ICADE

A valuation of the MKR token

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Introduction

Motivation and objective

The objective of the present paper is to value MKR, the governance token of the Maker Protocol. MKR is a digital asset or crypto asset. This is a new asset class that has emerged over the past decade since the invention of Bitcoin in 2009. It is enabled by blockchain technology, a software innovation allowing for verifiable, distributed databases and since then greatly developed and scaled.

Over the years the number and value of digital assets has skyrocketed, as has the complexity of blockchains and the tasks that they are able to perform. Associated to them are promises of radical transformation for the financial system and the internet. However, as their adoption has grown so have the criticisms and problems. Some of the main ones are directed at the price volatility of digital assets and, linked to this, at the difficulty for determining their value and differentiating them from Ponzi schemes.

This stems from the fact that digital assets are nothing more than what distributed ledgers recognise. For example, owning bitcoin is nothing more than having access to an account which the bitcoin blockchain credits with some bitcoins. The value arises from the fact that because these open ledgers are decentralized and no single party can tamper with them, they can implement digital scarcity and other promises regarding issuance and utility.

There is therefore a pressing need in the space for discerning the genuine value that can be delivered by this new technology from the pyramid schemes and frauds. Developing the capacity to understand and value digital assets and the utility behind them is a necessary step towards reducing their price volatility and integrating them with the real economy, enabling the innovation behind them to bear fruit.

The present work aims to work toward this aim by developing a valuation model for the MKR token. This digital asset is the governance token of the Maker Protocol, an application running on the Ethereum blockchain which is recognised as one of the leading examples of the possibilities offered by blockchains to deliver differentiated value. It offers certain products (a stablecoin, supported by lending, saving, and trading services) for which it collects revenues, and has costs and debts associated with its operations. MKR holders are responsible for its management and are rewarded or punished in

accordance with its performance. For these reasons, it is possible to understand MKR as the Maker Protocol's stock and therefore value it by analysing the underlying business and applying conventional valuation methods.

Methodology

The valuation methodology used to perform the valuation will be the Venture Capital Method as laid out by William Sahlman (Sahlman & Scherlis, 2009). This is a variation of a traditional Discounted Cash Flow analysis commonly used by venture capitalists to value high risk, long-term investments.

This method first projects net income at a terminal year based on a success scenario. An appropriate multiple is then applied to this terminal income to obtain an estimate of the value at the end of the forecast period. Finally, the present value of the company is calculated by discounting this future value with a high enough discount rate to reflect systemic and non-systemic risk expectations.

The use of this method will be justified by an analysis of the nature of the MKR token and of the Maker protocol behind it. It will be shown how MKR has great potential for growth and disruption by virtue of both its underlying technology (blockchains and smart contracts) and the way the unique design of its protocol leverages it. However, at each of these levels there can be found the corresponding uncertainties and risks, which will likewise be laid out in detail. This high-risk, high-reward nature makes the challenge of valuing Maker akin to that of valuing a disruptive startup, which justifies the use of the venture capital method.

For this analysis the information, whitepapers, and technical documents provided by Maker itself are the most important resource. Opinions and frameworks from leading industry experts are also incorporated when appropriate. The bulk of the data used for informing the model will be obtained from several websites directly managed by Maker such as daistats.com or makerburn.com, or that use open-source software to review the blockchain for information such as Dune Analytics. Other well-respected sites in the space such as DeFiLlama.com, CoinGecko.com or TheBlock.com are also used.

Maker's performance will be forecasted by projecting the broader stablecoin market as a percentage of the M2 US Dollar supply (data on which will be obtained from the Federal Reserve). Additionally, by making reasoned guesses about Maker's market share, as well

as about other figures related to profitability, it will be possible to obtain a net income estimate at the end of a forecast period of five years (2027).

