VitaMeme: A Social Media-Based Incentive Protocol for Enhancing On-Chain Meme Vitality

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ABSTRACT

Internet memes evolve like life forms through social media, traditionally showing brief vitality driven by impulsive attention span (e.g., #icebucketchallenge). The emergence of Web3 introduced memecoins (e.g., $DOGE, $PEPE, $SHIB), combining cultural phenomena with decentralized finance, extending meme longevity through financial incentives. Recent memecoin launch platforms like pump.fun (e.g., $CHILLGUY, $PNUT, $GOAT) have further democratized memecoin creation. However, smart contracts of memecoins are "blind organisms" that lack direct connection to social media engagement signals, instead relying solely on market trading driven by community sentiment, often leading to short-lived momentum and premature extinction. We present VitaMeme, an experimental protocol that acts as a vital catalyst to sustain meme life through directly incentivizing social media engagement. Early memecoin adopters create reward pools with dynamic bonding curves to encourage organic meme creation and consistent propagation. Creators and curators earn rewards through verifiable social media engagement using TLS Notary protocol, enabling smart contracts to "see". A return mechanism channels value back to pool donors for mutual benefit. This permissionless protocol, applicable to any memecoin, creates a self-sustaining viral marketing system that extends meme vitality throughout its lifecycle.

CCS CONCEPTS

• **Information systems → Incentive schemes**; • **Human-centered computing → Social media**; • **Social and professional topics → Information system economics**.

KEYWORDS

Web3, Memetics, Internet Meme, Viral Marketing, Game Theory, Protocol, Memecoin, Social Media, Meme Diffusion, Verifiable Computation, TLS Notary, Mechanism Design, Artificial Life

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1 INTRODUCTION

First introduced by Richard Dawkins in "The Selfish Gene"[5], a meme is any cultural item—such as an idea, behavior, or style—that replicates and evolves across society via imitation, potentially mutating and adapting like a biological organism. Susan Blackmore extends this view in "The Meme Machine" [3], suggesting that memes effectively use human minds as their "copying machines." With the rise of social media, this process has accelerated: memes now spread rapidly across social media platforms like Twitter, TikTok, and Reddit, where researchers have modeled their diffusion as a contagion-like process [14] similar to epidemiological models, where memes surge ("go viral") before quickly fading as public interest wanes. The Ice Bucket Challenge [10] perfectly illustrates this pattern—in 2014, it captured global attention and raised substantial funds for ALS research, yet mainstream engagement dissipated within a year or two [11]. While such viral marketing campaigns can spark intense short-term involvement, sustaining that momentum over a longer horizon remains an enduring challenge.

The emergence of "memecoins" in the Web3 era extends meme vitality by embedding financial incentives into cultural phenomena [8]. One of the earliest and most prominent examples is Dogecoin[1], launched in 2013 as a tongue-in-cheek commentary on cryptocurrency market speculation. Bolstered by social media hype and high-profile endorsements—such as those from Elon Musk—Dogecoin soared over 11,000% in value within two years [2]. Each time meme-related publicity surges, such as the announcement *"SpaceX will launch a moon mission funded by Dogecoin in 2022"*[2], can spark price spikes, which in turn attract more attention and fuel community participation through social media content propagation. This self-reinforcing dynamic, which we call the "**Culture-Value Flywheel**," creates a positive feedback loop where cultural spread and financial speculation amplify each other, extending the meme's lifespan. Kapoor et al. [7] likewise demonstrate the positive influence of social media on NFT valuation. As of 2024, Dogecoin has become the seventh-largest cryptocurrency by market capitalization[3], underscoring the sustaining power that arises when memes merge with financial incentives.

Following a similar flywheel model, numerous successful memecoins—including $SHIB[4] and $PEPE[5]—have emerged across various blockchain networks, each quantifying a distinct Internet meme. In 2024, memecoin fair-launch platforms like Pump.fun (launched January 2024) pushed this memecoin trend to a new height, generating

[1] https://en.wikipedia.org/wiki/Dogecoin
[2] https://www.space.com/spacex-dogecoin-moon-mission
[3] https://www.coingecko.com/en/coins/dogecoin, visited on Dec 18, 2024
[4] https://www.coingecko.com/en/coins/shiba-inu, visited on Dec 18, 2024
[5] https://www.coingecko.com/en/coins/pepe, visited on Dec 18, 2024

over five million new memecoins in under a year[6]. By applying a bonding curve pricing model to adjust token prices according to supply and demand, Pump.fun democratizes memecoin creation and distribution. A notable example is $CHILLGUY[7], which skyrocketed to a $657 million market cap within a week—driven in large part by TikTok virality and a high-profile tweet from Salvadoran President Nayib Bukele, similar to Elon Musk's impact on Dogecoin.

