

# Setheum Margin Trading Protocol White Paper

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**Muhammad-Jibril B.A.**

mba@setheum.xyz

Setheum Labs

Slixon Technologies Limited

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## i. ABSTRACT:

In this paper, I will elaborate the economic model of the Setheum Margin Trading Protocol - SettIndex on the Setheum Network. After going through this paper, the reader will understand the economic model and technicalities behind the SettIndex Margin Trading Protocol, from the Liquidity Pool to the Margin Providers and the Hedge Net Positions.

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## 1. Introduction

Setheum Margin Trading protocol enable traders to ***margin buy*** and ***short sell*** any trading pair supported by the liquidity providers, including forex pairs such as EUR-USD and USD-JPY, other popular assets like XAU-USD, TSLA and AAPL, as well as crypto-assets such as BTC-USD, at their chosen leverages up to 50 times of their own deposits.

## 2. Liquidity Pools

A liquidity provider can run his/her own liquidity pools after depositing tokens to be used as collateral to open margin positions, and set up their trading parameters such as spread, lot size and leverage ratio that they support, as well as which trading pairs they would like to trade against with the traders.

SetIndex protocol supports coexistence of multiple liquidity pools, and traders are free to choose which liquidity pool to trade against with.

To trade in a liquidity pool, a trader needs to deposit his/her tokens into the pool first. Traders can choose to top up their account anytime, and any free margin, i.e. the amount of tokens that are not held as collateral for any open positions, may be withdrawn anytime by the trader.

Once tokens are deposited into the pool by the liquidity provider and all participating traders, they will be kept in one smart contract.

Liquidity Pools could be stable, incentivized, incentivized-stable, et al.

## 3. Model Setup

The following model is set up for margin buying and short selling trades.

- $t$  - Time
- $i$  - Trades numbered in  $i = 1, 2, 3 \dots$
- $j$  - Traders numbered in  $j = 1, 2, 3 \dots$
- $m$  - Midpoint of Market Exchange Rate in the form of Trade Pair 1 (TP1) against Trade Pair 2 (TP2), e.g. when market rate of EURUSD equals to  $m$ , one EUR is worth  $m$  unit of USD.

$-m_0^i$  - Midpoint of Market Exchange Rate of trade  $i$  at its opening position

$-m_t$  - Midpoint of Market Exchange Rate at time  $t$

- $\theta$  - Market Fluctuation

$$m_t = m_0^i (1 + \theta_t^i) \text{ for any particular open position}$$

- $b$  and  $a$  - **Bid** or **Ask** spread between the bid price  $m_t - b_t$  or ask price  $m_t + a_t$  to the market midpoint  $m_t$  set by the liquidity provider of a pool, which are chosen by the liquidity provider and can be changed anytime. Historical spread information of all liquidity pools are provided for traders' references.
- $w$  - Equity of a trader in a particular liquidity pool in a unit of tokens. Equity of a trader is equal to sum of all his/her deposits, realized profit and loss in all his/her closed trades, unrealized profit and loss in all his/her opening trades, and accumulated swap income/cost, deducted by all his/her withdrawals and any fees incurred.

–  $w_t^j$  - Initial deposit made by trader  $i$

–  $w_t^j$  - Equity of trader  $i$  at time  $t$

- $z$  - *Leverage Ratio*,  $z \leq 50$
- $z$  - *Leverage Ratio*,  $z \leq 50$
- $v$  - Amount of one side of the trader pair in a leveraged position. A positive value of  $v$  indicates a long position in that side, which is an asset of the trader; while a negative value of  $v$  indicates a short position in that side, which is a liability of the trader;

–  $v_t^{i,tp1}$  - Initial Amount of Trade Pair 1 when a leveraged position is opened

–  $v_0^{i,tp2}$  - Initial Amount of Trade Pair 2 when a leveraged position is opened

–  $v_t^{i,tp2}$  - Amount of Trade Pair 2 that the position would worth if position is closed immediately at time  $t$