Since MKR trades in liquid markets and there is data on Maker's profitability, it is possible to arrive at a reasonable multiple to apply to the income projection. This multiple can also be compared with banking industry multiples to further assess its reasonableness. Finally, an understanding of the Maker Protocol and its risks can ground estimates for the discount rate to be applied.

With these elements in hand, it is possible to arrive at a valuation of the Maker Protocol. A sensitivity analysis will be carried out to examine how this value estimate varies in response to changing the three most important inputs to the model: the discount rate, the multiple and the percentage of USD M2 supply attained by the stablecoin market.

The purpose of this valuation exercise is less about producing a specific number and more about developing a deep understanding of the protocol and how the range of reasonable valuations changes in response to beliefs about the future. The model and the outcomes of the sensitivity analysis can be contrasted with current market valuations to develop a critical view and ground a discussion on Maker's fair value.

Structure

The paper will be divided in three chapters. The first chapter explores in detail the nature of the MKR token and the Maker protocol. Its purpose is to provide the reader with an adequate understanding of their fundamental aspects, which will ground subsequent discussions on the risks and potential of the protocol.

It begins at the most fundamental level, explaining the nature of blockchains, their value proposition and their disruptive potential. After this, a review and analysis of stablecoins is carried out. Since this is the main product offered by the Maker protocol, developing an understanding of these assets and the dynamics behind them is essential to understanding Maker. The final section of the chapter is an in-depth exposition of the designs and mechanisms that make up the Maker Protocol.

The second chapter covers issues on valuation methodology. It first examines the similarities and differences between MKR and stock in a real-world company. Following this is a discussion on the businesses that might be considered comparable to Maker and the difficulties of making these comparisons. The rest of the chapter focuses on the

valuation methodology to be applied. First, the difficulties of applying a traditional DCF given Maker's uncertainties and unique risks are laid out. Following this, the venture capital method is described and presented as an adequate solution.

The third chapter is dedicated to building the valuation model. The first step in this exercise is a detailed historical analysis that informs an understanding of performance drivers and growth. This information together with all other discussions in previous chapters are then concentrated in a description of what Maker's success scenario looks like and the risks that lay on the path towards it. This qualitative description is then translated into quantitative projections, multiples, and discount rates. The outputs are the valuation estimates laid out in a series of three tables after performing a sensitivity analysis. Finally, the conclusions summarize the results and implications, and possible future lines of research are laid out.

Chapter 1: What is MKR?

The following chapter will describe the nature and mechanisms behind the MKR token. Its purpose is to lay out the core concepts and frameworks to ground an adequate understanding of the asset. This will enable a discussion of the suitability of different valuation models (chapter 2).

It will consist of three sections going from the more general to the more specific aspects of MKR as a digital asset. First, an exposition of the technologies enabling and defining digital assets such as blockchains and smart contracts. Second, a study of stablecoins, a specific type of digital asset whose price is pegged to one or several other assets. This is of relevance because, even though MKR is not a stablecoin itself, its purpose it to be the governance token of DAI, the first and largest decentralized stablecoin. Finally, a detailed account of the Multi-Collateral Dai system, the protocol behind MKR and DAI which contains the rules for their issuance and utility.

1.1. Blockchains, smart contracts and decentralization

1.1.1. Blockchains: Bitcoin and decentralized code

The first blockchain was Bitcoin, invented in 2009 by Satoshi Nakamoto. The anonymous inventor or inventors defined it as a Peer-to-Peer Electronic Cash System (Nakamoto, 2008). The basic idea was to structure a network of independent computers (nodes) which kept a list of transactions (ledger) and constantly and securely agreed on changes to it. Furthermore, they would be able to do this in a completely trust-less manner, without needing to know each other and trusting only that at least 51% of the computational power of the network was not colluding maliciously. This would allow for a permissionless and decentralized internet currency which would not depend on any financial intermediary.

