eckoDEX

Introducing KDX Liquidity Mining Programme

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Intro

Following up on our article presenting the KDX Staking tool, we are excited to introduce you to the KDX Liquidity Mining Programme. At eckoDEX, whenever we create and develop a new product or feature, we always strive to maintain a fine balance between efficiency and user experience. Let's start off with a brief contextualization to level the playing field among all readers, from the novice to more experienced investors.

1. Decentralized Exchanges

Traditional exchanges trade assets using a classic order book model. In this case, a trade happens when the exchange can match a buyer and a seller who are willing to accept the same price. Moreover, this centralized model assumes that exchanges maintain funds under their custody during and from the order entry to the end of the transaction. It is also very common for exchange-traded products to charge abusive taxes – or fees - on the users' invested amount and profits. Fundamentally, the order book model not only fails to fulfill the cryptocurrency premise of eliminating intermediaries from financial markets, but it also gives all the power to the middleman, who maintains tokens under their custody and capitalizes on both the trading volume and locked value.

In the last couple of years, decentralized exchanges (DEXes) have been revolutionizing this paradigm by applying mathematical and algorithmic strategies to intermediate trades. In essence, liquidity providers (LPs) leave their assets under the control of a smart contract, which is responsible for intermediating trades and ensuring that buyers and sellers will be able to trade at any given time. Thus, the Automated Market Model (AMM) model guarantees that traders will no longer need to leave their tokens under a DEX custody. On top of that, all the fees collected from swaps are shared between LPs. Ultimately, DeFi allows you to be your own bank.

At launch, eckoDEX's will implement a safer and modernized version of the Uniswap-v2 AMM using the Pact programming language. eckoDEX software is built upon the already known and community-tested [https://github.com/kadena-io/kadenaswap] modules. One of the most impactful features we added to the code is the liquidity mining programme, which is meant to incentivize people to act in our ecosystem as liquidity providers.

1.1 Why Should you Provide Liquidity?

In regular finance, users benefit only from their own market activity. On the other hand, the DeFi space allows users to benefit from each other's trading activity as well as by providing liquidity in pools. eckoDEX's programme will distribute 0.25% of all the fees back to LPs. Specifically, the total daily rewards paid by a pool is calculated as

$$r = s \times v \times 0.0025$$

where $0 \leq s \leq 1$ is the user-supplied share of the pool, and v represents the total volume of fees collected by the pool on that day.

Illustrative example:

- The overall pool liquidity equals $5,000,000
- Pool daily fee volume equals $1,000,000
- You are providing $250,000 in liquidity (5%)
- The standard rewards for LPs are fixed at 0.25% of the fee volume.

In this case, your APR (Annual Percentage Return) would be the following:

- Daily Rewards: $1,000,000 x 5% x 0.25% = $125
- Annualized: $125 x 365days = $45,625
- Against your position: $45,625 / $250,000 = 0.1825
- Therefore, your APR would be 18.25%

1.2 Understanding Impermanent Loss

The biggest risk associated with providing liquidity in decentralized finance is the infamous Impermanent Loss (IL) phenomenon.

Basically, Impermanent loss is a cost of opportunity. It represents the difference between the value of the liquidity that a user gets back from a pool and the hypothetical value they would have, had they not invested in the pool, just holding the corresponding tokens instead.

As pools are constantly rebalanced by arbitrageurs to maintain the market prices of assets (in a profit seeking environment), the proportion of each asset in the pool changes alongside their prices. IL represents the opportunity cost incurred by this rebalancing, which is greater the more volatile an asset is. Therefore, providing liquidity is not a risk-free investment, as your initial liquidity will realistically never come back intact due to the risk of Impermanent Loss (IL).

An example will help translating concepts into practice:

The LP inserts liquidity for $250,000 – [$t_0$]

- The pool has the following metrics:
- KDA/kFRAX pool ($2,500,000 in KDA/ $2,500,000 in kFRAX)
- KDA is priced at $5 - resulting in a total of 500,000 KDA ($2,500,000/$5)
- If over a year, KDA price would reach $5.5
  - ◊ 500,000 KDA would be worth $2,750,000
- The LP liquidity of $250,000 is worth 5% in respect to the overall liquidity

Let's see what happens when the LP removes his initial position $250,000 - [$t_1$]