Nonetheless, most memecoins lack intrinsic value and have no governing central authority, thus operating largely as speculative "pump-and-dump" assets. Viewed as "public goods" of culture—nonexcludable and nonrivalrous—memecoins frequently encounter free-rider problems [4]. Early token owners may exit once they profit, halting subsequent meme propagation. Newcomers likewise fear losses, discouraging further participation and creative engagement. As a result, 99% of memecoins on Pump.fun fail within a month[8], never evolving into the kind of robust cultural phenomenon needed for meme longevity. The excessive emphasis on price action overshadows the creative cultural dynamics that initially fuel meme engagement.

The core of this challenge is the notion that typical memecoin smart contracts is "blind" [9]: they can only access on-chain financial signals, not the off-chain social media engagement data that truly drives meme vitality. While on-chain trading metrics may reflect immediate market sentiment, it cannot capture the accumulating life cycle of meme creation, propagation, and adaptation social media platforms like Twitter. As a result, these contracts fail to incentivize the kind of community-driven engagement that gives memes their cultural sustaining power.

To bridge this gap, we introduce VitaMeme, an experimental protocol designed to boost meme vitality by directly rewarding social media engagement. Leveraging TLS Notary protocol [6], VitaMeme securely verifies off-chain social media posts, enabling smart contracts to "see" viral social media engagement without relying on a centralized API. Early adopters contribute to dynamic bonding-curve reward pools that compensate creators and curators for verified social media engagement. A portion of each pool's returns flows back to these initial backers, creating a mutually beneficial ecosystem where both sponsors and creators share in the meme's ongoing success. This permissionless protocol, applicable to any memecoin, provides a self-perpetuating viral marketing mechanism [13] to sustain meme vitality throughout its lifecycle.

In summary, our contributions are three-fold:

(1) We propose the concept of the "Culture-Value Flywheel," highlighting a self-reinforcing mechanism where cultural memes and tradable tokens amplify each other's growth.
(2) We present VitaMeme as a catalyst for sustaining meme vitality through an incentive mechanism that encourages meme creation and propagation. The protocol uses trustless verification to link off-chain social media engagement with on-chain rewards.
(3) We discuss how this model may shape decentralized viral marketing, noting current limitations and identifying directions for further exploration.

2 RELATED WORKS

2.1 Bridging On-chain and Off-chain Worlds

2.1.1 Limitations of Existing Oracles. Blockchains, by design, operate as deterministic and self-contained systems, making them "blind" to any data not already stored on-chain. This limitation has given rise to blockchain oracles [1]—middleware solutions responsible for bridging smart contracts with real-world data in both directions. Foundational oracle paradigms encompass both inbound frameworks, which feed external data into the blockchain, and outbound frameworks, which transmit on-chain data to external systems [9]. Research also demonstrates that oracles may employ cryptographic authenticity proofs to ensure data integrity. In addition, theoretical studies explore strategies to detect malicious data feeds, design incentive-centric game-theoretic mechanisms, and implement decentralized consensus algorithms that reduce single points of failure [9]. However, oracles face significant challenges in accessing certain types of information. For example, data from social media platforms and other dynamic, permission-restricted sources often remains beyond their reach.

2.1.2 TLS Notary as a Privacy-Preserving Verification Mechanism. TLS Notary has emerged as a pivotal mechanism for verifying the integrity of off-chain data captured through TLS sessions [12] without requiring trust in a central authority. Unlike standard TLS, which only secures point-to-point data transport, TLS Notary integrates an auditing protocol that enables a third party (the auditor) to confirm that the retrieved content genuinely originates from a particular server and was not tampered with during transit. This protocol supports "partial-visibility" options, enabling users to disclose only the minimal necessary content for verification while keeping other parts private [6]. TLS Notary operates directly from the user's browser, bypassing centralized social media APIs, to provide cryptographic verification of social media posts' existence and content, thereby ensuring their authenticity and integrity. Supported by Ethereum Foundation's Privacy and Scaling Explorations (PSE) team[9], TLS Notary[10] is recent available as an open-source project.

3 DESIGNING PROTOCOLS

In this section, we propose the design of the VitaMeme protocol to incentivize and sustain memetic vitality by linking on-chain reward with off-chain social media signals.

