

CASE STUDY

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Three Case Studies in Tokenomics

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Abstract

Blockchain technology has facilitated the creation of artificial economies based on tokens and cryptocurrencies. These artificial economies are different from real economies in many aspects. They are more narrowly focused around the provisioning of only a few (sometimes only one) goods or services. They can be more flexible, as blockchain technology allows the development of smart contracts to control the issuance or burning of tokens under any arbitrary conditions. Also, there are other types of exogenous risks, such as new kinds of regulations, and speculative or hacking attacks on exchanges. This means, that many of the tools, theories and methods that apply in economics do not apply in the case of token economies. The tokenomist needs to sometimes come up with new models and tools for each individual case. Since tokenomics is a new field, the open discussion around tools and methods is extremely important, and can speed up the development of methods that will later turn into standard practices. This article outlines three different case studies around tokenomics and discusses how the challenges of each case were approached.

Keywords: *blockchain, ico, initial coin offering, tokenomics, token economies, cryptoeconomics***1. Introduction**

Designing a token economy is one of the most important parts of an ICO. A good tokenomics model can ensure the long-term viability of a blockchain startup, whereas a bad tokenomics model can severely impact the growth and the investment potential of a business.

Tokenomics can be a quite complicated and challenging topic for many reasons such as:

- There are usually many conflicting incentives within the token economy which interact with the business model. For example, investors might want to see appreciation of the token, but the users might benefit from lower inflation or volatility.
- There are technological demands which can impose all sorts of constraints on the economy. E.g. the speed of transactions might impose constraints on the velocity of the token, which can then impact the price.
- Pre-ICO companies with no users or clients often have to base their whole model on forecasts, which can be quite inaccurate. This means that the tokenomist might have to resort to working with boundary scenarios,

rather than use the actual numbers. The lack of established models in then field makes this very difficult, since the tokenomist might have to devise new techniques and method in each case.

Since tokenomics is new as a field, it is important that the community shares ideas, concepts and stories (successful or unsuccessful). This article is providing an overview of three different tokenomics case studies, and discusses how the problems in each were approached. It is the hope of the author that some of the ideas outlined in this article can lead to a degree of standardization of techniques, models and theories in the field of token economics.

2. Qredo**Analysis type: Microtokenomics****Analysis methodology: Agent based modelling**

Qredo [1] was examining the creation of a new blockchain protocol for telecommunications called “proof-of-speed”. Qredo was faced with the choice of various mechanisms as to how to synchronize transactions, reward nodes that confirmed transactions, and avoid fraud.

Qredo's tokenomics problems were around the area of microtokenomics. Microtokenomics deals with the incentivisation of the nodes of the network to perform their duties. Microtokenomics issues revolve around the following areas:

- 1) Provide economic incentive to nodes to confirm transactions. The traditional mechanism to do that is to reward the nodes with tokens for validating blocks.
- 2) Ensure that the nodes do not commit fraud, through ensuring that the economic incentives to do so are low or non-existent. In proof-of-work this is solved through technical means, by making it computationally prohibitive to overtake the network. In proof-of stake this is done through the negative incentives that the protocol is providing to the nodes. Nodes are simply punished when fraud is detected, since they have a stake in the system.
- 3) A less discussed problem around microtokenomics is that the rate of issuance of tokens can affect the wider economy. In many cryptocurrencies (e.g. Bitcoin and Ethereum being the prime examples) the mechanism of issuance of new tokens is through the verification of transactions. Bitcoin's mechanism, for example, of issuing new tokens turns into it a commodity that faces deflationary pressure. Ethereum's mechanism, on the contrary, is inflationary.

An agent based modelling was created for Qredo that simulated their blockchain network, from users to nodes. The simulation contained over 10 parameters including: different mechanisms for verifying transactions, numbers of evil users, numbers of evil nodes, frequency of transactions, and more.

With the lack of widely accepted theories around tokenomics, agent based models can be a very powerful tool, since they allow the explicit simulation of any agent within the system (be it user, node, or otherwise) without the need for theory. The drawback of this approach is the development cost of setting the simulation up, as well as the lack of theoretical guarantees around the outcome. The simulation is studied by executing many iterations, collecting statistics over the outcomes and then performing further analysis using statistical and machine learning methods.

This is what happened in this case, with the simulation being executed multiple times in order to examine the effect of different parameter combinations on events such the probability of double-spending, or the system crashing. A random forest model was used in order to predict the probability of failure based on the input

parameters, and a genetic algorithm was used on top of that in order to get parameter settings for the best and worst-case scenarios, that make the network most or least resilient.

This allowed Qredo to:

- 1) Prove that their proposed method worked better for their domain (telecommunications) over a baseline algorithm which imitated other existing blockchains.
- 2) Understand the limits of the system in terms of fraudulent nodes.
- 3) Improve the parameters of their current algorithm.

Whereas agent-based modelling is a very powerful methodology when we care about modelling interactions down to the smallest level, quite often the challenges that we face in tokenomics relate to structural concerns around the economy. The next two scenarios fall under this category.

3. Dot

Analysis type: Macrotokenomics

Analysis methodology: Structural and mathematical modelling

Dot is a financial cooperative for the digital economy. The aim of the project is to provide participants with a flexible set of financial features that are tied into a single user experience. The core of the app is a bank account with all of the common financial features already bundled together. This includes the set of features that are common among many challenger banks such as multi-currency support, free ATM withdrawals, at cost foreign exchange services and simple remittance solutions.