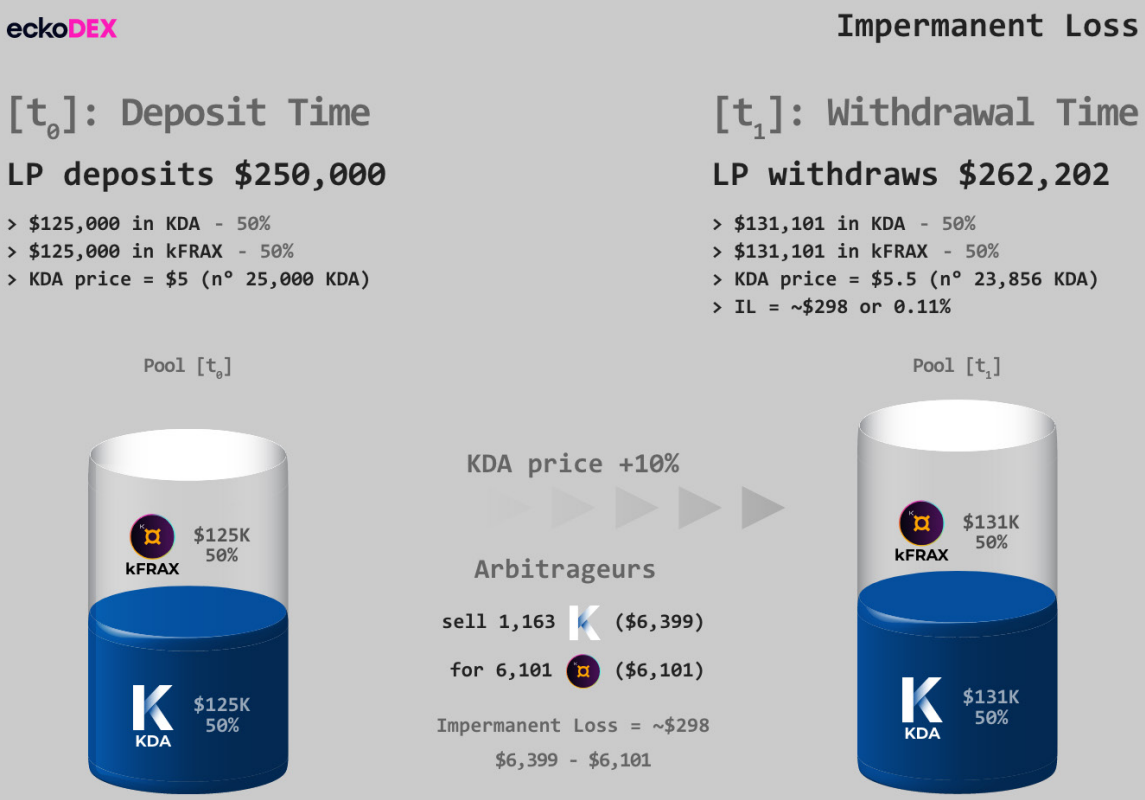
- Profit seeking, arbitrageurs sell approximately $6,398 worth of KDA in exchange for $6,101 kFRAX
  - ◊ This equals (n°) 1,163.44 KDA
- When removing their capital, the LP will receive back $262,202 - $131,101 in KDA and $131,101 in kFRAX - plus accrued fees
- The Impermanent Loss on his initial capital amounts to $297.79
  $[(p_{kFRAX}\ [t1] * q_{kFRAX}\ [t1] + p_{KDA}\ [t1] * q_{KDA}\ [t1]) - (p_{kFRAX}\ [t1] * q_{kFRAX}\ [t0]) + (p_{KDA}\ [t1] * q_{KDA}\ [t0])] * [LP's\ share\ of\ the\ pool\ (\%)]$

Where p= price and q=quantity

- *The LP is facing Impermanent Loss for approximately 0,11%*
  *(IL / (p_{kFRAX} [t1] * q_{kFRAX} [t0]) + (p_{KDA} [t1] * q_{KDA} [t0]))*

Now that we have also accounted for Impermanent Loss, we know that the net LPs rewards are:

- $45,625 (fees collected) - $297.79 (Impermanent Loss) = $45,327.21 (LP's IL accounting for fees ($))
- APR_{LP} = 17.38%



Impermanent Loss is impossible to predict, as tokens volatility is under nobody's control. Hence, everyone should really move away from false claims of IL avoidance and be aware of the risks involved with their investments.

Aware of these dynamics, we created a unique Liquidity Mining programme, which leverages on a system of incentives used to attract and create the most profitable and risk-averse environment for LPs. Next, we will carefully discuss all the innovative features embedded in our programme.

2. The Tokenomics and Liquidity Mining relationship

It is remarkably rare to have a DeFi protocol, with a maximum supply of tokens, sharing rewards in their native tokens to LPs. This happens as the tokens are minted. In many cases, rewards are distributed to new users at the expense of the token values, which ultimately depreciates for the long-term holders. At eckoDEX, we want to benefit the longstanding users while also being fair and innovative.