This breakthrough was possible through the combination of several innovations from cryptography, which would incentivize the nodes to participate in the network and at the same time keep it secure. Chief among these was the “proof of work” consensus mechanism. It works by accepting new information (organized in “blocks” of transactions) into the database only if a certain amount of computational power has been spent to solve a function which includes the information of the block itself, and

information from the previous block. This links together one after the other all blocks of information into a “chain”, hence the term “blockchain”.

A rule of trusting the longest chain, which equals trusting the chain with the most computational work put into it, is enough to reliably coordinate all nodes without needing to know their number or identity. To modify a block in the ledger, an attacker would need to perform the computational work to add it to the previous one, but also to continue adding blocks after it. So long as this attacker controls less than 51% of the computational power of the network, the rest of nodes would continue adding to the unmodified block at a faster rate. The non-malicious chain would therefore become longer.

In order, to incentivize nodes to make the effort to compile transactions and add them to the blockchain, they are rewarded by the protocol with newly created bitcoins in each block. In proof of work blockchains, this process is referred to as “mining” and nodes are “miners”. In the case of bitcoin, these rewards go down over time to prevent the supply of Bitcoin form growing and becoming inflationary. This is programmed into the code so that it is guaranteed that there will never be more than 21 million bitcoins (Bitcoin.org, 2023).

Overall, the system works effectively because it is hard to add new information to it, but very easy for anyone to reliably verify whether the required work has been done. This is because of one-way functions, which are mathematically easy to compute in one direction but very hard to do in the other.

This first model of a blockchain was quickly seized and expanded on. Many iterations have been developed to solve for different limitations of the system. Most famously, other consensus mechanisms different from proof of work have been developed that try to produce the same result of reliably coordinating a trust-less network of nodes.

The most relevant example of this are proof-of-stake mechanisms. Instead of requiring computational work from participants, it asks them to put up (stake) economic capital in the form of the blockchain’s native asset. This gives nodes the right to participate in creating and validating new blocks, but also makes them responsible for completing their duties. If they fail to do so, either by negligence or by behaving maliciously, they are exposed to having a part or all their staked capital being destroyed (burned). A game theoretic mechanism therefore secures the network, whereby attackers would have to stake and then lose more capital than they could hope to win from a successful attack.

Many successful blockchains operate with this consensus mechanism, such as Cardano, Solana and Ethereum, which switched from proof-of-work in September 2022. Whereas it is more complex than proof-of-work, it requires far less energy consumption (which mitigates environmental criticism that has plagued proof-of-work) and has other benefits for scalability and asset issuance (Ethereum.org, 2023).

All the variations aside, the basic purpose of all blockchains is to run computer programs in multiple independent computers. Because these nodes are coordinated by a game-theoretic mechanism and none of them control the program, blockchains are "resilient to modifications to their underlying physical components, effectively making them resilient to human intervention" (Dixon, 2020). The significance of this is that "for the first time, a computer system can be truly autonomous: self-governed, by its own code, instead of by people. Autonomous computers can be relied on and trusted in ways that human-governed computers can't" (Dixon, 2020). It is for this reason that the utility of blockchains can be understood as "computers that can make commitments" (Dixon, 2020).

1.1.2. Smart contracts: Ethereum and computers that can make commitments.

The first blockchain, Bitcoin, was a financial application and made several commitments in this regard, such as the rules regarding asset issuance and the upper limit of 21 million on Bitcoin supply. However, the potential for applying blockchain and autonomous computers to a much wider array of use cases was soon understood (Buterin, 2014).

The programming of Bitcoin was not designed to allow for the development of other complex applications, which created significant obstacles. To respond to this need, the Ethereum blockchain was launched in 2015. Its purpose was "to create an alternative protocol for building decentralized applications" (Buterin, 2014). The potential was that "rather than being a closed-ended, single-purpose protocol intended for a specific array of applications in data storage, gambling or finance, Ethereum is open-ended by design, and we believe that it is extremely well-suited to serving as a foundational layer for a very large number of both financial and non-financial protocols in the years to come" (Buterin, 2014).

