Nsure.Network

Open Insurance Platform for Open Finance

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Abstract

Nsure is an open insurance platform for Open Finance. The project borrows the idea of Lloyd's London, a market place to trade insurance risks, where premiums are determined by a Dynamic Pricing Model. Capital mining will be implemented to secure capital required to back the risks at any point of time. A 3-phase crowd voting mechanism is used to ensure every claim is handled professionally.

Background

Insurance is a tool that helps to re-distribute risk across a community. Due to the extensive amount of capital required to underwrite these risks, the multi-trillion-dollar industry is dominated by huge companies that have the ability to pool capital at scale for potential claim obligations.

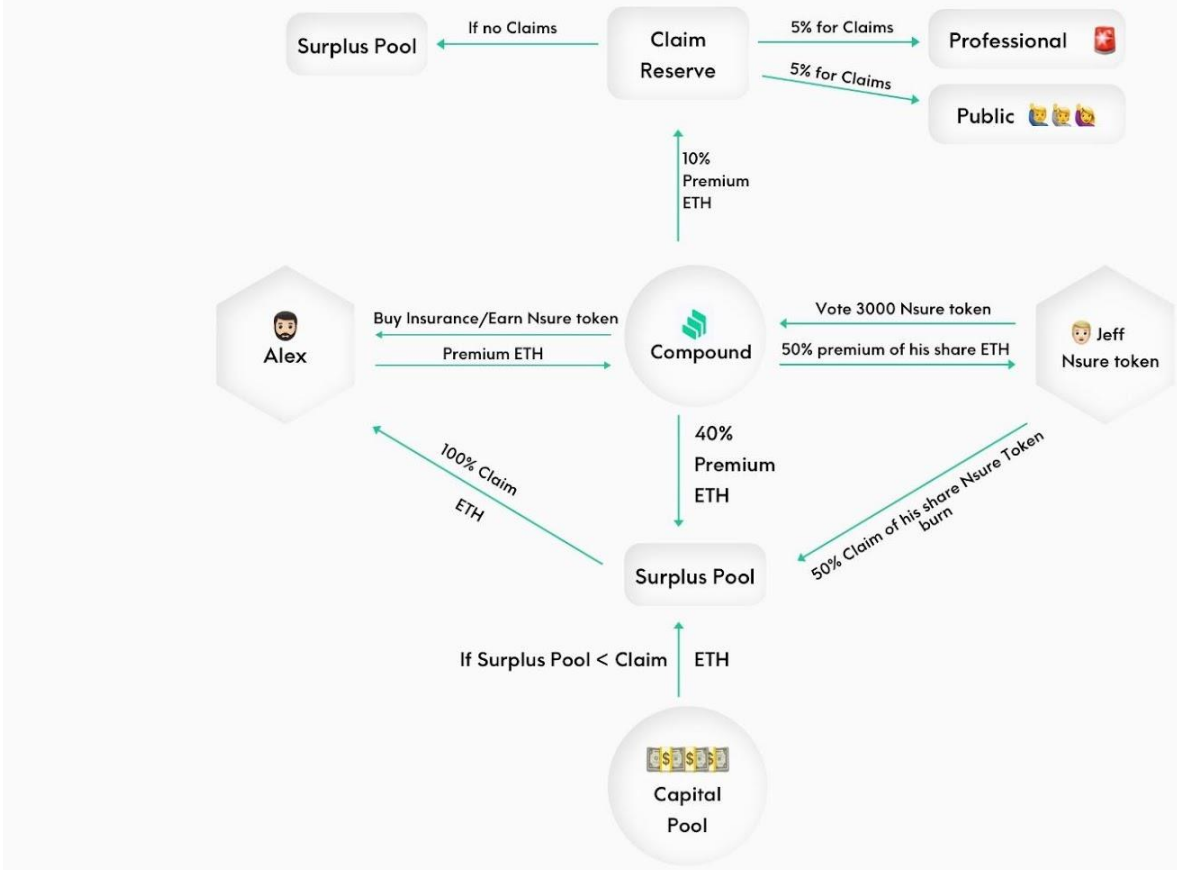
The profitability of insurers depends on the amount of claim payouts relative to the amount of premiums collected. Despite heavy regulatory oversight, there exists an agency problem as there is an incentive for insurers to turn down claims. In addition, the conservative nature of insurers and their increasing reliance on data-driven risk assessments means that the protection gaps of newer risks will continue to remain unfilled.

