Tracer: Perpetual Swaps

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Abstract

To date no platform offers permissionless market deployment of perpetual swaps. Existing offerings require governance approval and/or developer support to deploy new markets. Herein we propose a generalised perpetual swap protocol that avoids all third party requirements. The Tracer Perpetual Swap system is a Factory compatible template that offers customised market deployment without permissions. The smart contracts contain mechanisms that allow markets to operate at significantly lower cost to participants. We have designed a riskless liquidation mechanism via a slippage reimbursement receipt, rendering the act of liquidation risk-free and the cost to liquidated traders competitively inexpensive. As a result, users can trade at higher leverage and open positions with minuscule investment sizes. The Tracer Perpetual Swap is a piece of financial infrastructure that can be accessed by anybody with an internet connection. Using this infrastructure, any graphical user interface, financial institution or individual can access global market exposure in the decentralised economy.

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Introduction

A perpetual swap contract is a derivative that enables counterparties to gain long or short exposure to an underlying asset for any amount of time. This contract closely replicates the payoffs of purchasing, or selling short, an asset in the spot market. Perpetual swaps provide broad market access, permitting exposure to global markets without excessive international brokerage fees or licensing. Most current perpetual swap offerings, or similar contract for difference (CFD) offerings, rely on third parties to function. Perpetual swaps offered by third parties are vulnerable to censorship and system downtime. Where perpetual swaps are trustless, their design is still limited by either managed insurance funds, poorly engineered liquidation functions or insecure oracle frameworks. New markets cannot easily be deployed and require third party permission. For the perpetual swap to become a widely adopted and scalable contract type, a secure and trustless alternative must be engineered.

The Tracer Perpetual Swap is a generalised smart contract design that will serve as a universal standard for engaging in perpetual swap agreements. Tracer Perpetual Swaps coordinate all market agents in a manner that is permissionless, low cost and most importantly trustless. Anyone may deploy a Tracer Perpetual Swap market from the Tracer Factory. If the contract deployer permits market-based DAO governance, governors can interact with the live market contract to optimise the contract details without market down-time. Long and short traders, as well as liquidity providers, have the option to trade through an order-book mechanism or through an Automated Market Maker (AMM).

Tracer Perpetual Swaps have a novel interaction between the liquidator and the insurance fund. The liquidation mechanism eliminates flat liquidation costs and is instead competitively inexpensive. A riskless liquidation design incentivises liquidations to occur at the smallest profitable margin. Thus, the cost of liquidation to a trader's margin is so small that it enables smaller minimum investment sizes for traders and higher leverage ratios. Where a trader's margin cannot cover the cost of liquidation, a market specific insurance fund reimburses liquidators. The market specific insurance fund has capital-efficient funding targets and an insurance funding rate that adjusts in response to the insurance fund deficit. As such, insurance funds no longer endlessly grow until parameters are adjusted by centralised intervention. The contract design can be leveraged for all markets globally.

Factory Template

Features

The Tracer Perpetual Swap is a Factory compatible template which anyone may customise and deploy from the Factory once installed. The contract mechanisms incentivise all market agents to perform their specific functions without requiring governance. Live markets can have stand-alone economies that operate indefinitely without intervention. Notably, the template has the capacity to implement 24/7 trading for assets with irregular price updates.

The template format supports the input of any feasible market pair. If a price feed exists for the **base** asset (**BTC**/USDC), a market supported by a tokenised **quote** asset (BTC/**USDC**) can be deployed. Note the quote asset is used to settle and clear the agreement. With an oracle that reports off-chain prices, a perpetual swap can be a derivative of any off-chain asset without requiring a trusted party to hold that asset as collateral.

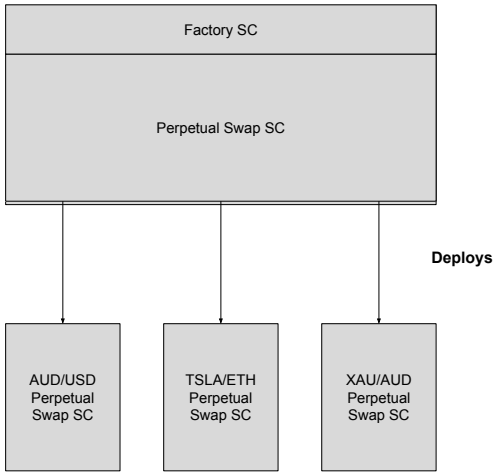

FIGURE 1: The Tracer Perpetual Swap smart contract (SC) template held within the Factory. This template can deploy limitless Perpetual Swap markets in the form of smart contracts (SC).

