

Mithril Whitepaper

Mithril is a rare and precious metal in Tolkien's universe, renowned for its properties of being:

1. Strong and lightweight.
 2. Resistant to tarnishing and corrosion.
 3. Rare and more precious than gold.
 4. Useful ornamentally and to fashion objects of import.
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Mithril Token: A Floor Adaptive Elastically Stable Token (FAST)

We propose Mithril, a FAST token on AO that exemplifies the metal's benefits of being:

1. **Strong:** A Floor Adaptive *Elastically Stable* Token that allows for upward mobility.
2. **Corrosion Resistant:** Immune to excessive downward swings through fiscal policy.
3. **Ultra rare:** with token emissions, quantities and halvings inspired by Bitcoin.
4. **Useful:** with mechanisms that reward for its adoption across AO's ecosystem and beyond.

A Primer on Stable Tokens and the Volatility Problem

Various stable tokens have existed since the inception of Bitcoin, in an attempt to solve the *volatility problem* of crypto currencies - where prices frequently change dramatically in relatively short periods of time.

The volatility problem leads to knock-on effects, causing challenges in:

1. Using crypto as a true store of value
2. Consistent pricing and incursion of menu costs, making it difficult to use them practically in the real world.

The volatility problem undermines crypto currencies' true ability to function as effective mediums of exchange, stores of value, and units of account and has so far allowed cryptocurrencies to only be used as instruments of speculation.

Stable tokens attempt to solve the volatility problem

Various types of stables have arisen to try to address these challenges. We categorise these stables below:

1. Fiat-Collateralized:

These maintain a 1:1 peg with a fiat currency by holding audited reserves of fiat so that each token is redeemable for the equivalent amount of the pegged currency. E.g. USDC, BUSD.

2. Real World Asset-Backed:

Similar to Fiat-Collateralized, each token represents a physical counterpart of an asset held in an audited vault. E.g. PAXG and SLVT for Gold and Silver assets respectively.

3. Crypto-Collateralized:

These decentralized stablecoins are generated through over-collateralized debt positions in smart contracts. Users lock excess crypto collateral (typically 150% or more) in vaults, minting stablecoin tokens. Liquidation mechanisms are used to maintain the desired peg. E.g. DAI

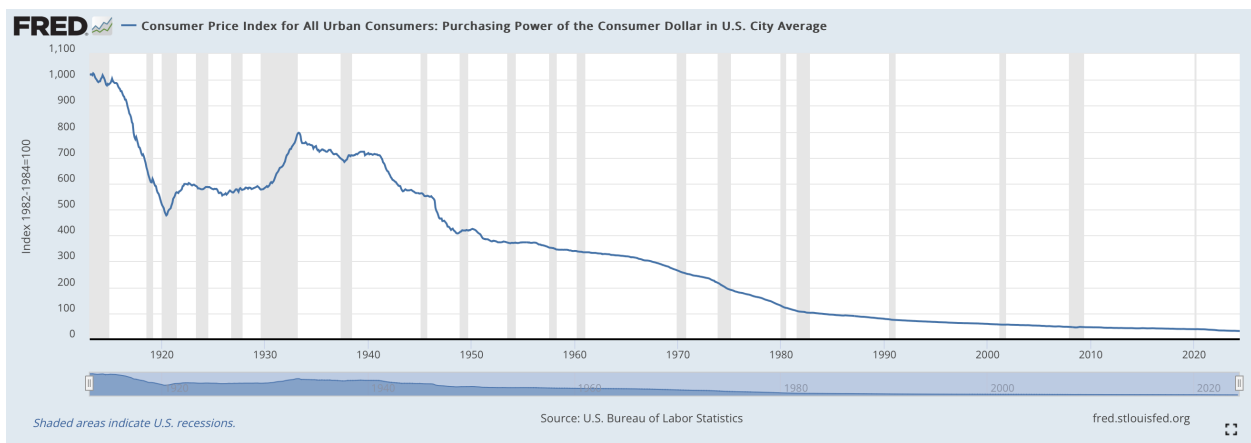
4. Algorithmic:

These stablecoins use various algorithmic approaches to maintain price stability. For example, UXD uses delta-neutral rebalancing mechanisms to allow capital efficient minting of UXD.

