



CRYPTO FUTURES AND OPTIONS MARGINING

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1. Introduction

Contracts listed on AsiaNext Digital Derivatives Pte. Ltd. (henceforth “AsiaNext”) are derivatives: they derive value from movements in underlying cryptocurrencies such as Bitcoin (BTC) and Ethereum (ETH) but, as derivatives, they don’t carry any rights to ownership of these underlying cryptocurrencies.

Exchange members who make trading profits from their futures and options contracts realise this derived value in cash via hourly **variation margin** credits in US dollars to their call accounts at AsiaNext. If they make trading losses, these losses are realized via hourly **variation margin** debits in US dollars from their call accounts at AsiaNext.

In order to ensure that members always have sufficient funds to meet their variation margin obligations, AsiaNext requires them to maintain **initial margin** and **minimum deposit** balances with the exchange. Finally, in order to protect members against a possible default by any member/s of the exchange, AsiaNext maintains a **default fund**. This fund is capitalized primarily by AsiaNext itself, but AsiaNext’s members also make contributions to the **default fund**.

The purpose of this document is to provide a simple outline of how these four elements of the exchange margin framework - variation margin, initial margin, minimum deposit, and default fund - are computed. It should be read in conjunction with the AsiaNext Derivatives Trading Rules, which govern the operation of the exchange. If there is any conflict between this document and the AsiaNext Derivatives Trading Rules, the Trading Rules take precedence.

2. Variation Margin

AsiaNext computes members’ variation margin debits and credits every hour, based on hourly settlement price calculations for the contracts listed on the exchange. These calculations are carried out slightly differently for futures and for options. Each calculation is outlined separately, in turn, below.

a. Futures

Tier	Method / Calculation
a	If the contract traded in the last 5 minutes before the hourly settlement run, then the contract settles to the volume-weighted average price (VWAP) of the trade(s) done in the last 5 mins before the hourly settlement run.
b	If there was no trade in the last 5 minutes before the hourly settlement run, then the contract settles to the midpoint of Bid/Ask - calculated based on VWAP - from an order book snapshot taken during the hourly settlement run.
c	If neither trade nor Bid / Ask prices are available, then an external reference spot rate is used as below to determine the settlement price: <u>Calendar Futures:</u> Reference Spot Rate * [1 + [(Days to expiration/360) x Interest Rate]] <u>Perpetual Futures:</u> Reference Spot Rate where, Reference Spot Rate = SIX Reference Rate Crypto Index Interest Rate = SOFR Term Rate for USD

b. Options on futures

AsiaNext’s options settle into the underlying futures, but contracts are designed to expire at the same time that the futures expire. They are therefore entirely cash-settled, in line with the underlying futures.

No option premium is settled when options are traded on AsiaNext because the market value of options purchased or sold offsets the value of any premiums due to be paid or received. However, as the options’ market values are adjusted every hour, their premiums are paid, effectively, in hourly increments as time passes.

For example, an out-of-the-money option might be traded at a premium of \$1,000. If none of the option pricing inputs changed over its life, it would gradually lose value as time passed, reaching a valuation floor of zero at the time it expired. During each hourly settlement run, as the option lost value, the seller would realise variation margin credits and the buyer would realise variation margin losses. At expiry, the option would expire worthless and the cumulative variation margin credits for the seller, as well as the cumulative variation margin debits for the buyer, would equal the premium of \$1,000.

Hourly settlement prices for options on futures at AsiaNext are computed from the Black-76 model. Its pricing inputs consist of the hourly settlement prices for the underlying futures as outlined above and a market-standard implied volatility surface obtained from a market data vendor.

c. Margin calls

AsiaNext computes its members' total variation margin obligations every hour, across all their positions in futures, options and perpetual futures, whether based on BTC, ETH or on any other underlyings. The total net variation margin balance is added to or subtracted from (if negative) from members' call accounts at AsiaNext.

If a variation margin debit from a member's call account at AsiaNext results in a negative call account balance, a margin call to the member is made to bring the balance back to the required minimum level.

3. Funding rate for perpetual futures - Revised

Perpetual futures have no expiry date: they are constructed to replicate the behaviour of a trading position which rolls forward every day. In order to capture the funding cost of maintaining this position, a funding rate is computed based on a **Premium Index**, the spread between the bid and ask prices of the perpetual future and AsiaNext's Reference Spot Rate (namely the SIX Reference Rate Crypto Index). The **Premium Index** is then adjusted by a clamp and a fixed interest rate, and then divided by the funding interval to create the final funding rate.