Network Rewards account for 40% of the KDX total supply. This large tranche of tokens will boost the DEX activity in the long-term, ensuring a fair and decentralized distribution that directly benefits the DEX participants. Our Tokenomics are inherently favorable to welcome a lucrative Liquidity Mining Programme. More explicitly, from a max cap of 1 billion KDX, eckoDEX will distribute 400 million KDX (40%) to liquidity providers. Again, the fact that we will not mint extra tokens guarantees that boosted rewards do not come at the expense of KDX holders in terms of inflation.

3. KDX Liquidity Mining Parameters

KDX Liquidity Mining Programme – the set of mechanisms designed to attracting liquidity through distribution of native KDX tokens – is designed to generate lucrative pool boosters for early LPs that will non-linearly decrease with time, as the volume grows to the point where they are no longer needed.

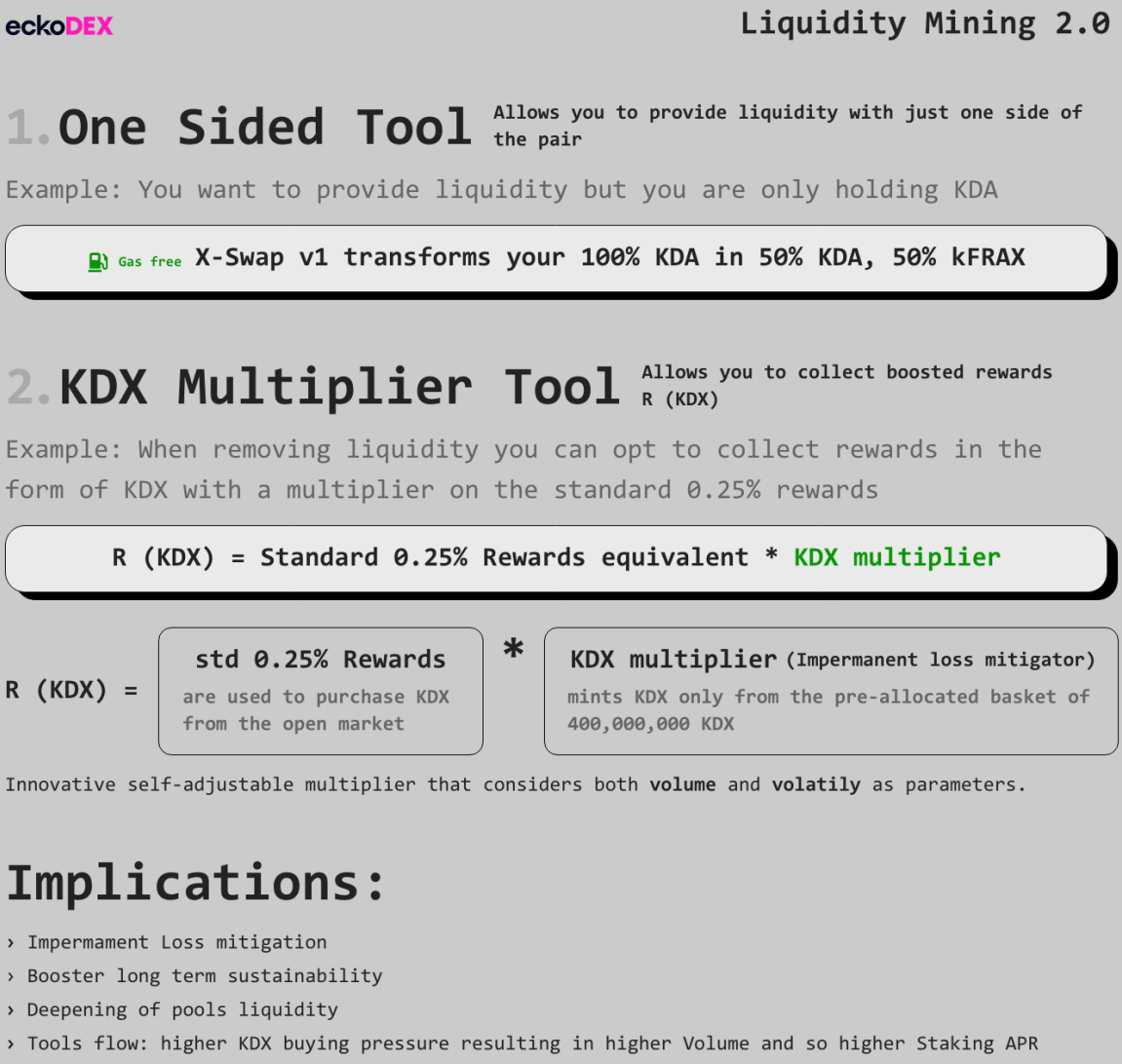
Let us now take a closer look at the key parameters of this program.