The problem of using Fiat as a pricing mechanism

While stable tokens have solved for menu costs by maintaining parity to the dollar with varied success, security guarantees and trade-offs, they also suffer from the following disadvantages:

1. By pegging themselves to fiat, they inherit the same inflational weaknesses that have seen a large drops in purchasing power over years.
2. This gives them a false sense of stability, where they are always equal to a dollar that by definition of being fiat, cannot maintain its value. Like fiat, they lose their ability to serve as a consistent measure of value over time



Source: U.S. [Bureau of Labor Statistics](https://www.bls.gov)

Flat coins as a solution to the Fiat Problem

Flatcoins attempt to remain stable while staying immune to inflation. They track and react to inflation indices such as the Consumer Price Index (CPI). Rather than being exactly equal to the USD, a flat coin will over time become slightly more valuable as the true value of USD decreases.

Ampleforth: a price-stable but supply volatile cryptocurrency

Ampleforth implements elastic supply protocols to *rebase* the token supply in response to price fluctuations. It uses oracle-fed price feeds and execute regular rebases, expanding or contracting token supply to all holders proportionally, targeting a price equilibrium of a CPI-adjusted USD.

During rebases, the total balances of all wallets either increases or decreases. However, the rebase algorithm tries to target a stable (USD terms) value in users' wallets.

In other words, while a wallet's native balance changes, the USD value remains approximately the same.

Price stable but supply volatile currencies typically have two actors that react differently to the supply adjustments.

1. Slow Actors:

- Typically hold for long periods and only occasionally buy/sell
- Generally indifferent to whether demand information is reflected in price or supply
- Net balance in their accounts (USD terms) remains the same before and after rebasing
- No compelling reason for them to buy or sell before or after a rebase

2. Fast Actors:

- Operate on short time windows and benefit from near-term trades
- See rebasing events as new market dynamics to potentially capitalize on

When a rebase happens, there exists a small time lag (window) before prices adjust to the increased or decreased supply.

During the Expansion window:

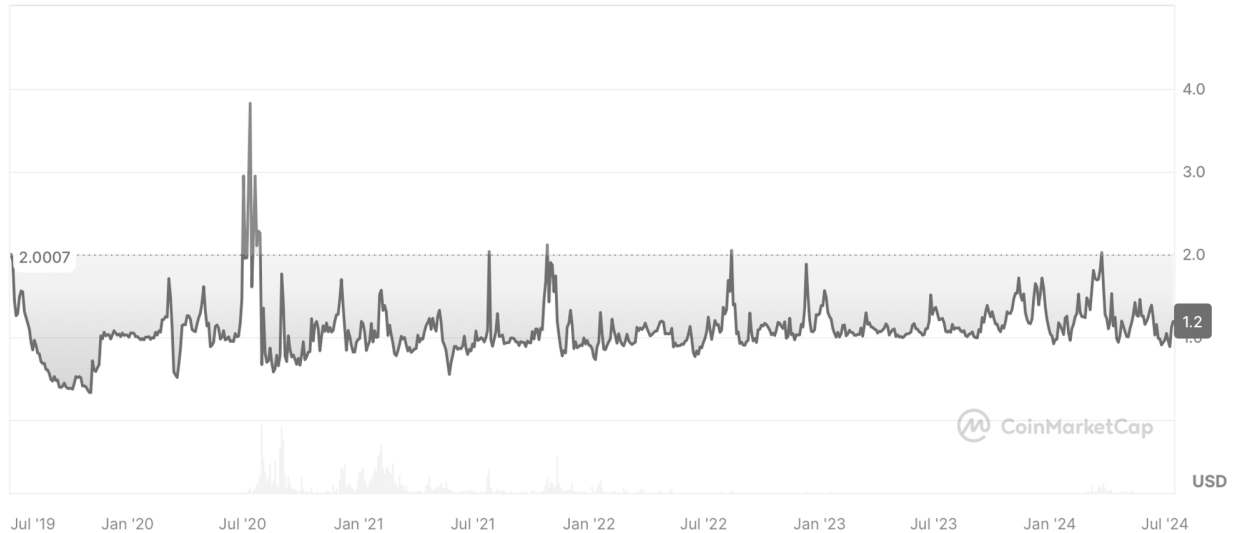
Fast actors have a limited opportunity to sell more units than before at the increased price, before other fast actors sell to restore prices to the desired lower equilibrium.

During the Contraction window:

Fast actors have a limited opportunity to purchase a greater percentage of the network before prices catch up to the limited supply.

In simple terms, fast actors act in anticipation of upward or downward price movement, based on the algorithm's rebase schedule.

This incentive mechanism has maintained AMPL at an equilibrium around its price target since 2019.



Source: [coinmarketcap](https://coinmarketcap.com)

Disadvantages of Flat coins

While pegging a token to the CPI solves for:

1. Volatility
2. Inflation

It still inherits the problems of targeting what is effectively a *derivative of Fiat*.

1. CPI Measurement Issues

- **Scientific rigour:** The fundamental problem of measuring the true purchasing power exists. The goods to include, the relative weight of each, etc are arbitrarily chosen.
- **Accuracy and Timeliness:** CPI is calculated and reported by government agencies, which may introduce lags and potential inaccuracies. Changes in CPI are not instantaneous and can lag behind real-time economic conditions.
- **Methodological Changes:** The methods used to calculate CPI can change over time, which can affect the consistency of the inflation measure.
- **Subjectivity:** The CPI represents an average basket of goods and services that might not reflect the consumption patterns of all individuals or regions. This means the adjustment may not be equally relevant for all users of the currency.

- **Temporal effects:** Factors like quality improvements in products or shifts in consumer preferences can affect its accuracy.
- **Political Manipulation:** There is a risk that CPI figures could be influenced by political agendas, leading to potential manipulation to present favourable economic conditions.

2. Artificial Downward Suppression of price

Keeping a currency tied to a CPI hinders its ability to naturally increase in value as its demand and usage grow over time. This artificial cap on appreciation limits the inherent potential of the currency to reflect true market dynamics and removes a compelling reason to hold it.

This perspective challenges the conventional Keynesian view that favours inflation and instead aligns more closely with economists who argue that some forms of deflation can be beneficial or at least not harmful to an economy.

For example, healthy deflation can result from:

1. Improved production efficiencies that lead to drops in prices
2. Growth of GDP in relation to the supply of currency

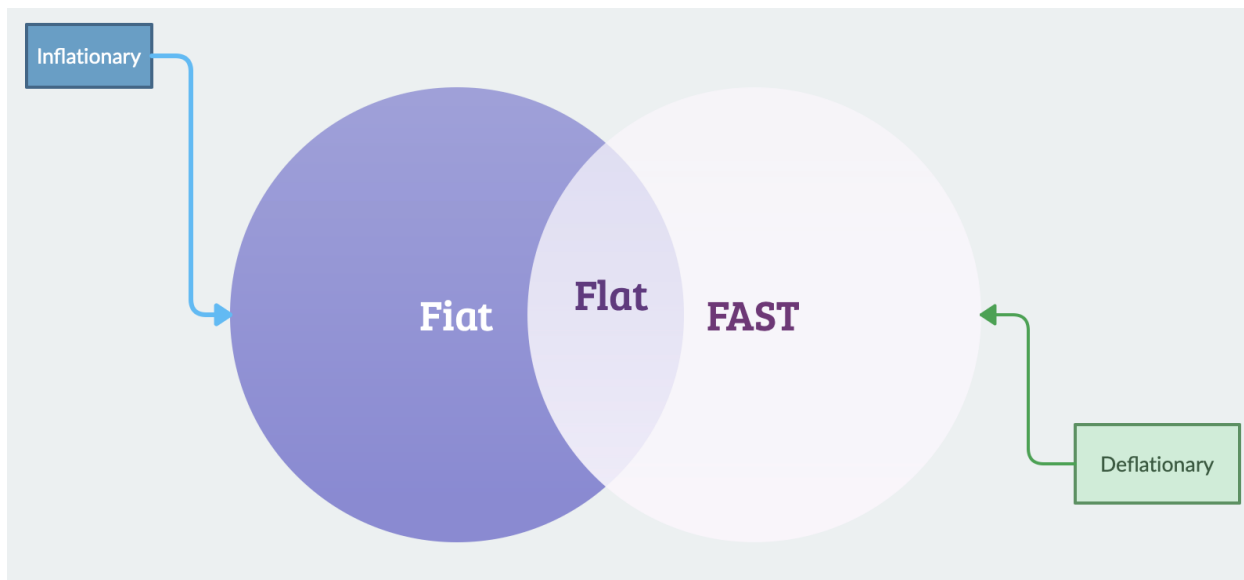
As goods become cheaper to produce, their prices should naturally fall, benefiting consumers and encouraging saving. This is in contrast to the unnatural pressure fiat places on spending and unnatural growth at all costs, to cover positions in a debt based system.

By artificially preventing appreciation, a CPI pegged fiat coin misses out on the potential benefits of natural deflation, such as increased purchasing power for consumers.

Mithril: A Floor Adaptive Elastically Stable Token (FAST)

Mithril uses the concept of rebasing to implement a FAST token with novel properties, that solves the problem of:

1. Fiat as a pricing mechanism.
2. Stable tokens' issue of inflation
3. Fiat tokens' issue of artificial downward suppression



While Fiat is inherently inflationary, and Flat Coins use Inflation and Deflation to maintain a peg, Mithril uses Deflation to maintain a price floor, while allowing the market to choose its upper-bounded price.

Target Price

Like Ampleforth, Mithril is a price-stable but supply volatile cryptocurrency that targets a price equilibrium.

Unlike Ampleforth, Mithril's price target is *dynamic*, allowing the market to price in higher equilibriums over time.

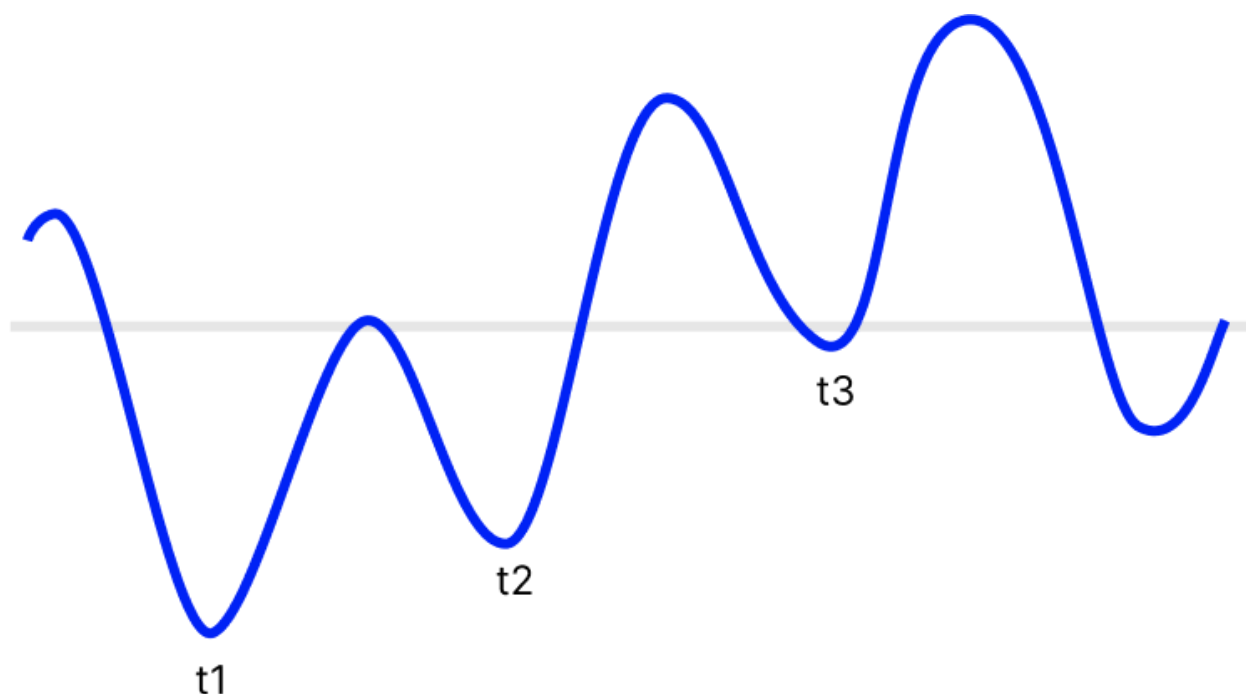
Floor Adaptive

Mithril periodically reduces its global supply so that lower prices revert to the *token lifetime's highest low*.

By reducing the supply globally (all wallets including AMMs), prices should automatically adjust to supply and demand. Even though the amount in an individual wallet would reduce during a rebase, *its percentage ownership of the entire market cap, relative to other wallets, remains the same*.

When a rebase happens, the market takes a certain amount of time to respond and for prices to equilibrate to a higher level. This creates a game-theoretic opportunity to acquire more tokens during dips after a rebase is triggered.

This is where fast actors come into play.



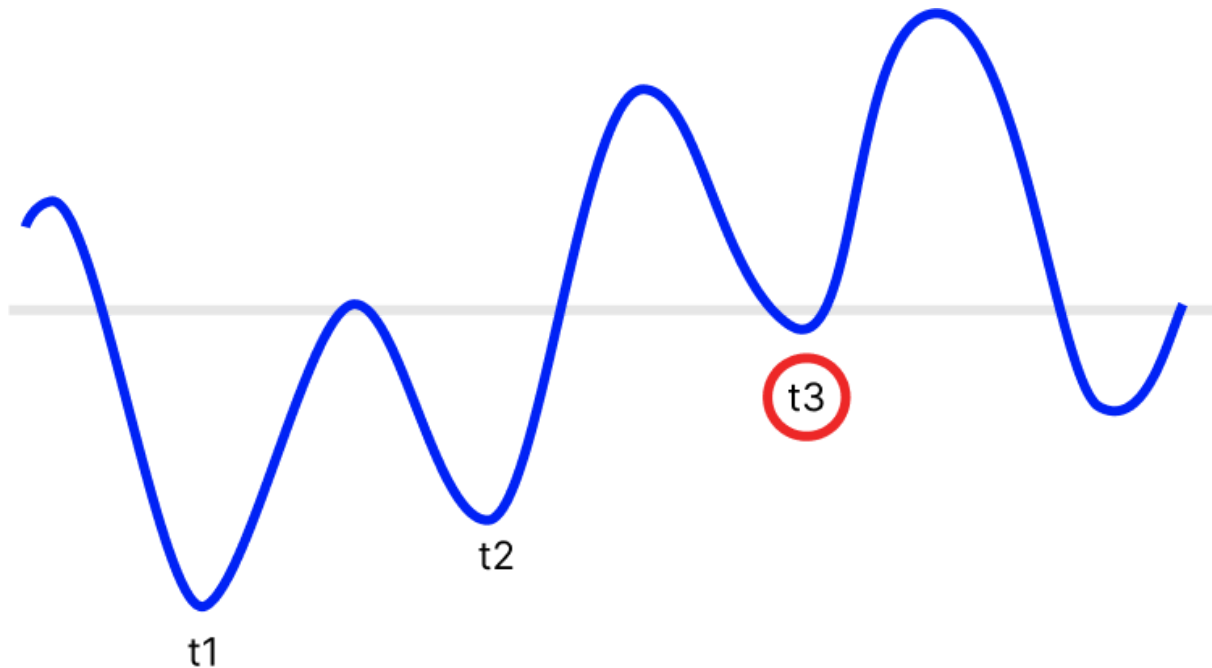
At each time period (t1 to t3) the highest low is recorded, acting as a rebase point for future dips.

Prices dropping below the current highest low trigger a rebase. In other words, Mithril is a *self-deflationary token that tries to ensure higher lows over time.*

Interval

The rebase happens every 24 hours, using the price of a selected AMM. This gives sufficient time for market makers to equalize prices in different AMMs across different blockchains before a rebase takes place. Additionally, a short period reduces the emotional dynamics that could take place during prolonged periods, such as excessive speculation.

Whales trying to trigger market dumps would simply have the sold tokens first collected by fast actors, then absorbed by the rebasing mechanism within 24 hours.



Above: Highest low is registered

Elastically Stable

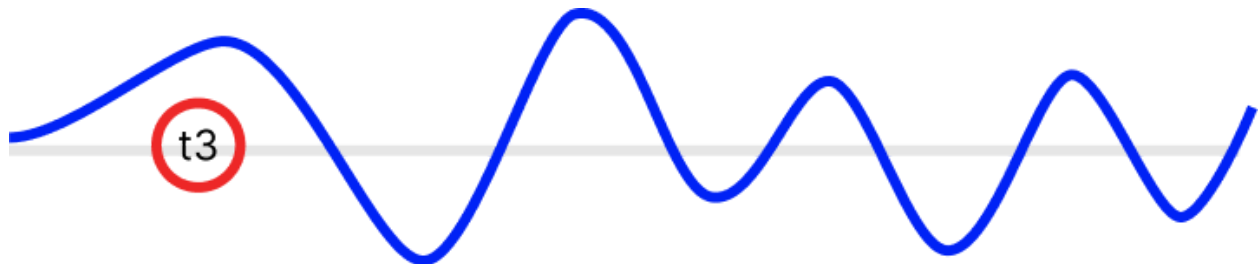
Mithril's price allowed to *stretch* upwards to attain a market based steady-state.

During periods of excessive greed, the token price rises until the market realizes it is overvalued, triggering a sale (a pattern observed in all instruments, over seconds, minutes, hours, etc.) When this happens, prices will drop to either of:

1. A higher low and resume climbing or remain stable. In this case, the algorithm records the current market's fair valuation of the token (highest low)
2. A lower low: Speculators are incentivized to own a bigger share of the token before a rebase happens, triggering buys. The rebase is then triggered (if necessary) bringing the price back up to the highest low.

Steady State (Game Theoretic Outcome)

Over time, the token reaches a dynamic equilibrium, where it is fairly stable, with its floor price tracking its record highest low.



Over time, Market approximates this as fair value around the highest low

This record can be broken (and raised) again during periods of:

1. Market exuberance, where the market re-values the token.
2. Growth of total stagnant tokens held in user wallets, which act as economic sinks that reduce the velocity of the current supply.
3. Growth in demand from increased usage

How Rebasing works

Rebasing works by having an internal

This rebasing mechanism employs an internal fixed-supply unit of account to implement elastic supply tokens. The protocol maintains a dynamic conversion rate between the internal units and the user-facing tokens. During a rebase, instead of directly altering user balances, the system updates this conversion rate. User balances in the elastic token are calculated by multiplying their internal unit balance by the current conversion rate. This method allows for efficient supply adjustments without modifying individual user balances, ensures proportional changes across all holdings, and minimizes gas costs as only a single value needs updating during a rebase event. By storing balances in the internal units and converting on-the-fly for transfers and balance checks, the system maintains accuracy and proportionality while enabling the elastic supply mechanism.

Tokenomics

Total Supply

Total theoretical supply: 21 million tokens

Decimal places: 8

Fair Launch and Emission Rates

1. Mithril is a 100% fair launch token following Bitcoin's economic model.
2. Mithril has a similar halving cycle of 4 years, with new tokens being distributed every 5 minutes to minters.

Minting Economics of Mithril

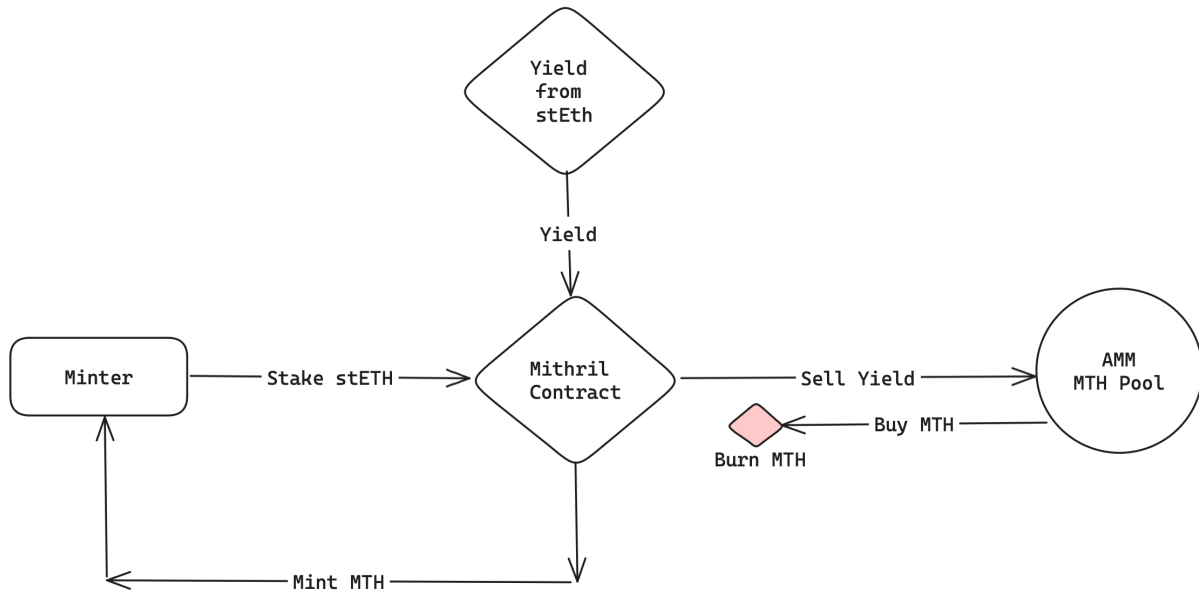
Being hyper-rare, the Mithril can only enter circulation through minting. Minters need to deposit approved yield bearing tokens such as stETH or LP tokens into a smart contract on AO.

