ODERA

MICROFINANCE REIMAGINED

Antela, D., Kim, S., Mqamelo, R., Yang, Y.

How many unbanked people have we banked? How many dapps have we created that have substantial usage? How much value is stored in smart contracts that actually does something interesting? How much usage of micropayment channels is there actually in reality?

Vitalik Buterin
Founder of Ethereum

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ABSTRACT

Odera is a peer-to-peer microfinancing platform that leverages blockchain technology to link lenders to borrowers who have small business proposals. We facilitate small, interest-free loans through our dollar-pegged Odera token and reward lenders with gains proportional to the limited supply of Levy, a second, market-driven token. We are the first cryptocurrency system that exploits the dynamics of crypto economics to incentivize investors not only to fund projects tied to real world impact, but also to remain active within the Odera ecosystem. The Odera philosophy is simple: the more you give, the more you get.

INTRODUCTION

Odera combines lessons learned from the micro financing industries in different contexts all over the world and the rapidly evolving field of cryptoeconomics. Odera is founded on the principles of interest-free borrowing for people who lack access to traditional financial institutions, and incentivized lending for people who wish to make a difference while benefiting from their philanthropy.

In a perfect world, we would all be funding worthy business ventures and would support each other to create economically robust communities. Unfortunately, there is a huge gap between those who have the ability to invest and those who need the investment most.

While successful micro financing communities already exist, interest-free loans make it difficult to retain or even draw in potential lenders. The risk of losing the initial loan does not make it easier. There simply is no incentive to attract philanthropy on an effective, large scale.

Cryptocurrencies were originally launched with the vision of bridging that gap and making access to financial markets easier by mitigating the need for the middleman, decentralising power, and protecting people from fiat currency manipulation. Instead, over the past few years we've seen cryptocurrencies begin to resemble traditional markets more and more, with very little tangible economic impact to show for all the hype. We still live in a world where an ICO of a non-existing product can raise $200 million in less than a day, yet a woman who wants to start a local agricultural business that is likely to employ an entire community struggles to find $1000 dollars for startup capital.

USERS

All users who register on the Odera platform are given an encrypted private key to access their profile. Further verification is achieved by providing personal information such as ID number and location.

There are two types of Odera users:

Borrowers

A person with a need for capital, such as an entrepreneur in a developing country.

- **Submit proposals and request funding**
  Borrowers submit business proposals through the unique Odera template, which prompts them to include important information such concept, financial plan, short term and long term goals, and expected loan repayment period. This information becomes publicly viewable on the Odera blockchain.

- **Receive loan funding in ODR**
  ODR is a cryptocurrency which can be exchanged and deposited directly into a bank account.

- **Return ODR payment**
  Borrowers pay back the loan in ODR increments over the specified loan repayment period.

- **Receive ratings**
  Ratings exist as an additional trust signal for lenders and to avoid abuse of the platform by borrowers.

    - Ratings on business proposals are ranked on a scale of 1-5.
    - Ratings are adjusted as a reward/penalty depending on early loan repayments and defaults respectively.

Lenders

A person with access to excess capital, motivated by philanthropy and/or economic gain via interest.

- **Lend in ODR**
  Lenders deposit ODR into their accounts through a direct deposit from their bank account and can transfer a loan to borrowers whose projects they wish to fund. Loans can only be made in increments of $20 and lenders are not guaranteed to get their money back.

- **Receive loan repayment in ODR.**
  Successful ventures repay their initial investors at a 0% interest rate.

- **Receive funding rewards in LVY**
  Lenders are rewarded in Levy proportionally to the number of projects funded and number of project proposals rated.

- **Rate borrower proposals**
  Lenders rate proposals of borrowers on a 1-5 scale
  (a) 5 random ratings mandatory upon registering with Odera
  (b) A proposal must be rated to be funded

Note that in practice, a user can be both a lender and a borrower. All users have a reputation, which essentially records their credit history. Users can read from and write to the blockchain with our web interface. All users can get information from the blockchain. This can be information about (a) all existing loans any user has requested money for, (b) the current user's outstanding and borrowed loans, (c) any user's previous history, including reputation, or (d) a project's history.

PROTOTYPE WORKFLOW

Borrowers submit business proposals onto the Odera platform through our user-friendly online template.

