



INDEX METHODOLOGY

NASDAQ-100 ESG BUYWRITE INDEX

NQYLEI

INDEX OVERVIEW

The Nasdaq-100 ESG BuyWrite Index (the Index) tracks the performance of a systematic monthly rolled, covered call strategy.

On each Index calculation day, the strategy has exposure to the Nasdaq-100 ESG Total Return Index (NDXESGT), a short call option on the Nasdaq-100 Index® (NDX) and a hypothetical cash account (a Collateral Account).

INDEX PARAMETERS

Nasdaq-100 ESG BuyWrite Index Parameters:

	Index Component / Reference Component	Symbol	Target Exposure	Option Type
1	Nasdaq-100 ESG Total Return Index	NDXESGT	100%	N/A
2	Nasdaq-100 Index	NDX	-100%	Call

INDEX CALCULATIONS

Index values are calculated on a daily basis in accordance with the following formula:

$$I_t = CA_t + U_{NDXESGT,t} \times P_{NDXESGT,t}^{close} + U_{call,t} \times P_{call,t}^{close}$$

where I_t = the Index Value for time t ;

CA_t = the value of the Collateral Account for time t ;

$U_{NDXESGT,t}$ = the number of units of NDXESGT index for time t ;

$U_{call,t}$ = (signed) the number of units of the short call option for time t ;

$P_{NDXESGT,t}^{close}$ = the end of day value of the NDXESGT index for time t ;

$P_{call,t}^{close}$ = the last NBBO mid-Price for the current NDX short call option prior to 4:00 pm ET for time t .

Collateral Account

The Collateral Account is a hypothetical cash ledger for the Index. It is credited or debited, as applicable, by the settlement amounts of expired options, as well as the cost of any hypothetical purchases of call options.

On non-Roll date:

$$CA_t = CA_{t-1}$$

On Roll date:

$$CA_t = CA_{t-1} + U_{call,t-1} \times SV_t - U_{call,t} \times P_{call,t}^{VWAP} - (U_{NDXESGT,t} - U_{NDXESGT,t-1}) \times P_{NDXESGT,t}^{VWAP}$$

where $U_{call,t-1}$ = (signed) the number of units of short call option that is expiring on roll date t ;

$U_{call,t}$ = (signed) the number of units of selected call option on roll date t ;

$U_{NDXESGT,t} - U_{NDXESGT,t-1}$ = change of number of units of underlying NDXESGT index on roll date t ;

$P_{call,t}^{VWAP}$ = the VWAP of the new short call option on roll date t ;

$P_{NDXESGT,t}^{VWAP}$ = the NDXESGT Index value at the end of the VWAP period on roll date t ;

SV_t = the calculated Settlement Value of short call option that is expiring on roll date t .

PERIODIC EVENTS

Rolling Options

The call options are held to expiry and newly selected call options are notionally entered into at a volume weighted average price (VWAP) on the same day (a Roll Day), a process known as “rolling”. The VWAP is determined over a two-hour roll period (11:30 ET to 13:30 ET) on each Roll Day. If, for a call option, there are no relevant trades during the VWAP period, then the VWAP for that option will be deemed to be the last bid quote before the end of such VWAP period.

Selecting New Options

Each month, on the same day as the monthly option expiry (Selection Day), new NDX call options (the newly selected Index Components) are selected. The parameters for each short call option will be:

- Underlying: NDX
- Expiration Month: the next following month.
- Exercise Prices: for the short call option: the closest exercise price of the listed options for NDX that is equal to, or greater than the NDX value immediately prior to 11:00 ET on such Selection Day.

Target Exposure

On Roll date, the number of units of the call option component and the number of units for the NDXESGT Index component are calculated as

$$U_{call,t} = -\frac{CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}}{(P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP})}$$
$$U_{NDXESGT,t} = -U_{call,t} * \frac{P_{NDX,t}^{VWAP}}{P_{NDXESGT,t}^{VWAP}}$$

Where $P_{NDX,t}^{VWAP}$ = the NDX Index value at the end of the VWAP period on roll date t .

INDEX ROLES

Index Administrator: Nasdaq, Inc.

Index Calculator: Volos Portfolio Solutions, Inc.

INDEX VALUES & DATA

Daily Index values are calculated each business day after the close of listed options markets using prices for Index Components as of 16:00 ET and are made available on the Nasdaq Global Index Website (<https://indexes.nasdaqomx.com/Index/Overview/NQYLEI>).

With the exception of Roll Days, intraday Index values are calculated and disseminated every 15 seconds during normal market hours. On Roll Days intraday Index values will start to be disseminated at 13:45 ET.

APPENDIX: DETAILED UNITS FORMULAE DERIVATIONS

The appendix herein includes detailed derivation and explanation of equations used in Units Sizing in the Nasdaq-100 ESG BuyWrite Index (NQYLEI).

Base Accounting Equations (Index Level and Collateral Account Level)

Following two equations are standard accounting equations to compute the index level and the Collateral Account level on any index calculation date t .

$$I_t = CA_t + U_{NDXESGT,t} \times P_{NDXESGT,t}^{close} + U_{call,t} \times P_{call,t}^{close}$$

For the Collateral Account the equations are as follows.