For instance, if a trader opens a long position of EURUSD of standard buy lot of EUR 100,000 at market rate  $m_0 = 1.1858$  with spread of  $b_0 = a_0 = 0.0050$  each side (i.e. bid/ask prices are 1.1808/1.1908), we have

$$v_t^{i,tp1} = 100,000$$

$$v_0^{i,tp2} = -100,000 \times 1.1908 = -119,080$$

Suppose market price goes up one hour later that the current bid/ask prices are now 1.2008/1.2108, we have

$$v_t^{i,tp2} = 100,000 \times 1.2008 = 120,080$$

that the trader has made an Unrealized Profit of USD1,000.

- $g$  - Margin required to open a leveraged position, i.e. the Margin Held.

$$g = \frac{\text{USD value of } |v_0^{i,tp1}| \text{ at time 0}}{z}$$

For instance, in above example, the margin required to open such position at 10x leverage would be

$$g^i = \frac{|v_0^{i,tp2}|}{z^i} = \frac{119,080}{10} = 11,908$$

- $s$  - Swap/Interests Cost of one single leveraged unit, of one side of a Trade Pair, in a defined time unit, set by the Liquidity Provider. For instance, suppose  $s^{\text{EUR}} = -9.3 \times 10^{-5}$  applied for every EUR, and  $s^{\text{USD}} = 3.7 \times 10^{-5}$  applied for every USD in an open long EURUSD position after each night since opening of the position, that equity of the trader will be deducted by USD5.6 for a long EUR100,000 leverage position one night after opening of the position.
- $\alpha$  - Margin Level of a trader, as quotient of his/her Equity and current value of all his/her total leveraged positions in USD.

$$\alpha^j = \frac{30,000}{\sum(|v_t^{i,tp1,j}| \text{ valued in USD at time } t)}$$

For instance, suppose a trader have a long open position of EURUSD of EUR100,000 and a short open position of EURUSD of EUR200,000, and the current **bid/ask** prices are 1.2008/1.2108, and his/her Equity is USD30,000 that his/her margin level,

$$\alpha^j = \frac{w^j}{100,000 \times 1.2008 + 200,000 \times 1.2108} = 8.28\%$$

- $\beta$  - Margin Call threshold for a trader, set separately for each leverage ratio in each liquidity pool. Once a trader's margin level reaches the Margin Call threshold, he/she will be notified to top up his/her account to increase his/her margin level.

If a trader has open positions in different leverage ratios, a weighted margin call threshold applies.

For instance, suppose margin positions of a trader are opened at  $20x$  leverage, and his/her margin level goes down to  $3\%$  as the market goes against his/her favor, he/she will be notified to top up his/her account.

- $\gamma$  - Stop Out threshold for a trader, set separately for each leverage ratio in each liquidity pool. Once a trader's margin level reaches the Stop Out threshold, all his/her open positions can be liquidated immediately by any party, including a liquidator, or the liquidity provider.

If a trader has open positions leveraged in different ratios, a weighted margin call threshold applies. All risk positions will be closed automatically after the Stop Out threshold is reached.

For instance, suppose margin positions of a trader are opened at  $20x$  leverage, and his/her margin level goes down to  $1\%$  as market goes against his/her favor, all his/her open positions will be closed by either the liquidity provider or any liquidator, if he/she does not close them him/herself, or top up his/her account.

## 4. Open Position

Suppose a trader is interested in opening a margin position of leveraged amount of  $v$  unit of Trade Pair 1, at leverage ratio  $z$ , he/she needs to have equity no less than  $g$ , the margin required to open such position,

$$g = \frac{\text{USD value of } |v_0^{i,tp1}| \text{ at time } 0}{z}$$

When the position is opened,  $g$  USD stablecoins is locked as margin held

### 4.1 Margin Buying

Suppose the trader opens a EURUSD margin buying position in trade  $i$ , that he/she longs EUR  $v_0^{i,tp1}$  at leverage ratio  $z$  when market price is  $m_0^1$ , and shorts USD of

$$v_0^{i,tp1} = - (m_0^1 + a_0^1) v_0^{i,tp1} \text{ by locking margin of } g^i = \frac{|v_0^{i,tp2}|}{z} = \frac{|(m_0^1 + a_0^1) v_0^{i,tp1}|}{z}$$

