

CryptoCompare Blockdaemon Staking Yield Index Methodology

CC Data Limited

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1 Version History

Version	Date	Details
1	26-Sep-2022	Initial version

2 Introduction

2.1 Index Description

The CryptoCompare Blockdaemon Staking Yield Index for a given Digital Asset refers to the indicative daily yield in annualised terms of such Digital Asset calculated in accordance with this index methodology document. Staking, which is the process of delegating or committing digital asset holdings to a validator in order to bolster the security of a blockchain, generates rewards for both the token holder and validator. It is an integral part of any blockchain network based on the proof-of-stake model. The purpose of each Index is to provide an indicative yield for the underlying Digital Asset that may be used for research or benchmarking purposes or for the development of yield-based digital asset investment strategies.

The CryptoCompare Blockdaemon Staking Yield Index Family is the proprietary yield calculation methodology of CC Data Limited (“**CC Data**”) for certain proof-of-stake digital assets, based on staking data provided by Blockdaemon Inc. A detailed list of available CryptoCompare Blockdaemon Staking Yield Indices can be found in Table 1 in Appendix A.

2.2 Index Properties

Index value type	Single-asset indicative daily yield in annualised terms for a given calendar day
Dissemination frequency	Daily
Day close	16:00 UTC
Calculation days	Every day of the week including weekends
Market coverage	Five (5) proof-of-stake coins

3 Definitions

API means the Application Programming Interface.

Asset or **Digital Asset** means, with respect to an Index, the underlying digital asset as specified under column ‘Underlying Asset’ in Table 1 in Appendix A.

Base Date means, with respect to an Index, the date from when the historical Index Values are available, and is as specified in Table 1 in Appendix A.

Blockchain means, with respect to a Digital Asset, the relevant decentralised distributed ledger whose native currency is such Digital Asset.

BMR means the UK BMR and the EU BMR.

Calculation Agent means CC Data Limited.

Data Provider means Blockdaemon Inc.

Day Close means 16:00 (4pm) UTC.

EU BMR means Regulation (EU) 2016/11 of 29 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds.

Index means each CryptoCompare Blockdaemon Staking Yield Index listed in Table 1 in Appendix A.

Index Administrator means CC Data Limited.

Index Business Day means each calendar day.

Input Data means, with respect to an Index, the raw data set retrieved from the relevant Blockchain, and then processed and made available by the Data Provider for use in Index Value calculation.

Index Owner means CC Data Limited.

Index Value means, with respect to an Index and an Index Business Day, the value for such Index and Index Business Day calculated in accordance with subsection 5.1.

Launch Date means, with respect to an Index, the date the Index goes live, and is as specified in Table 1 in Appendix A.

Overight Function means an internal committee composed of CC Data personnel that is independent of the Technical Committee and responsible for overseeing, reviewing and challenging the activities carried out by the Technical Committee.

Period means, with respect to an Index, each section of time over which the Input Data is collected and, if applicable, aggregated by the Data Provider.

Technical Committee means an internal committee composed of CC Data personnel with valuable experience or expertise in the design, calculation and effective governance of indices, in particular digital asset indices.

UK BMR means the EU BMR as it has been applied (onshored) in the UK since 31 December 2020 pursuant, among other things, to the European (Withdrawal Agreement) Act 2020 and the Benchmark (Amendment and Transitional Provision) (EU Exit) Regulations 2019 (SI 2019/657).

UTC means Coordinated Universal Time.

4 Data Collection

4.1 Data Source

Underlying staking information required for the calculation of the CryptoCompare Blockdaemon Staking Yield Indices is provided by the Data Provider. For each underlying Asset, the Data Provider runs a node on the relevant Blockchain to retrieve the required raw data; processes and, if applicable, aggregates such raw data into usable data fields (collectively defined as Input Data); and finally makes available the Input Data on their API, typically on a per-Period basis.

4.2 Data Format

At a minimum, the Input Data for each Asset consists of the following:

- Period number: string or numerical
- Period start time: date and time in UTC timezone
- Period end time: date and time in UTC timezone
- Supply staked: numerical
- Rewards distributed: numerical

Certain Assets may require additional fields to account for Blockchain-specific staking characteristics.

4.3 Data Validation

Input Data for each Index is validated for the following:

- Each field has the correct data format
- Each field is available at the expected time
- Period start and end times are not in the future
- Each field has a reasonable magnitude

4.4 Failure of Data Retrieval

CC Data has implemented automated alerts to flag missing Input Data. In the event of a failure to retrieve the required Input Data at the expected time, CC Data shall notify the Data Provider through the usual communication channels, who shall then endeavour to backfill the missing data as soon as reasonably practicable. Additionally, the Data Provider has implemented automated alerts on their end to monitor timely data updates.