The rise and fall of other DEXes has often been correlated with their incentive's emission schedule. The end of extra incentives for LPs leads to a loss in the overall DEX value, as LPs will just migrate to newer and more lucrative options. This results in a difficult multivariate balance between attracting liquidity (with higher incentives) and implementing a sustainable reward issuing program. With this in mind, the KDX Liquidity Mining Programme has been designed to be **profitable**, **sustainable**, and decentralized.

- *The KDX liquidity mining program is set to last no-less than 4 years*
  - ◊ The Liquidity Mining Program generates extra rewards on top of the 0.25% from all swapping fees. Rewards are magnified by a multiplier if withdrawn in form of KDX.
- *You can collect your boosted rewards whenever you want*
  - ◊ KDX rewards are vested for 5 days. This short vesting period helps ensuring there is no trading pair manipulation and helps preserving market stability.
- The DAO will have total freedom in assigning the multiplier to their preferred pools, ensuring that V's rewards will be applied according to the community's interests.

4. The overall KDX Multiplier benefits

First, the possibility of collecting KDX as rewards increases the KDX buying pressure from the open market. Why? The eckoDEX smart contracts utilizes the standard 0.25% of the pool tokens fees to purchase KDX from the open market. Therefore, the Multiplier only mints the KDX resulting from the delta between the standard fees and the boosted rewards.



Implications:

› Impermament Loss mitigation
› Booster long term sustainability
› Deepening of pools liquidity
› Tools flow: higher KDX buying pressure resulting in higher Volume and so higher Staking APR

The purchase of KDX, resulting from allowing end users to collect boosted KDX rewards, has a second and potentially more powerful implication: **an increase in the overall DEX volume.** Why is this important? *This is because it directly benefits KDX Staking APR*. An increase in volume means an increase in DEX fees and consequently rewards for stakers. A symbiotic flow that financially boost the DEX activity as well as those staking their KDX. From governance to the overall DEX empowering, KDX has strong and well-defined scopes. Well thought-out Tokenomics goes hand to hand with the token's capacity of providing concrete use-cases and benefits.

The Liquidity Mining Programme is set to last for around 4 years. What will happen when it is over? At that point Kadena bridges will most likely be available and the overall DeFi world will have witnessed the only PoW gas-free DEX. Because of this, we are extremely confident that volume on eckoDEX will be one of the greatest in this space. Volume and TVL predictions aside, the end of the KDX boosted rewards will also reduce the KDX emission schedule proportionally. By then, the only option to get your hands on some KDX will be through the open market: where more buying pressure results directly in more scarcity. A deflationary status which is achievable also thanks to the burning of the KDX Staking penalties for early unstakers. KDX Tokenomics always points at value creation, programmatic emission, and scarcity.