An example of an underserved segment is the Decentralized Finance (DeFi) sector. The rapid development of DeFi and innovative liquidity mining schemes have brought about a substantial increase in the total value of assets utilized on the chain. Liquidity providers are willing to provide capital to bootstrap DeFi products in return for yields without fully understanding the potential security risks. Even with security audits in place, the nascent DeFi sector continues to be a target of hacks and smart contract exploitations, resulting in the loss of users' funds.

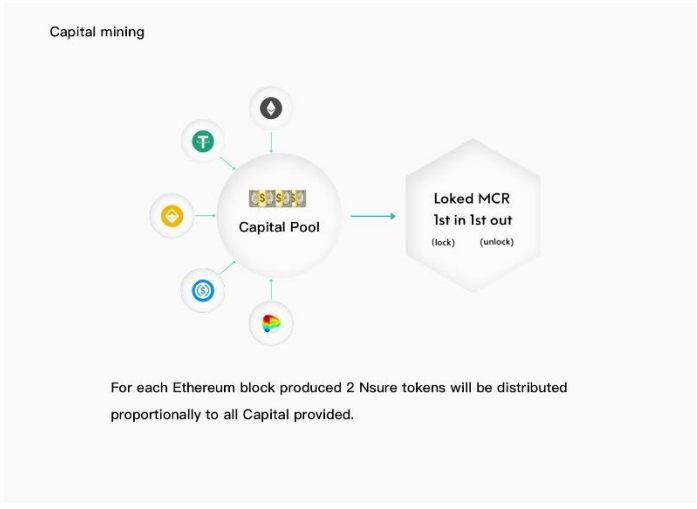
Nsure is purposefully designed to solve the agency problem and allow anyone to become an insurance issuer for the DeFi sector. While conventional insurance depends on issuer' judgement on claims, Nsure rids these unequal judgments by employing smart contract oracles.

Economic Model - How it works

Nsure's "DeFi insurance" is based on 1) vote-based Dynamic Pricing Model, to find the right price via supply and demand; 2) the Capital Model, to secure capital required to back the risks at any points of time; and 3) 3-phase crowd voting mechanism, to make sure every claim is handled in a permissionless and transparent manner.



- Capital Pool (Capital Mining)

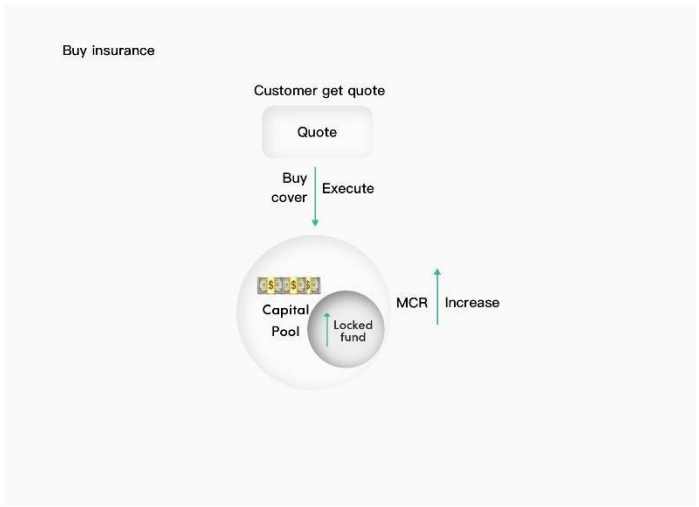


The Capital Pool is an important business module of the platform. Nsure tokens will be rewarded to capital providers of the pool. For each Ethereum block produced, 2 Nsure tokens will be distributed proportionally to all capital provided. The capital pool has a withdrawal lockup period of 30 days. During the lockup period, Nsure tokens will still be awarded and if there is a claim that needs to be covered, the pending assets will still be paid out proportionally. This design prevents capital runs on the capital pool when certain risk is exposed.