5 Staking Yield Calculation

5.1 Calculation Methodology

Each CryptoCompare Blockdaemon Staking Yield Index is designed to capture the indicative daily annualised staking yield of the relevant Digital Asset. However, idiosyncrasies of the underlying Blockchain technologies and how each Asset is staked and its rewards distributed and compounded, mean each Asset has a unique yield calculation methodology and implementation.

5.1.1 SOL (Solana)

SOL token holders can earn rewards by delegating tokens to one or more validators on the Solana blockchain. The CryptoCompare Blockdaemon Solana Staking Yield Index reflects the average daily yield in annualised terms that can be achieved by staking SOL.

Rewards are distributed at the end of each Period, called an epoch, and automatically redelegated as active stake and hence compounded. An epoch is the time in which a sequence of leaders (validators) are selected to append entries to the ledger. It consists of 432,000 slots (blocks) and it lasts roughly 2-4 days.

The Index Value for each Index Business Day is calculated as the time-weighted average yield of all epochs that fall within that Index Business Day as follows:

$$DY_t = \sum_{i \in C_t} \left(\frac{d_{i,t}}{m} \cdot EY_i \right) \quad (1)$$

Where:

DY_t is the annualised staking yield for Index Business Day t ;

i denotes an epoch;

C_t is the set of epochs any part of which take place on Index Business Day t ;

$d_{i,t}$ is the duration in seconds of epoch i that falls within Index Business Day t ;

m is the number of seconds in 1 day; and

EY_i is the annualised staking yield for epoch i and is calculated in accordance with Equation 2.

The average staking yield for each epoch is calculated by taking the total rewards distributed to delegators and validators during that epoch and dividing it by the total supply staked in the network during that same epoch. The epoch yield is calculated as an annualised figure as follows:

$$EY_i = \left(1 + \frac{r_i}{s_i}\right)^{\left(\frac{n}{d_i}\right)} - 1 \quad (2)$$

Where:

EY_i is the annualised staking yield for epoch i ;

r_i is the total rewards distributed (to both delegators and validators) in epoch i ;

s_i is the total supply staked in epoch i ;

n is the number of seconds in 1 year; and

d_i is the duration in seconds of epoch i .

The CryptoCompare Blockdaemon Solana Staking Yield Index for Index Business Day t is calculated and published as soon as the required information for all epochs that take place on such Index Business Day becomes available, which can be anywhere between Day Close on $t + 1$ and Day Close on $t + 5$.

5.1.2 DOT (Polkadot)

DOT token holders can earn rewards through staking on the Polkadot blockchain as a validator, which requires a node running 24/7, or as a nominator, whereby they nominate a validator. The CryptoCompare Blockdaemon Polkadot Staking Yield Index reflects the average daily yield in annualised terms that can be achieved by staking DOT.

Total network rewards are distributed on average equally across validator pools regardless of the total amount staked in the individual validator pool. Within a validator pool, a percentage of the reward goes to pay the validator's commission fees and the remainder is paid pro-rata, i.e. proportional to stake, to the nominators and validator. DOT rewards are distributed at the end of each Period, called an era. The length of one era is 24 hours and consists of 14,400 slots (each slot is 6 seconds) or 6 epochs (each epoch is 4 hours). Once distributed, rewards have the potential to be compounded, or withdrawn from staking. For the purposes of this yield calculation, we assume that DOT rewards are automatically redelegated as active stake, and hence compounded.

The Index Value for each Index Business Day is calculated as the time-weighted average yield of all eras that fall within that Index Business Day as follows:

$$DY_t = \sum_{i \in C_t} \left(\frac{d_{i,t}}{m} \cdot EY_i \right) \quad (3)$$

Where:

DY_t is the annualised staking yield for Index Business Day t ;

i denotes an era;

C_t is the set of eras any part of which take place on Index Business Day t ;

$d_{i,t}$ is the duration in seconds of era i that falls within Index Business Day t ;

m is the number of seconds in 1 day; and

EY_i is the annualised staking yield for era i and is calculated in accordance with Equation 4.