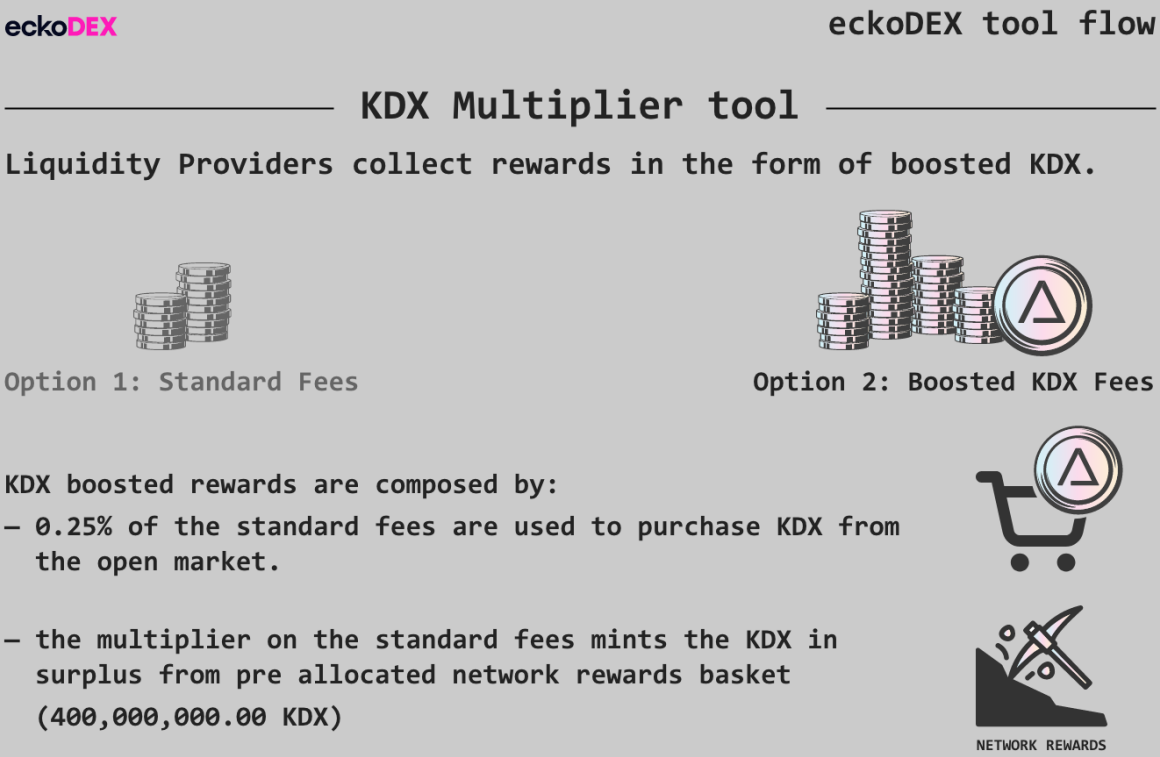
4.1 KDX liquidity mining five purposes:

- **Impermanent Loss coverage:** by distributing rewards to LPs in form of KDX in addition to the 0.25% of the overall DEX trading fees volume.
- **Deepening Pools Liquidity:** by incentivizing users' participation in providing liquidity.
- **Keeping the KDX vesting schedule predictable and providing long term sustainability:** as the rewards emission schedule of KDX is programmatic and self-adjusting according to market conditions.
- **KDX rewards waste management:** an algorithmic multiplier that finetunes rewards accordingly to market conditions. Rewards will never be too low or too high.
- **Benefitting the Staking APR** by distributing rewards in the form of KDX. The buying pressure increases leading to a higher trading volume and therefore a higher APR for KDX Stakers.

With regards to this last point, we have seen how the process works in the prior paragraph. To consolidate the topic, find more details below.

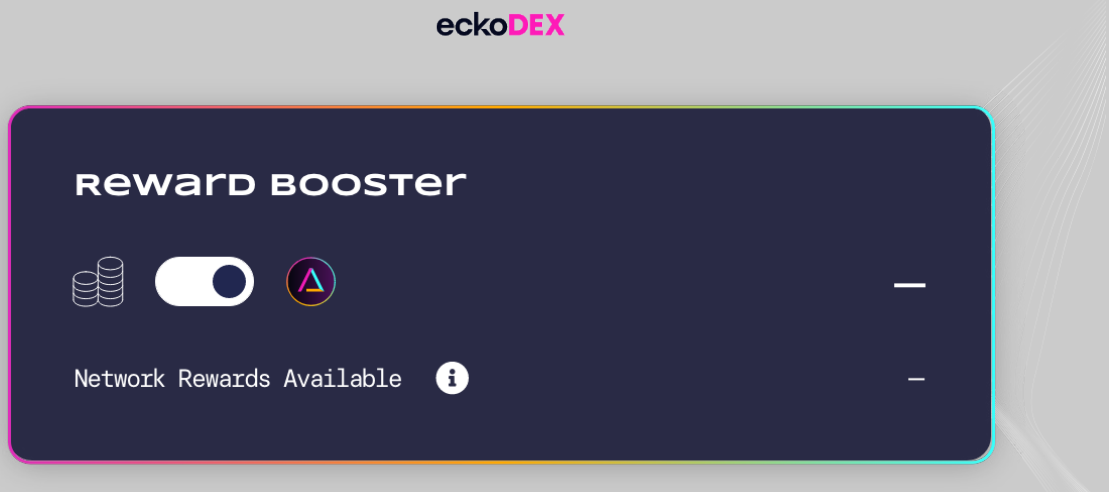
4.2 Tools Flow interactions

eckoDEX smart contracts are truly unique in their functionality. When users withdraw liquidity and opt for boosted KDX rewards, eckoDEX smart contracts use the users' accumulated rewards – funded by the 0.25% trading fees – to purchase the equivalent value of KDX on the market, and the delta between the standard rewards and the multiplier is minted from the network rewards. This allocation amounts to 40% of the KDX total supply and creates a predictable scarcity schedule – which we believe lies at the core of Bitcoin's success. Buying KDX on the market entails upping KDX buying pressure and consequently increasing the overall trading volume on eckoDEX and token price.