When the surplus pool is unable to cover the Minimum Capital Requirement (MCR), a portion of the capital pool will be locked to meet the MCR. The locked-up transactions will be based on a ‘first in first out’ mechanism, allowing earlier capital providers to

exit the capital pool first. For example, Alice contributes 100 ETH to the pool on day 1 and the 100 ETH is locked for MCR needs; if Bob contributes another 100 ETH to the pool, Bob's ETH will be locked and Alice's 100 ETH will be unlocked since MCR is only at 100 ETH. In the event the MCR increases to 200 ETH, and assuming that no more ETH is contributed to the pool, Alice's 100 ETH will be re-locked back because of the increasing MCR needs. However, she still retains her priority to unlock her ETH if more capital enters the pool. On the other hand, if David contributes 200 ETH to the pool, both Alice and Bob's assets will be unlocked.

- Buy insurance



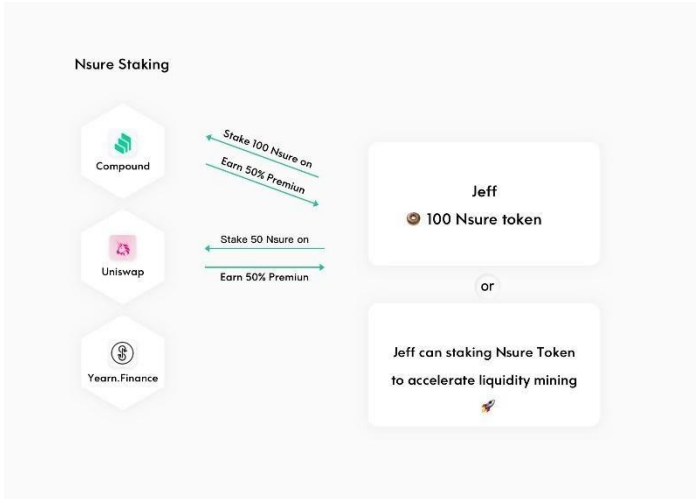
An insurance contract is generated whenever a user purchase one or more insurance products. The insurance contract stipulates the insurance risk, the insurance amount, the date of insurance and the corresponding premiums. Users can use ETH, Nsure, USDT, DAI, and USDC to pay. The insurance contract will automatically take effect after payment.

For every insurance contract generated, 10% premium equivalent of Nsure tokens will be minted and used to stake for the claim. These bonus tokens will be burned for hostile claim requests. When the contractual payment conditions are met during the insurance periods, the platform will automatically initiate a compensation request, and NsureDAO will initiate one or more voting decisions to decide on the grant compensation.

- Surplus Pool

The surplus pool will accrue whenever an insurance premium is paid. 40% of the premium will be added into the surplus pool. Another 10% will be reserved till the expiration of the contract. If there is no claim, it will add into the surplus pool. The surplus pool will grow over time and will be utilized to cover insurance claims first. When the surplus pool cannot cover all the claims, the capital pool will be used to pay the rest. When the surplus pool grows large enough, the mining speed will slow down. The community can vote to use the surplus pool to repurchase Nsure tokens for token burns.

- Nsure Staking



Nsure holders can stake on different projects to earn 50% of the premiums at a linear release. The overall staking power is determined by the Capital Model, which takes into account the correlation between different projects. Nsure holders can choose to stake on un-correlated projects to obtain leverage on their capital, thereby earning more premiums.

For the first phase, we will focus on the risk against hacks in smart contract code. More risks will be traded

at community's request.