For instance, if a trader opens a 20x long position of EURUSD of standard buy lot of EUR 100,000 at market rate  $m_0 = 1.1858$  with spread of  $b_0 = a_0 = 0.0050$  each side (i.e. bid/ask prices are 1.1808/1.1908), we have

$$\begin{aligned} v_0^{i,tp1} &= 100,000 \\ v_0^{i,tp1} &= -100,000 \times 1.1908 = -119,080 \\ g^i &= \frac{119,080}{20} = 5,954 \end{aligned}$$

Suppose the trader opens a EURUSD margin selling position in trade  $i$ , that he/she shorts EUR  $v_0^{i,tp1}$  at leverage ratio  $z$  when market price is  $m_0^1$ , and longs USD of

$$v_0^{i,tp1} = - (m_0^1 + b_0^1) v_0^{i,tp1} \text{ by locking margin of } g^i = \frac{|v_0^{i,tp2}|}{z} = \frac{|(m_0^1 + b_0^1) v_0^{i,tp1}|}{z}$$

For instance, if a trader opens a 20x short position of EURUSD of standard sell lot of EUR 100,000 at market rate  $m_0 = 1.1858$  with spread of  $b_0 = a_0 = 0.0050$  each side (i.e. bid/ask prices are 1.1808/1.1908), we have

$$\begin{aligned} v_0^{i,tp1} &= -100,000 \\ v_0^{i,tp2} &= -(-100,000 \times 1.1808) = 118,080 \\ g^i &= \frac{118,080}{20} = 5,904 \end{aligned}$$

## 5. Unrealized Profit & Loss of an Open Position

### 5.1 Margin Buying Position

For a trader  $j$  that opened a margin buying open position with  $z$  leverage ratio at ask price  $m_0^1 + a_0^1$

$$\{ v_0^{i,tp1} \mid v_0^{i,tp2} \} = \{ v_0^{i,tp1} \mid - ( m_0^1 + a_0^1 ) v_0^{i,tp1} \}$$

as his/her first and only trade after an initial deposit of  $w_0^j$ , when midpoint of market price reaches  $m_t$  after one hour, his/her unrealized profit and loss of the trade  $i$

$$\pi_t^i = v_0^{i,tp1} [ (m_t^i - b_t^i) - ( m_{t0}^i - a_0^i ) ]$$

that his/her current equity

$$w_t^j = w_0^j + \pi_t^i$$

For instance, suppose a trader deposits 30,000 USD Stablecoins, opens a  $20x$  long position of *EURUSD* of standard buy lot of EUR100,000 at **bid/ask** prices 1.1808/1.1908, and the market goes up to 1.2008/1.2108 after one hour, he/she has made unrealized profit of

$$\pi_t^i = 100,000 \times (1.2008 - 1.1908) = 1,000$$

and his/her current equity

$$w_t^j = 30,000 + 1,000 = 31,000$$

### 5.2 Short Selling Position

For a trader  $j_t$  hat opened a margin selling open position with  $z$  leverage ratio at bid price  $m_t^i - b_0^i$

$$\{ v_0^{i,tp1} \mid v_0^{i,tp2} \} = \{ v_0^{i,tp1} \mid - ( m_0^i + a_0^i ) v_0^{i,tp1} \}$$

as his/her first and only trade after an initial deposit of  $w_0^j$ , when midpoint of market price reaches  $m_t$  after one hour, his/her unrealized profit and loss of the trade  $i$