Applications

The Tracer Perpetual Swap is capable of supporting markets for:

- Localised commodities such as a city's fuel prices. Users can hedge against increasing fuel price (by taking a long position) for any given quantity of fuel that they intend to consume.
- Hedging exposure to deflating property markets by taking a short position on a local real-estate index.
- Gaining leveraged exposure to a piece of art, music, or other intellectual property represented by a NFT, where fractions of the NFT are traded in a liquid spot market.
- Going long on a bundled package (or an ETF) that consists of a combination of stock, commodities, ecosystem credits and other assets that are considered 'environmentally friendly'.

Trading

Going Long or Short

A perpetual swap is a financial contract between two parties which allows agents to be long or short on an underlying asset without the need to purchase it. When the contract is established both parties agree on a price. The contracts' payoffs simulate holding the underlying asset—where the profit/loss from holding is the change in size of the user's position. The size of the user's position is known as notional value and the profits/loss can be calculated as notional value multiplied by the percentage difference between the current market price and the initial market price. The change in value of a trader's account following a movement in the price of the asset they hold can be given by:

$$\text{Long-Value-change}(t) = \text{Notional Value}(t-1) \cdot \frac{\text{Price}(t)-\text{Price}(t-1)}{\text{Price}(t-1)}$$

$$\text{Short-Value-change}(t) = \text{Notional Value}(t-1) \cdot \frac{\text{Price}(t-1)-\text{Price}(t)}{\text{Price}(t-1)}$$

Counterparties enter into a long or short position in accordance with their beliefs (long if they believe the price of the asset will rise, and short if they believe it will fall). The long and short agents are speculators or hedgers. Speculators are trading in order to profit (seeking financial upside), whereas hedgers are betting that something bad will happen to their net worth (insuring against downside risk).

Traders can either interact in an entirely peer-to-peer fashion though an order-book mechanism or in a peer-to-contract fashion through an Automated Market Maker (AMM). When trading through an order-book, a trader can either take an order or make an order. Taking an order is choosing to match with an order that is already placed and publicly broadcast. Making an order is publicly broadcasting your order at a fixed quantity and price, waiting for it to be taken by another trader. Makers and takers can either be matched by on-chain contract logic or through an oracle network that aggregates and gossips their order-book before submitting an answer on-chain [1]. The alternative to trading through an order-book mechanism is by trading with an on-chain AMM. The role of AMMs in the Tracer Perpetual Swap contract are outlined in a separate section.

Once two counter-orders have been matched the agreement is considered live. An agent that wants to exit their position can sell it to another trader or to an AMM. Selling a position transfers the position to another party without cancelling the original agreement. The counterparty to the original agreement remains in a perpetual position regardless of position transfers. A trader taking a large position can also be matched with multiple counterparties who can then trade in and out of the position.

Margin and Leverage

As the conviction of their belief increases, so does an agent's appetite for risk. A trader may be so certain of their belief that they will borrow funds to increase exposure in their chosen position in order to magnify their prospective gains. Agents have to hold collateral in order to borrow funds. The collateral that is held against these borrowed funds is called margin.

A *margin account* allows agents to apply leverage to their position. Leverage is a trading mechanism which allows a trader to finance their investment through a combination of borrowed funds (debt) and margin. Leverage is the ratio of an agent's notional value to their margin [2]. A trader who trades at 1x leverage is funding the position completely via margin. A trader who trades at 2x leverage funds 50% of the position via borrowing. The Tracer Perpetual Swap implements a

maintenance margin that requires borrowers to maintain at least a certain level of margin as collateral against their borrowings. Note the Tracer Perpetual Swap system does not have an initial margin requirement higher than the maintenance margin. A contract-compatible user interface may, however, display a warning advising a margin deposit greater than the maintenance margin to prevent instant liquidation in the event of price movements.

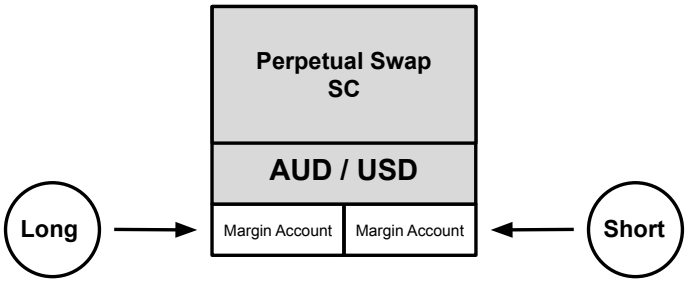

FIGURE 2: An agreement between two traders with trader's margin accounts. These margin accounts are specific to a single Perpetual Swap market's smart contract (SC).