Exchange members will make or receive funding rate payments in proportion to the size of their market position.

At AsiaNext, the settlement of initial and variation margin is made on an hourly schedule, eliminating any accumulation of funding payment exposures between the exchange and its members. As such, members' market positions, for the purpose of funding rate payments, are computed as their average market position through the relevant funding rate hour.

a. The funding rate calculation

The funding rate is computed every hour as follows.

First, the **Premium Index** is computed, using the following rules:

- When the bid price of the future is at a premium to the index, the **Premium Index** is the difference between the bid price and the index.
- When the ask price of the future is at a discount to the index, the **Premium Index** is the difference between the ask price and the index.
- When the index is between the bid and ask prices of the future, the **Premium Index** is set to zero.

Then, a **Funding Basis** is computed: setting a cap and a floor on the **Premium Index**, in order to contain the impact of any extreme market movements, and using a "clamp" formula to normalise the **Funding Basis** towards a fixed interest rate I , currently set to 1 basis point.

The formulae for these rules are set out below.

$$1. \quad p_{BID} < p_{Index} < p_{ASK}:$$

$$premium\ index = 0$$

$$2. \quad p_{Index} < p_{BID}:$$

$$premium\ index = (p_{BID}^{Average} - p_{Index})/p_{Index}$$

$$3. \quad p_{ASK} < p_{Index}:$$

$$premium\ index = (p_{ASK}^{Average} - p_{Index})/p_{Index}$$

$$4. \quad r_f^{funding\ basis} = premium\ index\ (P) + clamp(interest\ rate\ (I) - premium\ index\ (P), min, max)$$

$$where\ clamp(x, min, max) = \begin{cases} min, & if\ x < min \\ max, & if\ x > max \\ x, & if\ min \leq x \leq max \end{cases}$$

As long as the premium index is between the min and max clamp range, then the funding rate is equal to the interest rate (I). There can be a scenario where premium index equals zero and long position holders pay the interest rate to short position holders.

Finally, Step 5 is to scale the funding rate according to the frequency of funding settlement. i.e. for AsiaNext's settlement cycle of 1 hour and the market-standard funding interval of 8 hours in most premium index calculations, the funding rate will then be further divided by 8 (multiplied by 1/8) in order to normalize it to the sum that would be payable on an eight-hourly settlement cycle.

The formula for this rule is set out below.

$$5. \quad r_f = r_f^{funding\ basis} / funding_interval$$

b. Calculations and Definitions

interest rate (I) – The “default” funding rate applicable to the funding interval considered, as set by AsiaNext. Step 4 above will return the **Funding Basis** equal to this “default” funding rate as long as the calculation is within the range as implied by the clamped function.

funding basis – The premium index adjusted by the clamp formula.

funding interval – The assumed funding window to which the funding rate is applied. The market standard is 8 hours but some exchanges (for example, Kraken, Gemini) use 24 hours.

p_{Index} – SIX/BITA spot index price at the hour.

p_{BID}, p_{ASK} – Average of all snapshots of volume-weighted average Bid/Ask price from perpetual futures order book, where volume is the number of contracts aggregated from the best price (e.g. highest bid and lowest ask), up to the Impact Quantity defined. See below for the calculation steps:

1. Set an Impact Quantity on the number of contracts.
2. For every 1-minute snapshots of *p_{BID}, p_{ASK}* during the hour (i.e. total 60 snapshots),

$$P_{BID} = \frac{\sum(\text{Volume} \times \text{Bid Prices})}{\sum(\text{Volume})}, \text{ where Volume is up to Impact Quantity}$$

$$P_{ASK} = \frac{\sum(\text{Volume} \times \text{Ask Prices})}{\sum(\text{Volume})}, \text{ where Volume is up to Impact Quantity}$$

3. Compute *p_{BID}^{average}* and *p_{ASK}^{average}* for the hour by taking a simple average over the 60 snapshots:

$$p_{BID}^{average} = \frac{1}{n} \sum_{i=1}^n P_{BID}^i \quad \text{and} \quad p_{ASK}^{average} = \frac{1}{n} \sum_{i=1}^n P_{ASK}^i \quad \text{where } n = \text{of Snapshots} = 60$$

Note: In the event there are fewer than 60 snapshots, the averaging calculation is to be performed according to the number of available snapshots, subject to Condition 4 below.

