Votable Supply Prediction Using LLM

--By Chain_L and Team

Table Of Content:

Predicting Token Governance Parameters using Growth rates and standard deviation

Methodology:

This methodology examines the relationships between key factors that influence the security and stability of the system, specifically focusing on their impact on the votable supply (VS) and the cost of an attack. Four main parameters are considered: Participation Ratio (PR), Price Stability Index (PSI), Voting Power Index (VPI), and Liquidity Activity Ratio (LAR). By analyzing how these factors interact, leveraging historical data and the capabilities of a Language Model (LLM), it becomes possible to ground predictions in realistic trends, understand their collective effect on the system's resilience, and increase the difficulty of launching an attack. This integrated approach ensures the system's security and stability over time.

Analysis of Parameter Relationships with Votable Supply and Cost of Attack

This section explores the relationships between key parameters Participation Ratio (PR), Price Stability Index (PSI), Voting Power Index (VPI), and Liquidity activity Ratio (LAR) and their implications for the votable supply (VS) and the cost of attack, based on historical data.

Participation Ratio (PR) : The Participation Ratio (PR) directly determines the proportion of the circulating supply (CS) that becomes votable. This relationship is captured by the formula:
$VS = CS \times PR$.

Price Stability Index (PSI) : PSI has no direct effect on the votable supply. However, it plays a crucial role in shaping the system's resistance to attacks by modulating voting power influence. By altering the dynamics of voting power, PSI indirectly impacts the system's security and the cost of attack.

Voting Power Index (VPI) : VPI measures the system's sensitivity to changes in the votable supply and other parameters. Its formula is given as:
$VPI = (VS / CS)^{(PR + PSI)} + LAR$
This equation highlights how VPI is influenced by the interplay of PR, PSI, and LAR.

Liquidity Activity Ratio (LAR) : LAR reflects the stability and security of token allocation over time. Determining its relationship with the system security can be helpful in predicting the Cost of Attack and hence the Votable Supply.

Maintaining Trends

To ensure the reliability of the analysis, trends were maintained by leveraging month-over-month (MoM) growth rates and standard deviations derived from historical data. This approach preserved continuity by aligning growth rates with prior periods, reflecting natural patterns while avoiding abrupt or unrealistic changes. Standard deviations were used to account for expected variability, ensuring new data points remained within a realistic range. Unusual jumps in trends were carefully scrutinized and excluded unless justified by external factors, maintaining systemic integrity. This method provided a balanced and realistic projection of parameter relationships, enabling robust insights into the dynamics of votable supply and attack costs.

Cost of Attack Analysis

The system's resistance to attacks is fundamentally tied to the engagement of participants and the resultant votable supply (VS). A key observation is that increased participant engagement, reflected by a higher Participation Ratio (PR), directly contributes to an increased VS. This expansion in VS strengthens the system's security by distributing voting power more widely, thereby making it more difficult for any single entity to gain disproportionate influence.

Quantifying Attack Resistance : The resistance to attacks is quantified using the following formula:

Resistance Score = 1 / (1 + e^(PSI – VPI – LAR))

In this formula:

- **PSI** accounts for the influence of individual tokens on voting power.
- **VPI** measures the interplay of votable supply, PR, and other security parameters.
- **LAR** reflects the stability and security of token distribution over time.

A higher resistance score indicates a more secure system.

Observations :

Analysis of Parameter Relationships with Votable Supply and Cost of Attack

Participation Ratio (PR) :

- An increase in PR signifies greater participation, which results in more tokens becoming votable. Consequently, this expands the votable supply (VS).

Price Stability Index (PSI) :

- A higher PSI reduces the concentration of voting influence, making it harder for malicious actors to manipulate the system. Therefore, PSI indirectly raises the cost of an attack by enhancing system security.

Voting Power Index (VPI) :

- A higher VPI increases the cost to affect a meaningful proportion of the system, as the effort required to influence the outcome scales with the growth of VS, the strength of PSI, and the token security provided by LAR. This makes the system more robust to potential attacks.