The introduction of Ethereum was a pivotal moment in the development of blockchain technology and digital assets. The key breakthrough of autonomous code was now available in a blockchain abstract enough that developers could write any program they

wished. Some of the most discussed applications are smart contracts, decentralized finance, the issuance of new assets such as currencies and non-fungible tokens, decentralized social media, decentralized governance, etc.

The concepts of smart contracts and decentralized finance (commonly referred to as DeFi) are of particular importance to understand MKR. A smart contract is a program that contains a set of rules, actions, and consequences (hence a "contract") that are executed automatically when conditions are met (hence "smart"). The protocol behind MKR is a good example of the use of this technology. It automatically liquidates the positions of borrowers whose collateral has dropped in value below required levels. This eliminates the need for margin calls and guarantees the security of DAI, the asset issued to borrowers and backed by the collateral they post. Other examples include financial derivatives, such as automatically enforced hedging contracts, or insurance protocols which automatically make payments once a claim has been verified.

Decentralized finance is the use of smart contracts and digital assets to build systems and applications that perform the functions of traditional finance without the need for intermediaries and with transparent, automatically enforced contracts. Maker was the first application in this field to gain significant adoption and is still today among the leading players. It has more than $7 billion worth of assets deposited into it (DeFi Llama, 2023), more than any other competitor and surpassed only by Lido, which is not a competitor of Maker.

Other important players in the DeFi space are other lending protocols such as Aave or Compound and Decentralized Exchanges (DEXs) such as Uniswap or Curve. In total, the space has almost $50 billion of value deposited into different protocols and applications, down from a peak of almost $180 billion in November 2021 (DeFi Llama, 2023).

One final application of smart contracts that is of relevance to understanding the MKR token is the design of governance mechanisms. The fact that the programs on a blockchain can be relied upon to operate as designed means that they can be used to structure voting systems and consensus across the internet without an intermediary. For example, it can be assured that a pool of funds within the protocol will not be transferred until most users (or a subset of them, or some specific ones, or any similar variation) have signed off on it. These systems have come to be called Decentralized Autonomous Organizations (DAOs).

The MKR token is governed by such an entity: MakerDAO. The MKR token grants voting rights, and members decide on important matters regarding the protocol such as risk parameters for different types of collateral and the use of the profits obtained.

1.2. Stablecoins

Stablecoins are digital assets. In other words, they are digital records on a decentralised database. Their defining characteristic is that their price is pegged to another asset, or to a basket of them. These are usually currencies such as the US Dollar, Euro, or Yen, although they can also track other assets such as gold or financial instruments. The US Dollar is by far the dominant asset of reference, constituting 99.3% of the fiat stablecoin supply on Ethereum (The Block, 2023).

Stablecoins provide utility by protecting against the volatility of most digital assets such as Bitcoin or Ethereum. Investors can use them to manage risk without needing to exit a blockchain, which requires an intermediary and is therefore less efficient. They can also support ecommerce and remittances, cases where users might be eager to benefit from the ease, security, and open nature of blockchains but would be wary of being exposed to the volatility of digital assets while doing so.

The mechanisms and assets used to back stablecoins and defend their peg can be used to classify them. At a high level, we can distinguish between centralized and decentralized stablecoins. The former rely on a centralized entity, typically a corporation, to issue stablecoins and keep sufficient reserves to maintain the 1:1 peg. Circle, Tether and Paxos are examples of such entities. Decentralized stablecoins make use of smart contracts to implement systems that automatically maintain the peg, such as MakerDAO and the failed Terra. The key difference is that users of centralized stablecoins put their trust in conventional corporations whereas users of decentralized stablecoins chiefly trust the public code uploaded to the blockchain and the incentives it generates.