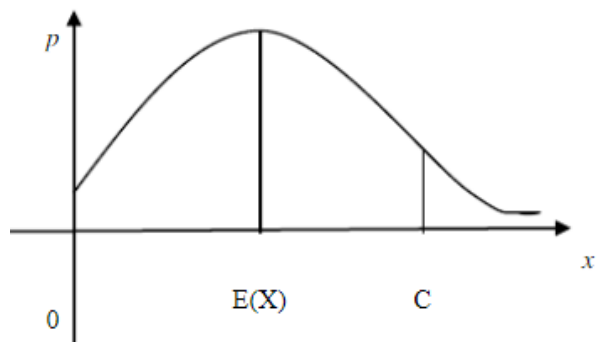
Risk Model Consideration

Risks are diverse. It is technically impossible for us to measure all risks and accurately calculate the required risk capital. Therefore, the risk reserve mentioned here refers to the minimum capital requirement that will not lead to "bankruptcy". We determine the minimum capital requirements based on the capital model. The source of the risk reserve consists of two parts, one part comes from the withdrawal of a certain percentage of the amount from each insurance policy, and the other part comes from the special compensation amount locked in the claim pool.

First of all, we must identify and select the main risks to be considered, which are mainly divided into four categories: asset risk, pricing risk, interest rate risk and other business risks; Secondly, use the probability of bankruptcy to calculate the risk coefficient and determine the risk capital required for this type of risk; Finally, we make adjustments based on the correlation between the risks.

Assuming that the total amount of the claim pool is A and the asset value of the insured amount is L, it should be ensured that for any small ε, $P\{L > A\} \leq \varepsilon$. The platform's surplus level is (A-L), 50% of which is withdrawn to the remaining and 50% of the risk reserve is used for dividends and management.

We set the random variable X=-(A-L), and the venture capital MCR is the minimum capital required to resist the adverse fluctuation of X. If $\varepsilon = 0.05$, the probability that X is not higher than the minimum capital level MCR must remain above 95%, that is $P\{X \leq MCR\} \geq 95\%$. The minimum capital level MCR is obviously related to the confidence level $1 - \varepsilon$.If we know the distribution function of X, F(x), and we are going to require MCR, we only need to set F (MCR) = ε, which is the quantile point corresponding to ε. Its geometric meaning is shown in the figure below, where E(X) represents the expected level of the fluctuation of unfavorable earnings and MCR represents the minimum capital requirement.



If we consider only one type of risk, the principle is the same. Unfavorable volatility is X=E (A)-A or X=L-E (L). Venture capital MCR can be understood as the minimum capital requirement to absorb unfavorable fluctuation, namely $P\{E(A) - A > MCR\} \leq \varepsilon$ or $P\{L - E(L) > MCR\} \leq \varepsilon$. If the probability distribution of A or L is known, then MCR is the corresponding number of points, expressed as: $MCR = E(A) - y(\varepsilon)$ or $MCR = y(1 - \varepsilon) - E(L)$.

Suppose we make A or L obey a normal distribution, then $MCR = \Phi(\varepsilon) \times \sigma$ or $MCR = \Phi(1 - \varepsilon) \times \sigma$, then the risk factor of the asset is$\frac{MCR}{E(A)}$ or $\frac{MCR}{E(L)}$, which is the ratio of the minimum capital requirement to the premium. From this, we can calculate the minimum capitals required for future claims based on the amount of premium.

