Laminar Margin Trading Working Paper

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1 Introduction

Laminar Margin Trading protocol enable traders to **margin buy** and **short sell** any trading pair supported by the liquidity providers, including forex pairs such as EURUSD and USDJPY, other popular assets like XAUUSD and APPL,as well as cryptoassets such as BTCUSD, at their chosen leverages up to 50 times of their own deposits.

2 Liquidity Pool

A liquidity provider can run his/her own liquidity pools after depositing USD stablecoins 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.

Laminar protocol support co-existence 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 USD stablecoins into the pool first. Traders can choose to top up his account anytime, and any free margin , i.e. the amount of USD stablecoins that are not held as collateral for any open positions, may be withdrawn anytime by the trader.

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

3 Model Setup

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

- t - Time

- i - Trades numbered in $i = 1, 2, 3...$

- j - Traders numbered in $j = 1, 2, 3...$

- m - Midpoint of Market Exchange Rate in the form of Trade Pair 1 (TP1) against Trader Pair 2 (TP2), e.g. when market rate of EUDUSD 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

- θ - Market Fluctuation
  $m_t = m_0^i(1 + \theta_t^i)$ 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.

- l - Liquidation Fee, a fixed fee prepaid in equal amount of USD stablecoins by the trader and the liquidity provider at opening of a position, which will be fully refunded to both parties if the position is closed normally, or rewarded to the arbitrager if the position is liquidated. Liquidation fee is utilized in our Ethereum protocol as an incentive for arbitrager to monitor and close the positions at risk, as well as an incentive for traders and liquidity providers to close the positions to prevent losing these fees. Liquidation fee will not be utilized in Laminar chain, our own independent blockchain, where we do not require help from any external party to to close any risk position.

- w - Equity of a trader in a particular liquidity pool in unit of USD stablecoins. Equity of a trader is equal to sum of all his deposits, realized profit and loss in all his closed trades, unrealized profit and loss in all his opening trades, and accumulated swap income/cost, deducted by all his withdrawals and any fees occurred.

    - w_0^j - Initial deposit made by trader i
    - w_t^j - Equity of trader i at time t

- z - Leverage Ratio, $z \leq 50$

- v - Amount of one side of the trader pair in an 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 an liability of the trader;

  - $v_0^{i,tp1}$ - 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

  $$v_0^{i,tp1} = 100,000$$

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

  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.

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

  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 $s^{EUR} = -9.3 \times 10^{-5}$ applied for every EUR, and $s^{USD} = 3.7 \times 10^{-5}$ 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.

- α - Margin Level of a trader, as quotient of his Equity and current value of all his total leveraged positions in USD.

$$\alpha^j = \frac{w^j}{\sum(\, |v_0^{i,tp1,j}| \, valued \, in \, USD \, at \, time \, t)}$$

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 Equity is USD 30,000 that his margin level

$$\alpha^j = \frac{30,000}{100,000 \times 1.2008 + 200,000 \times 1.2108} = 8.28\%$$

- β - 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 will be notified to top up his account to increase his margin level. If a trader have open positions in different leverage ratios, a weighted margin call threshold apply.

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

- γ - 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 open positions can be liquidated immediately by any party, including a liquidator, or the liquidity provider. If a trader have open positions leveraged in different ratios, a weighted margin call threshold apply.

  Liquidation fee is utilized in our Ethereum protocol as an incentive for arbitrager to monitor and close these risky positions as the liquidator will be rewarded the liquidation fees by triggering the liquidation process. Traders and liquidity providers are also motivated to close the risky positions to prevent losing these fees. Liquidation fee will not be utilized in Laminar chain, our own independent blockchain, where 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 margin level goes down to 1% as market goes against his favor, all his open positions will be closed by either the liquidity provider or any liquidator, if he does not close them himself, or top up his account.

4 Opening 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,

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

When the position is opened, g USD stablecoins is locked as margin held (and a extra of $2l$ USD stablecoins are also locked as liquidation fees in our Ethereum protocols, of each l contributed by the trader and the liquidity provider).