Liquidity Activity Ratio (LAR) :

- Direct Proportionality to Token Security: A higher LAR ensures that tokens are held in a way that enhances their long-term stability, reducing the likelihood of sudden shifts in influence.
- Inversely Proportional to Attack Cost: As LAR increases, the allocation stabilizes, raising the overall token security. This directly translates into a higher cost for attackers to disrupt the system.

Cost of Attack Analysis

For December 2025, the resistance score was maintained above 0.99, underscoring the token's high level of security. This achievement demonstrates the effectiveness of balancing key parameters to safeguard the ecosystem against potential attacks.

Results:

Using the described methodology, the month-wise predictions for all key parameters Participation Ratio (PR), Price Stability Index (PSI), Voting Power Index (VPI), Liquidity Activity Ratio (LAR) and Votable Supply (VS) were derived. The analysis incorporated historical trends, growth rates, and standard deviations to ensure realistic continuity and reliable projections.

The predictions indicate a steady month-over-month increase in the Votable Supply, driven by a compound monthly growth rate (CMGR) of 1.24%. This growth aligns with consistent PR values and reflects increasing participant engagement. The calculated resistance score remains above 0.99 throughout the projected period, confirming the system's robustness and high level of security.

These results highlight the effectiveness of maintaining realistic growth patterns and optimizing parameter interdependencies such as the Price Stability Index, Voting Power Index, and Liquidity Activity Ratio to enhance overall system security and resilience against potential attacks.

Month (MMM-YYYY)	PR	PSI	VPI	LAR	Actual VPI	VS
Dec-2024	0.0841	1.0035	0.3620	0.2842	0.0181	104534467
Jan-2025	0.0845	1.0040	0.3630	0.2853	0.0186	105673028
Feb-2025	0.0849	1.0045	0.3645	0.2865	0.0190	106002043
Mar-2025	0.0854	1.0050	0.3661	0.2878	0.0190	107350267
Apr-2025	0.0860	1.0055	0.3678	0.2888	0.0192	108693569
May-2025	0.0864	1.0061	0.3720	0.2901	0.0195	109783329
Jun-2025	0.0869	1.0066	0.3735	0.2915	0.0200	110821320
Jul-2025	0.0876	1.0071	0.3760	0.2929	0.0202	111912347
Aug-2025	0.0882	1.0077	0.3788	0.2945	0.0205	112894834
Sep-2025	0.0889	1.0084	0.3823	0.2961	0.0209	113883043
Oct-2025	0.0897	1.0090	0.3850	0.2978	0.0212	115067238
Nov-2025	0.0905	1.0097	0.3878	0.2996	0.0216	116183924
Dec-2025	0.0914	1.0103	0.3897	0.3006	0.0220	117031674

Predicting Token Governance Parameters using Correlation and Growth rates

Methodology:

To predict parameter values beyond November 2024, historical trends were analyzed to establish a foundation for continuity and realism. Correlations between key parameters were examined to understand their interdependencies, and the analysis leveraged the capabilities of a Language Model (LLM) to ensure projections align with observed relationships and system dynamics. Growth rates were carefully selected to extend existing trends in a logical and consistent manner, avoiding abrupt changes that might undermine the model's validity. By optimizing parameter values to maximize the cost of an attack, this approach not only considers future developments but also enhances system robustness against potential threats, ensuring predictions are both data-driven and strategically aligned with long-term objectives.

Correlation Analysis

Correlation analysis was conducted to examine the relationships between the votable supply (VS) and key parameters such as Participation Ratio (PR), Voting Power Index (VPI), Price Stability Index (PSI), and Liquidity Activity Ratio (LAR). The analysis aimed to identify how changes in these parameters impact the VS and their interdependencies.

Maintaining Trends

To maintain trend continuity, the growth rates were determined to ensure that the trends observed up until November 2024 continue seamlessly into December 2024 and beyond. These growth rates were carefully selected to reflect natural, gradual changes in the system, preserving consistency and avoiding sudden shifts. By aligning the parameters with historical data and trends, the objective is to provide realistic projections that maintain the integrity of the system's dynamics over time.

Cost of Attack Analysis

The methodology behind the cost of attack analysis focuses on leveraging key parameters to enhance the system's security and increase the cost of potential attacks. The primary approach involves increasing the Participation Ratio (PR) and Voting Power Index (VPI), which boosts participation in token governance. Higher participation makes it more difficult and costly for malicious actors to influence voting outcomes through attacks.