The average staking yield for each era is calculated by taking the total rewards distributed to nominators and validators during that era and dividing it by the total supply staked in the network during that same era. The era yield is calculated as an annualised figure as follows:

$$EY_i = \left(1 + \frac{r_i}{s_i}\right)^{\left(\frac{n}{d_i}\right)} - 1 \quad (4)$$

Where:

EY_i is the annualised staking yield for era i ;

r_i is the total rewards distributed (to both nominators and validators) in era i ;

s_i is the total supply staked in epoch i ;

n is the number of seconds in 1 year; and

d_i is the duration in seconds of epoch i .

Note that each era begins at 15:36:18 UTC of a calendar day and ends at the same time the following day. Therefore, the duration in seconds of each era is always 86,400 (the number of seconds in 1 day).

The CryptoCompare Blockdaemon Polkadot Staking Yield Index for Index Business Day t is calculated and published at Day Close on $t + 1$.

5.1.3 ATOM (Cosmos)

ATOM token holders can earn rewards by staking tokens to one or more validators within the Cosmos ecosystem. The CryptoCompare Blockdaemon Cosmos Staking Yield Index reflects the average daily yield in annualised terms that can be achieved by staking ATOM.

Cosmos is a decentralized network of independent parallel blockchains and is powered by a proof-of-stake consensus. As an ATOM token holder, staking on the Cosmos Hub¹ enables you to earn rewards, contribute to the governance

¹The Cosmos Hub is the first of thousands of interconnected blockchains that will eventually comprise the Cosmos Network.

and security of the network and vote on proposals that shape the future of the network.

Staking ATOM typically incurs a small commission fee (validator fee) that is deducted from the rewards distributed to the staker. ATOM is staked in blocks and each block lasts roughly 7 seconds. Certain staking platforms offer delegators to choose between automatically redelegating their rewards as active stake or cashing in once rewards are distributed. For the purposes of this yield index calculation, we make the following assumptions:

- Rewards distributed and total supply staked are aggregated across blocks by Index Business Day.
- Blocks may not begin or end exactly at midnight UTC, so for a given Index Business Day, the block with end time immediately following midnight UTC is selected as the last block to contribute to the yield calculation for such Index Business Day.
- Rewards are automatically redelegated as active stake, and hence compounded, at the end of each Index Business Day.

As each period is a full calendar day in UTC, the Index Value for each Index Business Day is equal to the period yield for the period that maps to such Index Business Day:

$$DY_t = PY_i \tag{5}$$

Where:

DY_t is the annualised staking yield for Index Business Day t ;

i denotes the period that corresponds to Index Business Day t ;

PY_i is the annualised staking yield for period i and is calculated in accordance with Equation 6.

The average staking yield for each period is calculated by taking the total rewards distributed to delegators and validators during that period and dividing it by the total supply staked in the network during that same period. The period yield is calculated as an annualised figure as follows:

$$PY_i = \left(1 + \frac{r_i}{s_i}\right)^{\left(\frac{n}{d_i}\right)} - 1 \tag{6}$$

Where:

PY_i is the annualised staking yield for period i ;

r_i is the total rewards distributed (to both delegators and validators) in period i ;

s_i is the total supply staked in period i ;

n is the number of seconds in 1 year; and

d_i is the duration in seconds of period i .

Note that each period begins approximately at 00:00:00 UTC of a calendar day and ends approximately at the same time the following day. Therefore, the duration in seconds of each period is set to 86,400 (the number of seconds in 1 day).

The CryptoCompare Blockdaemon Cosmos Staking Yield Index for Index Business Day t is calculated and published at Day Close on $t + 1$.

5.1.4 ADA (Cardano)

ADA token holders can earn rewards by either running their own stake pool or delegating their stake to a stake pool run by someone else on the Cardano blockchain. The CryptoCompare Blockdaemon Cardano Staking Yield Index reflects the average daily yield in annualised terms that can be achieved by staking ADA.

On the Cardano network, each slot lasts one second. Therefore each Period, called an epoch, which consists of 432,000 slots, lasts exactly 5 days. Rewards of staking in an epoch are distributed 1 epoch (5 days) after the end of that epoch. Rewards don't need to be manually claimed in order to be included in the delegator's staked balance. Hence, rewards are automatically redelegated every epoch unless withdrawn by the delegator, which may be done at any point during the staking period. There is no slashing during a staking period. For the purposes of this yield index calculation, we assume that rewards are not withdrawn and automatically redelegated, and hence compounded, at the end of each epoch.