It is important to note that the decentralized/centralized characterization is a spectrum more than a black-and-white separation. As will be explained in the following section, MakerDAO relies on smart contracts, but holders of MKR are expected to participate in governance and decide on the types of collateral accepted into the protocol and the risk

parameters associated with them, among other things. Both human management and automated smart contracts are integral to the success of the protocol.

Beyond centralization, stablecoins can also be grouped by the assets used to back them. There are in this sense three major groups: fiat-backed, crypto backed and algorithmic stablecoins. This criterion is not the same as centralization, but it runs parallel to it. For example, almost all centralized providers of stablecoins use fiat assets to back them, whereas decentralized backing mechanisms can only hold crypto or use an algorithmic system (this is because smart contracts on a blockchain can only recognize blockchain assets, and traditional fiat assets held in bank accounts and the traditional financial system can only be held by conventional corporations).

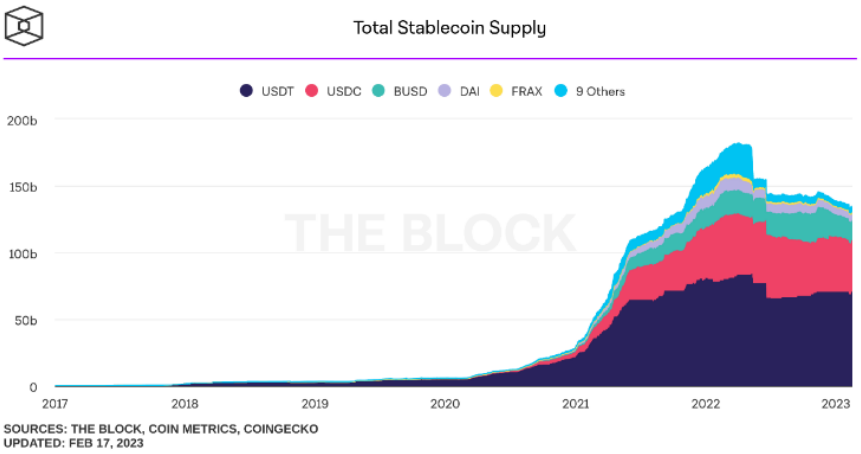

Figure 1:Total Stablecoin Supply (The Block, 2023)

1.2.1. Fiat backed stablecoins

The word “fiat” is used to refer to traditional currencies and monetary assets such as dollars, euros, yen, etc They are labelled this way because, since the end of the gold standard in 1971, their value and use is supported by state regulations and by central banks with mandates to contain inflation. They are therefore backed not by any asset or commodity but because the rest of the economy will recognize their value and accept them as a means of exchange, as well as by faith in the central banks’ capacity to maintain their value.

As can be seen on figure 1, just three fiat-backed stablecoins constitute most of the supply: USDT, USDC and BUSD. They are issued by Tether, Circle and Paxos (in collaboration with Binance), which are traditional incorporated businesses. These companies hold cash

and cash equivalents such as US treasury bills to back their circulating supply 1:1, so that there is a dollar held in reserve for every USD-pegged stablecoin issued.

Their profitability comes from generating yield on the dollars they have in reserves. Since not all the stablecoins in circulation will be redeemed at any given time, they can hold a portion of their reserves in yield-generating assets to obtain revenue. There is a strong incentive to pursue yield by reducing the portion of reserves held in cash or by investing in riskier, non-cash equivalent assets. However, taking this too far would expose the company to a bank run if the market lost sufficient confidence in the stablecoin's value. In less dramatic cases, a loss in trust could affect the stablecoins' adoption, which would in turn reduce the long-term reserves available for yield-generation.

The fundamental task of management is therefore to strike the right balance between maximising yield and maintaining trust in the stablecoin so that bank runs are avoided, and long-term growth protected. It will be noted that this model is analogous to the traditional banking model. However, stablecoin issuers are not regulated as banks, are therefore not included for government schemes of deposit insurance, and do not employ fractional reserves. For them, it is essential to be transparent and maintain trust in the 100% backing of their stablecoins.