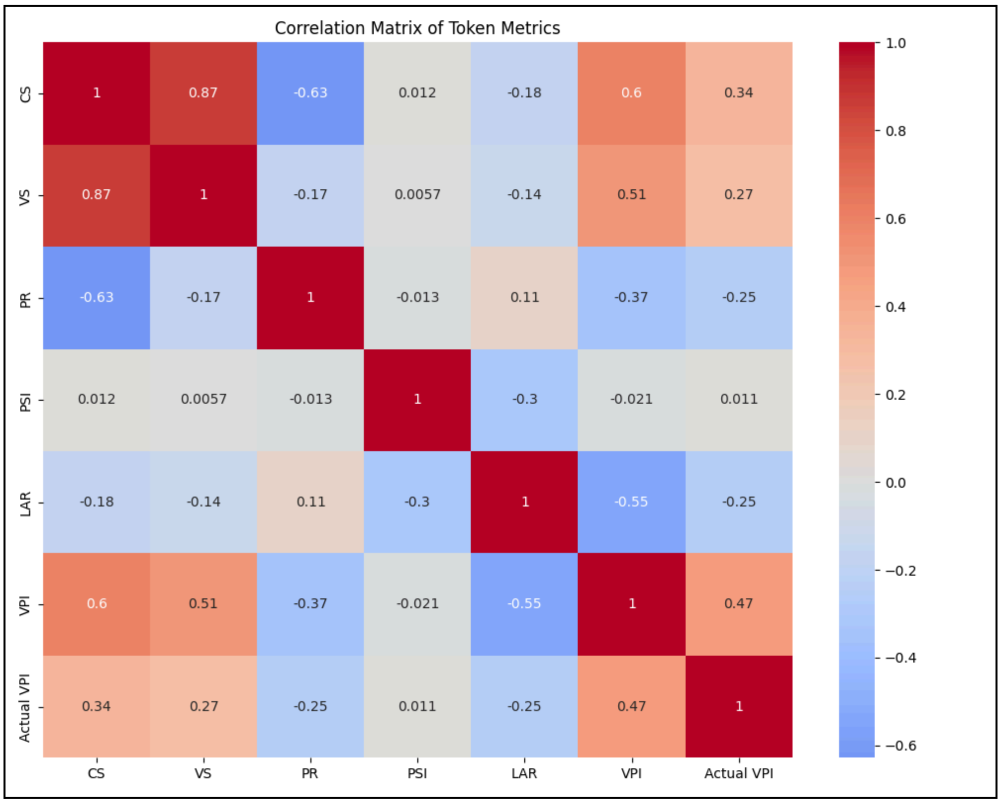
Additionally, a high Liquidity Activity Ratio (LAR) is used to signal strong network engagement and stability, deterring attacks by ensuring there is sufficient active participation to resist external manipulation. The growth of the Votable Supply (VS) is aligned with the expansion of the token economy, maintaining a healthy level of community involvement and governance. This ensures that as the economy grows, the system becomes more resilient without overextending its capacity.

To further maximize attack costs, the methodology aims to preserve strong gains in VPI while controlling any declines in LAR. This balance ensures that the system maintains both strong voting power distribution and sufficient liquidity, making it harder for attackers to gain control or influence.

Observations:

Correlation Analysis

The VS is correlated positively with PR, VPI, and Actual VPI. The VS negatively affects PSI and LAR. High VS could decrease the PSI and increase LAR, whereas low LAR or high PSI supports a higher VS. The correlation between VPI and VS is strong (0.5099), dictating a positive relationship between increasing voting power and the network's available votable supply.