Proposals go through an initial screening using machine learning that evaluates criteria such as loan size vs. estimated loan repayment period, location, and current monthly income.

Proposals are displayed on the Odera platform, and lenders can rate proposals on a scale from 1-5.

Lenders who wish to fund a proposal pledge interest-free loans in increments of $20 worth of ODR.

Lenders buy (*dollar pegged*) ODR and make a transfer to borrowers.

Borrowers who reach the minimum loan threshold may withdraw ODR directly to fiat currency.

Each time a lender funds a project, this is recorded as a percentage of the total lending pool for the week, and determines how much the of the weekly distributed LVY the lender receives.

TWO TOKEN SYSTEM

Most blockchain-based platforms struggle to retain long term capital commitment. Speculators jump from cryptocurrency to cryptocurrency based on which one is expected to have short-term growth. Odera wants to build a community that is owned and controlled by those with a long-term perspective.

Odera's two token system is both functional and financially lucrative - it enables users to fund real economic outputs while being rewarded for contributing such value.

Odera (ODR) token

Odera is the fundamental unit of lending on the Odera blockchain.

- **USD** Equivalent i.e. 1 ODR = 1 USD
- **ODR Deposit:** Users can deposit ODR directly from their bank account into their Odera Wallet
- **ODR Withdrawal:** Users can withdraw ODR from their Odera Wallet directly into their bank account
- Borrowers repay ODR with **0% interest** over time as specified in the contract
    - *Example: A lender loans 25 ODR to a borrower, and the borrower pays back the 25 ODR within one year.*

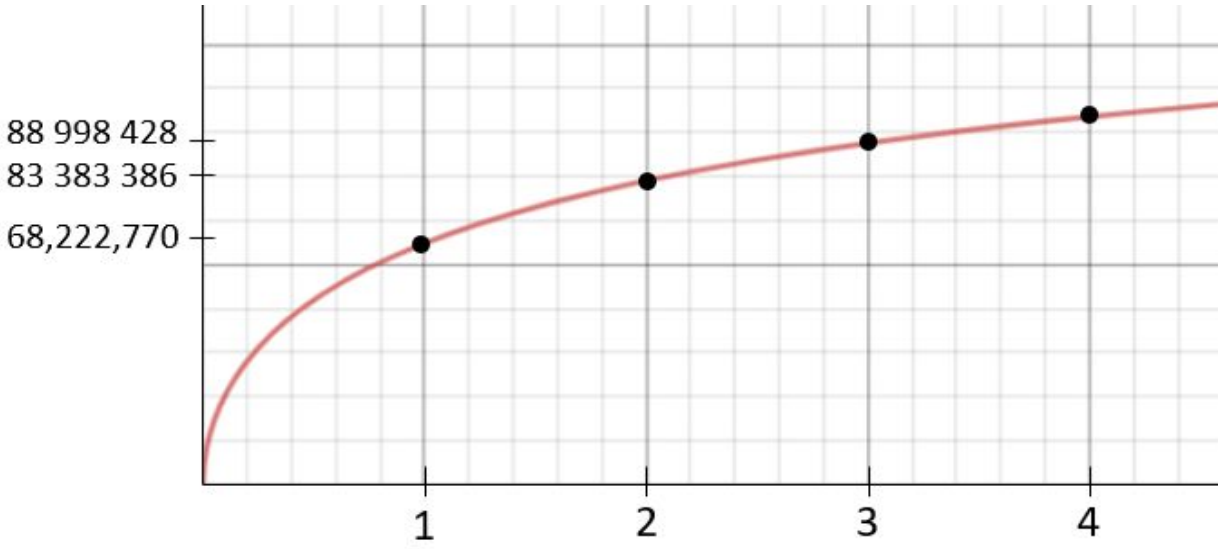
Levy (LVY) token

Levy is the market-driven funding reward token of the Odera blockchain.

The total market supply of LVY is capped at 102,334,155 LVY. Each year, we release a fixed number of LVY coins based on the following logarithmic function:

$$f(x) = \frac{102334155 - \sum_{n=0}^{x-1} f(n)}{(\frac{3}{2})^x} \qquad \{x \in Z \mid x > 0\}$$

This function ensures that the each year, the number of coins released is less than the number of coins released the previous year in order to create create scarcity in the market.



Exactly 85% of the annual increase is distributed on a weekly basis to lenders based on their percentage contribution to the total lending pool of that week.