Despite issuing the stablecoin with the largest circulating supply, Tether has often struggled with accusations of opacity and insufficient reserves. US-based Circle, the second largest stablecoin, has sought to position itself against it by championing transparency and regulatory compliance.

1.2.2. Crypto backed stablecoins

Given the high-risk nature of digital assets, stablecoins that use them as reserves are usually overcollateralized, which makes them far less capital efficient than fiat backed stablecoins. Whereas Circle's reserves represent 100,24% of the value of the USDC in circulation (Circle, 2023), Maker (the protocol controlling DAI, the most dominant crypto backed stablecoin), has a collateral ratio of 164,85% (Conti, Overview, 2023). It is therefore impractical and highly inefficient for a centralized company to use cryptocurrencies and other digital assets to back a stablecoin.

All crypto backed stablecoins are therefore decentralized and leverage the unique capabilities of smart contracts to offer a product with a different value proposition than the capital-efficient centralized stablecoins. They are permissionless, since the absence of

a central entity managing them and acting as custodian for the reserves means that they cannot be shut down or censored. They are also automated, so that less trust is put in human oversight and more in public smart contracts, and transparent, since the code and governance decisions are fully available on the blockchain for anyone to inspect.

The specific mechanisms used by Maker to create DAI and maintain its peg to the dollar will be explored further on in this chapter. The basic structure is to allow users of the protocol to borrow DAI by depositing various types of assets as collateral, which is then liquidated automatically if its value falls below a certain required threshold. This ensures that there are always more than enough funds locked in the protocol to redeem all the DAI in circulation. Other crypto backed stablecoins such as Magic Internet Money (MIM) or Aave GHO are structured along similar lines.

1.2.3. Algorithmic stablecoins

The third and final type of stablecoins are algorithmic stablecoins. They differ from the previous two types in that they do not keep any collateral as reserves. Instead, smart contracts are set up to manage supply and provide arbitrage opportunities that maintain a stablecoin's peg. The most common way to achieve this is through a "two-coin" system, whereby a smart contract is set up to exchange the algorithmic stablecoin for a fixed value (usually 1 USD) of a second token. If the stablecoin price rises, arbitrageurs can input 1 USD worth of the second token and obtain a more valuable stablecoin from the smart contract. Conversely, if the stablecoin price drops arbitrageurs can buy it and exchange it for 1 USD worth of tokens on the smart contract.

This second token is often a highly speculative asset with little intrinsic value, but so long as its price is high enough the smart contract will be able to issue more of it to back the associated stablecoin. This was the basic model behind stablecoins such as IRON and TERRA, associated to the TITAN and LUNA tokens respectively. Nevertheless, the resounding failures of these projects (TERRA had a market capitalization of almost $19 Billion before its collapse in May 2022 (CoinMarketCap, 2023)) speaks to the inherent vulnerabilities of this backing mechanism.

To function they require several factors that are not guaranteed and are most prone to fail during a crisis. Namely, they require a base level of demand for the tokens, sufficiently solid arbitrage activity, and reliable price information at all times (Clements, 2021). The first factor is the most important and vulnerable of the three. If demand falls below certain

thresholds, as it could during a crisis, the mechanism for defending the peg is likely to fail. More importantly, in a crisis, failures can build on one another in a negative feedback loop, as falling prices cause the smart contract to create more supply for the supporting token, further depressing price.

Their proven instability has made algorithmic stablecoins the least popular of the different stablecoin designs. There are, however, still some projects using this design or variations of it such as FRAX or Basis Cash.

1.3. The multi collateral Dai System and the MKR token

The Maker Protocol, or Dai Stablecoin system, or Multi-Collateral Dai (MCD) system, is a decentralized application (Dapp) deployed on the Ethereum blockchain. The current version of the system with multiple collateral types was launched in 2019, although a previous version based only on Ether was launched in 2017, and MakerDAO, the community behind the protocol, dates to 2015 (MakerDAO, 2019).