5. Liquidity Mining Front-End

The KDX Liquidity Mining Programme works through a simple and user-friendly interface, providing LPs with all relevant information. The option of choosing in which form to receive the rewards will be at their fingertips, as will the possibility of seeing the difference provided by the two tokens in terms of APR.



6. The first self-adjustable Liquidity Mining tool

Creating a self-adjusting multiplier that reacts to the market's conditions is a quite daunting task for a multitude of reasons. First of all, we need to settle what variables should be considered for establishing a suitable multiplier. From launch, two variables will influence the size of the booster we give:

- Pool's **Diluted Volume** (Volume/TVL) is what directly determines a pool APR, and it can be interpreted as a measure of how much the LPs are earning per dollar invested. In general, smaller volume in respect a constant amount of TVL requires higher boosted rewards – while a higher volume would require less additional rewards.
- An assets' **Volatility** is usually taken as a measure of its associated risk. However, for two highly correlated assets, we observe that the impermanent loss tends to float at lower levels in opposition to uncorrelated tokens. This leads us to consider the price rate volatility instead. Considering a pool consisting of two tokens A and B with prices a and b, respectively, we want our multiplier to increase accordingly to the volatility of the price rate a:b. Accounting for volatility in the KDX multiplier function is the core of our IL solution and KDX rewards waste management practice.
- Elapsed Time since launch. As time goes by, the KDX token will progressively become a scarcer resource and thus becoming harder to get high-end multipliers. However, time also makes the pool more sensible to scenarios with low diluted volume and high volatility.

In general, our approach consists in identifying the variables that determine the risk/reward ratio of a given pool and determine how do we want it to evolve in time.

7. KDX multiplier mathematics

We are now left with the final burden of broadcasting all the values and specifications involved in the KDX Liquidity Mining Programme into a single smart contract mathematical function. The process of finding a fine-tuned formula that is able to mitigate IL efficiently and sustainably will be an iteration of different constraints and objectives. Instead of presenting the final result, we opted to describe the whole rationale behind the KDX booster.

7.1 The KDX Multiplier activity domain

First of all, when setting the liquidity mining parameters, we have to make sure that the multiplier behaves between a pre-defined numerical domain. For this exact reason, we opted to profit from a mathematical concept called *Convex Combinations*. In doing so, we explicitly consider an upper-bound u and a lower-bound l, such that:

$$m(x,y) = p(x,y)u + (1 - p(x,y))l.$$

Such approach allows us to choose a function p | p(x,y) ∈ [0,1] for every x,y that works in the desired boundary $l \leq m(x,u) \leq y$.

7.2 Plugging in real-world variables

Now, having defined the multiplier boundaries, we are left with the task of setting p – and needing it to be p(x,y) ∈ [0,1] – t is natural for us to lean on functions which are commonly used to express probabilities. Looking back at the section above and recalling some well-known 'activation' functions, we consider an S-shaped Sigmoid function defined as

$$P_{\beta,b}(z) = \frac{1}{1 + \exp^{-\beta z + b}}$$

This simple attack to the multiplier dynamics satisfies are need of plugging exogenous variables – again, the assets volatility (vol), pool diluted volume (dv) and elapsed time - to the first algo-booster seen in DeFi. Thus, we consider:

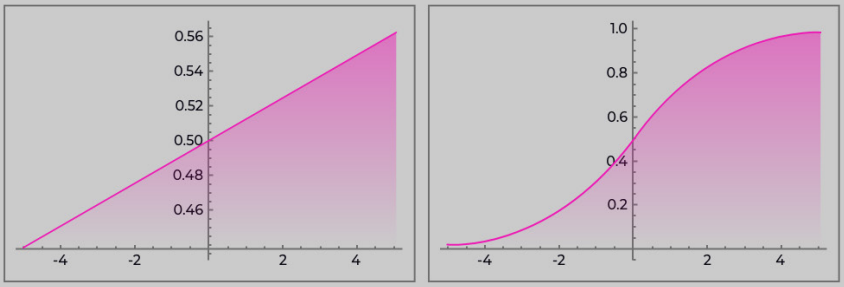
$$z = \frac{(5 * vol - 5 * dv)}{2}$$

The constants above are employed purely for scaling purposes and may be changed according to our tests and/or market conditions