Traders can allocate margin to a position in two ways. An individual agent can have multiple margin accounts for the single market, which is known as having isolated margins, or they can utilise one margin account for the market. Isolated margin allows an agent to specify a different margin base for every position they take in the market while a single margin account holds all of the margin, for all market trades.

The Funding Rate

A *funding rate* is a monetary transfer between counterparties which ensures that the perpetual swap derivative accurately simulates the experience of holding the base asset. In the case where the funding rate is positive, it means that the long agent pays the short agent. Conversely, when the funding rate is negative, it means that short agents must pay the long agent.The funding rate is calculated by:

$$\text{Funding rate} = \text{Premium} \cdot \text{Sensitivity}$$

Premium

Premium (%) is the time-weighted difference between the *mark price* and the *fair price*. Fair price is the index price (the price provided by the oracle) adjusted by a time-value component (the average premium over the last 3 months). Mark price is the price of the perpetual swap derivative. The time-weighted difference is computed by calculating the sum of each individual hour (for the last 8 hours), then multiplying it by (8 - t), where t is the hours of difference between each hour and the current hour. The average is then calculated after factoring in this scale.

Sensitivity

Sensitivity is a multiplying factor applied to Premium. The sensitivity of the funding rate is best designed so that it is low when the derivative price is historically volatile; indicating a volatile underlying asset and/or low derivative liquidity. The default sensitivity is determined by the classification of the market. This is noted in the table below.

Market	Sensitivity
Cryptocurrency	0.1
Stock	0.5
Forex & Stablecoin	3

Funding payments ensure that the price of the perpetual swap derivative tends toward the price of the underlying asset. A positive premium indicates excess long demand for the derivative and requires long to pay short. Likewise, a negative premium indicates excess short demand and requires short pay long. Agents are incentivised to sell their positions when they have to pay funding while demand increases for positions receiving funding, bringing the fair price toward the mark price. This mechanism ensures that individuals are able to buy and sell the perpetual swap derivative at a price close to the fair price. The funding is continuously paid, with the rate of payment changing once every 8 hours (i.e. it is quoted as an 8 hour rate and recalculated every 8 hours).

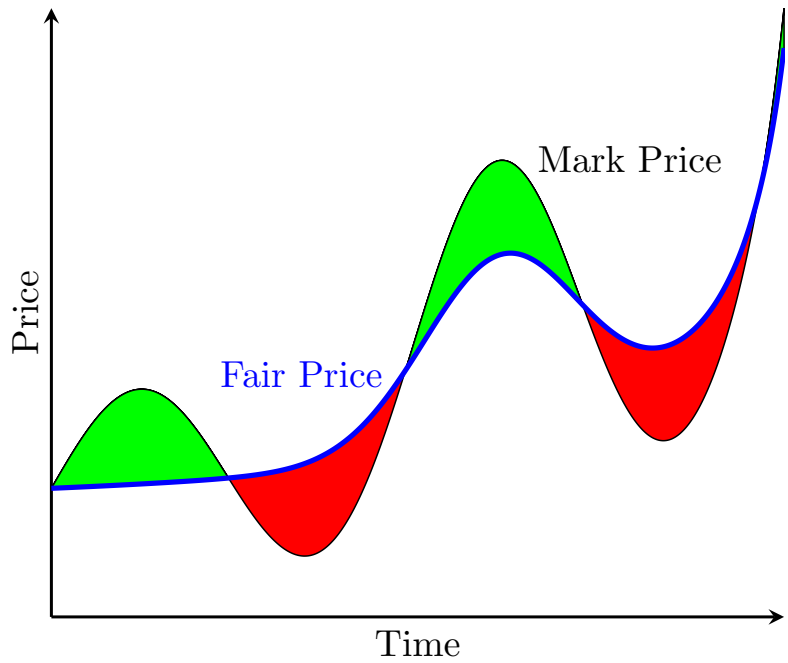

FIGURE 3: A potential relationship between the fair price (thick blue line) and the mark price (thin black line). The green areas indicate mark price is greater than fair price. When mark > fair, the premium is positive and thus the funding rate positive. The red areas indicate mark price is less than fair price. When mark < fair, the premium is negative and thus funding rate negative. This representation has been generalised for simplicity. In practice the funding rate will slightly lag behind the premium movements as it is a backwards looking calculation.

