Incentivized Long-Term Conviction in Digital Commodities Markets: HODL - The ETF Subnet

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Abstract

We present HODL - The ETF Subnet, a protocol for incentivizing long-term capital allocation in dynamic TAO (dTAO). The current Bittensor ecosystem suffers from excessive short-term speculation, leading to market instability and misaligned incentives. Our protocol addresses this through a reward distribution mechanism that combines stake size and temporal commitment. We introduce a secondary market for tradable conviction positions, enabling price discovery for time-locked assets while maintaining market stability. Our incentive function $I(S, D) = S^{\gamma}\left(1 + k \cdot \ln\left(1 + \frac{D}{30}\right)\right)$ provides sublinear returns on holding duration, preventing unbounded advantages while encouraging sustained participation. The protocol creates economic sustainability through deflationary token-economics via TAO-denominated fees that fund automated Alpha buybacks, and a unique performance fee structure on realized premiums. This work demonstrates a path toward reducing volatility and improving capital efficiency in decentralized digital commodities markets.

1 INTRODUCTION

The Bittensor Network employs a fuzzy consensus mechanism known as Yuma Consensus which allows for isolated incentive systems known as Subnets. These permissionless gamified environments, driven by reward functions, are designed to orchestrate peers to contribute meaningful work. Said output is commodified through the Subnet's token known as Alpha. Alpha tokens are emitted into the system as part of its token incentives. These Subnets face a fundamental coordination problem: how to align short-term capital mobility with long-term network stability. Current dynamic TAO (dTAO) markets exhibit characteristics of a continuous double auction with information asymmetry, where participants optimize for immediate gains at the expense of ecosystem health.

1.1 Market Dysfunction Patterns

The current dTAO market is characterized by three primary dysfunctions:

Hype-Driven Trading. Investment decisions are frequently based on news, rumors, and fear of missing out (FOMO), rather than fundamental analysis and long-term conviction. This creates inefficient price discovery and excessive volatility.

Rapid Capital Rotation. Participants constantly move capital between subnets in search of short-term opportunities, leading to fragmented liquidity and market instability. This behavior undermines sustainable subnet development through volatile emission funding.

Lack of Conviction Rewards. The current system does not adequately reward long-term holders. Those engaging in quick flips often reap greater rewards, creating a prisoner's dilemma where rational short-term behavior produces collectively suboptimal outcomes.

1.2 Proposed Solution

This paper introduces HODL - The ETF Subnet, which addresses these challenges through three key innovations:

1. **Time-weighted reward distributions** with logarithmic decay
2. **Tradable position certificates** enabling secondary market liquidity
3. **TAO-based fee structure** funding deflationary Alpha buybacks

We provide theoretical analysis, implementation details, and economic mechanisms for time-locked conviction positions.

2 SYSTEM ARCHITECTURE

2.1 Network Model

Let $\mathcal{N} = \{1, ..., n\}$ denote the set of miners in the subnet, where $n \leq 256$ initially. Each miner $i \in \mathcal{N}$ maintains a position characterized by:

- $S_i \in \mathbb{R}^+$: TAO-equivalent stake balance
- $D_i \in \mathbb{Z}^+$: uninterrupted holding duration (days)
- u_i: unique identifier (UID) slot

The subnet distributes total emissions E_{total} per epoch, with miner allocation:

$$E_{\text{miners}} = 0.41 E_{\text{total}} \tag{1}$$

2.2 Core Principles

Incentivized Holding. The subnet rewards participants for both stake size and duration through mathematical optimization. This directly aligns incentives with long-term holding strategies.

No-Code Mining. The mining process requires minimal technical expertise, lowering barriers to entry through:
- Simple web interface for all operations
- Automated delegation management
- Zero coding requirements

Tradable Conviction Positions. Revolutionary secondary market mechanics allow miners to trade entire index positions, including time-locked value and scarce miner slots, creating new asset classes beyond simple TAO holdings.

3 FRAMEWORK

3.1 Incentive Function Design

We define the staking incentive function:

$$I(S, D) = S^{\gamma} \left(1 + k \cdot \ln\left(1 + \frac{D}{\tau}\right)\right) \tag{2}$$

where:
- $\gamma \geq 1$: balance dominance exponent
- $k \in [0, 1]$: duration scaling coefficient
- $\tau = 30$: time normalization constant (days)

Initial parameters: $\gamma = 1.00$ (linear balance scaling), $k = 0.25$ (moderate duration bonus).