$$\pi_t^i = v_0^{i,tp1} [ ( m_t^i + a_t^i ) - ( m_0^i - b_0^i ) ]$$

that his/her current equity

$$w_t^j = w_0^j + \pi_t^i$$

For instance, suppose a trader deposits 30,000 USD Stablecoins, opens a 20x long position of EURUSD of standard buy lot of EUR100,000 at **bid/ask** prices 1.1808/1.1908, and the market goes down to 1.1608/1.1708 after one hour, he/she has made unrealized profit of

$$\pi_t^i = - 100,000 \times ( 1.1708 - 1.1808 ) = 1,000$$

and his/her current equity

$$w_t^j = 30,000 + 1,000 = 31,000$$

## 6. Open Position

The protocol caps the loss of the trader by setting a threshold on its trader's margin level, that an open position will be closed to stop loss if its trader's margin level goes down and reaches the preset Stop Out threshold. While profit of the trader is not capped, unless the liquidity provider runs too low in its equity that all open positions will be closed due to risk management, as shown in Section 9.

### 6.1 Safe Open Positions

An open position is considered **safe** if the margin level of its trader is above the preset Margin Call threshold. Margin Call thresholds are set separately for each leverage ratio in each liquidity pool. If a trader has open positions in different leverage ratios, a weighted margin call threshold applies.

For instance, suppose margin positions of a trader are opened at 20x leverage, and margin call threshold has been set up as 3% for this leverage ratio as the liquidity pool that his/her positions are opened, all his open positions are considered safe as long as his/her margin level is above 3%.



A trader may close a safe open position anytime  $t$  to have his/her current unrealized profit and loss realized, and unlock his/her locked margin  $g^i$ , that these tokens become free margin that he could use to open a new trade, as part of the equity to support loss of another open trade, or withdraw.

## 6.2 Unsafe Open Positions

Once a trader's margin level reaches the Margin Call threshold, all his/her open positions are considered unsafe, and he will be notified to top up his/her account to increase his/her margin level.

The trader may choose to either make more deposit, or close the open position to stop his/her loss.

Before his/her margin level goes back above the margin call threshold, the trader is no longer allowed to open any new position.

For instance, suppose margin positions of a trader are opened at  $20x$  leverage, and margin call threshold has been set up as  $3\%$  for this leverage ratio as the liquidity pool that his positions are opened, all his/her open positions are considered unsafe once his/her margin level goes down to  $3\%$ .

## 6.3 Liquidation of a Stop Out Position

An open position is to be completely liquidated, when the margin level of its trader keeps going down and reaches the Stop Out threshold  $\gamma \%$ .

For instance, suppose margin positions of a trader are opened at  $20x$  leverage, and the Stop Out threshold has been set up as  $1\%$  for this leverage ratio as the liquidity pool that his/her positions are opened, all his/her open positions are forced to be closed once his/her margin level goes down and reaches  $1\%$ .

## 7. Financing Rate of an Open Position

During opening and holding a margin position, regardless of its type (e.g. Forex, Index Tracker Stock CFDs, Single Stock CFDs, Cryptocurrency), traders finance the leveraged trading value with a credit/debit charge in every preset **time unit**. The length of the time unit (measured in seconds) and its **cutoff time points** depend on the type of the margin product.

For instance, in Forex and CFD margin positions, each time unit is  $24 \times 3,600 = 86,400$  seconds long with cutoff time at 5pm New York time of every calendar day; in Cryptocurrency margin positions, each time unit is  $8 \times 3,600 = 28,800$  seconds long with **cutoff time** at 04:00 UTC, 12:00 UTC and 20:00 UTC of every calendar day.

When a trader holds a margin position over a **cutoff time** point, his/her position will consequently be subject to financing credit or debit, i.e. he/she will only pay or receive funding for the previous time unit if he/she holds a position at one of the **cutoff time points**. If he/she closed his/her position prior to the **cutoff time**, then he/she will not pay or receive funding for the time unit immediately before the **cutoff time**. If a trader opens and closes a margin position within a single time unit and between two **cutoff time points**, he/she is not subject to any financing credit or debit.