Maintaining Trends

The chosen monthly growth rates for key parameters are as follows:

1. **PR (Participation Ratio)**: 0.25% – This reflects a modest increase in participation each month, leading to a gradual rise in the proportion of tokens available for voting.
2. **PSI (Price Stability Index)**: 0.38% – A steady increase in PSI, which indicates improving price stability and less volatility in token value.
3. **VPI (Voting Power Index)**: 0.94% – A higher rate of growth for VPI, signifying increasing voting power and influence within the system.
4. **LAR (Liquidity Activity Ratio)**: -0.63% – A slight decline in LAR, suggesting a decrease in the active liquidity within the network each month.
5. **Actual VPI**: -5.26% – A notable decrease in Actual VPI, reflecting a reduction in the effective voting power over time.
6. **VS (Votable Supply)**: 0.66% – A moderate increase in VS, which reflects a gradual expansion of the votable supply as more tokens become eligible for governance.

These growth rates were chosen to ensure a consistent and realistic progression of the system's dynamics while maintaining the overall stability and security of the network.

Cost of Attack Analysis

The aggregate attack resistance score is projected to increase slightly from 0.9929 to 0.9936, suggesting a small but positive improvement in the protocol’s security and resistance to attacks over the forecast period.

Results :

Using the described methodology, the month-wise predictions for all key parameters Participation Ratio (PR), Price Stability Index (PSI), Voting Power Index (VPI), Liquidity Activity Ratio (LAR), and Votable Supply (VS) were derived. The analysis focused on understanding the relationships between these parameters through correlation analysis, helping to identify their interdependencies. Additionally, growth rate analysis was applied to maintain the continuity of trends observed in the historical data, ensuring that the predictions align with realistic patterns. This approach allowed for reliable projections that reflect the dynamics of the ecosystem, taking into account both historical trends and the relationships between the parameters.

The predictions show a well-balanced and healthy growth trajectory across all parameters. The steady increase in PR, VPI, LAR, and VS, along with the improvement in PSI and Actual VPI, reflects an active and growing ecosystem that maintains strong participation in governance. This growth helps strengthen the protocol's attack resistance, making it more secure and resilient as the ecosystem expands. The consistent increase in these parameters, particularly the votable supply and voting power index, contributes to higher attack resistance and improved network security.

Month (MMM-YYYY)	PR	PSI	VPI	LAR	Actual VPI	VS
Dec-2024	0.0841	1.0069	0.3976	0.5431	0.0181	106825678
Jan-2025	0.0844	1.0106	0.4013	0.5478	0.0207	107543921
Feb-2025	0.0847	1.0143	0.4051	0.5524	0.0234	108275094
Mar-2025	0.0851	1.0180	0.4089	0.5571	0.0260	109019297
Apr-2025	0.0854	1.0217	0.4127	0.5617	0.0287	109776632
May-2025	0.0858	1.0255	0.4166	0.5663	0.0313	110547197
Jun-2025	0.0861	1.0292	0.4204	0.5709	0.0340	111331095
Jul-2025	0.0865	1.0329	0.4242	0.5756	0.0366	112128423
Aug-2025	0.0868	1.0366	0.4280	0.5802	0.0393	112939283
Sep-2025	0.0872	1.0403	0.4318	0.5848	0.0419	113763774
Oct-2025	0.0875	1.0441	0.4357	0.5894	0.0446	114601998
Nov-2025	0.0878	1.0478	0.4395	0.5941	0.0472	115454052
Dec-2025	0.0882	1.0515	0.4433	0.5987	0.0499	116320038

Predicting Votable Supply with SARIMA using combination of the parameters

Methodology:

The predicted Votable Supply (VS) values were calculated using a combination of key metrics Participation Ratio (PR), Voting Power Index (VPI), Actual VPI, Price Stability Index (PSI), and Liquidity Activity Ratio (LAR). The PR, VPI, and Actual VPI were treated as direct contributors to the VS, with higher values of these metrics leading to a higher VS. In contrast, PSI and LAR have an inverse relationship with VS, as higher staking or liquidity generally means fewer tokens are available for voting. A steady growth pattern was applied to the predictions, assuming increased participation and token distribution, which contributes to the overall security of the system. To ensure realistic and reliable projections, the Large Language Model (LLM) and SARIMA (Seasonal AutoRegressive Integrated Moving Average) were used together. These methods allowed for accurate forecasting while maintaining continuity with historical trends. By maximizing the VS, the cost of an attack—particularly governance manipulation—is increased, as acquiring a significant portion of the token supply becomes more costly. This methodology ensures that the system's security strengthens over time, making it more resilient to potential attacks.