The Index Value for each Index Business Day is calculated as the time-weighted average yield of all epochs that fall within that Index Business Day as follows:

$$DY_t = \sum_{i \in C_t} \left(\frac{d_{i,t}}{m} \cdot EY_i \right) \quad (7)$$

Where:

DY_t is the annualised staking yield for Index Business Day t ;

i denotes an era;

C_t is the set of eras any part of which take place on Index Business Day t ;

$d_{i,t}$ is the duration in seconds of epoch i that falls within Index Business Day t ;

m is the number of seconds in 1 day; and

EY_i is the annualised staking yield for epoch i and is calculated in accordance with Equation 8.

The average staking yield for each epoch is calculated by taking the total rewards distributed to delegators and pool owners during that epoch and dividing it by the total supply staked in the network during that same epoch. The epoch yield is calculated as an annualised figure as follows:

$$EY_i = \left(1 + \frac{r_i}{s_i}\right)^{\left(\frac{n}{d_i}\right)} - 1 \quad (8)$$

Where:

EY_i is the annualised staking yield for epoch i ;

r_i is the total rewards distributed (to both delegators and pool owners) in epoch i ;

s_i is the total supply staked in epoch i ;

n is the number of seconds in 1 year; and

d_i is the duration in seconds of epoch i .

Note that each epoch begins at 21:44:51 UTC of a calendar day and ends at the same time 5 days later. Therefore, the duration in seconds of each epoch is always 432,000 (the number of seconds in 5 days).

The CryptoCompare Blockdaemon Cardano Staking Yield Index for Index Business Day t is calculated and published as soon as the required information for all epochs that take place on such Index Business Day becomes available, which can be anywhere between Day Close on $t + 7$ and Day Close on $t + 11$.

5.1.5 AVAX (Avalanche)

AVAX token holders can earn rewards by either operating as a validator or delegating their stake to an existing validator on the Avalanche Blockchain. The CryptoCompare Blockdaemon Avalanche Staking Yield Index reflects the average daily yield in annualised terms that can be achieved by staking AVAX.

Avalanche validators can choose to bond their stake for anywhere between 14 days and 1 year. For a given validation period, rewards are distributed at the end of the validation period. Once distributed, rewards have the potential to be compounded, or withdrawn from staking. Reward distribution for AVAX is forward-looking, such that the actual rewards distributed and actual supply staked for a given validation period is known at the start of the period.

For the purposes of this yield calculation, we make the following assumptions:

- At midnight UTC of each Index Business Day, rewards from all validation periods (of any duration) that began in the past 24 hours are normalised into single-day rewards. As a result, each Period is one full calendar day in UTC.

- The single-day rewards are automatically redelegated as active stake and compounded every 14 days, which is the minimum length of a validation period.
- There is no slashing during a validation period.

As each Period is a full calendar day in UTC, the Index Value for each Index Business Day is equal to the period yield of the Period that maps to such Index Business Day:

$$DY_t = PY_i \tag{9}$$

Where:

DY_t is the annualised staking yield for Index Business Day t ;

i denotes the period that corresponds to Index Business Day t

PY_i is the annualised staking yield for Period i and is calculated in accordance with Equation 10.

The average staking yield for each period is calculated by taking the normalised rewards distributed to delegators and validators and dividing it by the total supply staked, both with respect to all validation periods that began in the past 24 hours. The period yield is calculated as an annualised figure as follows:

$$PY_i = \left(1 + \frac{r_i \cdot 14}{s_i}\right)^{\left(\frac{n}{u}\right)} - 1 \tag{10}$$

Where:

PY_i is the annualised staking yield for period i ;

r_i is the total rewards distributed (to both delegators and validators) in period i ;

s_i is the total supply staked in period i ;

n is the number of seconds in 1 year; and

u is the number of seconds in 14 days.

The CryptoCompare Blockdaemon Avalanche Staking Yield Index for Index Business Day t is calculated and published at 4pm UTC on $t + 1$.

5.2 Auditability and Replicability

Each CryptoCompare Blockdaemon Staking Yield Index is auditable and replicable since its calculation is based on raw staking data retrieved from the relevant Blockchain. Anyone that has access to this data can recreate the Index.

6 Ongoing Maintenance

6.1 Methodology Review and any Changes to Methodology

The methodology shall be reviewed at least every quarter by the Technical Committee to ensure that it remains representative of the relevant market or economic reality that it intends to measure. If the Technical Committee requires any material changes to the methodology, then such changes shall be signed off by the Oversight Function before entering a period of public consultation of no less than thirty (30) days. The Oversight Function shall undertake an internal review of the methodology at least annually.

In accordance with Article 13(1)(c) of the BMR, the consultation exercise shall provide notification to Index users, at a minimum, of the key elements of the methodology that would be affected by the proposed material change. Index users and customers shall be notified of the methodology consultation and proposed changes via the API newsletter and other direct client communication channels, and the proposed methodology amendments shall be made available for review at data.cryptocompare.com/research, where users would be able to submit feedback on any proposed change.