For instance, if a trader opened a long *100,000 EURUSD* at **11AM** NewYork time and closed it at **3PM** on the same day, he/she is not paying or receiving any **financing credit or debit** for this trade. **Financing rate** of each margin product is calculated based on the daily market interest rates provided by the Protocol through **Oracle feed, plus/minus a mark-up** preset by the liquidity providers, restricted to  $\pm 10\%$ .

**Financing rates** may be **positive** or **negative**, that a trader receives a **financing income** when the rate is **positive** and pays a **financing cost** when the rate is **negative**. At each **cutoff time points**, all open position holders are subject to receive or pay a **financing income or cost** on the **leveraged amount (notional value)** of the **margin position**, calculated by

$$\text{Financing Income / Cost} = \text{Value of a Margin Position} \times \text{Financing Rate}$$

**Financing Income/Cost** is **credited/debited** to/from traders of all **open positions** immediately after each **cutoff time point**.

For instance, if the market rate for *EURUSD* long position is  $-0.00009$ , the highest financing rate a liquidity provider could set would be  $-0.00009 \times (1 + 10\%) = -0.000099$  that a trader holding a *100,000 EURUSD* open position through a **cutoff time point** would pay a financing cost of  $100,000 \times (-0.000099) = 9.9$  USD stablecoins at that **cutoff time point**.

## 8. Risk Management of Liquidity Providers

Liquidity providers may choose to hedge their risks against traders by opening and closing margin positions off chain. Some of the risk management strategies are listed here as a reference.

### 8.1 Hedge All Trades Instantaneously

As a new margin position is opened by a trader, a liquidity provider may immediately open an open position off chain with the same leveraged value. When an open position is closed on-chain, a liquidity provider may also immediately close the associated opening position off-chain. This strategy provides lowest risk exposure for liquidity providers, with the lowest asset efficiency and guaranteed profit through margin spread and financing rate mark-up (conversion cost of USD stablecoin from fiat currency is not included).

### 8.2 Hedge Net Position Instantaneously

When a new *margin position* is opened by a *trader* or an *opening position* is closed *on-chain*, the *net position* of the total *open trades* in the *trading pair* changes, that a *liquidity provider* may open a new *opening position or close* an *opening position off-chain* immediately to match the change in *net position*.

For instance, when the *net position* of total *EURUSD* of a *liquidity pool* is short 500,000, if a *trader* opens a new *long 100,000 EURUSD* position, the *net position* changes to *short 400,000*, that the *liquidity provider* may close one *short 100,000* position *off-chain* to immediately match the new *net position*. This strategy *provides low risk exposure for liquidity providers*, with high asset efficiency and guaranteed profit through margin spread and financing rate mark-up (conversion cost of USD stablecoin from fiat currency is not included).

### 8.3 Hedge Net Position with Deferral

When a new *margin position* is opened by a *trader* or an *opening position* is closed *on-chain*, *net position* of the total *open trades* in the trading *pair changes*, that a *liquidity provider* may open a *new opening position* or close an

opening position off chain to match the change in *net position*, in a deferred time with speculation according to their own *risk management strategy*.

For instance, when the *net position* of total *EURUSD* of a *liquidity pool* is *short 500,000*, if a trader opens a new *long 100,000 EURUSD position*, the *net position* changes to short 400,000, that the *liquidity provider* may close one *short 100,000 position off-chain* five hours later to match the new *net position*, if they speculate that *EURUSD* rate may go down within this five hours.

This strategy provides *medium risk exposure for liquidity providers*, with *high asset efficiency*, while profit is not guaranteed, as uncovered profit and loss from differences in *opening rates* in *on-chain trades* and *off-chain hedges* may exceed income from *margin spread* and *financing rate mark-up* (conversion cost of USDstablecoin from fiat currency is not included).

## 9. Risk Management on Liquidity Pools

The Risk Management policy of Setheum lays a computed minimum requirement on equity of all liquidity pools at all time, in order to protect interests of all traders with opening positions.