Automated Market Makers

Market Specific Automated Market Makers

Users can also trade within a perpetual swap market through an on-chain peer-to-contract mechanism called an Automated Market Maker (AMM). The AMM is a trading mechanism that was applied to, and widely adopted by, Uniswap and has since been applied to perpetual swaps [3,4]. Perpetual swap AMMs buy and sell a derivative to traders at a price determined by a fixed pricing equation (otherwise called a bonding curve). AMMs act as standalone traders within a market and compete with one another by varying their on-chain fee rates. Each Tracer Perpetual Swap market has the ability to host an AMM, or multiple AMMs. While any AMM is compatible with the contract, agents may only deploy Factory approved AMMs. The addition of a new AMM pricing function requires a proposal to Tracer DAO. If a function is accepted, it is 'whitelisted' for deployment.

The Tracer Perpetual Swap template includes a novel AMM design named the Delta Neutral AMM (dnAMM). It is the first Factory template compatible AMM. The Tracer dnAMM is explained in a separate paper.

Providing Liquidity to an AMM

AMMs within the perpetual swap system work the same as a trader's account. The AMM uses the quote asset of the market as margin. For a given asset pairing, liquidity providers can deposit quote assets into the AMM in exchange for a share of the pool's returns. This deposit increases the AMM's quote holdings, and correspondingly, the overall number of pool tokens (these are proportional to one another - e.g. 1% more quote mints 1% more pool tokens). Pool tokens are sent to the liquidity provider that deposited. The AMM's fees grow the pool holdings over time (more quote), increasing the value of existing pool tokens. Returns can be realised when the liquidity provider burns pool tokens in exchange for their share of the quote token holdings.

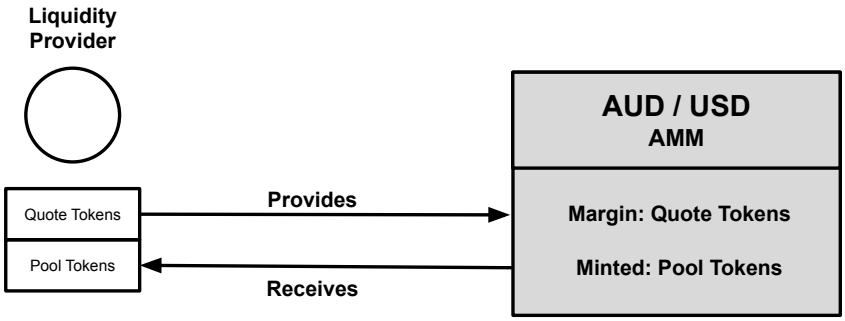

FIGURE 4: The interaction of a liquidity provider depositing into an AMM contract.

Liquidation and Insurance

The Need for Liquidation

The Tracer Perpetual Swap contract utilises a maintenance margin that requires leveraged traders to maintain at least a certain level of margin as collateral against their borrowings. The calculation that determines the maintenance margin is:

$$\text{Maintenance margin} = \frac{\text{Notional value}}{\text{Maximum leverage}} + 6 \cdot (\text{Liquidation gas cost})$$

Where the (notional value/ maximum leverage) component of the maintenance margin considers potential order-book slippage and is deemed a sufficient buffer amount. The second component, 6x liquidation gas cost of the last position, is included to partially protect the insurance fund from gas cost increases.

A maintenance margin is required as leveraged trading introduces significant risk. The risk is that an agent will become bankrupt and not be able to pay the counterparty who they are effectively in debt to. To minimise counterparty default, positions that fall below the required maintenance margin are deemed eligible for liquidation. Liquidation is the process in which a position is repossessed by a trader or agent that has adequate margin requirements. The agent liquidating (purchasing) the position is known as the liquidator.

Liquidating a Position

Positions below their maintenance margin can be acquired by anyone at a discount equal to the amount the position is below maintenance margin. If this discount is greater than the gas cost of liquidation, the position can be purchased for a profit. To ensure the ability to fund this discount, the trader's remaining margin is placed in margin escrow to cover liquidation costs (the discount, and any slippage costs). The margin escrow account ensures the trader does not exit the position prior to compensating the liquidator. If the margin in the escrow account is insufficient to pay this discount amount, the insurance fund will instantly cover the amount.

After the liquidator agent has purchased the position, they can do one of two things. The liquidator can now either hold the position or sell it back to the market. In the case where they sell it back to the market, they bear the risk that the entire position can not be sold at the market price due to insufficient market liquidity. This is known as slippage, or market liquidity risk. If this occurs to a liquidator during the allowed time to claim slippage reimbursement ($\sim$10 minutes), liquidators are guaranteed to be reimbursed for any losses they incur, with the exception of gas cost, from the time they acquire a below-margin position to the time they sell it. Liquidators are paid an initial amount equal to the amount a position was below its maintenance margin. If they sell the position within 10 minutes, receive an additional amount equal to the losses from briefly holding and selling the position. These payments to the liquidator first come out of the trader's remaining margin stored in margin escrow, if this is exhausted, then from the insurance fund. If there is any margin remaining in escrow after this process it is returned to the trader.

