Lending Market, a global and decentralized network for connecting lenders and borrowers fueled by blockchain

Dysopsis Studio

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Abstract

This paper presents Lending Market, an inclusive, global and decentralized blockchain-based network to promote lend economy. Along with lenders and borrowers, we introduce the concepts of escrow and hedge agents, and we define a novel approach to reduce uncertainty of loan payoffs based on *maximin boxes* and *smart funds*.

1 Introduction

Financial inclusion is on the rise globally, accelerated by mobile technology and the internet, but gains have been uneven across countries, with a significant percentage of global population still unbanked and small businesses lacking access to formal credits. World Bank's review [4] suggests that many opportunities are available to leverage new products and technologies among the 1.7 billion adults who remain unbanked in the world. Global Findex data reveals that 48% of adults from Latin America and the Caribbean do not own a bank account, and in countries like Brazil, Colombia and Peru, 60% of the unbanked consider the cost of having an account to be an impediment, while almost 30% cite the lack of trust in financial institutions as an important barrier to account ownership. In addition, approximately 70% of all micro, small and medium-sized enterprises (MSME) in emerging markets lack access to credit [1], whereas the potential demand for MSME finance in Latin America and the Caribbean is estimated to be about USD$ 1.4 trillion.

The evolution of internet and its ability to facilitate interaction between users across the globe, along with the emergence of disruptive crypto-technologies such as blockchain [10], has led to the development of decentralized electronic marketplaces and has significantly influenced financial disintermediation, especially in the area of peer-to-peer (P2P) lending, where individuals can borrow and lend to each other without the intervention of banks, offering new choices for credit outside of the traditional banking system. Conventional P2P lending platforms such as Prosper [9] and Lending Club [3] have been in operation for more than a decade in the US, claiming to have facilitated more than USD$ 50 billion on lending. In Latin America, the so called "Alternative Finance Market" (which includes lending) was reported to be about USD$ 342.1 million by 2017 [13].

More recently, blockchain-based lending platforms have become an interesting alternative due to its cryptographically secure, decentralized and distributed nature backed by blockchain technology. For example, SALT Lending [8], a membership based lending network with over USD$ 50 millions in loans issued, or ETHLend [5], which works exclusively through Ethereum smart contracts and ERC-20 tokens. Even banks, such as ING and Credit Suisse, have acknowledged the potential of blockchain when applied to lending: "Blockchain is set to transform collateral lending" [11]. Blockchain-based lending markets are an interesting and real solution for a variety of use cases, some of which are the following:

- **Inclusive lending:** Unbanked individuals or small businesses accross the globe can apply for a loan, regardless of credit history or geographic constraints, in a cost-effective platform.
- **Cash loans:** owners of digital assets can borrow fiat money for personal or business use, without the need of selling their digital assets. Instead, they use their assets as a collateral for borrowing, and once they pay the loan they receive their assets back.
- **Short selling:** market players can borrow an asset which they estimate will have a significant cutback on its price, to sell it at current price and buy it back at a lower price, making enough profit to pay back the loan and its interests.

Needless to say, there could be more scenarios and actors who would benefit from a global and decentralized lending network. In order to capitalize these tremendous opportunities, we introduce Lending Market, a blockchain-based global network to connect lenders, borrowers and escrows, presenting a novel approach to limit loan risk after a default using smart contracts and custom financial derivatives, as well as introducing the innovative concept of smart funds.

Lending Market provides an inclusive, global and decentralized marketplace to facilitate lend economy, providing support for any currency or digital asset, collateral loan coverage in case of default and interest rates based on global liquid market. The platform is made up of four main concepts: lending, escrow, hedge contracts and smart funds. Additionally, Dysopsis intends to unify all of this concepts on a single mobile application called *Singular Wallet*.

A brief review of our company along with a short introduction to lending concepts and an analysis of other solutions is given in Section 2. Lending Market is presented in Section 3, describing the architecture layer by layer. A few examples are given in Section 3.5 and a brief comparative analysis is described in Section 3.6. Finally, an estimated roadmap is given in Section 4.

2 Background

2.1 Dysopsis Studio

Dsysopsis Studio is an umbrella company for crypto-endeavours. Its main enterprise is CryptoMarket Inc [6], an exchange platform for digital assets in blockchain that integrates the main economies of the region; Chile (2016), Argentina (2017), Spain (2017), Brazil (2018), Europe Zone (2018) and Mexico (2018), connecting more than 160,000 users through 4 digital assets (Bitcoin, Ethereum, Stellar and EOS) and more than USD$ 70 millions in trade operations. During the first half of 2018, CryptoMarket closed a seed round for USD$ 600,000 in association with ConsenSys Venture and Magma Partners, with the purpose of expanding its presence in the region and integrating a new crypto-payment system, which successfully led to the development of CryptoCompra [7], a payment gateway allowing companies to receive payments in cryptocurrencies and automatically cash-in into local currencies in a simple and secure way.

Dysopsis Studio already has the necessary technical infrastructure and a valuable know-how about blockchain and financial solutions, along with a passionate team with more than 20 people from different backgrounds and cultures distributed accross the world.

2.2 Basics of lending

In a basic lending scheme there are two parties involved: a borrower and a lender. The former corresponds to an individual in need of money who makes a request for a loan to the latter, the lender, with the promise of returning the money after a fixed period of time. All loans consist of three components: The interest rate, security component and term. The interest rate refers to a charge for the use of the lender's money, and is agreed between the two parties. The rate can be fixed or variable, and is usually a small percentage of the amount lended. The term of a loan is the (maximum) period of time after which the borrower promised to pay back the loan. If a borrower fails to pay the debt, the loan is said to be on **default**.

Usually, a loan has a set of rules to be enforced on default. This leads to the security component, which is often referred as collateral and is considered a guarantee to the loan. A collateral is often a property or an asset with enough value to cover the loss in case of unpaid loan. This means the lender will be repaid one way or another, either with the loan's amount plus interests or with the collateral.

2.3 Other solutions

2.3.1 SALT

SALT stands for Secure Automated Lending Technology, and was one of the first on the scene of blockchain-based lending markets. Signup on their platform is subject to KYC and AML procedures, followed by a membership fee which limits user attributions depending on a subscription (basic accounts can only request USD on their loans, up to USD$ 10,000). Their process is composed of three steps:

1. Loan creation: a borrower sends collateral to the SALT collateral wallet and funds are transferred to the borrower's bank account. Any price appreciation or depreciation belongs to the borrower.

2. Loan repayment: a borrower makes timely, periodic payments to the lender.

3. Loan completion: upon repayment of the loan, the borrower's collateral is freely available for withdrawal.

Eligible collaterals include Bitcoin (BTC), Ether (ETH), Litecoin (LTE), and Dogecoin (DOGE). Additionally, becoming a lender in SALT requires to be an accredited investor, which means a net worth of at least $1,000,000, excluding the value of one's primary residence, or an income at least $200,000 each year for the last two years. In other words, average people can only signup as a borrower.

Regarding collaterals, SALT introduces the concept of **margin call**. A margin call occurs when the value of the loan's collateral drops enough to cause a breach of the agreed upon loan-to-value (LTV) threshold. The borrower is contacted by SALT staff for a Collateral Maintenance Call, and is given an opportunity to either add additional collateral or make an additional principal payment, bringing the collateral account balance back into equilibrium. Refusing to do so may end up in liquidation of the collateral. This mechanism, although it may seem as protective, could be exploited by lenders to take advantage of short-term fluctuations in the market and produce early liquidation of collaterals. Additionally, an asset-to-asset pricing service must be used in order to assess collateral value, adding complexity to the process.

2.3.2 ETHLend

ETHLend is a decentralized marketplace for lending and borrowing cryptocurrency over the Ethereum blockchain, built on ERC-20 compatible tokens. ETHLend does not lend or hold assets itself, as it does not store any data on centralized servers, but running peer-to-peer on Ethereum blockchain. This implicates that ETHLend does not enforce KYC and suggests it to be solved through messaging and interaction between the lender and borrower. Additionally, and as opposite to SALT, ETHLend does not impose restrictions to become a lender, which means anynone can become a lender or a borrower. Regarding their lending and collateralization mechanism, there are a few important considerations:

1. ETHLend considers a Decentralized Credit Ranking (DCR) to score users and attach those scores to users' Ethereum addresses. This DCR is intended to be connected with **oracles**, or off-blockchain sources, to access data and build a credit profile of the borrower.

2. Loans are given and paid in ETH.

3. Collaterals must be in the form of either Ethereum ERC-20 tokens or Ethereum Name Service (ENS).

4. Users can only borrow 67% of the collateral value offered.

5. If the value of the collateral drops to 100% (or less) of the original loan amount, the lender has the option to claim the tokens (collateral calling).

ETHLend faces the same issue as SALT regarding early collaterals liquidation. Lenders could take advantage of short-term market fluctuations in order to liquidate a collateral which would in fact have been a good long-term security.

2.3.3 Ripio Credit Network

Ripio Credit Network (RCN) is a protocol based on smart contracts intended to standardize credit lending through blockchain technology. The purpose of RCN is to connect borrowers, lenders and other network agents located anywhere in the world, allowing each one of them to manage the credit in their local currencies.

RCN introduces a variety of entities for interacting with their network. First of all, there is a **wallet provider**, which is an entity that wants to offer credit services to its users (borrowers will only connect with the RCN through a wallet provider). There are scoring agents, which analyze available information to statistically evaluate the probability of a default from a given user, and ID verifiers, which are in charge of KYC compliance. Both the scoring agent and the ID verifier are external parties which are rewarded with RCN tokens upon completion of their duties.

To deal with loan defaults, RCN introduces another agent called **cosigner**, who is considered to be a guarantor of the borrower and act as an intermediary between the borrower and the local legal system in the event a borrower

defaults. Cosigners collect a premium in RCN tokens in return for cosigning the smart contract along with the borrower. In addition, a cosigner is expected to be able to contact the borrower, offer repayment reschedule plans, report debts to local institutions and take legal action in the worst case. This means that the cosigner is most likely to be a real-world financial institution.

1. A borrower request a loan throught a wallet provider.
2. An ID verifier identifies the borrower to check that he is who he claims to be.
3. A scoring agent analyzes available information about the borrower and presents.
4. A cosigner uses the information provided by the ID verificer and scoring agent to establish the terms under which it will operate on a loan, creating a smart contract.
5. The smart contract is listed on a credit exchange to connect with potential lenders.
6. If a loan goes on default, the cosigner will take responsability for the borrower's debt.

3 Lending Market

Our solution aims to provide an inclusive, global and truly decentralized marketplace, introducing novel financial derivatives in order to address the risk associated with loan defaults.

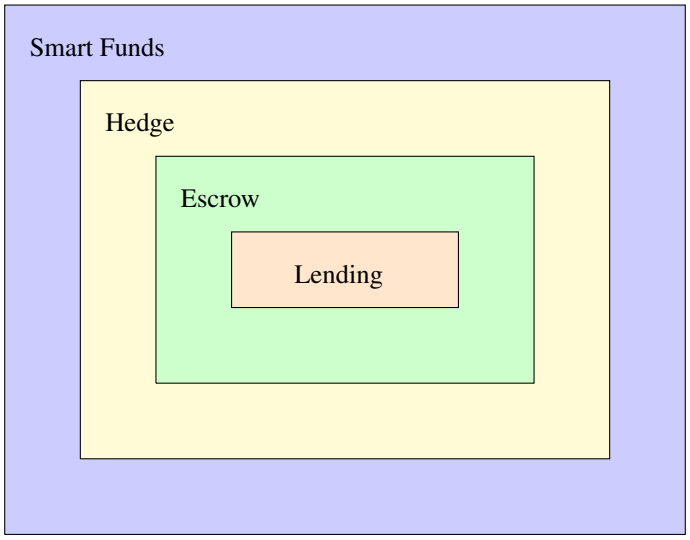

Figure 1: Layered architecture of Lending Market

Figure 1 represents the architecture of Lending Market, which is composed of four layers, each one enclosing the previous ones, enabling a progressive integration of functionalities. Therefore, the process is conceived as four consecutive phases:

1. Development of a lending marketplace, featuring smart collateral contracts for loan defaults.
2. Integration of escrow contracts, allowing external collateralization by a third party chosen by the borrower.
3. Integration of hedge contracts and the creation of a financial derivative for ensuring a minimum or maximum liquidation after a loan default, thus reducing uncertainty in collaterization.
4. Smart Funds system.

Figure 2 show the interaction between the components that interact through the different layers of Lending Market. A detailed description will be given in the next sections, but an overview is as follows:

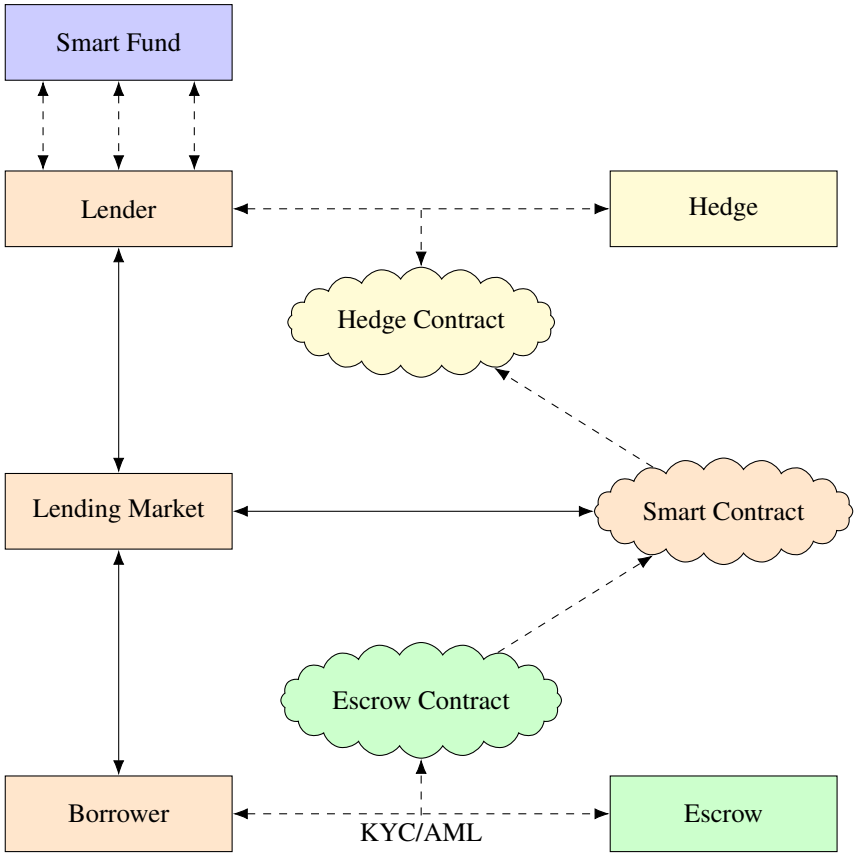

Figure 2: Components interaction

- A lender or a borrower creates an offer, after they have consigned their assets on Lending Market.
- Optionally, a borrower who does not own collateral could ask for it to an escrow agent. The escrow agent will assess the borrower profile, probably with a KYC/AML proccess, and a escrow contract would be created between them, delivering the required amount of collateral for the loan, ready to be consigned.
- A match occurs through Lending Market and a smart contract is created.
- Optionally, a lender who would like to ensure his loan payoff would engage with a hedge agent to make a futures contract over the collateral value. This contract establishes a payment (on the original loan asset) once the loan enters on default, and delivers the collateral to the hedge agent. Thus, the lender would receive **either the loan payment or the hedge contract payment**.
- If the terms of the smart contract indicate so, every time the borrower makes a partial payment a proportial part of the collateral is returned: i.e. paying half of the loan would deliver half of the collateral to the borrower. Likewise, the terms of the hedge contract would indicate that the promised payoff is proportial: i.e. half of the collateral would trigger a half hedge payment.

3.1 First Layer: Lending Market

Interaction between lenders and borrowers is possible through a public marketplace, namely Lending Market, where individuals can make offers to borrow or lend and they are guaranteed that their offers will be executed against the best possible match, similar to matching strategies used in cryptocurrency exchanges (such as CryptoMarket). The motivation for a borrower is clear, he wants to get a custom type of asset available in the market, commiting himslef to pay it back after a fixed period of time. For a lender, the motivation is to obtain profit out of an asset by offering it through a market.

In Lending Market, the algorithm for evaluating a set of rules to match an offer emulates that of a stock market limit order [12], where an order is set to buy or sell a stock at a specific price or better, with the main difference that in this case is a **multiple variable match**. That is to say, while an offer does not guarantee execution, it does ensure that an individual will borrow or lend only after a pre-determined set of conditions (or better ones) are satisfied, thus ensuring **risk-free** operations.

3.1.1 Scoring

As stated before, an offer to borrow or lend is composed of a set of conditions or requirements that the counterpart has to fulfil. The main difference between creating an offer to borrow or lend is the scoring mechanism applied to borrowers, which lenders can use to discriminate borrowers and assess potential risk of a loan default. The scoring mechanism is composed of two values, *sum scoring* (S) and *factor scoring* (F), defined as follows:

$$\begin{aligned} S &= \sum_{i=1}^{n} p_i, \quad \text{where } p_i \text{ is the paid amount for the } i\text{-th loan} \\ F &= \frac{\sum_{i=1}^{n} a_i}{S}, \quad \text{where } a_i \text{ is the total amount of the } i\text{-th loan, with } F \in [0,1] \end{aligned} \tag{1}$$

Equation 1 describes the formula for both S and F in terms of the total and paid amounts of past loans, where n is the number of loans borrowed. With this information, a lender can set a threshold for both values and only consider valid offers from individuals with a certain scoring. For example, setting $F = 1$ and $S = 5000$ means that the lender will accept offers from individuals who have paid all of their loans and have already paid a total of USD$ 5000 (or more) in all of their past loans.

3.1.2 Making an offer

The set of conditions required for creating an offer depends on whether the individual is looking to borrow or lend. The differences between them are the specification of a scoring value (only available for lenders) and the minimum or maximum conditions, i.e. while a lender would specify a minimum interest rate (accept 5% or more, for example) a borrower would specify a maximum interest rate (take 6% or less, for example). The purpose of making an offer is to define the specific conditions under which it will produce a match against the counter party. In other words, a match will occur only after a pre-determined set of conditions (or better ones) are satisfied, thus ensuring **risk-free** operations.

Name	Abbreviation	Comment
Maximum Time to Lend	MTTL	Maximum period of time the user is willing to lend
Minimum Interest Rate	MIR	Minimum rate of interest the user is willing to accept, calculated over a fixed period of time (i.e. yearly)
Asset	ASSET	Type of asset to be lended
Maximum Lending Amount	MLA	Maximum amount of asset the user is willing to lend
Collateral	COLL	Type of collateral requested
Minimum Collateral Amount	MCA	Minimum collateral amount requested
Minimum S Scoring	MINS	Minimum S scoring required (Equation 1)
Minimum F Scoring	MINF	Minimum F scoring required (Equation 1)

Table 1: Set of specifications to create an offer to lend

Name	Abbreviation	Comment
Minimum Time to Lend	MTTL	Minimum period of time the user needs to lend
Maximum Interest Rate	MIR	Maximum rate of interest the user is willing to accept, calculated over a fixed period of time (i.e. yearly)
Asset	ASSET	Type of asset to be lended
Minimum Lending Amount	MLA	Minimum amount of asset the user needs to lend
Collateral	COLL	Type of collateral requested
Maximum Collateral Amount	MCA	Maximum collateral amount the user is willing to deliver

Table 2: Set of specifications to create an offer to borrow

3.1.3 Collateral

A borrower is required to consign a collateral as a mechanism for establishing that he owns the offered collateral and that the offer is real. The specific amount of collateral for any offer would usually depends on the type of asset, amount of loan, borrower scoring, among other factors, and it will be set by the author of the offer. For example, a borrower with a good scoring and demonstrated solvency (past loans' amount) could bargain a lower collateral. A user who is borrowing for his first time, or using a highly volatile asset, could be asked for a greater amount of collateral. Either way, **the collateral must be consigned** in Lending Market before becoming available for listing it in an offer.

Further, Lending Market does not enforce any restriction upon type or amount of collateral offered nor provides margin calls or early liquidation of collaterals because this could allow lenders to exploit assets volatility in order to liquidate a collateral during a short-term market fluctuation, regardless of its long-term value. Instead, trust is set on borrowers by a scoring system, and the collateral mechanism is kept as simple as possible, avoiding as well the need for a high availability asset-to-asset pricing services to keep collaterals price up-to-date.

Figure 3: ETH price between March and May of 2018. Obtained from CoinMarketCap [2]

Date	Price
2018/03/07	USD$ 760.79
2018/04/04	USD$ 379.95
2018/05/07	USD$ 761.84

Table 3: ETH prices in USD. Obtained from CoinMarketCap [2]

The following is an example of the potential risk associated with **collateral margin calls**. Figure 3 shows the variation of ETH price with respect to USD, between March and May of 2018, and Table 3 contains specific prices during the same period. Consider the following scenario:

1. A borrower asks for a two-month loan on March 7, 2018 for a total of USD$ 6,000 and places an ETH collateral worth USD$ 10,000.

2. On April 4, 2018 ETH price drops and the collateral is worth USD$ 4,994.15, resulting in a reduction of more than 50% of the collateral value and an estimated pricing below the original loan amount. The lender decides to make a margin call and liquidate the collateral.

3. By the loan's end date, May 7 of 2018, the ETH collateral would have had an estimated value of USD$ 10,013.8, maintaining its value over the two-month period. Nevertheless, the short-term fluctuation on April enabled the lender to collect the collateral.

4. The lender does not get back its loan money nor the borrower gets its collateral. Instead, the estimated value of the collected ETH collateral gave the lender a profit of 66% over the original USD$ 6,000 lended.

To avoid this situation, Lending Market does not include any type of collateral liquidation mechanism. Instead, collateral contracts are as simple as possible: once the loan is paid, collateral is returned. If the borrower fails to pay, the lender seizes the collateral. Whether that ends up in profit or loss depends exclusively on the collateral's volatility and not on Lending Market's control mechanisms. In a similar way, if the terms of the contract indicate so, a borrower could make partial payments to the lender and he would be given back the same proportion of collateral without the need of any further calculation more than a simple proportion, which is another interesting feature. We believe these are fundamental characteristics in our solution, providing **simplicity and long-term robustness**.

3.2 Second Layer: Escrow

The second layer of Lending Market is the escrow agents. An escrow is a **third party** willing to provide an asset to a borrower to be used in a loan, and charge an **up-front fee** for it. That is, if a borrower does not have the required amount of collateral needed to apply for a loan, he could ask an escrow for the specific type and amount of collateral, paying a fee and commiting himself to pay the loan and return the collateral to the escrow.

Even though Lending Market facilitates the interaction of escrow agents in the system, it is important to notice that they are a **third party** and the terms of the agreement between escrow agents and borrowers depends only on them.

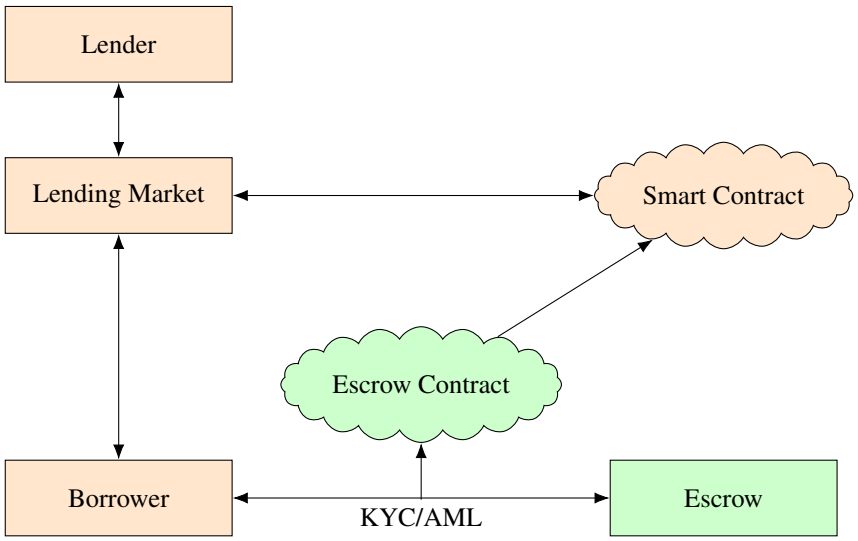

Figure 4: Escrow integration

Escrow agents play a fundamental role on Lending Market, as they enable more traditional financial use cases were users are not so familiar with cryptocurrencies. An individual with no knowledge whatsoever about cryptocurrencies could easily apply for a loan with the help of an escrow agent, with the sole responsability of paying his debt on time. In a way, they are intermediaries between the traditional system and a decentralized platform such as Lending Market.

Another thing to consider is that a borrower failing to pay his loan debt would also engage in a debt with the escrow agent as the borrower would no longer be in possession of the collateral (seized by the lender through a smart contract). For this reason, escrow agents are encouraged to carry out well-established **Know-Your-Customer** (KYC) processes before providing a collateral, along with performing a proper evaluation of risks associated with a specific individual and, ideally, be able to carry out the legal mechanisms to collect a debt. Additionally, escrow agents are encouraged to charge an **up-front fee** for every collateral provided, thus ensuring a long-term gain within its margins of risk and helping them deal with unexpected losses.

3.3 Third Layer: Hedge

The third layer of Lending Market are the hedge agents, which purpose is to make futures contract on the value of the collateral after a default. For the lender, a hedge contract is a mechanism to ensure on-default liquidation with the same asset in which he made the loan. For the hedge agent, it is a way to set a bet on the collateral future price and make a profit. In practice, a hedge contract is made upon an offer from the hedge to the lender in which he puts a bid on the collateral future price. For example, the lender has a loan with a collateral of 1.5 ETH but he does not want to receive ETH in case of a default, so he engages with a hedge agent and makes a deal for selling the collateral for USD$ 110 inmediately after the default (through a smart contract). Once the loan enters into default, the lender receives USD$ 110 and the hedge agent receives 1.5 ETH.

Considering the intrinsic risk associated with a futures contract scheme, the hedge agent must be willing to accept a gain or a loss, so this role is intended for **risk-aware** players. For example, in case the borrower fails to pay his debt and the collateral maintained (or improved) its pricing, gains would be substantial enough for the hedge agent as the collateral is expected to be a considerable percentage over the loan amount. In any case, the amount of the hedge contract is negotiated between the two parties, and the contract is executed only after a default. A remarkable consequence of hedge contracts is that they **reduce all uncertainty** about the outcome of a loan. That is, even though there could be cryptocurrencies involved in the process, the lender is able to effectively determine the risk associated with his investment.

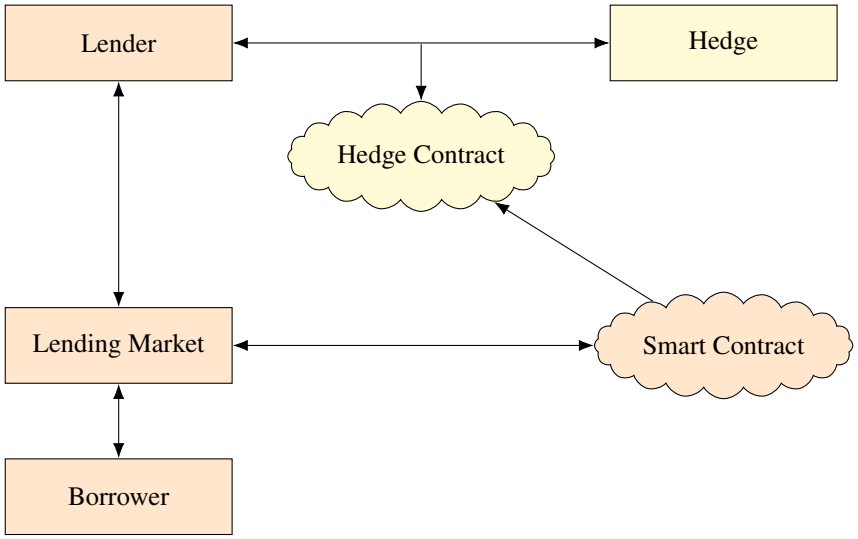

Figure 5: Hedge integration

Given that hedge contracts are based on loan collaterals, if a loan accepts partial payments, then its collateral would be returned to the borrower proportionally, and so the hedge price must be considered proportionally as well. In other words, if a borrower pays half of his debt, then 50% of the collateral would be returned to the

borrower, and the hedge contract associated with the loan would be for the remaining 50%.

Based on the above, we can define a finantial derivative called the **maximin box**. First, we outline a few useful concepts to later introduce the maximin box as a function of the loan.

Definition 1 (Loan default) *Given a loan x, then $d(x)$ is a function that returns 1 if the loan is on default, and 0 otherwise:*

$$d(x) \begin{cases} 1 & \textit{if the loan is on default} \\ 0 & \textit{otherwise} \end{cases}$$

Definition 2 (Amounts) *Given a loan x, its unpaid amount is given by $unpaid(x) \geq 0$, its paid amount is given by $paid(x) \geq 0$, and its associated hedge amount is given by $hedge(x) \geq 0$. Likewise, the loan total amount is defined as $amount(x) = paid(x) + unpaid(x)$.*

Definition 3 (Maximin box) *Given a loan x, the maximin box returns the loan payoff.*

$$maximin(x) = paid(x) + unpaid(x) \cdot (1 - d(x)) + hedge(x) \cdot d(x)$$

When the term of the loan is terminated, then the maximin returns the final payoff. This simple yet powerful concept allows the lender to determine the current state of his investment. Interestingly, a **probability distribution** for estimating loan defaults can be introduced on Definition 1, adding the possibility of evaluating the future return of an investment.

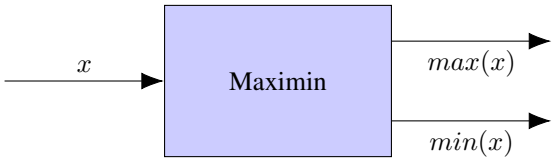

Figure 6: Maximin Box

Figure 6 shows a graphical description of the concept of a maximin box. Loan x is delivered, then a closed system composed of smart contracts generates two (only) possible outcomes, either a maximum (loan amount plus fees) or a minimum (hedge amount).

3.4 Fourth Layer: Smart Funds

A fourth layer can be built on top of the Maximin boxes. Considering a set of several loans, each one of them with a hedge contract attached (therefore its payoff is predictable), then a collection of Maximin boxes defines what we call a Smart Fund.

Definition 4 (Smart Fund) *Given a set X_n of n loans, each denoted as x_i, where $0 < i \leq n$, then a Smart Fund is the return of all loans in the set, given by:*

$$SF(X_n) = \sum_{i=1}^{n} maximin(x_i)$$

If the set X_n is composed only of terminated loans, then the return of the Smart Fund is safely bounded.

Definition 5 (Bounds of a SmartFund) *Given a set X_n of n terminated loans, each denoted as x_i, where $0 < i \leq n$, and the condition $hedge(x_i) \leq amount(x_i)$, then the Smart Fund $SF(X_n)$ is safely bounded by the sum of all hedge amounts and the sum of all loan amounts:*

$$\sum_{i=1}^{n} hedge(x_i) \leq SF(X_n) \leq \sum_{i=1}^{n} amount(x_i)$$

Furthermore, as stated in the previous section, if we introduce a **probability distribution** for estimating loan defaults on Definition 1, then we can predict the future state of the set of minimax boxes and therefore the return of a Smart Fund.

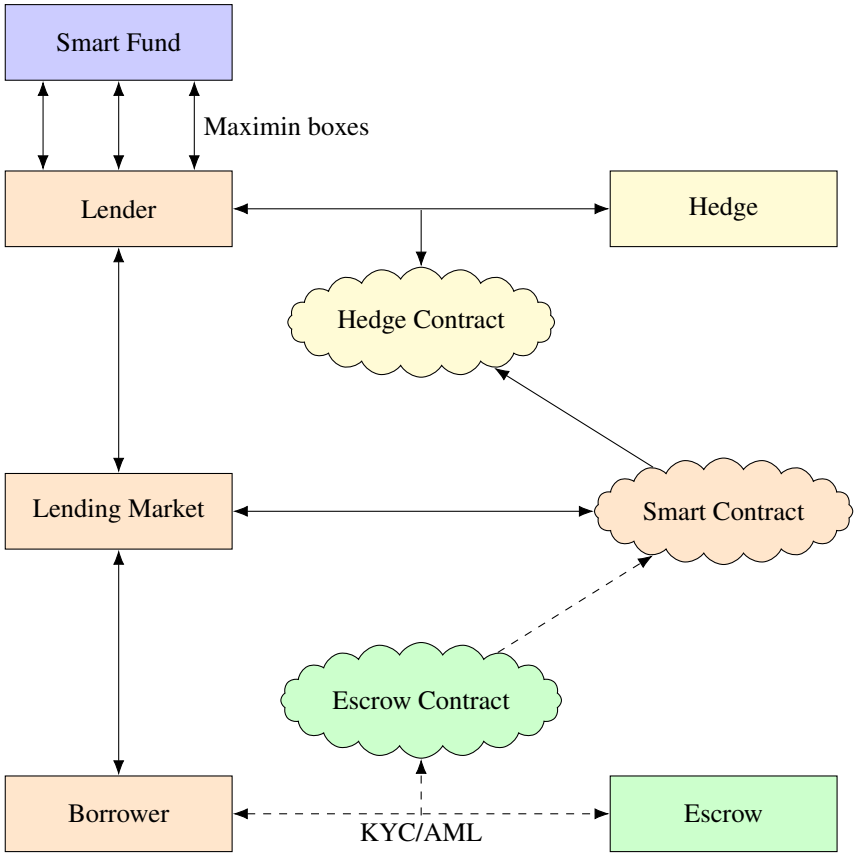

Figure 7: Smart Fund

3.5 Examples

In this section we provide a few examples in order to better illustrate the flow of possible use cases in Lending Market.

3.5.1 Example 1

Bob is looking for a **one-month** loan for **CLP$ 100,000** and he is willing to accept an **8%** interest rate, but he doesn't own any type of digital asset to use as a collateral. He goes to *Singular Wallet*, a mobile application that provides him a list of **Escrow agents** participating in Lending Market, and he signs up with them, each one having their own **KYC** process. After analyzing the proper information he selects the one he thinks offers him the best deal. **Escrow agent E** thinks Bob is a good candidate and is willing to place a **1.5 ETH** collateral for him, which at the time is worth about **150%** of the loan amount. Bob and Escrow agent E agree on an **up-front fee** of **CLP$ 5,000**, and they create an **escrow contract**. The collateral is already consigned in Lending Market by Escrow agent E, so it is possible to make an offer to the market. As Bob is a new user in Lending Market, his S and F scorings are 0 and 1 (zero loans amount paid so far, and no debts).

Lending Market finds a match with a lender, **Alice**, and a smart contract is created. Alice delivers **CLP $100,000** (consigned in Lending Market) with an **8%** interest rate, expecting to be paid after **one month**. The smart contract holds in reserve **1.5 ETH** in case Bob does not fulfil is commitment. Bob is now able to withdraw the CLP$ 100,000 to his bank account and use it as he wishes.

Two weeks after the loan was signed, the collateral had a cutback on its price and came to be worth **98%** of the loan amount. Nevertheless, as the period has not yet ended, nothing happens. A few days before the debt is due, Bob consigns back the **CLP$ 108,000** in Lending Market and pays the loan. As he paid the entirety of the debt, the collateral is delivered back completely to the Escrow Agent E. Thus, by the end of the term **Alice** had an **8%** gain, the **Escrow Agent E** recovered its collateral along with a **CLP$ 5,000** income, and Bob is debt-free.

3.5.2 Example 2

Charles is looking to make a profit out of the **200 EOS** he owns. He consigns them in Lending Market and offers to lend them for **two months** at most, asking for a **7%** interest rate. In return, he requires **5000 XLM** as he considers Stellar to be somehow estable.

Francis is a crypto-enthusiast and she is always up-to-date with news from the cryptocurrency world. She thinks EOS will have a significant cutback on its price very soon and she wants to make a profit by short selling, but at the moment she does not have EOS nor money to buy it, so she decides to go to Lending Market for an EOS loan in exchange for the cryptos she currently owns. She looks for EOS offers in the market and she thinks the offer from Charles is fair. She consigns her XLM in Lending Market and makes an offer to fulfil his requirements.

Lending Market makes the match and a smart contract is created, holding **5000 XLM** as a collateral. Francis receives the **200 EOS** and goes to CryptoMarket to sell them at market price, receiving something around **CLP$ 340,000**. One week later, EOS price goes down and Francis buys **214 EOS** for **CLP $300,000**. She decides to pay her debt right away, so she goes to Lending Market, consigns her **214 EOS** and pays the debt, receiving back her **5000 XLM**. Thus, Charles had a gain of **14 EOS**, and Francis made a profit of **CLP$ 40,000** with her short selling.

3.5.3 Example 3

Hector is looking to make a long-term profit from his savings, so he goes to Lending Market. He is expecting to obtain at least **7%** interest rate in **one year** by lending **CLP$ 10,000,000** for a **4.5 BTC** collateral backup worth about **CLP$ 11,497,500**, but he does not want to receive cryptocurrencies in case the loan goes into default, so he decides to engage with a Hedge agent. In the meantime, Lending Market finds a match for Hector's offer, and a smart contract is created holding **4.5 BTC collateral**, delivering the **CLP$ 10,000,000** to the counterpart. After that, **Hedge agent H** offers Hector to cover his collateral in one year from now, for **CLP$ 9,900,000**. Hector thinks this is a reasonable offer, as it makes the loan a liquid and risk-managed operation: either he receives the loan amount plus interests or the hedge contract amount.

By the end of the term, Hector was paid half of the loan amount with partial payments, thus the smart contract returned half of the associated collateral. Once the term is ended, the remaining collateral is delivered to the hedge contract, which is responsible for paying **CLP$ 4,950,000** to Hector and **2.25 BTC** to Hedge agent H. In total, Hector received half the loan amount plus half the hedge contract amount: **CLP$ 5,350,000 + CLP$ 4,950,000**, adding up a total of **CLP$ 10,300,000**. Thus, Hector not only did not lose but still had a **gain of 3%**. On the other hand, BTC price went down to **80%** its price at the end of the period, so the **2.25 BTC** are now worth **CLP$ 4,599,000**, which if sold on the market would translate into a **7.09%** loss for the Hedge agent H.

3.6 Comparative Analysis

Based on the concepts described in previous sections, we can build a comparative analysis between the different features provided by Lending Market and the other solutions.

Feature	**Lending Market**	**SALT**	**ETHLend**	**RCN**
Anyone can become a borrower or a lender	YES	NO	YES	YES
Scoring system for borrowers	YES	NO	YES	YES
Requires a collateral to ask for a loan	YES	YES	YES	NO
Allows third-party collateral placement	YES	NO	NO	NO
Prevents early liquidation of collateral	YES	NO	NO	NO
Allows to cover the lender payoff in case of default	YES	YES	YES	YES

Table 4: Comparative analysis

4 Roadmap

Below are the key milestones we have defined for Lending Market, divided in five periods including 2019 and the first two quartes of 2020.

Period	Description
2019 Q2	Smart Contract development kick-off.
2019 Q3	Smart Contract code source release (beta).
2019 Q4	Smart Contract running on blockchain; Python, Java and Javascript SDK Release (software development kit) and Institutional Alliances Stage 1.
2020 Q1	**Official Launch**. Institutional Alliances Stage 2. Integration with **SingularWallet**.
2020 Q2	Smart Scoring Algorithms and protocol add-ons. Institutional Alliances Stage 3.

Table 5: Lending Market roadmap

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