6.2 Backtesting and Benchmarking

In order to maintain confidence that the CryptoCompare Blockdaemon Staking Yield Indices are representative and replicable, the following tests shall be conducted:

- On an ad-hoc basis, the Index Value for a given Index and Index Business Day shall be spot checked against other yield data sources deemed reliable.
- On a quarterly basis, the Indices shall be recalculated for the preceding 3 months under a secondary implementation and compared with the official Index Values calculated in production. This will ensure that the Indices are replicable and transparent.

6.3 Discretion Regarding the Use of Input Data

Pursuant to Art. 12 No.1. (b) of the BMR, CC Data has established the following rules to identify how and when discretion may be exercised in the administration of the CryptoCompare Blockdaemon Staking Yield Indices.

In cases where Input Data is or appears to be qualitatively inferior or missing, different sources provide contradictory data, or a situation arises that is not covered by this index methodology document, CC Data may use or change the Input Data at its own discretion according to the following discretion policy after a plausibility check.

Any changes to Input Data that CC Data intends to apply because of missing data or other information concluding the inappropriateness or incorrectness of data must be subject to reasonable discretion. The decision on any change must be required, appropriate, commensurable, and in line with the respective index scope and objective. It must also reasonably consider and weigh in the balance the interest of users, investors in related products and the integrity of the market.

The Technical Committee ensures consistency in the use of discretion in its judgement and decision. Members of the Technical Committee are selected for their demonstrated experience and skills relevant to the development and administration of financial benchmarks. Significant decisions are subject to sign-off by a supervisor or the Oversight Function. In case of material changes to Input Data or the calculation methodology, the relevant situation shall be analysed in detail, described and presented to the Oversight Function, and discussed and reviewed with the Oversight Function.

The broad range of possible data quality and data latency issues does not allow a description of specific steps to be taken in each possible instance. CC Data shall always weigh the different interests of Index users, the integrity of the market and other involved parties, and determine the least disadvantageous measure that considers the relevant interests of all stakeholders.

In order to avoid repeat discretion on the use of data in similar cases in the future, an update of this index methodology document may be taken into consideration, if applicable. Other possible mitigation measures may include the use of alternative or additional Input Data, Data Provider and/or own research where possible and reasonable.

Records shall be kept about material judgement or discretion and shall include the reasoning for said judgement or discretion.

6.4 Potential Limitation

The CryptoCompare Blockdaemon Staking Yield Indices work best when there are no interruptions in underlying data provision. They rely on regular and timely staking yield updates retrieved, processed and made available by the Data Provider. The potential limitations of the Indices include circumstances where:

- the Input Data is unavailable, either due to an outage or disruption of the underlying Blockchain or the Data Provider's API; or
- the Input Data does not capture all of the staking information or is inaccurate for any reason; or
- if applicable, the Input Data is aggregated incorrectly for any reason.

If the Input Data for an Index is not available at the expected time, then the Index is at risk of becoming stale for the affected period. If the Input Data is

incorrect, incomplete or aggregated incorrectly for an Index, then the Index is at risk of giving an indicative yield value that does not sufficiently or accurately reflect the market reality.

7 Dissemination

The CryptoCompare Blockdaemon Staking Yield Indices are disseminated once a day at Day Close via CC Data's REST API. The CC Data API documentation can be found here: <https://min-api.cryptocompare.com/documentation>.

8 Disclaimer

No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law.

CC Data Limited is a registered company in England with company number 10966788 and registered address of 162 Main Road, Danbury, Chelmsford, England CM3 4DT.

A Appendix

Table 1: Index Information

Index	Index Symbol	Underlying Asset	Base Date	Launch Date
CryptoCompare Blockdaemon Solana Staking Yield Index	CCBYSOL	SOL	24-Jul-2022	28-Sep-2022
CryptoCompare Blockdaemon Polkadot Staking Yield Index	CCBYDOT	DOT	27-Jul-2022	28-Sep-2022
CryptoCompare Blockdaemon Cosmos Staking Yield Index	CCBYATM	ATOM	27-Jul-2022	28-Sep-2022
CryptoCompare Blockdaemon Cardano Staking Yield Index	CCBYADA	ADA	24-Jul-2022	28-Sep-2022
CryptoCompare Blockdaemon Avalanche Staking Yield Index	CCBYAVX	AVAX	27-Jul-2022	28-Sep-2022

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