This aligns with Bitcoin's Cost of Production (Energy-Value Equivalence) pricing model, which suggests that the cost of mining Bitcoin, primarily electricity and hardware costs, sets a lower bound on its price. Miners are unlikely to sell below their production costs for extended periods.

In a similar way, the opportunity cost of staking a yield bearing asset to mint Mithril helps to encourage a lower bound for the token.

Buy and burn

Yield earned from staked yield bearing tokens belongs to Mithril's contract. This yield will be used to buy and burn Mithril from its AMM.



Mithril Growth Engine (MGE)

In order to encourage:

1. Minters
2. Ecosystem growth

Given that transfer fees are significantly lower than what users are accustomed to on other chains, Mithril can charge a fee (F) that is greater than the standard fee (F_s), and less than the fee on other blockchains (F_b).

$$F_s \leq F \leq F_b$$

By default, a portion of this fee goes to minters, in addition to tokens they earn from minting. The transfer contract also allows two parameters to be passed into it by third parties:

1. X-Fee (a percent with a hard upper-bound that adjusts the transfer fee.)
2. X-Fee-Beneficiary (an address that receives the full amount of X-Fee)

When these two parameters are defined by a third party, the entire fee amount goes the requester. This is a non-inflationary way to encourages application, wallets and any other integrations to benefit from incorporating Mithril.

Use cases

The MGE creates an opportunity for non-custodial services to integrate Mithril and benefit from the fees. One can expect to see web3 analogs of services that encourage trade in exchange for fees, such as PayPal, eBay, Fiverr, Online Casinos, etc.

In DeFi, Mithril would also be useful as a hedge against volatility, unit of account for contracts, alternative reserve asset in diversified portfolios, etc. Any service integrating Mithril would earn extra revenue in each exchange.

MGE tokens

MGE tokens exist to fund and develop the growth of Mithril's ecosystem. When X-Fee and X-Fee-Beneficiary are not defined, MGE tokens are bought and burned by Mithril's default trading fee. MGE tokens will exist in an MGE/ Mi pool.

Caveats of Mithril

While Mithril presents an innovative approach to cryptocurrency stability and value preservation, it's important to consider potential challenges and limitations:

Although Mithril attempts to maintain a floor by reducing the supply, the USD value of a constant number of Mithril tokens is still dependent on its total market-cap. Like any instrument, its true value needs to come from a combination of trust and a growth in use-cases. While the floor-adaptive mechanism aims to maintain a price floor, extreme market conditions could potentially test this system.

Conclusion

Mithril presents a novel approach to stability and value preservation. While it faces challenges common to all cryptocurrencies, its unique features – particularly the floor-adaptive mechanism and growth incentives – position it as an intriguing option in the evolving digital asset landscape.

The success of Mithril will ultimately depend on its ability to build trust, demonstrate real-world utility, and foster a growing ecosystem of users and applications. With careful management, Mithril has the potential to address key challenges in the cryptocurrency space and offer a compelling alternative to traditional stable and volatile tokens alike.