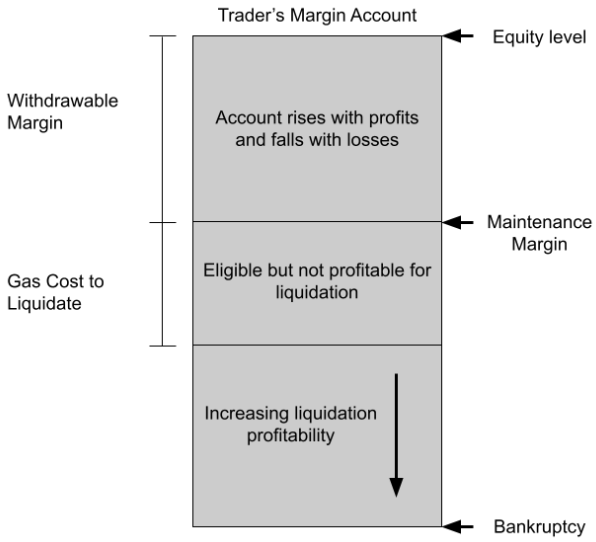

FIGURE 5: Aspects of the margin account. Above the maintenance margin equity is available to withdraw. Below the maintenance margin the position is eligible for liquidation. Liquidation is profitable when margin falls below the maintenance margin by the gas cost to liquidate. As the margin account approaches bankruptcy, profits from liquidation increase.

Liquidation Mechanism Design

The liquidation design outlined above is competitively inexpensive. Virtually all existing perpetual swap liquidation mechanisms charge traders a significant fixed portion or the entirety of their remaining margin. Fixed fees for liquidation cause high leverage positions to be prohibitively expensive. By charging competitively inexpensive liquidation fees, the Tracer Perpetual Swap contract enables traders to take on high levels of leverage with reasonable margin requirements. The slippage reimbursement receipt mechanism allows the insurance fund to cover slippage costs in excess of the remaining trader margin in escrow. In effect, the risk that a liquidator may lose money as a result of liquidating a position is eliminated. The only cost incurred by the liquidator during any liquidation transaction is the current gas price. Riskless liquidation encourages positions below their maintenance margin by any amount more than the current fast gas price to be liquidated—these positions represent risk-free profit.

Scenarios where the insurance fund covers liquidation expenses generally occur when a small position is liquidated after a huge spike in the gas cost, or when the slippage on a large position is greater than the maintenance margin. The amount that the insurance fund has to cover in both of these cases is often small, especially in markets with low volatility. As a result of mitigated insurance expenses, the insurance funding rate charged to leveraged traders is low. Low insurance funding fees and inexpensive competitive liquidation combine to let traders take greater leverage with lower minimum investment size. Margin requirements in Tracer Perpetual Swap contracts are as small as 6x the gas cost for liquidation.

Market-Specific Insurance Funds

Tracer Perpetual Swap's insurance funds are market-specific, meaning that there is an insurance fund for each individual market. In periods of high volatility, mass liquidations in one market do not affect other markets which minimises global protocol risk.

Capitalising the Insurance Fund

The insurance fund accrues capital in two ways:

1. Insurance funding payments from leveraged traders.
2. Individuals directly depositing into the fund in return for a proportion of the insurance funding payments.

Funding Source 1: Insurance Funding Rate

A variable insurance funding rate is paid from leveraged agents into the insurance fund. Each market-specific insurance fund sets a funding target. The funding target is set as a percentage of the total borrowed by traders (i.e. the market debt). The target is 1% in the default template, however, the market creator can specify any fixed percent or variable percent as optimized by the market's designated governance. It is necessary that the ratio of the insurance fund target to the total borrowed be positively correlated with the derivative price volatility, and typical order book slippage for larger trades. 1% of the total amount borrowed will be the default value in the template because it is a few times the amount needed to survive the largest market crashes observed in the past few years, based on research from existing perpetual swaps [5].

Derivatives with high volatility require higher insurance funding targets to prevent socialised loss. Socialised loss occurs when the insurance fund is emptied as the result of one or more large liquidations that cost more than the margin in escrow, requiring the funds to compensate liquidators be sourced via involuntary acquisition of other agents' margin. As leveraged traders are the sole reason for the insurance fund existing, they capitalise the fund. These agents pay a variable insurance funding rate based on how far the insurance fund is from the target size (insurance fund deficit). When the insurance fund is fully capitalised, the insurance funding rate is zero.

The insurance funding rate will update every 8 hours in order to achieve an insurance fund size that is equal to the insurance fund target. When the insurance fund is above target, the insurance funding rate is set to zero, otherwise, it is set to whatever amount would cause the insurance fund to reach its target in 3 months from collecting every 8 hours. 8 hours divided by 3 months is 0.0036523 giving a formula of:

$$\text{Insurance Funding rate} = \text{Max}(0.0036523 \cdot \frac{\text{Insurance Fund Target} - \text{Insurance Fund holdings}}{\text{Leveraged Notional Amount}}, 0)$$

Like the funding payments discussed above, the insurance funding payment is paid continuously and is quoted as an 8 hour rate. The insurance funding is paid by leveraged traders to the insurance fund accounts. The below formula calculates the total funding paid to the insurance fund over an 8 hour period. Note that the total borrowed from the system is updated every 8 hours.

$$\text{Insurance Funding} = \text{Insurance funding rate} \cdot \text{total borrowed from the system}$$

Funding Source 2: Direct Deposits - iTokens

Agents may voluntarily capitalise an insurance fund through a direct deposit into the public insurance account. In exchange for earning a proportion of the insurance funding rate payments, private individuals deposit their funds and take on the risk that all or part of their deposit will be lost covering liquidations that cost more than the remaining margin. Any user may deposit funds into an insurance pool to earn a proportion of insurance funding rate payments relative to their total share of the insurance fund, increasing the speed at which the fund is capitalised. The insurance funding rate is based on how far the insurance fund is from its target causing the return to depositors to approach zero as the fund nears it's target, approaching infinity as the insurance fund nears empty.

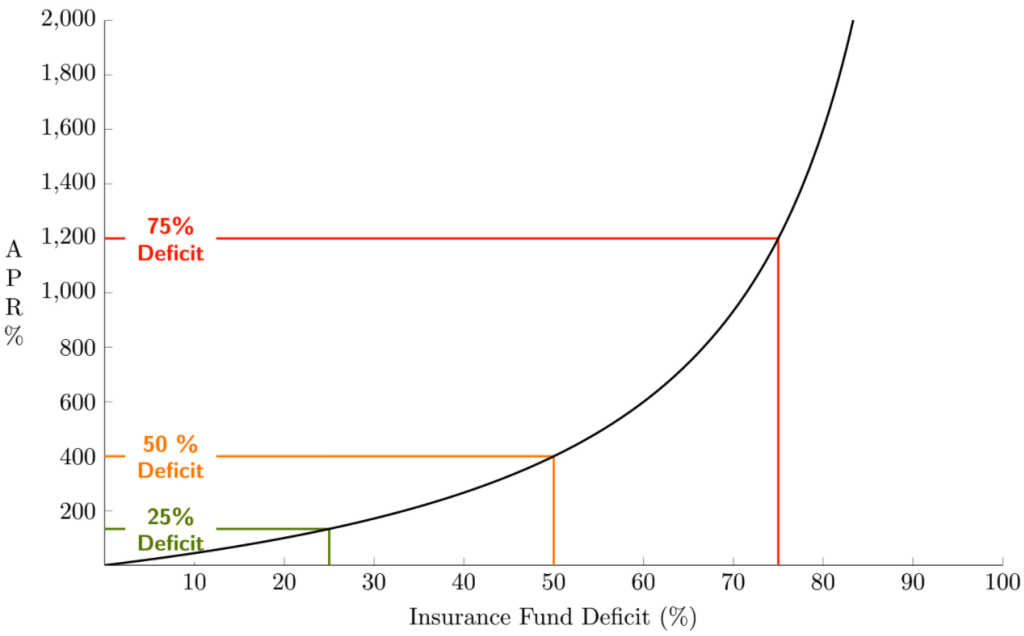

FIGURE 6: The relationship between APR (%) and the insurance fund deficit. As the deficit reaches 100%, the APR (%) goes to infinity. As the deficit reaches 0%, the APR approaches 0%. An insurance fund deficit of 25% corresponds to an APR of 133%, an insurance fund deficit of 50% corresponds to an APR of 400%, and an insurance fund deficit of 75% corresponds to an APR of 1200%.

When a user deposits funds into the insurance account, they are granted an ERC20 iToken, a fungible claim to their insurance position. An insurance fund depositor will deposit the market's quote asset to fund the insurance account and receive iTokens in return. For example, a user funding the insurance account with DAI will be granted iDAI that can be used to redeem their DAI deposit. The iTokens represent a proportional share of the public insurance account. As the public insurance account accrues capital via insurance funding payments, the value of the iToken increases. Note the insurance funding is paid in the quote asset. When the iTokens are redeemed for the deposit (in a process known as burning), insurers can realise potential returns. Insurers can sell their iTokens in a secondary market to reduce their exposure to the insurance fund without paying the withdrawal fee for redeeming their deposit. Conversely, buyers can gain exposure to an insurance fund by purchasing iTokens on a secondary market. Purchasing iTokens rather than directly depositing does not change the composition of the underlying fund, which may be desirable—the risk profile of the insurance fund remains unchanged.

iTokens will trade anywhere from the amount the system currently pays for burning (after *withdrawal fee*), to the amount the system would pay for burning in the future if the fund reaches its target and thus has no withdrawal fee. The price will tend to be higher if traders expect the fund to reach target soon, and lower if the public insurance fund is small and the chance of expenses high.

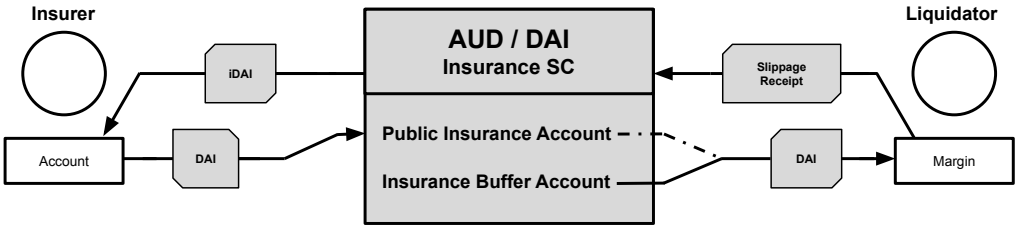

FIGURE 7: Two types of agents interacting with the insurance fund. On the left, an insurer deposits DAI into the AUD/DAI smart contract and in return gets minted iDAI. This is in addition to the insurance funding rate capitalising the accounts. On the right, a liquidator submits a slippage reimbursement receipt to the insurance contract and is compensated with DAI. The liquidator is first compensated by the insurance buffer account, as explained below, and then by the public insurance account.

Insurance Buffer Account

Each market specific insurance fund has an insurance buffer account. The insurance buffer account serves a specific purpose—it has priority for insurance expenses, providing a layer of protection for private depositors. Once the buffer account is depleted, expenses are shared by all depositors proportional to the size of their deposit. The insurance buffer account's margin increases via its share of insurance funding rate payments. The insurance buffer account's holdings make a return through the same yield that private investors make.

The insurance buffer account receives insurance funding payments the same as a public insurance account, however, it has two main differences. It has priority for insurance expenses and it receives 100% of the withdrawal fee from the public insurance account. At the start of the insurance fund, with no depositors, all of the funding rate would be paid to the insurance buffer account by default, however, anyone can deposit any amount to the public insurance account to collect 100% of the insurance revenue, which is likely to occur. As deposits increase, the withdrawal fee decreases. The initial withdrawal fee goes to the insurance buffer account, bootstrapping the account.

Withdrawing from the Insurance Fund

Agents can withdraw their funds at any time. Depending on the capitalisation level of the insurance fund, users may need to pay a fee to withdraw. Agents are charged a deposit withdrawal fee paid to the insurance buffer account equal to the percent the fund would be below target after the withdrawal has occurred. Time-locks can be enforced on withdrawals to further prevent insurance fund depletion in volatile market conditions.

For example, assume the fund target is \$6000 and the fund currently contains \$5000. A depositor wishes to withdraw \$500. The withdrawal fee will be:

$$\text{Withdrawal fee} = \frac{\text{Insurance fund deficit after the withdrawal}}{\text{Insurance fund target}}$$

$$\text{The insurance fund deficit after the withdrawal} = (6000 - 5000) + 500 = \$1500$$

$$\text{Withdrawal fee} = \frac{1500}{6000} = 25\%$$

Oracles

Oracles are utilised in the Tracer Perpetual Swap contract for several purposes:

- Oracles provide the contracts with price inputs. The index price (and by extension, the funding rate) rely on a spot market price in order to update.
- Oracles can be utilised to match orders. The order-matching logic should be kept on-chain. However, in high cost circumstances oracles are required to match orders. Reputation is a key factor in selecting order-book oracles and order logic should be verifiable and posted on-chain where possible.
- Oracles are used to determine the fair price when calculating if a position is eligible for liquidation and how far below maintenance margin it was at the time of liquidation.
- Oracles are used by the dnAMM to price correctly and incentivise a return to a delta neutral state.
- The liquidation function can be automated through an oracle call. External initiators can be used to monitor the blockchain and recognise when a position has fallen under its maintenance margin. An oracle can then automate this liquidation given they have a margin account set up, and automate a sale to the AMM or another trader if there is existing liquidity.

A price input oracle is set and customisable for each Tracer market. If no oracle solution exists for a specific asset pairing, it is possible that Tracer's governors can agree to finance the creation of an oracle solution. Oracle financing can occur for markets that wish to leverage spot market data that is difficult and expensive to acquire.

To protect the system against oracle failure, the perpetual swap smart contracts can be engineered to mitigate the damage caused by oracle failure. If there is an error with the oracle input that is detected on-chain, the smart contracts autonomously failover to another oracle solution. Governance can replace or change an oracle solution via timely proposal for a specific market if it has chosen to be governed by the DAO. Each market can have a built-in stop mechanism to activate final settlement and prevent new positions being opened. This mechanism may be activated by Tracer DAO vote and used in extreme cases where either an oracle feed has failed, and/or protocol manipulation is occurring. This function is only available to Tracer Perpetual Swap markets that have governance.

Factory Deployment and Market Economics

A Tracer Perpetual Swap template requires multiple variable inputs to be deployed. The market creator must select an oracle address for the funding rate, specify a fee rate or fee rate function, select a quote asset, base asset, and specify contract ownership. As previously mentioned, contracts can be deployed as either owner-less, privately owned, or Tracer DAO governed. Other factors such as funding rate, insurance funding rate, insurance pool target, and liquidation incentives can be customised at deployment.

Unless DAO governance or private ownership is specified, individual perpetual swap markets will be economically independent and will therefore require appropriate fee structuring for oracles and incentive alignment for market agents at the time of deployment. The benefit of deploying an owner-less perpetual swap contract is that there is zero third-party risk. The trade-off of being entirely permission-less is that the contract may not sufficiently incentivise all agents within the system and require redeployment. A portion of the fees collected by a perpetual swap smart contract can be used to incentivise market participants such as oracles and liquidity providers over time. Oracles can be subsidised and financed via governance, but it is unlikely that markets will survive unless they can directly incentivise and pay oracles.

Tracer DAO

When Tracer Perpetual Swap contracts are deployed, they are not necessarily under the purview of Tracer DAO and its governance. The deployer of the contract must elect Tracer DAO to govern the contract. Electing Tracer DAO to govern the perpetual swap contract allows DAO governors to customise any aspect of the market while it is live. DAO governance can, for example:

- Change a fee rate in order to increase the market's competitive advantage. Liquidity providers are incentivised to participate in markets with the lowest fees.
- Change an oracle address if it is failing, or is under threat from malicious actors, to prevent mass liquidation.
- Change a market's insurance funding target to address the appropriate volatility of the market.

The motivations for a deployer to specify governance could be to increase market efficiency, increase competitiveness, limit the actions of malicious actors, or to reduce unnecessary risk. With no embedded governance structure, markets are unable to make pivotal changes to contracts once they are initially deployed. When markets become large and require their own governance and incentive rights, they can foreseeably vote to engineer market-specific governance rights. This would separate markets to be governed by the individual market participants.

Reputation

Tracer implements a Reputation System aiming to identify, measure, and convey relevant risk to all market participants. Reputation scores will be developed for individual markets and individual traders. See *Tracer: Peer-to-Peer Finance* [6] for more detail. Below we include a non-exhaustive list of metrics that are verifiable and on-chain, that reputation scores can be based on:

Individual Traders

- Liquidation frequency
- Average leverage ratio
- Average time deposited within insurance fund
- Deposit withdrawal from insurance fund in times of volatility

Individual Markets

- Time that insurance fund is below target
- Oracle downtime
- Notional value of all trades
- Number of transactions

Conclusion

In this paper, we discuss the Tracer Perpetual Swap. Tracer Perpetual Swap is a set of smart contracts that coordinates all market participants in a way that is low cost, trustless, and has zero reliance on a third party. This contract system is a Tracer Factory compatible template that grants permissionless deployment of markets for any viable asset pairing. Traders can either trade via an order-book mechanism or through an Automated Market Maker contract. A novel liquidation mechanism is introduced that is competitively inexpensive and riskless for the liquidator. Market specific insurance pools with funding targets and insurance funding rates isolate risk to individual markets and ensure that counterparty risk is minimised. The liquidation and insurance mechanisms are capital optimised, granting traders higher leverage and lower minimum trade sizes. Tracer Perpetual Swaps provide the individual with broad market access and capital efficient exposure to global asset classes.

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