Dot is implementing token features that complement the development of the financial cooperative. Dot members will use the staking of tokens to grant access to lower fees on banking services, earn rewards through participations in community challenges and pay with Dot tokens as a single currency for the list of distributed applications that will be part of Dot.

Dot's tokenomics problems revolved around macrotokenomics. Macrotokenomic analysis is concerned with questions such as:

- 1) How can we that the volatility of the token is not prohibitive to the average user, to the degree that only speculators might want to invest.
- 2) How can we ensure enough liquidity, so that the system can cover rapidly increasing

- demand?
- 3) How can we ensure the long-term viability of the venture, through a stable economy?

Dot also faced lots of questions around their ICO, such as how many tokens to issue, how many stages their ICO should involve, and what incentives they should provide to early stage investors.

The structure of an ICO is connected to macrotokenomics analysis. Some challenges Dot faces are:

- 1) Does the total number of tokens that are issued influence future valuation?
- 2) How should the distribution of tokens in the ecosystem (team, users, bounty, etc.) look like?
- 3) How can we ensure token appreciation, while at the same time no single party has too much power over the ecosystem and the price stays stable?

Regarding 1, there is research to indicate that the total number of tokens issued is not directly affecting the valuation. It is rather other parameters, such as the velocity of the token or the total amount transacted in fiat that matter.

Regarding 2, experience has demonstrated that it is more a matter of managing the expectations of the community. As long as a structure is used that is not too dissimilar to that of other ICOs, then the community will not receive this under a positive or negative light.

Point 3, however, is an open question that changes from ICO to ICO, since it largely relates to the way the token economy is structured.

The first thing to do to tackle point 3, was to come up with a valuation formula. Vitalik Buterin's formula was chosen as a valuation model [2]. This equation, based on the quantity theory of money, is not necessarily a golden standard, but in absence of other standards it was deemed a reasonable choice.

This equation has indicated that reduced volatility is connected with high prices for the token. Therefore, a staking mechanism was created which would incentivize network effects and the growth of the user base, while at the same time reducing the velocity.

Also, a liquidity pool mechanism was chosen which combined token burning with token recycling, allows DOT to operate as a central bank. In addition to that, staking incentives were provided, which can increase holding time, and the valuation of the token over time.

This approach ensures token appreciation, but is also

the long term viability of the project, since there is a guarantee of liquidity, as well as the flexibility to intervene in case the economy faces exogenous or intrinsic shocks, such as a speculative attack.

5. Kimlic

Analysis type: Macrotokenomics

Analysis methodology: Structural and mathematical modelling

Kimlic [3] is a KYC(Know-Your-Customer) and "ID Verification as a Service" marketplace on blockchain. It enables users to complete identification and KYC once and onboard any business based on same identification. Any user data is stored on the mobile device of the data owner (user) and Kimlic requires no central data silo to function.

The cryptographic hash of verified user credentials is stored on Quorum blockchain and later used by relying parties to validate. Attestation of user credentials is either done by trusted third parties or the business that user wants to have account with. Verification cost are transitionally settled using the KIM token.

Kimlic's problems revolved around the following questions:

- 1) Given forecasts of transactions and user base expansion, how can we accurately forecast the price of a token in the future?
- 2) Is the structure of the token economy designed in a way that the token will rise in value over time?
- 3) The token economy of Kimlic should allow "verification providers" to have recurring revenue when those users onboard to different businesses based on their attestations.

The solution to Kimlic's relied in using an updated version [4] of Buterin's model discussed above. While this work is still under review, there was a clear need in the case of Kimlic for a mathematical model that could account not only for the real value of a token, but also for market expectations in the post-ICO period.

This model forecasted a sensitive period of around 1 year, during which Kimlic's real token valuation might be lower than the ICO price. An additional problem was detected, which was the low holding time of tokens. According to Buterin's formula, this can lead to the real value of the token dropping.

The solution was to draw some new vesting and staking mechanisms which ensured the following:

- 1) The investors are incentivized to hold tokens during the critical period.

- 2) Staking mechanisms ensure that the holding time increases, which leads to a faster appreciation of the token's value.

¹This claim is based on an article that is under review by the JBBA. Authors cannot be disclosed as the paper is still under review.

²This is more of an empirical evaluation. An academic study remains to be performed to support this claim.

The basic staking mechanism requires clients to stake tokens in order to use premium features of the system, such as more advanced verification or faster service. KYC providers also need to stake tokens in order to provide participate in the premium services. Failure to provide satisfactory service translates into some kind of punishment such as loss of tokens or lock-out from the services for a limited period of time.

Conclusion

This article discussed three different tokenomics case studies. In the first use case, a fairly technical quantitative methodology was used. In the second one, a more qualitative methodology was used, with some elements of quantitative analysis. The third case study required the development of a new model, based on existing theories.

These case studies demonstrate the complexity and challenges of tokenomics analysis. Tokenomics is a new field where many of the models in traditional economics might not work. However, at the same time there is the potential to use mechanisms that would have not been applied in a real economy such as liquidity pools, or staking.

Furthermore, we have the flexibility to try out approaches, which, while not 100% correct, can be adapted dynamically on the circumstances. Since the field is new, we can't expect our theories and models to work correctly all the time, indeed this is not the case for real-world economics either. However, we can create the right structures, models and assumptions which can shield a business against worst case scenarios, and provide the right incentives for growth.

It is up to the community to come up with the right models in order to fully utilize the capabilities that blockchain offers in the creation of artificial economies.

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