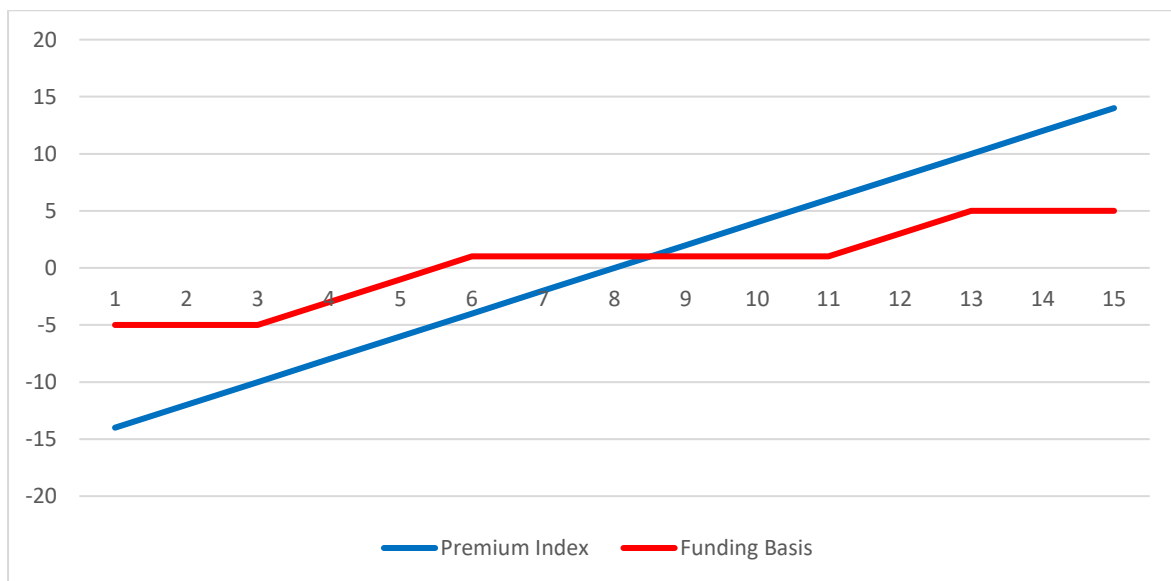
4. If fewer than the required X% of snapshots have been captured for the hour (i.e. a 50% requirement would translate to a minimum of 30 captured snapshots in an hour), the premium index will be determined as zero.
5. Finally, the funding rate *r_f* is computed as shown in the funding rate calculation above.

In order to prevent excessive funding exposure and maintain stability of the exchange, the resulting hourly **funding basis** is subject to appropriate **cap** and **floor rates**. The cap and floor rates will apply as below:

- If the funding basis calculated is above the cap rate (e.g. +0.05%) then publish and apply (for payment) the funding rate at the cap rate
- If funding basis calculated is above below the floor rate (e.g. -0.05%), publish and apply (for payment) the funding rate to the floor rate
- Be aware, the funding basis, cap rate and floor rate are **not** annualized rates.

As an illustration, if the interest rate is set at 1bp, minimum/maximum clamps are at -5bp/+5bp, and the floor/cap rates at -5bp/+5bp, the following scenarios can occur:

Premium Index	Effect of Clamp	Funding Basis
-14	5	-5
-12	5	-5
-10	5	-5
-8	5	-3
-6	5	-1
-4	5	1
-2	3	1
0	1	1
2	-1	1
4	-3	1
6	-5	1
8	-5	3
10	-5	5
12	-5	5
14	-5	5



c. Funding rate payment / settlement

The funding rate is **calculated and settled every hour** for application to the subsequent settlement cycle, i.e. one hour later.

The funding rate payment amount is calculated as:

$$\text{Funding Rate} \times \text{Average number of contracts} \times \text{Nominal} \times \text{Mark Price}$$

where

Funding Rate = the percentage calculated in the **funding rate calculation** above

Average number of contracts a Member has at point of Settlement Run

Average number of contracts calculation considers the size and duration of each position (long and short) held by Member throughout the funding interval.

Each position is assigned a weight based on the proportion of the funding interval it was held. Example: if a position was held for the entire 1hour funding/settlement cycle it will be assigned a weight of 1, however if a position was held for 30 minutes it will be assigned a weight 0.5. The weighted average position is calculated by multiplying each position by its corresponding weight and summing the results.

Example: Considering the post trade risk and settlement system has the granularity of trades done just before the hourly settlement runs (before the trades get consolidated into positions), let's say the open position from the last hour was 10 and in the current hour there were 3 trades done – buy 5 at time 9:15:50, sell 5 at 9:30:40, buy 2 at 9:45:20 then the calculation of the average position is:

$$\left\{ +10 + \left[+5 \times \frac{(10:00:00-9:15:50)}{60} \right] + \left[-5 \times \frac{(10:00:00-9:30:40)}{60} \right] + \left[+2 \times \frac{(10:00:00-9:45:20)}{60} \right] \right\} = +9.275$$

held for current hour.