In addition, if the expected cost of bankruptcy is increased, we are required to control the expected cost of bankruptcy to a percentage lower than the expected gap, such as 1% or 0.1%. When considering the

liability risk, it can be assumed that the asset value is fixed. The asset value L of the insured amount is a random variable, and it obeys a continuous probability distribution whose distribution density is p(x). EPD refers to the overall average of the portion of liabilities exceeding assets, the so-called gap or bankruptcy cost, that is:

$$D_L = \int_A^{\infty} (X - A)P(X)dx$$

The EPD ratio refers to $\frac{D_L}{E(L)}$ (or $\frac{D_A}{E(A)}$). Let $c_L = \frac{A-L}{E(L)}$ and assume that L obeys a normal distribution. It can be derived that the EPD ratio of the asset value risk L of the insured amount is

$$d_L = \frac{D_L}{E(L)} = K_L \phi\left(\frac{-c_L}{K_L}\right) - c_L \Phi(\frac{-c_L}{K_L})$$

The EPD ratio for the total amount of claim pool assets A is

$$d_A = \frac{D_A}{E(L)} = \frac{1}{1 - c_A}[K_A \phi\left(\frac{-c_A}{K_A}\right) - c_A \Phi\left(\frac{-c_A}{K_A}\right)]$$

Among them, $K_L\,(K_A)$ is the ratio of the standard deviation of the insured asset value L (the total amount of the claim pool is A) to the expected liability, $\Phi(\cdot)$ is the distribution function of L (A), and $\phi(\cdot)$ is the asset Or the density function of debt. Given the value of the EPD ratio (1% or 0.1%), combined with the above-mentioned equation, we can find the risk coefficient c_L or c_A we need, and then find the risk capital MCR_L or MCR_A of each type.

In more detail, if we take into account the correlation of risks between different businesses, we have to adjust the covariance.

Suppose we have n types of businesses of the same scale, the concentration is f = 1/n = the premium income of the largest type of business / the premium income of all businesses, and the risk capital MCR of each type of business is the same.

Assumption 1: we overestimate MCR, and Assumption 2: we underestimate MCR. Thus just offset their adverse effects. The concentration adjustment factor is

$$\sqrt{\rho + (1 - \rho)f} = \sqrt{\rho} + \sqrt{1 - \rho} \times f$$

If it is assumed that the average correlation coefficient between each business is 0.4, then $\rho = 0.4$, $\sqrt{\rho} = 0.63$ .Then the adjusted reserve risk capital requirement RBC=63%+37%×(the largest business reserve/all business reserves).

Dynamic Pricing Model

- Pricing principle

The pricing of insurance products is to use the data of past accidents to obtain the probability of risk. This risk and its probability of occurrence are objective and measurable. This is also the fundamental basis for determining the insurance premium.

The law of large numbers is that when enough events of the same nature occur, their risk probability will be closer and closer to the actual probability, so that a more accurate estimate can be obtained. Since there are differences in the way of thinking of each individual in real life, it cannot be assumed to be independent and identically distributed, so it is more general to quote the Chebyshev Theorem of Large Numbers.

Suppose that x_1, x_1, x_2, ……, x_n, ……are a group of independent random individuals, each of which has an expected value $\mathrm{E}(x_k)$ and a variance $\mathrm{D}(x_k)$. If

there is a constant MCR which makes $D(x_k) \leq c\ (k = 1,2,\dots,n)$, then for arbitrarily small positive numbers ε, the formula $\lim_{n\to\infty} P\left\{\left|\frac{1}{n}\sum_{k=1}^{n} x_k - \frac{1}{n}\sum_{k=1}^{n} Ex_k\right| < \varepsilon\right\} = 1$, as the number of people increases, that is, $n \to \infty$, the obtained mean will get closer and closer to the real mean of the real society.

- Pricing Model

However, due to the current lack of historical data on smart contract exploits and lack of relevant information on assisting pricing, it is expected that the cost of the new contract at the beginning will be higher. As the code undergoes more related tests, the processing cost will gradually decrease.