3.1 Design Consideration

3.1.1 Culture-Value Flywheel. Central to our design is establishing a self-reinforcing feedback loop between cultural vitality and economic value. As creators and curators generate engaging memes, their impact on social media is verified and rewarded on-chain. These rewards, in turn, encourage more participation, which fuels

[6]https://dune.com/jhackworth/pumpfun, visited on Dec 18, 2024
[7]https://www.coingecko.com/en/coins/just-a-chill-guy, visited on Dec 18, 2024
[8]https://www.binance.com/en/square/post/11667244760529, visited on Dec 18, 2024
[9]https://pse.dev
[10]https://tlsnotary.org

further cultural diffusion. This dynamic, we called it, "Culture-Value Flywheel"—helps maintain momentum over time.

3.2 Roles

3.2.1 Donor. A donor, typically an early adopter or coin holder who wants to accelerate meme spread, contributes capital in the form of target memecoin to the reward pool to incentivize meme content creation. By doing so, donors bet on the memecoin's longevity, anticipating that increased meme spread will drive up its price.

3.2.2 Creator and Curator. Creators create new meme content that generates traction around the target memecoin, while curators identify, promote, and manage emerging meme content through endorsement and social media resharing. Both creators and curators earn rewards based on their posts' verified social media impact. This financial incentive encourages creators to produce viral memes while motivating curators to expand the meme's reach.

3.3 State Variables

- Total Liquidity (L): Sum of all donor liquidity contributions in term of the target memecoin
- Per-donor Liquidity Shares (L_{donor}): Individual donor liquidity contributions
- Global Reward Index (I): Cumulative rewards distributed per unit of liquidity
- Per-donor Stored Index (I_{donor}): Individual donor's snapshot of I at last stake update

3.4 Rewarding Pool

For each target meme, VitaMeme creates a reward pool, where donors can donate memecoins. This pool serves as a reservoir of funds from which creators and curators draw their rewards. When a donor contributes an additional amount L_{donor}, the total liquidity is updated as follows: $L \leftarrow L + L_{donor}$. The current global reward index I is recorded as I_{donor} for this donor when donor donates. This baseline will be used for calculating the donor's proportional share of future rewards.

3.5 When a Claim Occurs

Claimants (creators/curators) initiate claims through social media posts containing verifiable references (e.g., contract addresses, designated hashtags) (See Fig. 1). Post authenticity is verified via TLSNotary, enabling on-chain reward claims based on engagement metrics E (reshares, likes, views). Each post can be claimed only once. The raw engagement E is converted into contribution score ΔS using a quadratic function:

$$\Delta S = \sqrt{E} \tag{1}$$

This quadratic funding approach [4] empowers grassroots creators by boosting the relative impact of smaller contributions while preventing centralization by limiting outsized rewards from viral posts.

The protocol's core is a bonding curve that dynamically allocates rewards based on social contribution score S:

$$B(S) = \alpha \cdot L^{\beta} \cdot \sqrt{S + S_0}, \tag{2}$$

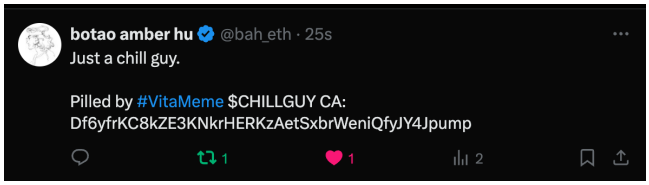

Figure 1: Sample social media post VitaMeme around the target memecoin $CHILLGUY, mentioning the contract address

where:

- α: A scaling constant
- β: A parameter controlling how rewards scale with liquidity ($0 \leq \beta < 1$); by default, $\beta = 0.5$
- S: The cumulative contribution score, defined as $S = \sum \sqrt{E_i}$, where E_i are the engagement metrics of recent claims
- S_0: An offset to ensure smooth initial distribution and avoid disproportionate early rewards

The incremental reward from the bonding curve is:

$$\Delta R = B(S + \Delta S) - B(S)$$

The reward follows a decreasing curve over time, rewarding earlier content propagation with higher returns. After each claim, the cumulative contribution score updates:

$$S \leftarrow S + \Delta S$$

3.6 Reward Splitting

Donors who initially seed the reward pool also share in the system's growth. A portion of the generated rewards flows back to these early supporters. This arrangement creates a mutualistic relationship: donors provide the initial capital, while creators and curators generate cultural engagement, collectively enhancing the meme's longevity and value.

