Exponential MEAL (EXEX)

A Decentralized Exponential Market Maker

Abstract

This document presents a decentralized exponential market-making mechanism. It is based on depositing the entire token supply at the outset, permanently locking the liquidity, and establishing a fixed incremental price increase per additional token. By selecting parameters according to mathematical definitions, the price evolves along a predictable exponential curve, without reliance on external asset injections or ongoing intervention.

Introduction

Decentralized exchange (DEX) protocols often rely on fixed-product formulas (e.g., $x \cdot y = k$) to provide a continuous and intermediary-free trading environment. Although such models enable decentralized trading, they frequently depend on external liquidity injections to maintain sufficient asset availability across broad price ranges.

Over time, this requirement for external input can hinder sustainable growth. As trading volume expands and demand rises, the corresponding price often increases nonlinearly, making it difficult to accommodate organic market expansion. Consequently, a scenario emerges where the initially provided liquidity is insufficient as the market evolves, and external factors become essential for ensuring stable operation.

Limitations of the Hyperbolic Model

Classical hyperbolic liquidity models assume that maintaining a fixed-product invariant will ensure continuous pricing. In practice, as demand intensifies, the quantity of assets available at a given price decreases, and the price responds with disproportionate increases. This pattern complicates economic analysis because any attempt to expand trading volume necessitates additional external liquidity to prevent steep price escalations.

Under these conditions, the market's growth depends on external participants willing to inject more assets. Without ongoing external supplementation, available liquidity diminishes, and prices spike sharply, discouraging entry by new participants and amplifying volatility. As a result, future growth is constrained. The system becomes reliant on external entities to sustain liquidity depth, introducing uncertainty and limiting long-term stability.

Furthermore, these models do not intrinsically define a strict mathematical trajectory for price evolution over time. The price progression is contingent on external supply conditions rather than a predetermined, quantifiable relationship. Without a fixed, internal mechanism to control price progression, the system lacks a predictable framework, complicating long-term analysis and strategic planning.

Principles of the Exponential Structure

The proposed solution eliminates external dependencies by depositing the entire token supply at the start. After this initial deposit, the liquidity pool (LP) NFTs are sent to a zero address, making their retrieval impossible and ensuring that liquidity cannot be altered post-deployment. This creates a static and immutable baseline that does not require additional external resources.

The supply is distributed across a predefined set of discrete price intervals, known as ticks, using Uniswap V3. Each tick represents a specific price segment. Defining a parameter α ensures that each incremental token added to the pool's order flow raises the price by a fixed ratio. Formally:

$$P(n) = P(0) \cdot (1 + \alpha)^{n}$$

where $P(0)$ is the initial price and n represents the number of tokens added. If N represents the number of tokens required for the price to double, then:

$(1 + \alpha)^N = 2 \Rightarrow \alpha = 2^{1/N} - 1$.

In this system, where N = 1,000,000**,** the parameter α is calculated as:

$\alpha \approx 2^{1/1,000,000} - 1 \approx 0.000000693147$, resulting in an approximate increase of 0.0000693% per token. After a total of one million tokens, the price doubles relative to the initial value.

This configuration establishes an exponential growth path independent of transaction size. Since the price increment per token is constant, large or small trades have the same proportional effect on price. The entire price trajectory is defined at inception and does not depend on subsequent asset additions. The system's evolution can be calculated precisely, as the liquidity is permanently locked and the price increments are determined solely by internal parameters.

This arrangement allows for complete quantitative analysis without assumptions about external conditions. Participants know the increment α and the specific points at which the price doubles, enabling straightforward planning. With the liquidity locked from the outset,

no external interventions are required. The market's long-term behavior is dictated entirely by the initial parameters and the defined exponential relationship.

Finally, by removing external control factors and prohibiting liquidity withdrawals, the mechanism prevents manipulation. It operates according to predetermined mathematical rules, ensuring predictable and stable behavior for any given n.

Conclusion

This exponential market-making structure redefines the relationship between supply, liquidity, and price by depositing the entire supply upfront, permanently locking it, distributing it across discrete ticks, and selecting α based on a chosen N. As a result, the price follows an exponential trajectory, defined by a known mathematical relationship. No external injections are necessary, and no adjustments are required. The resulting system is predictable, stable, and analyzable over the long term.

Appendices

Smart Contract Address:
0x4f4E65339ae6ec09fb3441Bbf765728cfd660244
View on Etherscan

Liquidity Pool Address:
0xf5D2c4209452c567705fe7DcC93DDCF61a63a100
View on Etherscan

Transaction Hash:
0x2f2874949053b6d1b8e3de9fe20cffd973ce7e0e8fa90509684d74e304156200
(Depositing liquidity across ticks and sending LP NFT to the zero address)
View on Etherscan

EXEX Overview
•Exponential Structure
•Price Simulator
•Market Simulation
•Liquidity Simulation
•Liquidity Details
View on Google Drive