Observations:

The observations from this analysis are as follows:

1. **Growth Rate Consistency**: A consistent 1.1% month-on-month growth rate was applied to the Actual VPI, using November 2024 as the base month. This growth rate aligns with the historical mean, ensuring trend continuity and providing a reliable forecast.
2. **Impact on Votable Supply (VS)**: The increase in VS due to the growth in the Actual VPI makes it more expensive for attackers to influence the governance system. As the VS increases, the cost for an attacker to acquire enough votes to manipulate the system also rises, enhancing security.
3. **Steady Metrics for Governance**: Key metrics, including Protocol Staking Index (PSI), Participation Ratio (PR), Voting Power Index (VPI), and Liquidity Availability Ratio (LAR), were assumed to either remain steady or increase due to rising votable supply. This steady increase helps maintain balance and fairness in the system, promoting decentralized governance.
4. **Security Enhancement**: The increasing VS enhances the security of the system by raising the cost for an attacker to acquire 51% of the votes. As a result, the network becomes more secure, and the cost of manipulation rises significantly.

5. **Attack Deterrence**: Potential attack vectors, including malicious acquisition of tokens and Sybil attacks, are mitigated by the increase in VS. The rising VS makes such attacks prohibitively expensive, thus deterring attackers.
6. **Security Improvement Over Time**: As the VS increases over time, the cost for an attacker to influence votes rises by approximately 1.1% per month. Over 12 months, this results in a substantial increase in the cost of an attack, leading to a significant improvement in the overall security of the system.

Results:

Using the described methodology, the month-wise predictions for Votable Supply (VS) were derived. The Predicted VS values are normalized. The actual token quantity will depend on the actual token economics and other factors. Below image shows the month-wise predicted value of the Votable Supply.

Month	Predicted VS (normalized)
2024-12	15654239.8
2025-01	15722051.9
2025-02	15788564.5
2025-03	15854060.8
2025-04	15920478.2
2025-05	15987252.6
2025-06	16051749.9
2025-07	16119561.8
2025-08	16184591.3
2025-09	16250087.7
2025-10	16316505
2025-11	16383379.6
2025-12	16447877

Predicting Votable Supply with SARIMA using Growth Rate of Actual VPI

Methodology:

The methodology employed for this analysis integrates statistical forecasting and advanced machine learning techniques to predict the growth of key governance metrics. Specifically, Seasonal AutoRegressive Integrated Moving Average (SARIMA) and a Large Language Model (LLM) were utilized to ensure accurate and data-driven predictions.

The key metrics analyzed include Price Stability Index (PSI), Participation Ratio (PR), Voting Power Index (VPI), and Liquidity Activity Ratio (LAR). These metrics were assumed to remain steady or show slight improvements over time, consistent with the projected rise in VS. The hypothesis driving this assumption is that these metrics, which are critical for ensuring fairness and decentralization in the governance system, will naturally improve with increased VS. This improvement is expected to enhance governance resilience and mitigate potential risks.

To establish a consistent month-on-month growth rate, the historical data of Actual VPI was analyzed, with November 2024 serving as the base month. The growth rate applied aligns with the mean historical growth rate, providing a realistic and data-supported foundation for projections. This approach ensures that the predictions reflect both continuity and strategic alignment with long-term governance objectives.

Observations:

- A consistent 1.1% month-on-month growth rate was assumed based on the historical mean growth rate of the Actual Voting Power Index (VPI), which forms the foundation of this analysis.
- The increase in the Votable Supply (VS) makes it more expensive for attackers to gain enough votes to influence the governance system, thus making the system more secure and raising the cost of an attack.

Results:

Using the described methodology, the month-wise predictions for Votable Supply (VS) were derived. Below image shows the month-wise predicted value of the Votable Supply.

Month	Predicted VS
2024-12	107000000
2025-01	108200000
2025-02	109430000
2025-03	110680000
2025-04	111950000
2025-05	113240000
2025-06	114560000
2025-07	115900000
2025-08	117260000
2025-09	118640000
2025-10	120050000
2025-11	121480000
2025-12	122930000