4.1 Margin Buying

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

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

by locking margin of

$$g^i = \frac{|v_0^{i,tp2}|}{z} = \frac{|(m_0^i + a_0^i)v_0^{i,tp1}|}{z}$$

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

$$v_0^{i,tp1} = 100,000$$

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

$$g^i = \frac{119,080}{20} = 5,954$$

4.2 Short Selling

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

$$v_0^{i,tp2} = -(m_0^i - b_0^i)v_0^{i,tp1}$$

by locking margin of

$$g^i = \frac{|v_0^{i,tp2}|}{z} = \frac{|(m_0^i - b_0^i)v_0^{i,tp1}|}{z}$$

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

$$v_0^{i,tp1} = -100,000$$

$$v_0^{i,tp2} = -(-100,000) \times 1.1808 = 118,080$$

$$g^i = \frac{118,080}{20} = 5,904$$

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 $m_0^i + a_0^i$

$$\left\{ \quad v_0^{i,tp1} \quad | \quad v_0^{i,tp2} \quad \right\} = \left\{ \quad v_0^{i,tp1} \quad | \quad -(m_0^i + a_0^i)v_0^{i,tp1} \quad \right\}$$

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

$$\pi_t^i = v_0^{i,tp1}[(m_t^i - b_t^i) - (m_0^i + a_0^i)]$$

that his 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 EUR 100,000 at bid/ask prices 1.1808/1.1908, and the market goes up to 1.2008/1.2108 after one hour, he has made unrealized profit of

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

and his current equity

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

5.2 Short Selling Position

For a trader j that opened a margin selling open position with z leverage ratio at bid price $m_0^i - b_0^i$

$$\left\{ \quad v_0^{i,tp1} \quad | \quad v_0^{i,tp2} \quad \right\} = \left\{ \quad v_0^{i,tp1} \quad | \quad -(m_0^i + a_0^i)v_0^{i,tp1} \quad \right\}$$

as his first and only trade after an initial deposit of w_0^j, when midpoint of market price reaches m_t after one hour, his 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 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 EUR 100,000 at bid/ask prices 1.1808/1.1908, and the market goes down to 1.1608/1.1708 after one hour, he has made unrealized profit of

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

and his current equity

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

6 Close 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 lower 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 margin level of its trader is above the preset Margin Call threshold. Margin Call threshold are set separately for each

leverage ratio in each liquidity pool. If a trader have open positions in different leverage ratios, a weighted margin call threshold apply.

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 open positions are considered safe as long as his margin level is above 3%.

A trader may close a safe open position anytime t to have his current unrealized profit and loss realized, and unlock his locked margin g^i (and have the prepaid liquidation fee l refunded in our Ethereum protocol), 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 open position are considered **unsafe**, and he will be notified to top up his account to increase his margin level. The trader may choose to either make more deposit, or close the open position to stop his loss. Before his 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 open positions are considered unsafe once his margin level goes down and reaches 3%.

6.3   Liquidation of a Stop Out Position

An open position is to be completely liquidated, when margin level of its trader keeps going down and reaches the Stop Out threshold $\gamma\%$. In our Ethereum protocol, both the trader and the liquidity provider have incentives to close such open positions to get their liquidation fee back. Besides, everyone else can also trigger the liquidation process if the trader and the Liquidity Provider have not done so to earn the liquidation fees as rewards.

For instance, suppose margin positions of a trader are opened at 20x leverage, and stop out threshold has been set up as 1% for this leverage ratio as the liquidity pool that his positions are opened, all his open positions are forced to be closed once his 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, Crypotocurrency), 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 Crypotocurrency 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 position will consequently be subject to the a financing credit or debit, i.e. he will only pay or receive funding for the previous time unit if he holds a position at one of cutoff time points. If he closed his position prior to the cutoff time, then he 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 is not subject to any financing credit or debit. For instance, if a trader opened a long 100,000 EURUSD at 11am New York time and closed it at 3pm on the same day, he 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 markup preset by the liquidity providers, restricted to $+/-10\%$. 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

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

Financing Income/Cost is credited/debited to traders of all opening positions immediately after each cutoff time points. 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 open an opening position off chain with same leveraged value immediately. When an opening position is closed on chain, a liquidity provider may also close the associated opening position off chain immediately.

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, 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 liqudity 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 liqudity 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 USD stablecoin from fiat currency is not included).

9 Risk Management on Liquidity Pools

Risk Management policy of Laminar protocol 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 unit 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 position 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 unit 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 EUR 200,000, 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 - USD 1,000,000 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 remain under 50%, or

- ELL goes down 10% and remain under 10%.

Margin call status of a liquidity pool is a public information to all traders. Until enough fund is 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 Laminar 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 and reaches 20% , or

- ELL goes down and reaches 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 Laminar 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 Laminar 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 Available Information

Laminar protocol provide various useful trading information to both traders and liquidty provider through easy-to-use user interface.

10.1 Traders

Traders have easy access to all his trading history and current finance status, including

- 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

- 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 valued added services, including and 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 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 the Laminar protocol by the token holder.