Rather than a single centralized entity setting up a premium rate, or individual capital suppliers and policy holders having to negotiate over premium terms, Nsure uses the Dynamic Pricing Model to set the price, based on supply and demand, the tokens backed and the policies bought. We assume the risk backers' thinking to follow a beta distribution:

$$X \sim Beta(\alpha, \beta)$$

where α is the total power provided by policies sold, and β is the total power backed for such risk. Then the final premium rate is calculated:

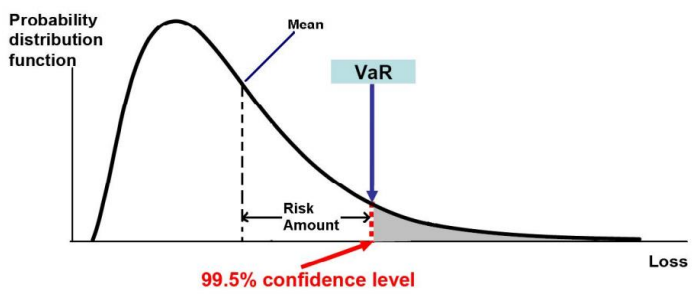
$$P\{X \leq MCR\} \geq 95\%$$

Additional 20% will be loaded for the claim settlement and internal cost. The model has the following pattern:

- When capital supply is high, i.e. more power is backed for a risk, the premium rate will be low
- When demand is high, i.e. more policies is sold out, the premium rate will increase
- More token is backed for a risk, i.e. more popular, less volatile of premium rate change is, and vise versa for a less popular risk, the premium rate will be sensitive for large demand change to avoid pricing error

Capital Model

Insurance is a highly leveraged industry; therefore, the primary concern of the insurance capital model is to calculate the capital required to guarantee solvency of the risk pool to some arbitrary and high confidence level like 99.5% in the latest EIOPA's Solvency II framework.



The Capital Model is used to calculate the minimum capital the fund needs to hold, which is used to determine 1) the capital locked in the Capital Pool and 2) the staking power used in the Staking stage.

ETH, Nsure, USDT, DAI, and USDC are allowed to be used for paying the premium and the liability will also be based off these currencies accordingly. Therefore, we will exchange the exposure with all other currencies into USDT, the MCR is calculated:

$$\sqrt{\sum_{i,j} Corr(i,j) * RF(i) * EX(i) * RF(j) * EX(j)}$$

Where

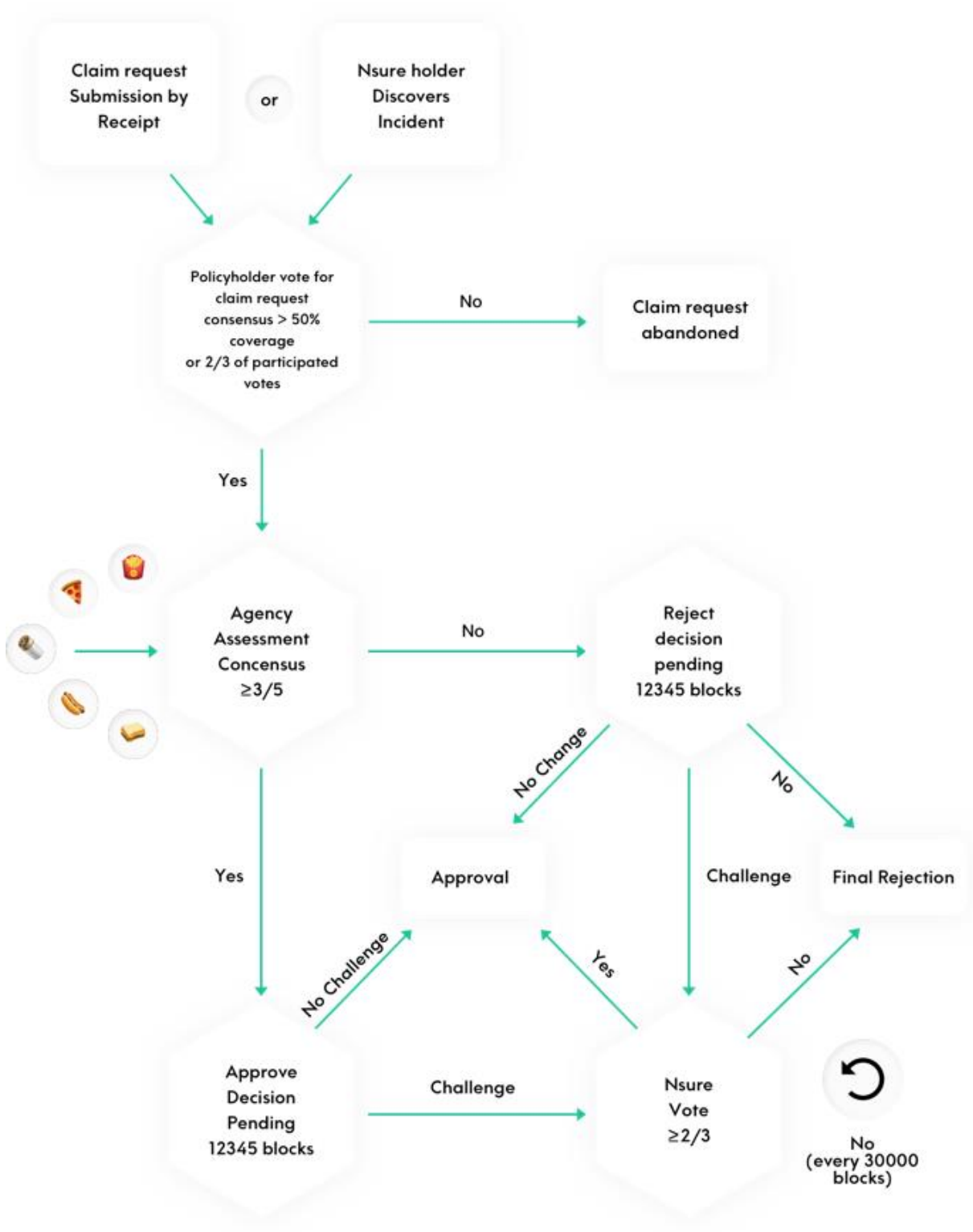
- RF(i,j) is the risk factor for product i and j
- EP(i,j) is the total exposure for product i and j
- Corr(i,j) is the correlation between product i and j, which initial data will be set at research based on the current data we have and will also be monitored based on voter's behavior

$$Corr(i,j) = \begin{bmatrix} 1 & \cdots & a \\ \vdots & \ddots & \vdots \\ a & \cdots & 1 \end{bmatrix}$$

The capital model result will be calculated off-chain daily, due to gas consideration, to track the systematic risk.

Claim Assessment

Nsure utilizes a 3-phase crowd voting mechanics for claims assessment.



A claim can be submitted by a policyholder with a receipt or filed by a Nsure holder if they discover one. The claim request will be voted by all policyholders in that project. If more than half of the policyholder or 2/3 of all participated votes pass then the claim is officially submitted. The policyholder's round is to prevent the waste of auditing from malicious claim requests. As Defi insurance claim assessments are highly complex and require domain specific knowledge, we do not think that having a simple vote by average participants will result in a prudent result and might potentially harm policyholder's interest. Nsure proposes the first phase of voting to be done by the top 5 auditing companies that are chosen by Nsure token holders. Auditing companies will stake their Nsure holdings to vote and release auditing reports if needed. 5% of the reserved policy premium will be utilized to incentivise the auditing companies. When the decision is made with at least 3/5 consensus over a claim assessment, the decision will be pending for 12345 blocks. If consensus is not reached or there are not enough auditing companies' votes then the case will pass to the next phase. During the pending phase, policyholders can stake Nsure tokens and start a challenge. If there is no challenge by any Nsure holders, then the claim will be approved and paid. If there is a challenge, then the claim assessment will escalate to the second phase - a public vote. All Nsure token holders except 1. address staked on the project of the pending case 2. staked Nsure to boost mining, can stake and vote for the claim assessment. If no consensus of 2/3 staked vote is reached, another round of public voting will commence after 30000 blocks. When a 2/3 consensus is reached, the claim becomes approved or rejected, and all voting participants will share 5% of the premium. The staked Nsure will be burnt if the claim is rejected. If the claim is approved, then the staked Nsure will be returned to the claim filer's account. Note that all staked tokens to participate in public voting will experience a 7 days of lockup period to prevent short term market manipulation.