Nominal = number of underlying per contract ie 0.1 for BTC and ETH

Mark Price = used for the Perpetual contract at the Settlement Run

Funding payments are debited from/credited to members' call accounts with AsiaNext on an hourly basis.

4. Initial Margin

The purpose of initial margin is to protect the exchange and its members against a possible variation margin call which fails. Because variation margin is charged on members' overall positions in futures and options, based on all relevant underlyings, initial margin is computed with exactly the same scope.

a. Value at risk models

AsiaNext uses for this purpose two value at risk (VaR) models which forecast possible movements in the value of a member's portfolio over the "margin period of risk" – currently eight hours – subsequent to the hourly settlement run. The value at risk models take into account all the positions and hedges owned by the member in question, across all underlyings, including both options and futures.

The first of the two models is based on historical simulation (HS). Historical simulations of eight-hourly movements in the value of the member's portfolio, including full revaluation of all option positions, are generated from a rolling time series of historical eight-hourly risk factor returns, encompassing both the option and futures underlyings and the options implied volatility surfaces.

This model produces an initial margin estimate by selecting from the distribution of the simulated valuation movements a quantile at a configurable confidence level α , for example setting $\alpha = 0.01$ to estimate possible losses at 99% confidence, i.e. at the first percentile of the distribution of possible valuation changes.

Explicitly,

$$VaR_{\alpha} = F^{-1}(r_{sim}, \alpha),$$

where F is the empirical cdf given by r_{sim} , the set of historical scenario returns.

If the quantile is between two scenarios the lower (or higher) scenario value is taken for a long (or short) position.

The second of these models is a “filtered historical simulation” (FHS): historical simulations are generated as above from historical risk factor returns but these historic returns are scaled up or down in line with recent market volatility. As a result, the filtered historical simulation is more reactive to changes in market conditions than the first, unfiltered, historical simulation.

AsiaNext combines the results from the two models by creating a weighted average initial margin as follows:

$$IM_{Hybrid} = \omega_{FHS} \times IM_{FHS} + \omega_{HS} \times IM_{HS},$$

where IM_{Hybrid} is the weighted average margin, IM_{FHS} is the FHS margin, IM_{HS} is the HS margin, and ω_{FHS} and ω_{HS} are the two weights.

This dual-model approach captures the advantages of both techniques: it reduces the procyclical effect of using a filtered historical simulation model alone, while mitigating the slow reaction-time that might result from using an unfiltered historical simulation model alone.

b. Margin floors

For a portfolio of long and short exposures in the same asset class (for example a calendar spread in BTC or ETH or a long position in an option straddle), modelled initial margin may be unreasonably small.

In order to defend AsiaNext and its members against model error on such portfolios, the initial margin charged to the member is subject to a floor based on the higher of the gross long or gross short in any underlying. For long and short exposures of different asset classes, a portfolio IM is computed subject to the sum of the margin floors applied to each asset class.

For sold option positions that are too far out-of-the-money to generate material modelled initial margin, a margin floor is computed based on an option delta of 25%.

c. Margin add-ons

Additionally, AsiaNext imposes margin add-ons in the form of a credit add-on, a liquidity add-on and a concentration add-on.

The credit add-on is a margin supplement charged to members of lower credit quality. This supplement protects the exchange and its default fund from variation margin call failures, while allowing it to accept membership from a wide range of applicants.

The liquidity add-on is an estimate of the close-out cost of a large portfolio, based on the size of the member’s positions in relation to the average traded volume in the contracts concerned.

The concentration add-on is an estimate of the close-out cost of a portfolio which represents a significant proportion of total open interest in the contracts concerned. While AsiaNext is in start-up mode, with limited open interest, this add-on is set to zero.

5. Minimum Deposit

The Minimum Deposit is the level of excess funding required to support a member’s positions in the event that the member is unable to address hourly margin calls, especially during weekends and public holidays when traditional USD payment systems are unavailable.

The key factor in calculating the Minimum Deposit is the length of time a member is expected to take to arrange for cleared funds to be visible in AsiaNext’s USD cash account following a margin call.

For members who can only transfer funds once a day over traditional payment systems during business hours, this period would normally be at least 1 day during business days and would rise to 3 days during weekends. On the other hand, for members with a back office that operates outgoing payments on a 24/7 basis, with 24/7 electronic connectivity to AsiaNext’s bank accounts (currently at Standard Chartered in Singapore and at Bank Frick in Lichstenstein), this period could be as shortened.