Proposition 1. *The function $I(S, D)$ is monotonically increasing in both arguments and exhibits sublinear growth in duration.*

Proof. Taking partial derivatives:

$$\frac{\partial I}{\partial S} = \gamma S^{\gamma - 1} \left(1 + k \ln\left(1 + \frac{D}{\tau}\right)\right) > 0 \tag{3}$$

$$\frac{\partial I}{\partial D} = \frac{k S^{\gamma}}{\tau\left(1 + \frac{D}{\tau}\right)} > 0 \tag{4}$$

The second derivative with respect to D:

$$\frac{\partial^2 I}{\partial D^2} = -\frac{kS^\gamma}{\tau^2\left(1+\frac{D}{\tau}\right)^2} < 0 \tag{5}$$

demonstrates diminishing marginal returns, preventing unbounded advantages from extremely long holding periods.
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3.2 Reward Distribution

Individual miner emissions follow proportional allocation:

$$\text{Emission}_i = E_{\text{miners}} \cdot \frac{I(S_i, D_i)}{\sum_{j=1}^{n} I(S_j, D_j)} \tag{6}$$

This mechanism ensures three critical properties:

1. **Strategyproofness**: Reporting true stake is optimal
2. **Sybil Resistance**: Splitting positions has no gain
3. **Bounded Advantage**: Logarithmic duration prevents dominance

3.3 Duration Cap Implementation

To prevent runaway boosts from extremely long holding periods, we implement:

$$D_{\text{eff}} = \min(D, D_{\text{max}}) \tag{7}$$

with modified incentive:

$$I(S, D) = S^\gamma \left(1 + k \cdot \ln\left(1 + \frac{D_{\text{eff}}}{\tau}\right)\right) \tag{8}$$

Setting $D_{\text{max}} = 365$ days provides a 12-month horizon for maximum duration benefits while maintaining bounded rewards.

4 TOKEN ECONOMICS

4.1 Alpha Token Value Model

The Alpha token derives value through conversion to TAO via automated buyback mechanisms. This section has been streamlined to reflect the core economic reality: Alpha token utility is fundamentally its convertibility to TAO through the buyback system.

Value Creation Mechanism:

- Secondary market generates TAO-denominated fees
- Fees automatically purchase Alpha from market
- Purchased Alpha creates buying pressure
- Token holders benefit from deflationary dynamics

The buyback mechanism serves as the primary value accrual pathway for Alpha holders, creating sustainable demand through protocol revenue.

5 SECONDARY MARKET PROTOCOL

5.1 The HODL Index Exchange

The secondary market, termed the HODL Index Exchange, enables trading of complete miner positions. Participants purchase positions to gain:

- Immediate entry/exit without slippage or price impact
- MEV protection through OTC-style execution
- Scarce miner slots with embedded time value

- No market disruption to underlying subnet tokens

5.2 Conviction Value Mechanism

The secondary market creates tradable time value through a novel mechanism:

Core Concept. Miners earn emissions based on staking duration and amount. When trading positions, buyers acquire not just current holdings but future emission streams.

5.3 Scarcity-Driven Value Creation

UID Scarcity Premium. Only 256 miner UID slots exist initially, creating artificial scarcity. Market dynamics:

- Limited supply (256 positions maximum)
- Growing demand as ecosystem matures
- Premium valuations for established positions
- Speculation on future emission value

Dynamic UID Expansion. To balance scarcity with accessibility, mining pools will be gradually introduced algorithmically—similar to Bitcoin's pooled mining—allowing participation beyond 256 UIDs while maintaining fair reward distribution.

Supply expansion follows market signals to achieve equilibrium between:
- Preserving index price premiums
- Maintaining healthy scarcity value
- Enabling broader participation

6 FEE STRUCTURE AND TREASURY MECHANICS

6.1 Transaction Fee Framework

Baseline Transaction Fee: 0.5%
- Applied to all secondary market transactions
- Payable in TAO
- Allocated to Alpha token buyback
- Remaining funds support platform development

Note: The 0.5% rate represents initial deployment parameters. Based on community feedback and transaction volumes, this may be adjusted downward (potentially to 0.2-0.25%) to encourage higher volume adoption while maintaining economic sustainability.

Performance fee on realized premiums: 20%
- Applied only to profitable sales
- Calculated as: $\tau_g = 0.20 \cdot \max(0, P_{\text{sale}} - P_{\text{purchase}})$
- Collected in TAO
- Used exclusively for Alpha buyback

This does not affect Tao Staked as Alpha in the Indexes or in other words the principle.The fee only applies when a sale generates a profit for the buyer from the premium. The performance fee on realized premiums serves as the primary revenue mechanism, supporting token health through consistent buyback pressure. This rate remains fixed at 20% to ensure adequate revenue generation, during early phases before high-volume trading develops.

6.2 Treasury Operations

Treasury accumulation evolves as:

$$\frac{dT}{dt} = f \cdot V_{\text{trade}} + \tau_g \cdot G_{\text{realized}} \tag{9}$$

where:

- $f = 0.005$: transaction fee rate (subject to adjustment)
- $\tau_g = 0.20$: performance fee on realized premiums
- V_{trade}: trading volume
- G_{realized}: realized capital gains

Automated Buyback Mechanism:
- Fees accumulate in treasury wallet
- Execute periodic Alpha purchases
- Purchased tokens remain in treasury
- Creates buying pressure and value accrual

6.3 Economic Sustainability

The fee structure creates a self-reinforcing value cycle:

Increased Trading → Higher Fees → More Buybacks → Alpha Appreciation → UID Expansion → More Trading

This mechanism ensures long-term sustainability while aligning participant incentives.