The remaining 15% of the annual increase is distributed as a form of interest to long term LVY holders at the end of each year. Lenders must hold LVY in their Odera Wallet to be eligible for this bonus interest. In this way, lenders are incentivized to remain part of the Odera ecosystem. With the above incentives, lenders can:

- Keep LVY in their Odera Wallet and earn interest
- Withdraw LVY at a network withdrawal fee
- Exchange LVY to ODR at 0% fee, which can be used to fund other proposals

BLOCKCHAIN ARCHITECTURE

The high-level components of our system are (a) a web interface, and (b) a network of nodes. The web interface is used to interact with the smart contract. A user enters a public key in the web interface to identify themselves. The web interface communicates with a node running on the same machine. This requires the user to have a private key stored in the node, and to initially unlock their account by entering a password at the node.

Instead of using a traditional client-server architecture, with a front-end web interface connected to a back-end server, Odera replaces the backend server with the blockchain. Thus, the web interface includes only client-side code, and the “back end” is the smart contract.

A blockchain-based system is necessary for three reasons:

- **Decentralised**
- **Allows for a token system that facilitates easy, safe cross-border payments**
- **Exclusion of central players ensures no manipulation**

A blockchain is a type of shared database, the contents of which are verified and agreed upon by a network of independent actors. In order for a new piece of data to be added to the blockchain, the independent verifiers must come to consensus as to its validity.

Because each new set of transactions (a “block”) is cryptographically linked to the previous block, it is near impossible to change data stored in a blockchain and any such change would be readily detectable. Thus blockchains are widely considered to be immutable and thus can serve as an immutable record of data, transactions and ownership.

Our technical challenge is twofold:

1. Creating an algorithm for transparent, authentic scoring of business proposals using relevant data frameworks that reflect true credit worthiness
2. Designing a cryptocurrency reward structure that incentivizes lenders to fund more proposals

Smart Contract

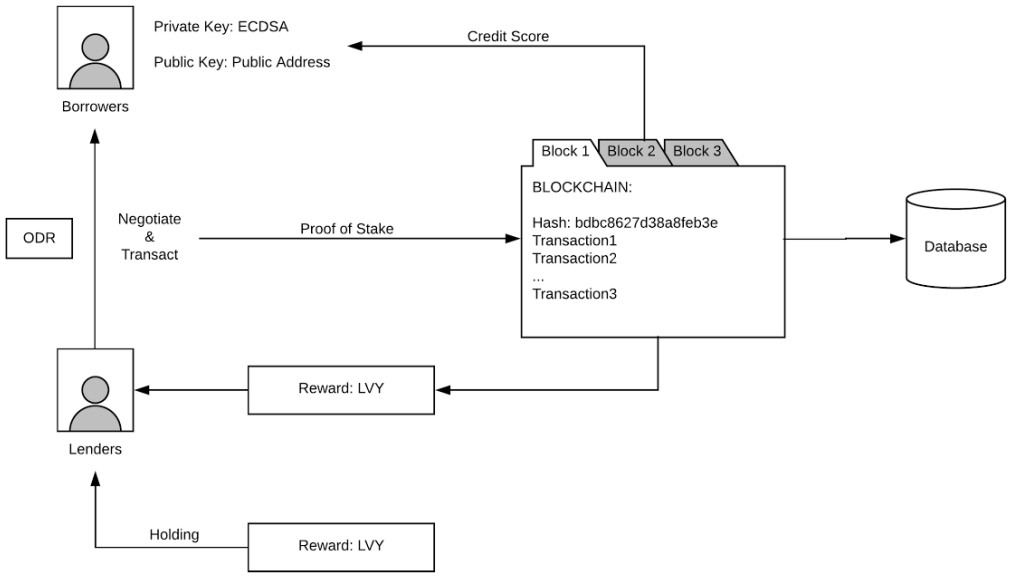
Odera supports multiple types of microfinancing. Crowdfunding with smart contracts is one of them. Smart contracts on Odera enable borrowers to set a specific amount of money as the target for crowdfunding, together with other necessary information like a business proposal. It functions as a built-in algorithm which only executes the transaction when a minimum threshold has been reached. Otherwise, when the fundraising period is over, the lended money will automatically return to the lenders' account. Smart contracts effectively replace the middleman role in fundraising and thus ensure the decentralization of the system.