Minimum deposit is thus computed individually for each member by scaling up the modelled initial margin from its standard margin period of risk to a period that reflects the member’s ability to meet AsiaNext’s margin calls promptly. If members’ back office capabilities alter, their minimum deposit calculation parameters would alter as well.

Cash and Margin Balances			Opening Balances			Call Account Movements			Closing Balances	
Account	Date/Time (UTC time)	Description	Call Account USD	Initial Margin USD	Deposit+/Withdrawal USD	Initial Margin Incr +/-Decr USD	Mark-to-Market Profit+ /Losses USD	Call Account USD	Initial Margin USD	
220ABC001	13 Sep 2023		4,990,950.00	0.00				4,990,950.00	0.00	
	01:00:00	Settlement Run	0.00	0.00	0.00	(8,602.07)	0.00	(8,602.07)	8,602.07	
		Total	4,990,950.00	0.00	0.00	(8,602.07)	0.00	4,982,347.93	8,602.07	

Members are required to hold a minimum balance at least equal to the Minimum Deposit in the Call Account. For the purpose of illustration, the minimum deposit is determined to be USD 5mm. If the current call account balance is less than this figure, USD 4.9823mm (as highlighted in above statement screencap), the member will receive a Min Deposit Notice for the shortfall (~USD 0.0177mm). This notice will be sent out at every hourly settlement run until the shortfall is topped up by the member.

Members who fail to maintain the minimum deposit in their account are in breach of the AsiaNext Derivatives Trading Rules, which govern the operation of the exchange. In addition, they run the risk of margin call failures resulting from delays in funds transfers. Consequently, they run the risk of forced liquidation of their portfolios.

6. Default Fund

In the event of the default of an AsiaNext member, the trading positions of other, non-defaulting members could be at risk. As outlined above, AsiaNext attempts to mitigate this risk by taking initial and variation margin and by taking prompt action to resolve any member default without delay.

In addition, in case these actions are not fully-effective, AsiaNext has a default fund to permit the exchange to continue operations after a member default. As outlined in the AsiaNext Derivatives Trading Rules, members are required to contribute to the default fund in proportion to the level of initial margin that they post.

While AsiaNext is in its start-up phase, the default fund contains a dedicated capital contribution from AsiaNext itself, representing its commitment to the safe operation of the exchange, and an initial contribution of \$100,000 from each member. Non-defaulting members’ contributions rank below AsiaNext’s dedicated capital contribution (amounting to member’s initial contribution) and below the contribution of a defaulting member in the event of a call on the resources of the fund.

The sufficiency of the default fund is tested on a daily basis against historic worst-case market movements, on the assumption that these market movements are accompanied by the simultaneous default of the two members to whom the exchange has the largest exposures. As AsiaNext’s volumes grow to the point that the initial default fund contributions are insufficient to cover this stress loss, members will be called for additional contributions to maintain the fund’s sufficiency.

Non-defaulting member contributions to the default fund will only be used after AsiaNext’s dedicated capital contribution (amounting to member’s initial contribution) has been exhausted and after all available financial resources from the defaulting member have been applied to mitigate their obligations.

7. Reference Rate Crypto Indices

AsiaNext has partnered with SIX to develop the SIX Reference Rate Crypto Indices. The reference rates represent the aggregated, executed trade flow of BTC and ETH on major spot exchanges. SIX Reference Rate Crypto Indices are calculated and disseminated on a hourly basis during a 24-hour a

day, 7 days a week schedule. Cryptocurrency futures on AsiaNext are cash-settled to the 16:00 p.m. UTC time reference rates. For details of the methodology, refer to the ‘[SIX Crypto Indices – Methodology Rulebook Governing SIX Real-Time Crypto Indices and SIX Reference Rate Crypto Indices](#)’ document. The most relevant sections for a general understanding of the index methodology are:

- Section 5.2 : Eligibility Criteria for Exchanges
- Section 5.3 : Eligibility Criteria for Crypto Currencies
- Section 6.4 : Calculation formula for the Real-Time Indices
- Section 7.4 : Calculation formula for the Reference Rates Indices

Additional relevant sections include:

- Sections 6.2, 6.3: Data Collection and Cleansing for the Real-Time Indices
- Sections 7.2, 7.3: Data Collection and Cleansing for the Reference Rates Indices
- Sections 8.1, 8.2, 8.3: Correction Policy

8. Disclaimer

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