### 9.1 Equity to Position Ratios

- **Equity to Net Position Ratio (ENP)** *ENP* is *quotient of current equity* (in units of USD stablecoins) of a *liquidity pool*, to the *absolute value* of USD valuation of the *Net Position* of all *opening positions* in the pool.

For instance, if the *current equity* of a pool with only *EURUSD opening positions* is *USD 1,000,000* and the *Net Position* of all *opening positions* is long *EUR 200,000*, that is valued at - *USD 250,000* at bid price *1.2500*, then the current *ENP* is *400%*.

- **Equity to Longest Leg Ratio (ELL)** *ELL* is quotient of current equity(in units of USD stablecoins) of a liquidity pool, to the absolute value of USD valuation of the total position of the longest legs in the pool.

For instance, if the current equity of a pool with only EURUSD positions is USD 1,000,000 and the Net Position of all opening position is long EUR200,000, while the total long position is 800,000 and total short position is 600,000 that the longest leg is long EUR 800,000 that is valued at - USD1,000,000 at bid price 1.2500, then the current ENP is 100%.

## 9.2 Margin Call

A liquidity provider running a liquidity pool will be margin called to top up its account with more deposit, if

- ENP goes down to 50% and remains under 50%, or
- ELL goes down 10% and remains under 10%.

Margin call status of a liquidity pool is a public information to all traders. Until enough funds are deposited to reach the ENP and ELL ratios of normal status, no new trade is allowed to be opened in this pool, and profit from spread at closing of any opening positions will go to the Setheum Treasury, instead of the liquidity provider. Margin call history of all liquidity pools are visible to all traders, which encourages liquidity providers to keep their on chain equity high enough.

## 9.3 Force Closure of All Deals

All opening positions will be forced to be closed, if

- ENP goes down to 20% , or
- ELL goes down to 2%.

All open trades will be closed at ordinary **Bid/Ask** price immediately. Profit from spread at closing of any opening positions will go to the Setheum Treasury instead of the liquidity provider, and an equal amount of profit from spread will be deducted from equity of the liquidity provider and transferred to the Setheum Treasury as penalty. Force Closure history of all liquidity pools are visible to all traders, which encourages liquidity providers to keep their on-chain equity high enough.

# 10. Terminal Information

Setheum provides various useful trading information to both traders and liquidity providers through an easy-to-use user interface.

## 10.1 Traders

Traders have easy access to all their trading history and current finance status, including but not limited to

- Real-time Equity
- Margin level, margin held, free margin
- Unrealized profit and loss of all opening positions
- Full trading history of closed positions

Traders also have easy access to summarised historical trading information of all liquidity pools, including but not limited to

- Historical Bid/Ask spreads
- Historical financing rate mark-ups
- Real-time ENP (Equity to Net Position) ratio
- Real-time ELL (Equity to Longest Leg) ratio
- Margin call or Force Closure History

## 10.2 Liquidity Providers

On top of standard information of all opening and closed positions traded, extra information and customized trading management interface are available as value added services, including but not limited to

- Total Trading Volume of each opening positions
- Net position of each opening trade pairs
- Weighted *Bid/Ask* prices of all open positions
- Uncovered profit and loss
- Hedge management - an added interface allowing liquidity providers to input their hedging volumes that are displayed against the real-time net position.

## 11. Tokenized Margin Positions

Besides individual margin positions, we aim to provide tokenized margin positions in the next stage, where fungible tokens will be minted at the opening position. Such tokens can be traded in external exchanges more conveniently, while the opening position associated with each token can also be closed within SettInDEX (Setheum's Built-in DEX) by the token holder.

## 12. Conclusion

Setheum allows traders to take a leveraged long or short EUR/CNY position against SETT. Can be used as a hedge against future price fluctuation e.g. an importer, who might need to pay CNY to the supplier in 2- months time, can use a 10x leverage with 10% margin hedging for the full risk expecting price fluctuating within 10%". Derivatives were originally developed to minimize the risk for parties involved in a trade. The same risk management tools will now be offered in Setheum.