The first phase of this 3-phase voting can be substituted with a lighter round of voters by decision from NsureDAO.

Distribution

The first issuance is aimed at a small group of cryptocurrency enthusiasts, who also serve as beta product testers to provide feedback on complex insurance products prior to its release. The short to mid-term development goal is to build a safe product that serves the DeFi sector's insurance needs. Majority of the short-term Nsure tokens will be distributed via capital mining and through participation of the NsureDAO. Broader sales, distribution and marketing channels will be established once the product has a consistent base of users. Given that future iteration of the insurance products require users to purchase Nsure tokens to Stake or to be utilized as currency for settlement, a set of sales and payment procedures,t as well as wallet tools will be developed to achieve large scale growth.

Our long-term development goal is not only to make products with great use cases, but to build a non-discriminatory platform that allows the masses to participate freely.

Distribution partners can use the integrated open API architecture of the blockchain to interact with our

products. Users who hold Nsure tokens are potentially our sales partners, because every insurance coverage sold generates dividends for all holders of Nsure. We will make the smart contract platform design as open and flexible as possible so that distribution partners can interact and communicate under the prescribed conditions.

Competitive Advantage

- Transparency

A key factor in making a good insurance platform is the health of financial information, such as the usage of funds and whether there are sufficient premium floats to pay potential claims. Since the blockchain is a distributed ledger, each node has the same copy of the data. When the data changes, every insured person can see the synchronized and updated data, making the operation of each fund open and transparent. Therefore, there will be a dedicated module on the homepage of the website to disclose relevant information, and provide an accurate real-time financial status every quarter such as risk factors, minimum capital requirements, historical data on token prices, a summary of claims assessment, and the number of locked and traded tokens.

- Product Upgrade roadmap

We will continue to pay attention to product improvements based on market feedback, and launch new products with blockchain code as the core to meet the needs of more users. We hope that with time, community members will drive each other to jointly promote and develop open-source tools for Nsure.

- The size of the capital pool

The capital pool size will scale alongside the type of product offerings, which will increase the level of diversification benefits for users of Nsure.This ensures the effective use of funds, reduces risk costs, reduces the risks caused by insufficient claims,and makes the cost of copying the project much higherA meaningful network of risk assessors (reputable smart contract code auditors) will be established, and sufficient incentives will be provided for our users to participate.

- Community Governance

Under normal circumstances, all operations on Nsure can be completed by smart contracts. But in reality, in order to take into account the interests of users, better achieve decentralization effects, and ensure the process to be more transparent, decisions of certain events will require the community to vote. Therefore, the platform will set up a NsureDAO organization to facilitate such decisions and manage extreme situations. It should be noted that NsureDAO does not have the custody of the fund pool, nor can it release funds to any specific person. Each committee member may be replaced by voting at any time.

NsureDAO will work in accordance with the two core principles of sustainability (that ensures the interests of community members by ensuring the sustainability of the overall funding pool) and growth (promoting sustainable premium increases and NsureDAO membership growth). The members of the NsureDAO organization include several people with specific expertise in insurance, co-governance, and blockchain development. Some powers that committee members have are: (1) Reaching consensus to implement specific code that cannot be automatically deployed; (2) Punishing bad actors within the Nsure ecosystem

(such as malicious claims, false claims, etc.); (3) The power to implement emergency suspension under special circumstances.

NsureDAO members can negotiate and propose relevant proposals to the benefit of the Nsure network. The voting proposals they submit must include clear voting options and NsureDAO's recommendations. Then each community member is given a period of time to vote, and the result with a majority decision will be implemented. Any Nsure holder can become a member of NsureDAO.