On non-Roll date:

$$CA_t = CA_{t-1}$$

On Roll date:

$$CA_t = CA_{t-1} + U_{call,t-1} \times SV_t - U_{call,t} \times P_{call,t}^{VWAP} - (U_{NDXESGT,t} - U_{NDXESGT,t-1}) \times P_{NDXESGT,t}^{VWAP}$$

The above equation is standard method of tracking changes to Collateral Account (CA) at the end of trading activity on Roll date t. The equation accounts for changes in CA as a result of

1. Settling the expiring option: $U_{call,t-1} \times SV_t$
2. Premium Collected from the new Short Call: $U_{call,t} \times P_{call,t}^{VWAP}$
3. Change in units of underlying NDXESGT: $(U_{NDXESGT,t} - U_{NDXESGT,t-1}) \times P_{NDXESGT,t}^{VWAP}$

So far, the above equation itself does not provide the units of each components of the index. For that we need to define the sizing constraints as in next section.

Index Units Sizing Constraints

There two constraints that define the units of each component. Note that these are the only two constraints applied to units, and this helps further clarify the mechanics of the index. These are as follows:

1. $CA_t = 0$ (Zero Collateral Account on any index calculation date)
2. $Notional_{NDXESGT,t} = -Notional_{NDX,t}$ (i.e., on Roll date notional of underlying NDXESGT long position should match the notional of Short NDX Call option).

These two combined define the Index sizing completely.

Index Units Sizing Equations Derivation

There are two unknowns to solve for.

1. $U_{call,t}$
2. $U_{NDXESGT,t}$

To solve for these, we need two algebraic equations and then it is solved using linear algebra. The two equations come from the two constraints as above.

1. $CA_t = 0$
2. $Notional_{NDXESGT,t} = -Notional_{NDX,t}$

The second equation gives the following equations:

$$\begin{aligned} \text{Notional}_{NDXESGT,t} &= -\text{Notional}_{NDX,t} \\ U_{NDXESGT,t} * P_{NDXESGT,t}^{VWAP} &= -U_{call,t} * P_{NDX,t}^{VWAP} \end{aligned}$$

or

$$U_{NDXESGT,t} = -U_{call,t} * \frac{P_{NDX,t}^{VWAP}}{P_{NDXESGT,t}^{VWAP}}$$

Note that above equation can be used to solve either $U_{call,t}$, $U_{NDXESGT,t}$ in terms of the other. This does not mean one unit is dependent variable and the other is independent variable.

Now the Collateral Account Constraint become:

$$CA_t = 0$$

$$0 = CA_{t-1} + U_{call,t-1} \times SV_t - U_{call,t} \times P_{call,t}^{VWAP} - (U_{NDXESGT,t} - U_{NDXESGT,t-1}) \times P_{NDXESGT,t}^{VWAP}$$

Rearranging terms, we get:

$$U_{call,t} \times P_{call,t}^{VWAP} + U_{NDXESGT,t} \times P_{NDXESGT,t}^{VWAP} = CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}$$

Substituting in above equation the notional values constraint $U_{NDXESGT,t} * P_{NDXESGT,t}^{VWAP} = -U_{call,t} * P_{NDX,t}^{VWAP}$

we get,

$$U_{call,t} \times P_{call,t}^{VWAP} - U_{call,t} \times P_{NDX,t}^{VWAP} = CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}$$

or

$$-U_{call,t} \times (P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP}) = CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}$$

Which gives:

$$U_{call,t} = -\frac{CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}}{(P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP})}$$

Index Units Sizing Equations

Using the above derivations, we reach following two equations:

$$U_{NDXESGT,t} = \frac{P_{NDX,t}^{VWAP}}{P_{NDXESGT,t}^{VWAP}} * \frac{CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}}{(P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP})}$$

$$U_{call,t} = -\frac{CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}}{(P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP})}$$

Note that another succinct way of writing these equations is,

$$U_{call,t} = -\frac{CA_{t-1} + U_{call,t-1} \times SV_t + U_{NDXESGT,t-1} \times P_{NDXESGT,t}^{VWAP}}{(P_{NDX,t}^{VWAP} - P_{call,t}^{VWAP})}$$

$$U_{NDXESGT,t} = -U_{call,t} * \frac{P_{NDX,t}^{VWAP}}{P_{NDXESGT,t}^{VWAP}}$$

Glossary of Symbols

Symbol	Description
I_t	The Index Value calculated on date t .
CA_t	The value of the Collateral Account on date t .
$U_{NDXESGT,t}$	The number of units of NDXESGT index for time t .
$U_{NDXESGT,t-1}$	The number of units of NDXESGT index for time $t - 1$.
$U_{call,t}$	The (signed) number of units of selected call option on roll date t .
$U_{call,t-1}$	The (signed) number of units of short call option that is expiring on roll date t .
$P_{NDXESGT,t}^{close}$	The end of day value of the NDXESGT index for time t .
$P_{call,t}^{close}$	The last NBBO mid-Price for the current NDX short call option prior to 4:00 pm ET for time t .
$P_{NDXESGT,t}^{VWAP}$	The NDXESGT Index value at the end of the VWAP period on roll date t .
$P_{NDX,t}^{VWAP}$	The NDX Index value at the end of the VWAP period on roll date t .
$P_{call,t}^{VWAP}$	The VWAP of the New Short Call option on roll date t .
SV_t	The calculated Settlement Value of short call option that is expiring on roll date t .

DISCLAIMER

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