Elliptic Curve Digital Signature Algorithm

The Elliptic Curve Digital Signature Algorithm (ECDSA) is the key signature verification function used in Odera. Compared to other digital signature algorithms like RSA, it has important advantages in the computational power used as well as its security. The general workflow of ECDSA implementation is it first generates a pair of private key and public key which are mathematically correlated. Clients can then transfer their money directly towards borrowers' public address without further encryption. Once a transaction is received, the node automatically generates a signature based on the message received as well as the user's private key. The ECDSA encryption method ensures the authenticity of each transaction.

Proof of Stake

Odera implements the Proof of Stake algorithm to verify the transactions instead of Proof of Work due to several reasons. First, Proof of Work is energetically costly as the miners spend most of their computational power on generating random numbers. Second, Proof of Work is also vulnerable to the tragedy of the commons as the mining power starts to centralize due to reduced reward and computation competition. By incentivizing people to hold and prove their ownership of the coin, the Proof of Stake algorithm successfully reduced the computation power waste while securing the integrity of the whole system.



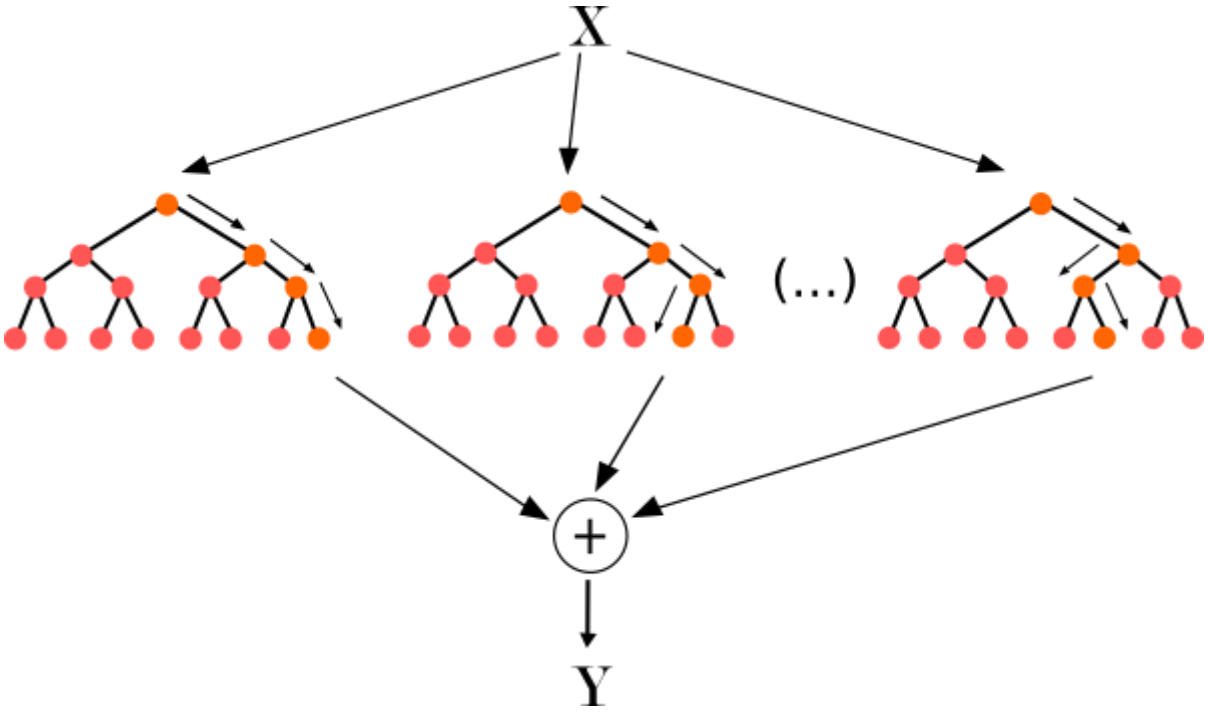
MACHINE LEARNING

Credit ratings are essential to microlending, providing lenders with a signal of a borrower's trustworthiness. Credit ratings on Odera are calculated according to a streamlined workflow:

1. Base calculation derived from an artificial-intelligence evaluation of business proposals. Our algorithms identify relevant categories such as current income, age, loan amount, loan period, location, etc.
2. Based on the extracted information, a machine learning algorithm will be able to predict whether or not a person would receive a loan approval to assess the system's confidence in the applicant's credit score

Methodology

The model chosen for the task of loan approval classification is a Random Forest Classifier, a machine learning algorithm rooted in the concept of decision trees. Decision tree learning is a statistical method that is able to predict a target value based on a multitude of input variables. The algorithm creates a tree that is organized in subsets based on its distinct attribute values. Through recursive partitioning, the process of splitting the tree is repeated. Odera's decision trees are of greedy nature due to their process of top-down induction that divides the trees until the condition of specified depth of the tree is satisfied or the contribution of value to the prediction at the given node is halted. Beyond the high accuracy of decision trees, another fundamental advantage inherent in its algorithmic process is the ability to learn from categorical data, which is ubiquitous in the data distribution of microloan applications.



Random Forests bases its decision on the ensemble of multiple decision trees, which aggregates the outcome for a consented prediction to avert the probable attractor state of high variance in decision tree learning. The algorithm's input vector X composed of the independent variables x1, x2, x3… xn produces the predictive output vector Y, which is tested on an unlabeled data set to estimate the accuracy and recall of the classifier. The prediction ŷ is then given by the average of the weighted neighborhood scheme that learns the features' weights by their local significance:

$$\hat{y} = \frac{1}{m}\sum_{j=1}^{m}\sum_{i=1}^{n} W_j(x_i, x')\, y_i = \sum_{i=1}^{n}\left(\frac{1}{m}\sum_{j=1}^{m} W_j(x_i, x')\right) y_i.$$

By providing a transparent, unalterable history, the Odera blockchain enables credit ratings that cannot be forged and only reflect the base quality of submitted business proposals and the loan approval score generated by Odera's machine learning system

Currently, our credit rating is a summary of a user's past borrowing activity. This includes a cash reputation (total value of repaid loans minus total value of defaulted loans), the number of defaulted and repaid loans, and the number and value of currently outstanding loans. We believe that this provides not only the most important information that lenders need but also establishes the required trust in the synergetic microfinance environment.

Recommender System

In order to better pair lenders with the potential business proposals that they would interest in, Odera adopts the recommender system using machine learning. By studying the mathematical correlation between different user ratings on the proposals, the recommender system is able to capture the unique pattern of each user and gives suggestion based on these patterns.

Specifically, Odera uses Memory-Based Collaborative Filtering by computing cosine similarity, one of the most popular algorithms in recommender engines, for feature learning. It combines both aspects of item-item as well as user-item filtering to give a comprehensive score according to the similar users who liked the proposal and the rating of closely related proposals.

A distance metric commonly used in recommender systems is cosine similarity, where the ratings are seen as vectors in n-dimensional space and the similarity is calculated based on the angle between these vectors. Cosine similarity for users a and m can be calculated using the formula below, where one takes dot product of the user vector u_k and the user vector u_a and divide it by multiplication of the Euclidean lengths of the vectors.

$$s_u^{cos}(u_k, u_a) = \frac{u_k \cdot u_a}{\left\|u_k\right\| \left\|u_a\right\|} = \frac{\sum x_{k,m} x_{a,m}}{\sqrt{\sum x_{k,m}^2 \sum x_{a,m}^2}}$$

To calculate similarity (or pairwise distances) between items m and b Odera uses the formula:

$$s_u^{cos}(i_m, i_b) = \frac{i_m \cdot i_b}{||i_m|| \, ||i_b||} = \frac{\sum x_{a,m} x_{a,b}}{\sqrt{\sum x_{a,m}^2 \sum x_{a,b}^2}}$$

Based on the similarity calculated, further predictions can be made by applying the following formulas on a scale from 1 to 5:[1]

$$\widehat{x}_{k,m} = \bar{x}_k + \frac{\sum_{ua} sim_u(u_k, u_a)(x_{a,m} - \bar{x}_{ua})}{\sum_{ua} |sim_u(u_k, u_a)|}$$

$$\widehat{x}_{k,m} = \frac{\sum_{i_b} sim_i(i_m, i_b)(x_{k,b})}{\sum_{i_b} |sim_i(i_m, i_b)|}$$

[1] Read more at: //economictimes.indiatimes.com/articleshow/55285858.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst