HOMELEND

A BLOCKCHAIN-BASED MORTGAGE
CROWDFUNDING PLATFORM

BUSINESS WHITEPAPER 2.1.2

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CONTENTS

1. INTRODUCTION

Homelend will transform mortgage origination into a simpler, more efficient and fair process, reducing the distance between borrowers and lenders in a way no solution has done before.

Mortgage loans are at the core of society.

One of our basic needs as human beings is shelter. Buying a TV, embarking on holiday travel, starting a business, or even sending your kids to college... These are choices you can choose not to make in order to avoid becoming indebted. But not having a home isn't —or shouldn't be— an option.

For most people, the only options for housing—besides living with their families, friends or relatives—are either renting or buying a place using a mortgage loan. Few are able to make a cash home purchase. Indeed, in the U.S., cash transactions account for only a third of home purchases[1]. Even when someone is able to pay cash, a small mortgage loan might continue to be preferable as mortgage interest payments can, in some places, be deducted for income tax purposes[2].

There is no shortage of statistics clearly illustrating the importance of the mortgage market from an economic and social standpoint. For instance, in absolute terms, in the Unites States alone the value of mortgage debt outstanding for 2016 was US$ 14.29 trillion, almost reaching pre-2008 global financial crisis levels[3]. This number is expected to reach US$ 31 trillion in 2018, at the global level, according to Market Reports Online[4].
In relative terms, on the other hand, one finds that in a small country like Israel, 61.53% of household debt and 37.29% of all debt stems from housing loans[5].

Despite how common and important they are, mortgage loans remain complex —involving a lot of paperwork, overhead costs and inefficiencies. The number of documents that need to be gathered and processed only for an application is considerable. Creating a new mortgage requires a significant amount of time for both the borrower and the lender. The process is still paper-based, in contrast to other financial areas that have already shifted to digital. In addition, the mortgage loan process continues to involve many parties, including the buyer, seller, financial institution, rating agency, appraiser, broker and so on, making it even more complex.

The market itself has also become more complex in recent years. Traditionally, the same inancial institution, a mortgage bank, would play the roles of originator, lender and servicer. In other words, banks issued loans using the funds generated by their clients' deposits, and managed the mortgage during its entire lifespan (which could reach 30 years or more). But during the last three decades, the mortgage market value chain has incorporated new players and stages. Most mortgage loans are no longer kept by banks in their balances, but rather sold to third parties in a secondary market. This creates distance between-borrowers and lenders. As a result, an individual who wishes to refinance his mortgage loan often does not know with whom he should negotiate. In extreme cases, a home foreclosure might be granted by a judge in favor of a bank, and it surfaces only later that the mortgage has in fact

been resold to a third party in a secondary market[6].

The introduction of mortgage-backed securities (MBS), while expanding financing sources and liquidity, introduced further complexity. Mortgage market securitization, for all its advantages, created an environment where sound credit assessment was relaxed. Confident that MBS would remain a low-risk instrument because most mortgages debts are paid religiously (even if some borrowers could default on their debts), banks began granting sub-prime loans under unfavorable conditions. The number of sub-prime loans in the U.S. reached almost a quarter of total mortgages originated in 2006[7]. This created a systemic risk that turned into the sub-prime crisis of 2007, and was also the main factor of the global financial crisis of 2008 and the ensuing Great Recession years.

One of the underlying reasons for the severity and extent of the sub-prime crisis was the combination of irresponsible lending with real estate speculation. Individuals who couldn't afford an expensive house were nonetheless given credit on the assumption that housing prices would keep increasing. People borrowed money in order to speculate on the housing market, not because they needed a home. But given that the assessment on a mortgage application was solely based on economic grounds (primarily in terms of credit ratings), speculation was boosted.

In fact, the 2008 financial crisis can be thought of as a consequence of a typical market failure in a strict economic sense. Given the importance of the mortgage market for the economy and society, various innovative solutions that address these inefficiencies and unnecessary complexities are rapidly gaining ground. Quicken Loan, for instance, a non-bank U.S. mortgage lending company, has already overtaken Bank of America in mortgage lending volume (US$ 79 billion in 2015), trailing only JPMorgan Chase and Wells Fargo[8].

The mortgage industry is evolving toward innovative solutions, capable of dealing with the aforementioned problems and of increasing efficiency, reliability and transparency. This evolution will also address market failures derived from a purely economic logic.
In this new market environment, Homelend is developing an innovative platform that taps into the power of blockchain technology and will disrupt the mortgage industry.
This will be done by opening new P2P funding / investment opportunities, better managing information, and automating business processes with the help of smart contracts.

2. BLOCKCHAIN AND THE MORTGAGE INDUSTRY

Blockchain and smart contracts have the potential to save between US$ 3 billion and US$11 billion to the mortgage industry.

Capgemini Consulting

Many areas in the financial world have been disrupted by the Internet revolution. However, mortgage lending, despite being one of the largest areas, is still generally conducted under the same traditional system. The mortgage value chain has grown in complexity during the past three decades, due to the trend towards securitization, which has significantly amplified financial supply. Nevertheless, mortgage lending processes remain mostly paper-based and involve many players, making them complicated, tedious and slow.

This has several negative consequences for the borrower as well as for other parties involved. For instance, many borrowers are burdened by the sheer amount of paperwork they need to manage. But the large amount of documents that need to be filled and the number of entities involved in the mortgage origination process are a consequence of two facts. First, there's a real need for information gathering, analysis and checks to guarantee that the mortgage loan will be repaid. Second, this continues to be a paper-based legacy process that has not been sufficiently modernized and aligned with technological progress.

Blockchain technology has an enormous potential to address both of these facts. Due to its distributed nature, a blockchain ledger can significantly ease the transfer of and access to information for each of the parties involved in the mortgage value chain. Also, with its unique capability to generate trust, transparency, and record immutability, it is an effective move toward digitization, not only of mortgage documentation but of all related business processes.

In the next sections, a brief explanation of the mortgage value chain will be given in order to point out the shortcomings of the current system. As will be observed, many of these problems can be addressed through blockchain technology.

2.1. Mortgage value chain

The mortgage value chain consists of three distinctive stages or phases: origination, servicing, and securitization. Origination is the process of applying for and closing a mortgage loan. Servicing involves executing the obligations that arise from the loan during its lifespan (e.g. monthly payments of principal plus interests). Securitization is the issuing of financial instruments called mortgage-backed securities (MBS). Both servicing and securitization take place after origination has been completed.

Mortgage **origination** comprises all the steps and procedures that are necessary for the request, analysis, offer and formalization of a mortgage loan. Specific steps and their precise order might vary depending on the location's legal regulations and business practices. Each step taken during the origination process has a specific objective.

Taken as a group, however, all the steps are instrumental in relation to a central goal: formalizing a mortgage loan in order to allow the purchase of a property, under legal and financial conditions that will make the repayment of the loan very likely.

Once the mortgage loan is formalized, it becomes an asset for the lender and a liability for the borrower, who must periodically pay an amount that comprises principal and interest, in addition to other payments such as insurance or taxes. The collection of this money throughout the life of the loan, and related procedures such as sending mortgage and escrow statements or pursuing late payments, is known as mortgage **servicing**. Servicing can be done by the mortgage lender, but is commonly performed by a specialized entity to which the mortgage lender sells or transfers its servicing rights.

Finally, **securitization** is "the process through which an issuer creates a financial instrument by combining other financial assets and then marketing different tiers of the repackaged instruments to investors." [9] Mortgage Backed Securities (MBS) are the best-known example of securitization.

An MBS is created when a number of mortgage loans are purchased from lenders and bundled into a pool by an aggregator. These are then securitized by issuing an MBS that represents claims on the principal and interest payments of the mortgage loans in the pool.
The biggest advantage of MBSs is that they significantly expand the liquidity of the market, increasing the amount of funds available for mortgage lending. On the other hand, MBSs were at the origin of the 2008 global financial crisis, as the collateralization of these loans created a systemic risk that affected the entire financial system.

Because the lender knows beforehand that the mortgage loan is going to be traded in the secondary market, and therefore will not end on his balance sheet, he does not apply the same level of care in collecting information. In other words, because securitization creates a distance between the mortgage originator and the bearer of the default risk (e.g. the one who holds an MBS), the former has less incentive to carefully screen a borrower's loan application[10].

The increased distance between the original mortgage and the final MBS incentivized a system where lack of transparency was rampant. As a result, the process of aggregating, issuing and marketing these MBSs came under close scrutiny by government authorities, and is now under strict regulations in many countries, notably in the U.S. under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

MBSs, while very common in large housing markets like the U.S., are far less popular in smaller countries like Israel, where according to the Bank of Israel, securitization is almost non-existent[11].

2.2. Mortgage origination issues and problems

Due to the sheer number of documents and parties involved, mortgage origination is usually a lengthy process, averaging close to 50 days[12]. Gathering all the required documents for a mortgage application, (including bank statements, pay stubs, tax returns, etc.) can be very time-consuming for the borrower. Filling the application form requires attention to detail, and many applicants aren't familiar with the terminology or don't understand many important concepts.

To some extent, the complexity of the mortgage origination process cannot be avoided. Each step, document, activity, etc. is there to protect the interests of the lenders and the borrowers. The health of the credit system depends largely on the avoidance of defaults and delinquencies. Thus, determining the creditworthiness of the borrower and the value of the collateral are crucial.

Borrowers and real estate agents are aware that the process is not simple, but sometimes complain about poor management by lender officers. Loans are in many cases extended without collecting enough information about the borrower. These mortgage loans (known as "low documentation" or "no documentation" loans), and lenders' laxity in properly scrutinizing borrowers, exist partly because of the trend toward securitization. Indeed, according to the U.S. Financial Crisis Inquiry Commission, in 2006 (at the height of mortgage securitization, prior to the sub-prime crisis), 27% of all mortgages originated were "low-doc" or "no-doc"[13]. Moreover, the complexity, length, and number of parties involved in the mortgage origination process creates additional difficulties for information processing and gathering.
A large number of documents, coming from different parties, needs to be collected and analyzed. While some of these documents have already been digitized, the use of paper-based mortgage files persists.
As a result, the process remains a lengthy one.

2.3. What blockchain technology offers

Blockchain is an instance of what are known as Mutual Distributed Ledgers (MDL).
A distributed ledger is a shared database where records are stored in multiple locations, in such a way that no organization or entity has control over it, and therefore cannot modify it.

In a traditional non-blockchain scenario, databases are handled by a single organization. For instance, a bank has a record of the amounts deposited by its account holders. Were someone able to hack the system and modify the database, he would also be able to steal a large amount of money (of course, banks have many security measures to counter these attacks). The reason why depositors continue to put their money in banks' hands is that they trust the banks and their systems. "Trust is the stock-in-trade of financial services. In reality, financial services trade on mistrust. If people trusted each other on transactions, many financial services might be redundant[14]."

As was described in the previous section, the mortgage origination process involves many steps, documents and entities. These actors must access, analyze and verify information provided in the mortgage application and subsequent steps. In this sense, a distributed ledger, accessible by all parties, would enhance transparency, efficiency and reliability in the access to information contained in the documents handled during mortgage origination. Inconsistencies in the data available to each actor (appraiser/insurer/ loan officer, etc.) would be reduced to zero if all documentation was stored in a distributed database, immutable and equally accessible.

Besides storing information obtained from previous documents in an unalterable and consistent way, blockchain technology allows for the processing of transactions, generating records that are immutable and easily accessible. For instance, the closing of the mortgage loan itself, including the signature and subsequent issuance of the promissory note and mortgage deed, can be performed in the blockchain. A digital document, with a unique hash identifier and other metadata, would be created. This would significantly increase efficiency in the subsequent stages of servicing and securitization.

Moreover, all information created and stored would be kept private, only accessible to the parties involved in the origination process, according to their needs.

2.4. Smart contracts

While distributed ledger technology (DLT) constitutes the core of blockchain platforms, the other important feature that has gained increased attention is the ability to code and execute **smart contracts**.

Smart contracts are computing programs that execute specific actions or adopt determinate states when pre-defined conditions are met.

The concept itself has existed for over 20 years, and the underlying functionality, i.e. the automatic execution of an obligation when the specified input is entered, is as old as the soft drinks vending machine[15]. Smart contracts are not native to DLT or blockchain technology: automatic execution of obligations, when certain conditions are met, can and has been developed in proprietary information systems. Many business processes are already automated without human intervention—for example, the timely charge of a utility bill against a credit card, or the accrual of air miles once the state of an airline's information system is updated. In these examples, however, the automatic processes run in a proprietary platform that can be altered by the organization that owns it. As a result, for these "proprietary" smart contracts to work, from a business perspective, there has to be a degree of trust in the entity that runs them.

The smart contract, as it is understood in the crypto world since the creation of the Ethereum blockchain platform, has a key added feature: it runs in a distributed, shared platform such that its automatic execution

it runs in a distributed, shared platform such that its automatic execution cannot be affected by any single person or group of people.

This way, transactions and agreements can be carried out between disparate parties, without the need for a central authority, legal system or external enforcement mechanism. As a consequence, transactions are traceable, transparent and irreversible[16].

For the financial industry, smart contracts bring several other benefits. For instance, less reliance on physical documents increases efficiency and diminishes delays, errors and fraud. Smart contracts also reduce or eliminate the need of financial intermediaries, with all the overhead costs they carry. In the mortgage industry specifically, smart contracts also introduce significant cost savings.

In a report about smart contracts in the financial industry, Capgemini Consulting estimated that, for the US and the EU markets, blockchain could save loan providers a minimum of US$ 3 billion through the automation of tasks by means of smart contracts. On the other hand, if external entities like insurance companies, tax authorities and land registries become accessible through the blockchains, costs savings could be as much as US$ 11 billion[17]. For the individual borrower, costs savings could be range from US$ 480 up to US$ 980, based on an average processing fee of US$ 4,350 for each mortgage loan (i.e. a significant 11% to 22% cost saving). These costs savings would be the consequence of a more efficient origination process and are just part of the story.

In the end, the applicability of smart contracts in many financial processes depends on the extent to which they can express, in programmable language, the logic of business transactions.

3. HOMELEND'S MORTGAGE LENDING PLATFORM

Homelend P2P mortgage crowdlending platform works by embedding into smart contracts the business logic of origination processes. This creates a system where borrowers and lenders can interact without the need of a trusted financial intermediary.

3.1. P2P Lending and the Mortgage industry

Peer-to-peer (P2P) lending, also known as "alternative finance," is the process by which individuals can borrow and lend from each other without the intervention of banks or other financial intermediaries. It was made possible thanks to the Internet revolution. P2P lending platforms such as Prosper and Lending Club have been in operation for more than a decade in the U.S[18]. In fact, the market has outgrown expectations: ten years ago, experts estimated a US$10 billion market size for U.S.[19]. In reality, at the end of 2016 the market size was US$34.5 billion[20].

Blockchain technology creates new possibilities for P2P lending. It's now considered the next step in digital ledger technology (DLT), after decentralized money payments surged in the form of bitcoin and other crypto-currencies. Indeed, the immutability, transparency, and security provided by DLT makes it possible to record transactions, among them loans, without banks or other financial entities acting as middlemen.

While numerous blockchain-based P2P lending platforms have been developed for microloans and consumer spending, no such platform exists for the mortgage market. The mortgage industry is especially susceptible from a financial and social perspective. Loans are considerably larger, and defaulting can create undesirable circumstances for individuals and families, in the case of a foreclosure. For this reason, the process of originating a loan requires a cautious analysis of many factors in order to minimize the possibility of a default. This results in a rather complex and lengthy process, which follows a specific business logic.

3.2. Homelend's P2P mortgage lending mechanism

Homelend P2P platform works by **embedding mortgage lending business logic into smart contracts**. This is the platform's core functionality. By creating a set of smart contracts that execute business processes, Homelend allows individuals to borrow money from their peers in a trusted, transparent, and secure way. The key idea is that borrowers and lenders are not linked by means of a financial intermediary (i.e. a bank or a centralized P2P lending platform), but rather by smart contracts that automatically execute a pre-defined business logic.

Any mortgage loan, to be successfully originated, must follow a pre-determined path. From the moment when a potential buyer of a property applies for a loan, to the actual closing of the mortgage loan and transfer of the property from the seller to the buyer, a series of business processes take place. These processes are instrumental. They are subordinated to three main objectives, issuing a loan that: **1)** makes possible the purchase of a property; **2)** can be successfully paid back by the borrower; and **3)** can be recovered to a satisfactory extent in case of default.

These processes can be divided into two fundamental types: information flows, and financial flows. Information flows are related to either the borrower or the property. Financial flows, on the other hand, are represented by the transmission of monetary resources from the lender to the seller (at origination) **(figure 1)**.

These flows, processes, and objectives are interconnected. The financial flow from the lender to the seller fulfils the first of the aforementioned objectives: it makes possible the purchase of the property. The information flow related to the borrower aims, above all, to assess his or her creditworthiness (objective 2) in what is known as the loan underwriting. The information flow related to the property is meant to guarantee a satisfactory recovery of the loan in case of default (objective 3). This recovery is possible when the property's value is enough to cover the amount of the loan. The assessment regarding its value is called a property appraisal.

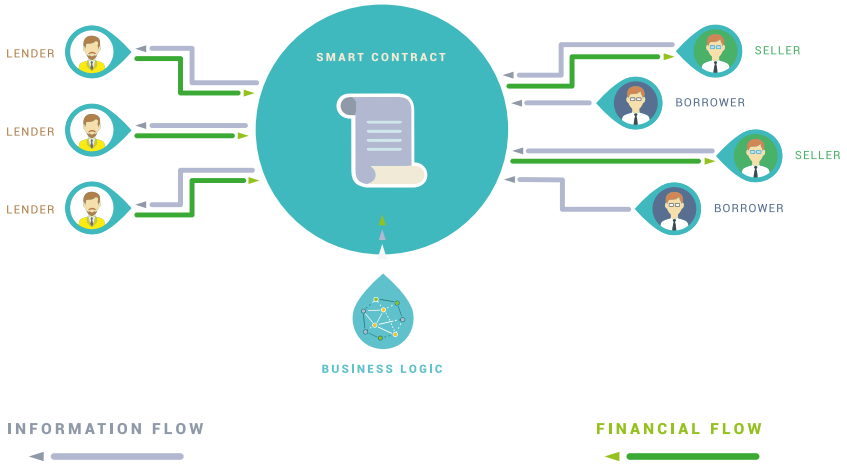

Figure 1. Information & Financial flow

3.2.1. Information flows

One of the main reasons behind the excessive length of the mortgage origination process is the amount of borrower information that needs to be obtained to assess creditworthiness. Most of this information is contained in paper-based documents, which in turn come from different parties (banks, employer, etc.). Without this information, it would be impossible to perform a sound assessment regarding the borrower's creditworthiness. The most relevant information (aka "hard" information) is related to the financial situation of the borrower. This includes credit score, income, expenditures, personal balance, etc. Another type of information, known as "soft" information, is related to personal circumstances such as age, education level, preferences, etc.[21] While creditworthiness assessments are mostly based on hard information, soft information can be very useful and is increasingly utilized. In particular, P2P lending systems are making extensive use of data generated in social networks, with the help of artificial intelligence (AI) and machine learning (ML)[22]. For the reasons mentioned above, one of the key pillars of a P2P mortgage lending platform is to allow an efficient and accurate gathering of borrower information, as well as executing a sound creditworthiness assessment. In other words, both the collection of borrower's information and its use are crucial.

In Homelend's platform, the collection of information is performed in an "all digital" way. Even the data residing in paper-based documents must be transferred to a digital repository based on distributed ledger technology. This data is provided by the user and double-checked through professional verification providers. Once the information is verified, a smart contract based on algorithms powered by I & ML automatically performs a creditworthiness assessment of the borrower's application and, if satisfactory, issues a pre-approval of the mortgage loan application. It is important to highlight that the mortgage underwriting, i.e. the borrower's creditworthiness assessment, is not performed by humans. Instead, a sophisticated set of pre-defined approval scenarios is developed prior to the borrower's application. Then, according to the specific scenario build upon the information provided, the smart contract makes a mortgage loan pre-approval decision. If the loan is indeed pre-approved, all its conditions (amount, interest rate, APR, duration, etc.) are specified. The appraisal of the property's value follows a different path, as no smart contract is involved. The value of a property is usually determined by analyzing market data, previous transactions, environmental conditions (such as the likelihood of floods), etc. This information resides in documents and in principle could be entered into a system. However, property appraisal involves a physical inspection, which still requires human intervention. It is, therefore, a business process that cannot yet be fully automated.

In any case, Homelend's platform reduces both the number of steps and people involved in originating a mortgage (figure 2). As a result, efficiency increases in terms of time and costs.

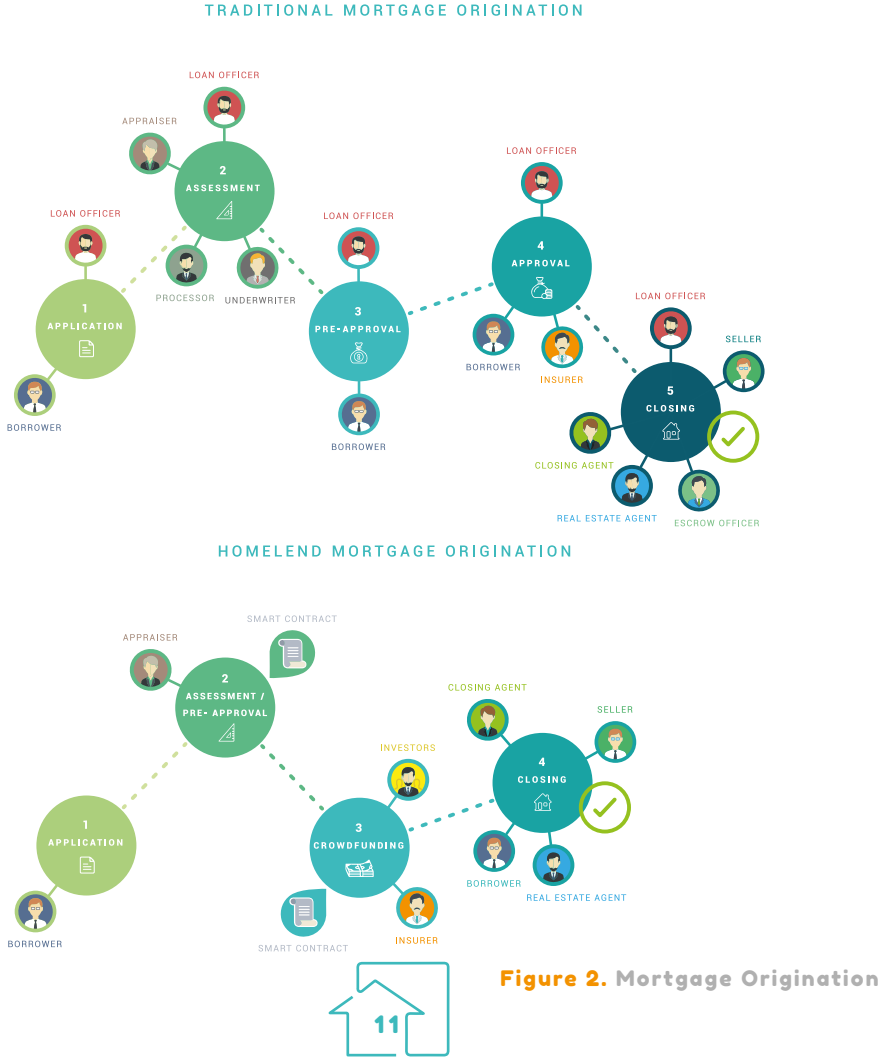

Figure 2. Mortgage Origination

3.2.2. Financial flows

In Homelend, the flow of financial resources from the lenders to the borrowers (and, ultimately, to the sellers) is executed purely by smart contracts. There is no financial intermediation, control or decision-making by Homelend.

After a buyer receives pre-approval from the system, regarding a specific property, the corresponding mortgage loan is "listed" in Homelend's platform. By then, the borrower has committed a specific down payment, and the mortgage amount is determined.

Any individual willing to act as a lender can access the platform and search for investing opportunities. At this point, each one of the mortgage loans pre-approved by the platform is financed through a P2P crowdfunding mechanism, as follows:

(A) Each pre-approved mortgage loan is "sliced" into smaller, identical units. For instance, a $200,000 loan can be divided into twenty $10,000 "slices."

(B) Each "slice" is given a risk score, which is reflected in the terms of the loan pre-approval. A higher risk score entails a higher interest rate.

(C) Individuals can lend financial resources to borrowers by "buying" a number of these pre-packaged mortgage loan "slices". A single individual can lend money to different borrowers by "buying slices" that belong to different pre-approved mortgage loans. In this way, a pre-approved mortgage loan can be financed by a number of different lenders, up to the number of "slices" into which it is divided.

(D) Once all the "slices" of a specific pre-approved loan are "bought" by a number of lenders, the crowdfunding is finalized, and the mortgage is sent to final closing.

(E) The period during which the slices will be available for funding from individual investors **will not last more than 30 days**. If after this time, the mortgage loan is not fully funded (i.e. all "slices" sold), the process is cancelled, and all funds are returned to investors.
An important feature of the system is that all financial flows are performed in cryptocurrency. Both the prices of the houses listed in the platform and the amount of loans pre-approved, as well as their "slices," are determined in fiat currency.

The use of cryptocurrency for financial flows is due to their frictionless functionality: the transfer of money from the lender's wallet to the seller's wallet is done without any sort of commission payment.
In addition, cryptocurrency flows can be fully governed by smart contracts, while fiat currency flows are subject to several legal, technological or financial constraints (such as the T-2 settlement cycle)[23].

On the other hand, each of the financial amounts (property price, loan size, down payment) shall be determined in fiat currency. This is due to the inherent volatility of cryptocurrency values, which makes fixing amounts even for the short term unpractical. In the case of mortgage loans, which usually last for 20-30 years, it is economically unfeasible to fix their size in cryptocurrency.

3.3. P2P lending methods

Homelend will develop three different P2P lending methods: pure crowdfunding, pooling, and auction. In each of them, the flow of financial resources is controlled and executed by smart contracts, without middlemen or financial intermediaries. Also, the splitting of mortgage loans into "slices" is present in each method. The difference between the methods arises from the specific approach used to and a pre-approved mortgage loan.

3.3.1. Crowdfunding method

Under the crowdfunding method, which is the simplest one, potential lenders will find investment opportunities in the form of the aforementioned "slices." From the borrower's perspective, his pre-approved mortgage loan will be divided into smaller fractions, such that different lenders can finance his loan by funding these "slices." **(figure 3)**.

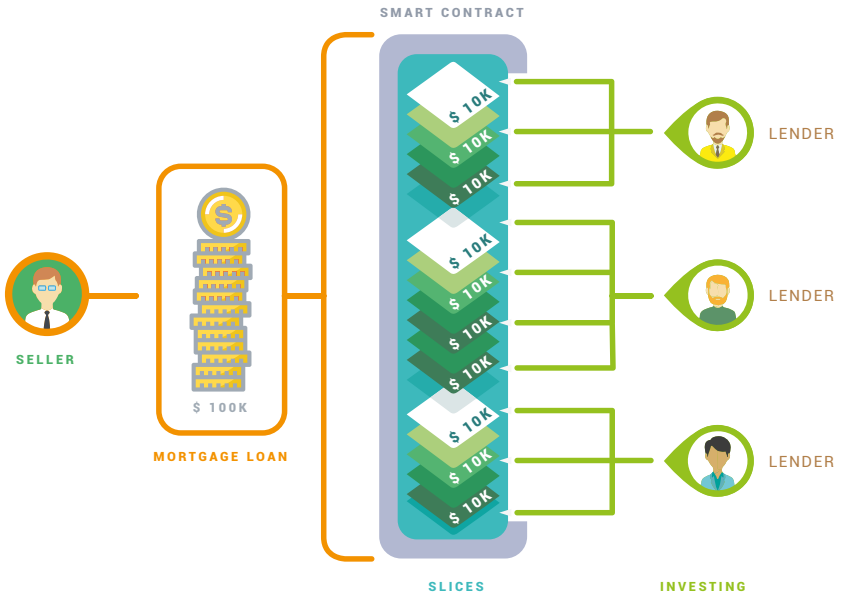

Figure 3. Crowdfunding Method

For instance, a mortgage loan pre-approved in favor of individual A for $250,000 could be divided into fifty equal "slices" of $5,000 each. This would mean that up to fifty different investors (X, Y, Z...) would be lending money, though the number could be smaller if one or several of them funds or "buys" more than one "slice."This method implies that the amount of fundsinvested by the lenders is equal to the size of the loan received by the borrowers. Simply put, for a pre-approved mortgage loan of $250K, the total amount of funds sent to the smart contract by lenders shall be exactly $250K. The advantage of the pure crowdfunding method is its simplicity. A disadvantage, however, stems from the difficulty of finding enough investors for a loan.

Until all "slices" are "bought," the mortgage loan cannot be closed. There is no option of using funds raised before the pre-approval of the mortgage loan.The crowdfunding process must take place after the mortgage loan has been properly "sliced."

3.3.2. Pooling method

The pooling method adds some economic flexibility to the system, but is also less simple from a technological perspective.

In contrast to pure crowdfunding, under pooling, lenders will be able to invest money through smart contracts before the specific mortgage loan to be financed has been pre-approved. The investment is conducted under the same "slices" framework. The difference is that the smart contract will allow lenders to "pre-buy" the "slices" before they have been properly created (after a mortgage loan pre-approval).

To this end, the Homelend system will classify mortgage loans according to their risk level. Loan applications will then be pre-approved under a specific risk category. Thus, potential lenders will be able to invest by sending cryptocurrency to the balance of the smart contract that controls the process of a specific risk category **(figure 4)**. All "slices" created by dividing pre-approved mortgage loans, under a specific category, will be managed by the same smart contract. Therefore, a lender will be able to invest in all existing or future "slices" managed by a particular smart contract.

The advantage of the pooling method is that it allows some level of financial buffering, without the need of a financial intermediary or a middleman. In other words, in contrast with pure crowdfunding, the total amount of funds sent to the smart contract by lenders can be higher than the size of pre-approved loans managed by the specific smart contract.

The smart contract will allocate funds from risks pools to specific slices on a first-come-first-serve waterfall basis. Whtat this means is that investors will subscribe specific number of slices, and as mortgage loans are pre-approved and sliced, the available slices will be allocated to the earliest investor, for the number of slices subscribed, then to the second earliest investor, and so on.

This feature adds flexibility and efficiency to the financing process, although it is somewhat more complicated than pure crowdfunding.

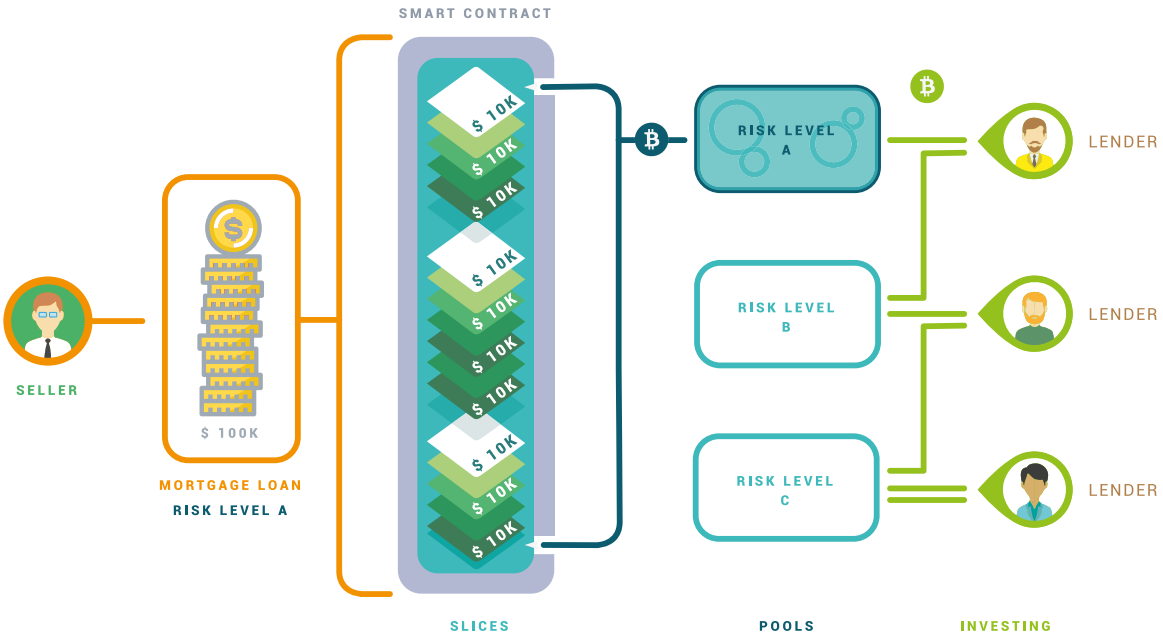

Figure 4. Pooling Method

3.3.3. Auction method

The auction method will be developed as a variant of the pure crowdfunding method. Unlike pooling, no financial buffering will be involved. The central difference between the auction method and pure crowdfunding is that lenders will be able to offer borrowers better conditions than those pre-approved by the platform.

When a mortgage loan is pre-approved, it will be divided into "slices" the same way it is under the other two methods. The size of the loan, its duration and conditions (such as whether the interest rate is fixed or variable), will not be subject to any change.

However, lenders will be able to bid on specific "slices" by offering better terms in two ways:
1) by charging a lower interest rate than the one pre-approved; and **2)** by providing discount points to the borrower.

For instance, if a mortgage loan has been pre-approved with a fixed interest rate of 4.00%, lenders will be able to bid on its corresponding "slices" by offering lower rates (3.75%, 3.50%, etc.). In a similar manner, they will be able to offer discount points instead of (or in addition to) a smaller interest rate **(figure 5)**.

In traditional mortgage lending, discount points are a specific way of pre-paying loan interests or fees. Generally, each discount point is equivalent to 1% of the total loan amount. By pre-paying interest through discount points, borrowers will benefit from lower periodic installments during the life of the loan[24].

Once all "slices" have been funded, the process will continue in the same way as in the pure crowdfunding method, with the mortgage loan being ready for final closing.

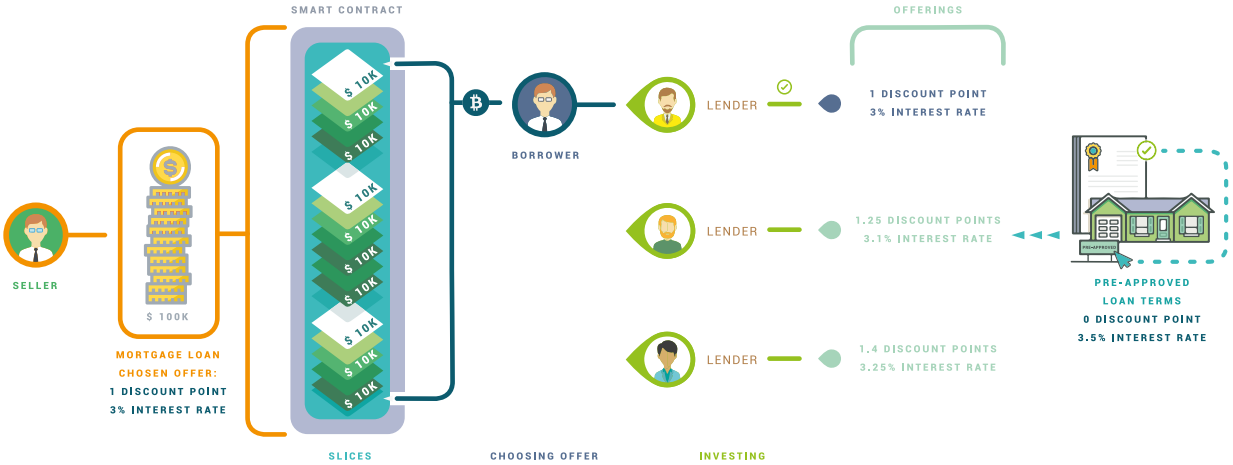

Figure 5. Auction Method

3.4. Closing and mortgage deed assignment

The closing of the mortgage is the final and, typically, the more complex stage of the origination process. It requires signature approval on many documents and involves several parties. Above all, it is the moment when the property is transferred from the seller to the buyer/borrower, and when the promissory note and mortgage deed are issued and registered in favor of the lender. Fortunately, during recent years, some jurisdictions have begun allowing the closing act to take place in a digital form. New "eClosing" or " digital closing" providers such as **Notarize**[25] and **Black Night**[26] have made it possible to close a mortgage from home, without needing to visit a bank or escrow agent office.

The date of the closing is crucial, as it determines the moment in which the funds raised from the lenders will be transferred to the seller. The transfer will be executed by the smart contracts that control the crowdfunding mechanism. The condition that will prompt the smart contract to send the funds to the seller is precisely the closing of the mortgage. This transfer will be executable in one of two ways, based on the seller's preference: **a)** in cryptocurrency, directly to the seller's wallet; or **b)** in fiat currency, by previously liquidating through a third party. The option to liquidate into fiat currency will be offered in order to protect against cryptocurrency price volatility. However, as the digital closing procedure significantly reduces the time span between the loan funding and the closing date, it's likely that many or most sellers will choose to receive the funds in cryptocurrency.

The P2P lending crowdfunding mechanism, due to the multiplicity of lenders, creates some issues regarding the promissory note and the mortgage deed. Under the traditional model, a bank extends a mortgage loan and becomes the creditor of the promissory note and the holder of the mortgage deed. Under a P2P system, however, directly assigning the promissory note and the mortgage deed to a group of individuals (the lenders) can create legal and practical problems. The solution, under Homelend's system, is the creation of a non-profit vehicle (NPV) whose legal form might vary according to the jurisdiction (foundation, association, etc.). The promissory note and mortgage deed shall be assigned to the NPV, but the NPV as an entity will be composed precisely by the lenders. They will be its beneficiaries. This way, all of the loan's periodic payments (principal + interests) will be done in favor of the NPV and automatically distributed among its beneficiaries according to the credit stake they have.

In the first stage of the development of Homelend's system, the service of the mortgage loan will be completed by a third-party servicer, which will be hired by the NPV, according to the preference of the lenders. Homelend's vision is that, in the future, the servicing itself will be automated through smart contracts and managed directly by the platform itself.

4. BUSINESS MODEL

Homelend go-to-market strategy will be directed first to those segments of the population that are looking for alternative, more efficient and fair methods of financing. The millennial generation is expected to be the largest group of users.

Homelend is being developed as a blockchain solution that will significantly increase the housing financing possibilities for many individuals and families. Our value proposition is socially sensitive and anchored in a P2P progressive approach that aims to use technology for society's benefit.

Nonetheless, Homelend is also based on a sound and profitable business model, which consciously reaches out to address an underserved market. On the one hand, Homelend creates an investment opportunity for many individuals, with a solution that unites a traditional industry as real estate, with an innovative technology like blockchain. On the other hand, it makes possible for many individuals (who due to various circumstances, including current limitations in the traditional credit risks models, do not possess a solid credit score but are otherwise creditworthy) to access to housing financing and solve one of their most basic aspirations: having a home of their own.

This chapter will discuss Homelend's go-to-market strategy as well as revenue sources and monetization opportunities.

4.1. Go-to-market strategy

Homelend will pursue a go-to-market strategy based on two pillars: rapid growth in the number of users (sellers/borrowers/lenders), and a targeted approach to segments underserved by mortgage banks.

The primary users of the Homelend platform will be borrowers and lenders. Those who intend to acquire a new home or refinance their current one will gain value from Homelend in several ways. First, they will enjoy an easy-to-use, state-of-the-art application platform. Borrowers will be able to apply for mortgage loans and begin using the platform free of charge. The only thing a prospective borrower will need to do in order to use Homelend is register on the platform using an email address.

Access to the mortgage loan crowdfunding platform will be enabled through Homelend tokens (HMD). If the mortgage loan is successfully closed, the borrower will deposit a number of HMD tokens with a value equal to 1% of the approved mortgage loan.

Use of the platform will be free of charge for lenders. They, too, will only need to register in order to search for investment opportunities in the form of pre-packaged mortgage loan "slices." This strategy aims to gather, as quickly as possible, a significant mass of platform users. We are confident that one of the platforms' key success indicators will be its number of users. Much in the line of Metcalfe's law for telecommunication networks, we believe that the value of Homelend will increase exponentially with the growth of its user base.

The other pillar of the go-to-market strategy is the targeting of population segments that have difficulty accessing mortgage financing, whether because they

are generally underserved by banks or don't use formal financial services (this accounts for roughly 2 billion people according to the World Bank)[27], or because their credit score isn't good enough despite the fact that they are creditworthy (for instance, people with insufficient credit experience). This segment of the population is the one that will likely benefit more from P2P mortgage lending, and therefore will be more willing to use the platform. In particular, we anticipate a high usage by millennials.

It's important to emphasize that Homelend's solution will not offer a new way to extend sub-prime mortgage loans. Creditworthiness assessments will be thorough and sound. We believe, however, that creditworthiness assessments based primarily on traditional credit scores fail to consider other relevant information. For this reason, Homelend looks forward to tapping into the power of artificial intelligence and machine learning and apply it to mortgage loan assessments.

4.2. Mortgage origination gas

In traditional mortgage lending, it is common that an origination fee is paid by the borrower at the moment of closing, along with other origination costs. It is charged by the mortgage originator (usually a bank), and normally ranges between 0.5% and 1% of the total amount of the mortgage loan.

As the mortgage origination processes will be managed by Homelend's platform, an origination gas will be deposited by the borrower in order to access the P2P financing platform. The gas will be fixed at 1% of total mortgage loan amount, and will be deposited by the borrower after the loan is pre-approved, before the beginning of funding (be it under the crowdfunding, pooling or auction method).

This gas will be, in any case, deposited by means of a token to be issued by Homelend through a Token Generation Event (TGE), as will be discussed in the following chapter.

4.3. Other platform services

4.3.1. Property listing

Homelend aims to develop a P2P lending platform that will not only create financing opportunities for millions of financially excluded people, but that will also increase efficiency and speed in the origination process, significantly reducing the amount of time it takes to close a mortgage. As previously discussed, this increased efficiency will be based on the automation provided by smart contracts.
In order to further speed up and streamline the process, Homelend will offer sellers the opportunity to list their properties on the platform, in turn enabling prospective borrowers to search for a home directly from within the platform.
If a property is listed on the platform, the seller will deposit HMD equivalent to 0.1% of the selling price as a listing gas.

4.3.2. Digital closing

As previously mentioned, digital closing of mortgages is finally becoming a reality, at least in the U.S. market. With Homelend, digital closing is an important element as it reduces the time between a mortgage loan getting fully funded and the day of closing.

To this end, Homelend will work with digital closing providers who will find, through our platform, an extended and captive market. In the same way that a commission is charged in addition to the appraisal fee, Homelend will receive a commission over the fees charged by digital closing companies. Again, this will be a premium paid by the borrower for accessing financing in a more efficient and inclusive way.

4.4. Data analytics

The use of the platform by an increasing number of borrowers will generate a sizable amount of data. While Homelend will comply with all data protection laws, and will protect data privacy, the amount of data gathered will allow for performing valuable data analytics. To this end, at the mortgage application step, Homelend will ask the user for permission to use his or her personal data for statistics and analytics purposes.

Data analysis will be powered by machine learning (ML) and artificial intelligence (AI) in a constantly evolving process generating more powerful algorithms.

The effectiveness of ML & AI is proportionally related to the amount of data used[28].

For this reason, the increasing amount of data handled by the platform, plus the refinement of algorithms through ML & AI, will contribute to the development of ever more accurate creditworthiness assessments, among other things.

Indeed, even if mortgage creditworthiness assessment is the primary purpose of data analytics, the wide variety of data collected in the origination process (including demographic, economic, social, cultural, etc.) will be beneficial for other financial sectors like microloans, credit cards, car loans, etc.

5. TOKEN GENERATION EVENT

HMD tokens will offer access to the services provided by the platform. Borrowers will be able to deposit tokens in exchange for discount points and origination gas.

In this chapter, we will explain the use, functionality and characteristics of a token to be issued by Homelend through a Token Generation Event (TGE), also commonly known as an Initial Coin Offering (ICO). This token, simply called the "Homelend token" and identified as HMD token, will be the fuel of the P2P lending platform, as will be discussed in more detail.

The choice to create a utility token has been carefully considered by the founding team, and it is based on several reasons and goals. Below we describe the rationale behind the issuance of HMD tokens.

5.1. Justification for a token

The creation and issuance of a crypto token for Homelend is justified by the platform's economic dynamics. In contrast to many other ICOs or TGEs, whose final product is not necessarily blockchain-based, Homelend is developing a lending system that has, at its technological core, smart contracts and distributed ledger technology. A key feature of the system is the reduction of friction costs, and the availability of the service for a wide population underserved by banks or other mortgage lenders. Indeed, the system will be able to operate independently of any third party/financial intermediary that needs to approve the transfer of fiat currency.

Financial operations, such as the issuance of a loan, generate friction costs in the form of commissions, origination fees, etc. These are unavoidable to some extent, as they represent the retribution for a service provided. Other friction costs stem merely from the involvement of middlemen. Some friction costs are specifically related with money flows. For instance, it is well known how high transactional costs for international wire transfers are, where banks charge commissions as high as $40 plus a significant spread over the exchange rate. These transactional costs are also present in cryptocurrency exchanges, particularly with fiat currency/cryptocurrency exchanges.

As we've discussed, Homelend opens an opportunity for P2P lending in several main cryptocurrencies. This feature aims to broaden financing possibilities. However, access to services provided by the platform through different cryptocurrencies (or fiat currencies) will generate administrative friction costs that can be avoided.

The use of a token, in this case the HMD token, standardizes the access to services provided through the platform, regardless of the cryptocurrency in which the loan is extended or the country where it takes place. It also hedges the Homelend platform against volatility from cryptocurrencies.

Borrowers from any country will be able to benefit from Homelend's services, without the limitations or restrictions derived from monetary policies established by governments.

The use of a token will increase accessibility to Homelend platform for unbanked or financially excluded people; they will have the opportunity to acquire HDM tokens from their wallets by exchanging other cryptocurrencies or digital tokens. This feature aims to level the playing field for borrowers that have more trouble in opening a bank account because of local banking service limitations.

5.2. Token functionality

The HDM token's main functionality will be to offer access to the services provided by the platform. These services will either be provided directly by Homelend or through third parties working in coordination with Homelend.

The core service provided by the Homelend platform is the facilitation of P2P lending by means of smart contracts and standardized processes. The system will create a more affordable, accessible and efficient mortgage origination process. As previously mentioned, the borrower will deposit an origination gas equivalent to 1% of the mortgage loan, in order to access the financing mechanism.

5.3. Token economics

Cryptocurrencies and digital tokens have generated new ways of transferring value and clearing transactions. While different in many important ways from government-issued currency or the old bank notes from free banking times, some basic monetary theory principles remain applicable insofar as they purport to have transactional functionality.

One of the most basic principles is the importance of token supply for the sound operation of the system. Many Initial Coin Offerings (ICO) or Token Generation Events (TGE) have been conducted in recent years. Most of them issue tokens that are qualified as: "utility tokens" with transactional value: they are meant to be the medium of exchange inside the platform or system to be developed[29]. However, few of them explain why a specific token supply has been chosen. They limit themselves to indicating the total number of tokens to be created and how they will be distributed.

The total number of tokens issued in a TGE determines the token supply. The nature of tokens (whether they are "security" or "utility" tokens) is an important factor for defining a specific token supply. In the case of security tokens, the supply of tokens has important organizational implications for the company or entity that develops the project. Security token holders are usually given voting and dividend rights, with the token being a sort of share. Both the company and the token holders benefit from an increase in the trading value of the token.

Utility tokens, in contrast, are meant to contribute to the platform or system functionality. While these tokens have been issued with a wide variety of uses, the most common is to offer access to the services provided in the platform. In this case, it is not in the best interest of the system to allow for steep increases (or decreases) in token value.

High volatility would impair the token's ability to work as a medium of exchange.

For utility tokens designed to work as a medium of exchange, basic monetary principles are particularly applicable, one of them being the Quantity Theory of Money (QTM).[30]

The QTM is an accounting identity stating that the value of transactions in a period **(T)**, equals the amount of money **(M)** times its velocity **(V)**.

$$T = MV$$

Velocity is the number of times a unit of currency changes hands in a given period, such that a higher number of transactions means a higher velocity.
The formula can be re-stated in a way that expresses the value of each unit of currency.

$$\frac{T}{MV}$$

The price of digital tokens, of course, will not be derived deterministically from the QTM formula, as many factors influence it. But other things being equal, an increase in the token supply will decrease the price of each token.

In any case, the price of each token, when it is meant to function as a medium of exchange, will depend on the token supply, the time period and the number of transactions. Intuitively, the number of transactions will depend on the platform size in terms of users.
In the case of Homelend, as a P2P mortgage lending platform, the number of transactions made using HMD tokens will be directly correlated with the amount of funds lent. As was previously stated, the main use of HMD tokens will be as a mortgage origination gas, which is equal to 1% of the mortgage loan.

Statistics show that in the U.S., the number of mortgage loans closed in 2016 was 8.4 million[31].

Also, the aggregated value of mortgage originations for the same year was US$1,891billion[32].

Also, the aggregated value of mortgage originations for the same year was US$1,891 billion[33]. The average mortgage loan in the U.S. for 2016 was, therefore, approximately US$225,120.

Under a fixed mortgage origination fee of 1%, the total value of origination fees for 2016 would be US$18,910 million, with an average of US$2,251 per transaction. This means that each day, approximately US$51.8 million is paid in origination fees.

Data from **CoinMarketCap** shows that the average 24-hour velocity for the ten cryptocurrencies with the highest market cap is .055, meaning that about 5% of the total supply of tokens changes hands daily.[33]

Assuming, on a utopian scenario, that all mortgage loan originations in the U.S. are closed through Homelend's platform on a given day, and that the number of circulating HMD tokens is 50 million, with an average velocity of .055, the price of the HMD token, according to the QTM formula, would be US$18,83.
The same formula would predict, therefore, that for a market share of 5.3% of U.S. mortgage originations, the value of the

HMD token, with a circulating supply of 50 million and a velocity of 0.05, would be roughly one dollar.

Of course, several assumptions previously expressed are unrealistic or far-fetched; 5.3% of market share is huge. But so is a velocity of 0.05, which is proper of cryptocurrencies with very high market cap (in other words, a far lower velocity is to be expected for tokens with less market cap).

The important point here is that the total supply of tokens and their level of liquidity, along with the size of the platform in terms of transaction volume, will directly influence the price of HDM tokens.

Homelend is consciously and intently designing its Token Generation Event, taking these factors into consideration. The guiding principle is to procure price stability for HDM tokens, such that they will properly perform their access function.

This, nonetheless, does not exclude a mildly deflationary monetary policy, where the price of HMD tokens would increase over time due to platform adoption.

5.4. TGE specifications

Homelend tokens are minted (not mined), Ethereum based ERC-20 standard tokens. As previously explained, their function will be to allow access to the services provided by the Homelend platform, either directly or indirectly.

HMD tokens are therefore designed as utility tokens and not security tokens.

They will not confer any voting or dividend rights. Additionally, they would not pass the well-known Howey test for identifying securities under U.S. regulation[34].

5.4.1. Token supply

The total number of HDM tokens to be issued in the Token Generation Event (TGE) will be 250 million. Of this total supply, 50 million HMD token (20%) will be held in a reserve fund, and 200 million HMD tokens (80%) will be in circulation. The face value of each HMD token will be 1 ETH = 1,600 HMD.

5.4.2. Token distribution

Apart from the 50 million HMD tokens held in reserve, the 200 million HMD tokens to be initially in circulation will be distributed as follows:

20 million (8%): Founding team
20 million (8%): Advisors & Bounty
70 million (28%): Pre-Sale
90 million (36%): TGE Public Sale

5.4.3. Discount incentives

The pre-sale token distribution will be completed through a private placement, where bonus incentives will be offered over the face value of the HMD tokens.

Also, during the TGE public sale, a discount incentive will be offered, based on the time of token purchase:

First day: 30%
Week 1: 20%
Week 2: 15%
Week 3: 10%
Week 4: 0%

5.4.4. Reserve fund

Reserve fund tokens are to be kept in a public wallet address, where any person will be able to check the number of HMD tokens at any given time. The purpose of the reserve fund is to allow for some level of token supply control.

As the Homelend platform grows, an increase in the demand of HMD tokens is to be expected. This increase will cause token price to rise, other things being equal, according to QTM. Therefore, in order to avoid excessive volatility, Homelend will be able to increase the number of tokens in circulation by drawing HMD tokens from the reserve fund.

6. OUR TEAM

Homelend is being developed by a global team with extensive experience in blockchain technology. The company is based in Israel, known as the "Start-up nation" due to its innovative and entrepreneurial environment. In fact, the number of Israeli companies listed on NASDAQ trails only that of USA and China[35]; and Israel has more venture capital and startups per capita than any other country in the world.

6.1. Executive Team

Itai Cohen
Chief Executive Officer

Itai holds an MBA in Finance, a BA in Economy, and is a CPA (Israel). He has wide global financial experience, including eight years as senior manager at KPMG. He has been a team leader in complex consulting projects, including worldwide tax planning, IPOs & M&As.

Netanel Bitan
Chief Technology Officer

Netanel holds a BSc in Computer Science. He has more than eight years of experience as a senior engineer and team leader in several high-tech companies, including Perion, an Israel-based ad-tech company providing engagement and monetization solutions for web- and mobile-based digital businesses. He has expertise in Big Data, microservices, P2P platforms and blockchain technology.

Ricardo Henriquez
Chief Innovation Officer

Ricardo holds an MBA in International Business (EAE/UPC-Spain). He is professor of strategic management at EAE Business School, Barcelona, and has more than five years of experience in innovation and entrepreneurship coaching and consulting. He was Chief Financial Officer at BlockGemini FZ-LLC, an international blockchain developing company based in Dubai.

6.2. Developing Team

Kanat Tulbassiyev
Leading Blockchain Developer

Kanat is the former IT Director of the National Bank of Kazakhstan, where he led the development and execution of a blockchain-based money transfer project. He has extensive experience in blockchain development on the Ethereum and Hyperledger platforms. He currently serves as CEO of GenesisZero, a blockchain developing company.

Ram Stivi
Backend Developer

Ram holds a BSc in Computer Science. He has years of experience as a backend developer in several cybersecurity and P2P platform startups, as well as experience in C++, .NetCore, and Solidity.

Gal Zakay
Frontend Developer

Gal holds a BSc in Computer Science. He is an experienced frontend developer in P2P lending platforms, and also has experience in React, HTML, PHP, CSS, and JavaScript.

Vinod Morkile
Blockchain Developer

Vinod holds a doctorate from Babasaheb Ambedkar Technological University. He has years of experience in R&D, product engineering, technology strategy, innovation, architecture, design and development.

6.3. Advisory Board

Asher Dory
Chairman

Asher is the Chairman & CEO of Negev Technology Partners Inc. He divides his time between London and New York, focusing his client work on sectors relating to Advanced Technologies and New Economy with an emphasis on strategy, innovation, product development and rapid commercialization of digital products, services and platforms. He has achieved major success in redirecting corporate and business unit objectives, improving M&A processes, managing post-merger integration, improving R&D effectiveness and boosting productivity. He is the COO and ICO Execution Team Leader of Bancor.

Yoran Uzan
Entrepreneur

Yoran is a real estate entrepreneur. He has built more than 5,000 residential houses, and has extensive experience in the real estate, finance and mortgage industries.

Moti Friedman
Marketing consultant

Moti holds a PhD in Marketing. He has 20 years of experience as a marketing consultant and international market researcher, as well as 15 years of experience as start-up/fund-raising consultant.

Danny Coddy
Appraisal

Danny holds an MBA as well as a BA in Economy. A real estate appraiser, he has 10 years of experience as lead appraiser in Bank Mizrahi. He is the owner of a real estate appraisal company.

Raghuram Bala
Analytical Technology Executive

Raghu is CEO of NetObjex. He is a technology thought-leader and author, as well as an educator at MIT OpenCourseWare.

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[34] Under the Howey test, for an instrument to be considered a security, it has to fulfil 4 conditions: 1) being an investment of money; 2) in a common enterprise; 3) with an expectation of profit; 4) to be mainly derived from the effort of others. The Homelend token is intended for use and consumption in the platform (as a medium of exchange and payment for services). Even if its price increases, this would be due to economic (monetary) forces, not from the diligence of company management. In fact, as mentioned, the guiding principle will be to maintain price stability, in line with the transactional function expected from the token. An explanation of the Howey test and its inapplicability for utility tokens can be found in Batiz-Benet et al. (2017) "The SAFT Project: Toward a Compliant Token Sale Framework". Whitepaper. Cooley and Protocol Labs, https://saftproject.com/static/SAFT-Project-Whitepaper.pdf

[35] "How Israel turned itself into a startup nation", The Times of India, March 5, 2017, https://timesofindia.indiatimes.com/trend-tracking/how-israel-became-startup-nation/articleshow/57465402.cms

THANK YOU