7.3 Defining Beta

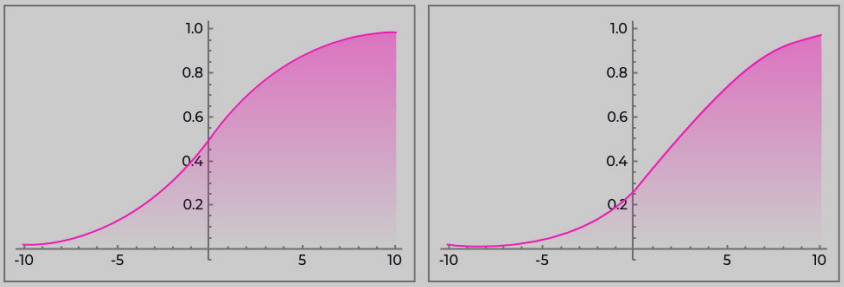
Our next task is therefore to set the *Beta* variable. In order to achieve at the same time a guaranteed minimal *amount of curvature* and the *multiplier variability at mid-levels*, we set the β within the interval [0.3, 0.7]. In the figure below we can see how decreasing values for β linearly increase the multiplier, and on the other hand how increasing values for Beta contribute to the concentration of growth from the multiplier. Using the same technique presented above, we consider:

$$\beta = (1 - t) * 0.3 + t * 0.7, \text{ where } t = \min\left\{1, \frac{\text{elapsed\_days}}{4 * 365}\right\}$$



Sigmoid A: curve change according to Beta

We also need to determinate the parameter b of our sigmoid function; therefore, we iterate by analyzing its impact on the multiplier function:

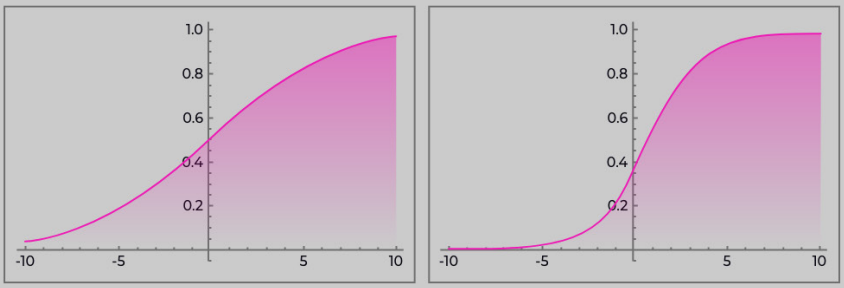


Sigmoid B: curve change according to b

The Sigmoid curve behavior perfectly reflects our desired outcome. On one hand, the central value of the KDX multiplier is reduced, which consequently will decrease the overall KDX emission. On the other hand, the variation of β guarantees the slope at the central value to increase, which shows that the system will still be keen to help in case of high volatilities and/or low volumes. Having in mind our programmatic inflationary policy, we adapted the KDX system to last at least for 4 years. A period in order to maintain a desired but programmatic inflation rate. Thus, we set

$$b = \frac{elapsed\_days}{4 * 365}$$

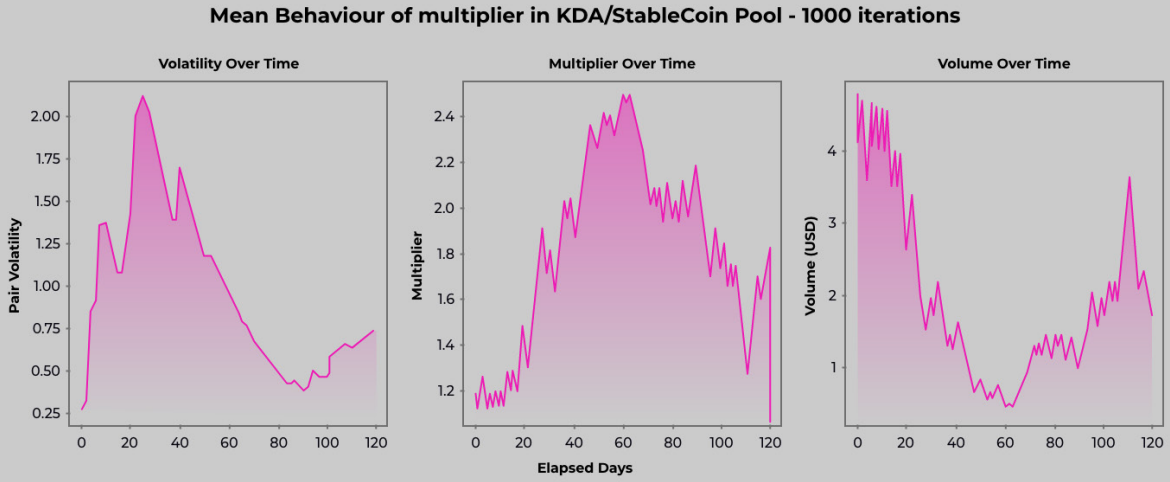
Finally, this is how the multiplier curve will evolve over time.



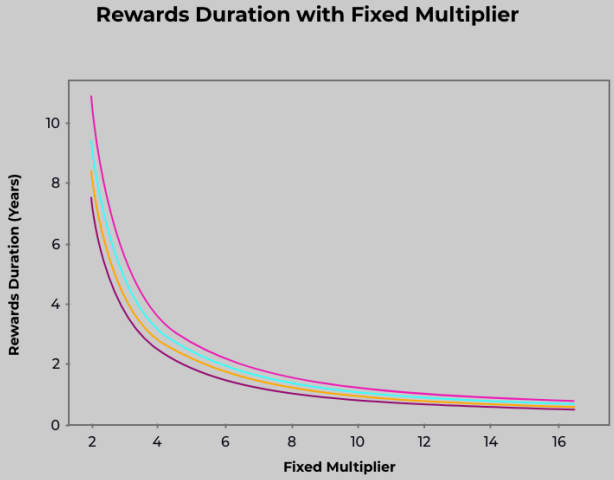
Sigmoid KDX: curve change according to both Beta and b

7.4 KDX Multiplier Testing

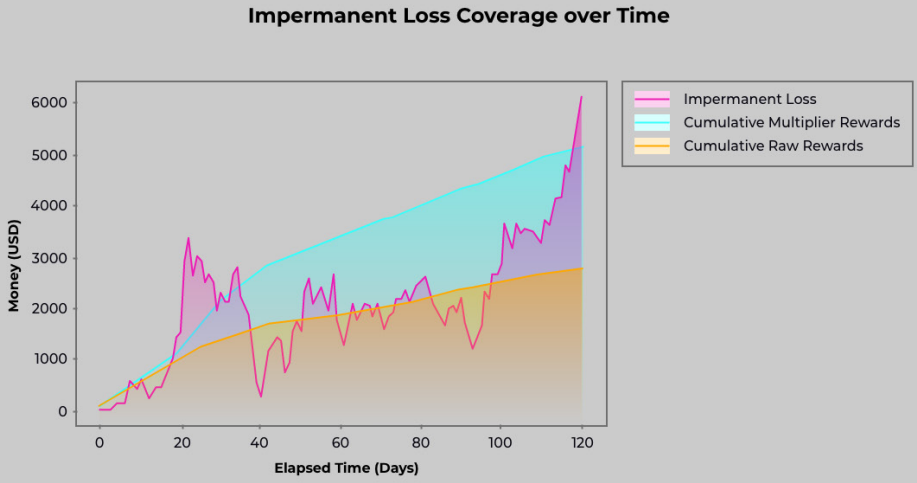
Finally, we test the mathematical iterations conducted on the multiplier to see its reaction when facing real-world scenarios. We estimated 30,000.00 possible pools scenarios by applying the (modified) Monte Carlo Brownian motion leveraging real data and parameters. In the Monte Carlo simulation, we considered three different pools: KDA/BTC, KDA/ETH, and KDA/kFRAX. As we can see in the graphic below



the KDX multiplier reacts as expected. When the volatility is high and volume is low, we are left with a 'high' multiplier. On the other hand, when we have a high volume and low volatility, the multiplier decreases accordingly. Also observe that the multiplier is bounded between 1 and 3, which in our experiments were set to be the lower and upper bounds, respectively. We can also observe that rewards stay sustainable in the pre-defined period of rewards emission activity. Period needed to define an expected and programmatic KDX inflation rate, while being a scarce resource.



Also, for each of the pools we simulated, we analyzed the IL coverage over time, while also observing the behavior of the KDX boosted rewards. The following image summarizes the dynamics just mentioned:



It is visually intuitive how the multiplier is able to well follow the IL path – pretty remarkable success. In doing so, it is very important to notice, that the KDX will keep its maximum supply Tokenomics. Another important remark is how the multiplier follows IL without exceeding in the number of rewards given – as that would result in a theoretical disequilibrium of the overall KDX incentives.

As a final note, since the rationales behind the KDX multiplier are a new ground-breaking approach to IL and were never explored in this fashion, we reserve the possibility of further fine-tuning the mathematical functions underpinning the KDX Liquidity Mining Programme.

If you have made it this far you are ready to take full advantage of the eckoDEX tools, your time has been wisely invested.

Daniele De Vecchis
Ariel Serranoni