6.4 Transfer Mechanism

Positions transfer via atomic batch operations on Bittensor:

Technical Specifications:
- Transaction type: Batch stake transfer and Hotkey Swap
- Execution: Fully automated

Properties:
- Atomicity: All-or-nothing execution
- Security: Cryptographic proof of ownership
- State preservation: Buyers inherit full position benefits

7 IMPLEMENTATION AND DEPLOYMENT

7.1 Phased Rollout

Phase 1 (October 2025): MVP with 3 subnet indexes
- Validate core incentive mechanisms
- Test mathematical reward distribution
- Establish baseline participation

Phase 2 (November 2025): Expand to 5 indexes
- Reallocate 41% emissions (8.2% per index)
- Grow toward 256 UID capacity
- Optimize distribution algorithms

Phase 3 (December 2025): Full V1 deployment
- Achieve stable 256 miner participation
- Establish Alpha token utility
- Finalize foundation for V2

Phase 4 (January 2026): V2 Exchange launch
- Deploy HODL Index Exchange
- Enable position trading
- Implement secondary market mechanics

7.2 Technical Architecture

UID Slot Management:
- Maximum 256 slots initially

- Automated allocation by stake and timing
- Fair distribution preventing centralization
- Future expansion via mining pools

Integration:
- Built on TrustedStake infrastructure
- Proven index management systems
- Automated rebalancing
- Real-time tracking and reporting

Security:
- Cold key authentication
- Smart contract automation
- Regular security audits
- 99.9% uptime target

8 COMPETITIVE ANALYSIS

8.1 Value Propositions

First-Mover Advantage:
- Revolutionary secondary market design
- Proven team with existing platform
- Early access to emerging opportunities

Technical Niceties:
- Simple mechanism to mitigate gaming
- No-code accessibility
- Professional index management
- Automated systems reducing error

Economic Innovation:
- Novel tradable time-locked positions
- Scarcity-driven premiums
- Deflationary token mechanics via buybacks
- Sustainable fee-based revenue

8.2 Market Differentiation

Versus direct subnet investment:
- Professional diversification and risk management
- Automated rebalancing
- Long-term conviction rewards
- Reduced complexity

Versus traditional staking:
- Tradable positions with liquidity
- Time value monetization
- Scarce UID slot premiums
- MEV and slippage protection

9 FUTURE DEVELOPMENT

9.1 Short-Term (Q1 2026)

Mining Pool Implementation:
- Remove 256 UID limitation

- Maintain fair reward distribution
- Enable participation for all stake sizes
- Enhance accessibility and UX

Fee Optimization:
- Evaluate transaction fee reduction based on volume metrics
- Balance between adoption incentives and sustainability
- Maintain 20% performance fee on realized premiums for revenue stability
- Implement dynamic adjustment mechanisms if warranted

9.2 Long-Term Vision (2026+)

Ecosystem Expansion:
- Cross-chain integration
- Institutional onboarding programs
- Traditional finance bridges

Innovation Pipeline:
- Predictive analytics
- Advanced derivatives (options, futures)
- DAO governance evolution
- AI-powered optimization

10 CONCLUSION

HODL - The ETF Subnet represents a novel approach to mechanism design for decentralized markets. By combining token incentives, tradable conviction positions, and sustainable token-economics through TAO-based fee structures, we address fundamental challenges in dTAO ecosystem stability.

10.1 Key Contributions

1. **Framework:** Sublinear incentive function balancing stake and duration
2. **Secondary Market Protocol:** Tradable positions with embedded time value
3. **Economic Sustainability:** Self-reinforcing deflationary mechanics via buybacks
4. **Strategic Treasury Management:** Value preservation through non-destructive reserve accumulation

10.2 Theoretical Implications

Our work demonstrates that properly designed incentive mechanisms can align short-term individual rationality with long-term collective welfare in decentralized systems. The logarithmic duration component prevents centralization while encouraging sustained commitment.

10.3 Practical Impact

Initial deployment targets:
- Reduced market volatility through conviction rewards
- Improved capital efficiency through position tradability
- Professional-grade portfolio management access
- Novel asset class creation via time-locked positions

Future work will focus on empirical validation, parameter optimization, cross-chain generalization, and derivatives market development.

The protocol represents a step toward mature decentralized financial infrastructure, where speculation gives way to conviction, volatility to stability, and individual trading to community-driven wealth creation.

The future of conviction-based investment starts with HODL.

This whitepaper represents current vision and technical specifications. As a living document, it will continue evolving based on community feedback, market conditions, and technological developments. All participants should conduct independent research and consider risk tolerance before participating.

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