceptions when applying the methodology if the need arises. In any scenario where the treatment differs from the general rules stated in this document or supplemental documents, clients will receive sufficient notice, whenever possible.

In addition to the daily governance of indices and maintenance of index methodologies, at least once within any 12-month period, the Index Committee reviews the methodology to ensure the indices continue to achieve the stated objectives, and that the data and methodology remain effective. In certain instances, S&P Dow Jones Indices may publish a consultation inviting comments from external parties.

For information on Quality Assurance and Internal Reviews of Methodology, please refer to S&P Dow Jones Indices' Equity Indices Policies & Practices Methodology.

Index Policy

Announcements

Announcements of the daily index values are made after the market close each day.

Holiday Schedule

The index calculates daily, throughout the calendar year, when the U.S. equity markets are open.

A complete holiday schedule for the year is available on S&P Dow Jones Indices' Web site at www.spglobal.com/spdji.

Rebalancing

The Index Committee may change the date of a given rebalancing for reasons including market holidays occurring on or around the scheduled rebalancing date. Any such change will be announced with proper advance notice where possible.

Unexpected Exchange Closures

For information on Unexpected Exchange Closures, please refer to S&P Dow Jones Indices' Commodities Indices Policies & Practices Methodology.

Recalculation Policy

For information on the recalculation policy, please refer to S&P Dow Jones Indices' Options Indices Policies & Practices Methodology.

For information on Calculations and Pricing Disruptions, Expert Judgment and Data Hierarchy, please refer to S&P Dow Jones Indices' Commodities Indices Policies & Practices and Options Indices Policies & Practices Methodology documents.

Contact Information

For questions regarding an index, please contact: index_services@spglobal.com.

Index Dissemination

Index levels are available through S&P Dow Jones Indices' Web site at *www.spglobal.com/spdji,* major quote vendors (see codes below), numerous investment-oriented Web sites, and various print and electronic media.

Tickers

The table below lists headline indices covered by this document. All versions of the below indices that may exist are also covered by this document. Please refer to the *S&P DJI Methodology & Regulatory Status Database* for a complete list of indices covered by this document.

Index	BBG	RIC
S&P 500 Futures 10% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	SPXI10EV	.SPXI10EV
S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (USD) ER	SPXI12EV	.SPXI12EV
S&P 500 Futures 12% Intraday Edge Growth TCA 1.5% Decrement Index (AUD) ER	SPXI12AU	.SPXI12AU
S&P 500 Futures 7% Intraday Edge Volatility TCA 2% Decrement Index (USD) ER	SPXI7EV2	.SPXI7EV2
S&P 500 Futures 35% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	SPXI3EV6	.SPXI3EV6
S&P 500 Futures 40% Intraday Edge Volatility TCA 6% Decrement Index (USD) ER	SPXI4EV6	.SPXI4EV6
S&P Multi-Asset 5% Intraday Edge Macro TCA 0.5% Decrement Index (USD) ER	SPXI5MAD	.SPXI5MAD
S&P Multi-Asset 5% Intraday Edge Macro TCA Index (USD) ER	SPXI5MAE	.SPXI5MAE
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA 2% Decrement Index (USD) ER	SPXI7MOM	.SPXI7MOM
S&P Multi-Asset 7% Intraday Edge Macro Adapt TCA Index (USD) ER	SPXI7MOE	.SPXI7MOE
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA 1% Decrement Index (USD) ER	SPXI5MOM	.SPXI5MOM
S&P Multi-Asset 5% Intraday Edge Macro Adapt TCA Index (USD) ER	SPXI5MOE	.SPXI5MOE

Index Data

Daily constituent and index level data are available via subscription.

For product information, please contact S&P Dow Jones Indices, www.spglobal.com/spdji/en/contact-us.

Web Site

For further information, please refer to S&P Dow Jones Indices' Web site at *www.spglobal.com/spdji*.

Appendix A

Determination of Maturity Date

On each weekday, the index selects PM-settled SPXW options expiring in one week (seven calendar days). If the weekday is a holiday, the corresponding subindex rebalances on the next business day. At any calculation time *t*, the time to expiry calculates as the total time from *t* to the selected option expiry time (4:00 p.m. on the maturity date), expressed as a fraction of the number of annual calendar days (365).

Calculation of Forward Price and Delta

The risk-free interest rate *R* is based on U.S. Treasury yield curve rates[10], applying linear interpolation to derive the yield on maturity date *T*.

At each minute from the Implied Volatility Calculation Window, the forward price calculates by applying put-call parity. The delta calculation uses the same forward price (ATM forward) for all strikes with the same expiration, using the same forward price for the calculation of implied volatility:

$$F = Ka + e^{rT}(Call_K - Put_K)$$

where:

Ka = Strike at which the difference between the call and the put mid-prices is the smallest, also referred to as the at-the-money (ATM) strike Ka. If there are multiple put-call pairs with the same minimum absolute difference, then select the lowest strike among them.

T = Time to expiry, defined in accordance with *Determination of Maturity Date* above

$r = \log\left(1 + \frac{R}{2}\right)^2$ = Continuously compounded interest rate

$Call_K$ = Mid price for call option, calculated as the average of bid and ask prices

Put_K = Mid price for put option, calculated as the average of bid and ask prices

Calculate implied volatility σ using *F* using the Black model with F as underlier.

Calculate Δ_{call} and Δ_{put} using the Black model (with F and σ):

$$\Delta_{call} = e^{-rT} N\left(\frac{\log\left(\frac{F}{K}\right) + \frac{\sigma^2 T}{2}}{\sigma\sqrt{T}}\right)$$

$$\Delta_{put} = e^{-rT}\left(N\left(\frac{\log\left(\frac{F}{K}\right) + \frac{\sigma^2 T}{2}}{\sigma\sqrt{T}}\right) - 1\right)$$

[10] The rates are captured around 18:00 New York Time every day and used for the following business day. Source: Government Treasury Website | US Department of the Treasury.