The incremental reward ΔR is divided between the claimant and the donors:

$$\Delta R_{\text{claimant}} = \Delta R \cdot (1 - s), \quad \Delta R_{\text{donor}} = \Delta R \cdot s,$$

where $s \in [0, 1]$ is the fraction of rewards returned to donors, serving as interest rates over time, which can be determined through a donor-driven DAO vote governed by voting power L_{donor}. The protocol maintains equilibrium in response to market conditions. If meme engagement wanes, increasing donor interest rates can incentivize renewed participation, stabilizing the economy and fostering long-term community stewardship.

To fairly distribute ΔR_{donor} among all donors, the protocol maintains a global reward index I that tracks cumulative rewards per unit of liquidity:

$$I \leftarrow I + \frac{\Delta R_{\text{donor}}}{L}.$$

Each donors, holding a fraction of L_{donor}, can determine their return reward by measuring $L(I - I_{donor})$. This mechanism ensures that return rewards are allocated proportionally over time.

3.7 Parameter Effects

The parameters α, β, and S_0 significantly influence reward dynamics:

- Larger α increases overall payout magnitudes.
- The exponent β determines the sensitivity of rewards to changes in L. For example, setting $\beta = 0.5$ results in sublinear scaling, preventing excessive increases in payout as liquidity grows.
- The offset S_0 ensures that early claims do not dominate the reward distribution, keeping initial increments in check.

As S increases, the incremental rewards ΔR decrease due to the $\beta < 1$, ensuring diminishing marginal returns. Similarly, as L rises, the rewards scale sublinearly (for $\beta < 1$), preventing dramatic spikes and maintaining stability over time.

3.8 Technical Implementation

3.8.1 A Web App. A web application provides an interface for donors, curators, and creators. It enables users to view current reward pools, track meme engagement metrics, initiate donations, claim rewards, and adjust parameters such as interest rates.

3.8.2 Solana Contract. We implement the reward logic as a Solana smart contract, leveraging the blockchain's high throughput and low transaction costs. This contract manages the bonding curve, performs reward calculations, and securely stores user balances and engagement proofs.

3.8.3 A TLSNotary-based Chrome plugin for verifying the post. A browser extension built upon TLSNotary technology allows users to cryptographically verify their social media posts without relying on centralized APIs. After creating or promoting a meme off-chain, the user runs the plugin to produce a verifiable proof. The smart contract trusts this proof, enabling the user to claim their rightful share of the reward pool.

4 DISCUSSION

4.1 Implications

4.1.1 Enhancing Meme Vitality. Through continuous incentivization of meme creation and propagation, VitaMeme enhances cultural vitality by directly aligning social influence with economic rewards, enhancing that memes transcend ephemeral trends.

4.1.2 Addressing Free Rider Problem. To mitigate free-rider issues—where speculators consume cultural value without contributing—the protocol rewards active engagement over social media. This direct incentive ensures the growth and sustainability of the meme's cultural footprint, reducing the likelihood of participants exploiting the system for short-term gains.

4.1.3 Decentralized, Permissionless and Trustless System. VitaMeme aims to function without central authorities. Any participant can initiate or join reward pools, submit proofs of social media engagement, and claim incentives. By removing gatekeepers, the protocol fosters organic growth, lowers entry barriers, and supports a more democratic cultural market, where meme vitality emerges from grassroots participation rather than top-down curation.

4.1.4 Dynamic Game Theory. The VitaMeme ecosystem can be modeled as a dynamic game in which participants strategize their contributions. Creators weigh the value of producing new memes, curators assess the worthiness of promoting certain memes, and donors consider long-term returns. These strategic interactions produce emergent behaviors and market equilibria, often incentivizing cooperation over defection for collective meme survival over time.

4.2 Limitations and Future works

Economic incentives may still attract gaming or incentivize superficial content, necessitating continual adjustment of bonding curves, quadratic funding mechanisms, and influence-weighting parameters. Future work may explore richer verification metrics, improved governance models, and integration with scaling solutions. As Web3 tools mature, VitaMeme's principles could inspire more resilient, decentralized ecosystems where value creation, cultural engagement, and economic rewards are closely and sustainably intertwined.

5 CONCLUSION

The VitaMeme protocol merges blockchain incentives with social media cultural dynamics, creating a new model for decentralized viral marketing. By rewarding verified social media engagement, it enables continuous grassroots participation, extending meme longevity.

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