Calculation of Implied Volatility

The implied volatility calculates every minute during the Implied Volatility Calculation Window, using the last snapshot of bid/ask prices for each option at the end of each minute, as follows:

1. Find the strike at which the difference between the call and the put mid-prices is the smallest, also referred to as the at-the-money (ATM) strike Ka. If there are multiple put-call pairs with the same minimum absolute difference, then select the lowest strike among them.
2. Calculate forward price using put-call parity:

   $$F = Ka + e^{rT}(Call_{Ka} - Put_{Ka})$$

3. Select K_0 as the strike price equal to or immediately below *F*.
4. Select out-of-the-money call options with delta > 0.01. Start at the call with strike K immediately greater than K_0 and move to successively higher strike prices. After encountering two consecutive calls with a bid price of 0, no calls with higher strikes are considered.
5. Select out-of-the-money put options with delta < -0.01. Start at the put with strike K immediately less than K_0 and move to successively lower strike prices. After encountering two consecutive puts with a bid price of 0, no puts with lower strikes are considered.
6. At strike K_0, take the average of put and call prices.
7. Calculate implied volatility at the given minute:

   $$\sqrt{\frac{2}{T}\sum_i \frac{\Delta K_i}{K_i^2} e^{rT} Q(K_i) - \frac{1}{T}\left(\frac{F}{K_0} - 1\right)^2}$$

Calculation of Average Implied Volatility

The average implied volatility over the specified window calculates on each business day and is used to rebalance that day's subindex.

As previously mentioned, the target expiration on each weekday *d* is seven calendar days away, i.e. *d* + 7. If a given weekday *d* is a holiday, then the corresponding subindex rebalances on the next business day. Therefore, effectively, on *d*+1, the index calculates two implied volatilities: one for day *d* (with target expiration *d*+7) and one for day *d*+1 (with target expiration *d*+8).

If the target expiration is a business day but not a valid expiry date, the implied volatility for the preceding and following expiration dates interpolate using the exact time to expiry for each, as follows:

$$IV = \sqrt{\frac{T_L IV_L^2 (T_U - T) + T_U IV_U^2 (T - T_L)}{T(T_U - T_L)}}$$

where:

IV_L = Implied volatility (IV) calculated for the preceding expiration date L

T_L = Time from the end of IV calculation to the expiry-time on day L

IV_U = Implied volatility (IV) calculated for the following expiration date U

T_U = Time from the end of IV calculation to the expiry-time on day U

T = Expiration time (4:00 pm ET) on the target expiration date

If the target expiration is a holiday, then the next day is the target if it is a valid expiry date. Otherwise, interpolation applies as shown above.

Appendix B

Historical Data Used for Calculating Index Levels

Prior to 05/06/2022, the indices only include SPXW options listed on some weekdays. Beginning on 05/06/2022, the indices include SPXW options listed to expire on each business weekday. For each weekday *d*, the index identifies the nearest day preceding its target expiration (< *d*+7) on which an SPXW option is listed to expire. The index also identifies the nearest day following its target expiration (> *d*+7) that corresponds to a listed SPXW option expiry.

Appendix C

Historical Calculations for Back-Test Extension

S&P 500 Futures Intraday Edge Indices

For history from 01/04/2007 to 07/05/2013, due to the lack of intraday option data prior to 2013, the indices used end-of-day values in lieu of intraday values for the Fixing and TWAP Values used in the Rebalancing and Implied Volatility Calculations. To account for different data availability timing, the indices used the below formulas for calculations.

Implied Volatility Calculation. For history prior to 2013, the indices calculated the implied volatility (*IV*) using end-of-day options data in lieu of intraday data on each business day to rebalance the subindex corresponding to that day. The indices calculated implied volatility using the same approach as described in *Index Construction*.

The target expiration on each weekday d is seven calendar days away, i.e., $d + 7$. If a given weekday d is a holiday, then the subindex corresponding to it rebalances on the next business day. Therefore, on $d + 1$, two implied volatilities calculate: one for day d (with target expiration $d + 7$) and one for day $d + 1$ (with target expiration $d + 8$).

If the target expiration was a business day but not a valid expiry date, the implied volatility for the preceding (*L*) and subsequent (*U*) expiration dates were interpolated using the exact time to expiry for each, as follows:

$$IV = \sqrt{\frac{T_L IV_L^2 (T_U - T) + T_U IV_U^2 (T - T_L)}{T(T_U - T_L)}}$$

If the target expiration was a holiday, then the next day was the target if it was a valid expiry date. Otherwise, the interpolation applied as shown above.

In cases where both the nearest expiration dates were past the target expiration date, the indices applied linear interpolation to calculate the implied volatility. If only one value from (IV_L, IV_U) was not available, the indices used VIX as a 30-day measure of implied volatility and applied linear interpolation to estimate the one-week implied volatility. In rare cases where both IV_L and IV_U could not calculate, the indices directly used VIX as a substitute for the one-week implied volatility.

Disclaimer

Performance Disclosure/Back-Tested Data

Where applicable, S&P Dow Jones Indices and its index-related affiliates ("S&P DJI") defines various dates to assist our clients by providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P DJI defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Information presented prior to an index's launch date is hypothetical back-tested performance, not actual performance, and is based on the index methodology in effect on the launch date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Also, the treatment of corporate actions in back-tested performance may differ from treatment for live indices due to limitations in replicating index management decisions. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

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will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used. Index returns shown do not represent the results of actual trading of investable assets/securities. S&P DJI maintains the index and calculates the index levels and performance shown or discussed but does not manage any assets.

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