The Maker Foundation, originally based in Denmark, is the organization that was most responsible for building and launching the protocol. However, it must not be understood as the "owner" of the program or synonymous with it. Governance is carried out by holders of MKR, a digital token, through decentralized voting mechanisms on the Ethereum blockchain that will be explained further on in this section. Although the Foundation played a key role in development, it gradually gave up control and in 2021 announced that full decentralization of governance was complete (Christensen, 2021).

The purpose of the protocol is to create and maintain Dai, a "decentralized, unbiased, collateral-backed cryptocurrency that is soft-pegged to the US Dollar" and whose value lies in providing the stability that other digital assets such as Bitcoin cannot (MakerDAO, 2019). It achieves this by having users borrow Dai against other digital assets that they deposit as collateral into Maker Vaults.

1.3.1. Maker Vaults

Maker Vaults are smart contracts where users can deposit various types of collateral and receive a certain number of Dai in return. They are non-custodial, meaning that unless they are liquidated no one can access the locked assets except for the original depositor.

As of 20th February 2023, there were 30,217 vaults created, although only a portion of these were active (Conti, Ecosystem, 2023).

Depositing assets as collateral in a vault creates a Collateralized Debt Position (CDP). Users must repay the borrowed Dai along with a Stability Fee accrued over time (i.e., interest) to retrieve the collateral, although there is no due date for them to do so. If the vault is emptied, it remains in existence and can be used if the need arises again.

Only one type of collateral can be deposited per vault, so if a user wanted to deposit Ether and Bitcoin, she would have to open two separate vaults. The chief task of Maker Governance is to decide both on which assets are accepted as collateral and on the risk parameters associated with them (MakerDAO, 2019). These include the stability fee and the liquidation ratios below which a vault's collateral is auctioned off.

Safer assets warrant more lenient risk parameters, and vice-versa. There can also be different types of vaults with different risk parameters for the same collateral asset. For example, there are three different options for creating Ether-collateralized vaults: ETH-A, ETH-B and ETH-C. As of February 20th, 2023, their respective liquidation ratios and stability fees were 145%-1.5%, 130%-3.0% and 170%-0.5% (Conti, Collateral, 2023). As can be seen, a borrower can opt to pay a higher Stability Fee in exchange for a lower liquidation ratio. This allows Maker to satisfy different risk profiles and appetites.

Aside from the stability fee and the liquidation ratio, other risk parameters are the Debt Ceiling, the Liquidation Penalty, the Auction Price Function, the Auction Price Multiplier, the Collateral Auction Duration, the Max Auction Drawdown, Local Liquidation Limits, the Breaker Price Tolerance, and Kick incentives. The debt ceiling limits the amount of debt that can be created from a single collateral type, which helps diversify Maker's collateral portfolio[1]. The liquidation penalty is added to a vault's outstanding obligations if a liquidation occurs and serves to encourage appropriate collateral levels. The other risk parameters govern the characteristics of the Collateral Auctions.

The options for collateralizing a Maker Vault have increased over time. Several digital assets associated to different blockchains and Dapps such as Ether, Bitcoin, Matic, Uni, Link or Yfi are accepted. Other stablecoins such as USDC, GUSD and USDP can also be

[1] There is also a global debt ceiling which limits the total amount of Dai that can be created. Both the collateral's Debt ceiling and the global debt ceiling must be satisfied to create new Dai.

used. Furthermore, real world assets like tokenized real estate debt, receivables and financial debt have also been incorporated into the protocol (MakerDAO, 2022). Figure 2 shows the relative proportions of the different assets backing Dai as of 21st of February 2023.

Figure 2: Dai Collateralization (Conti, Overview, 2023)

1.3.2. Liquidation

For the protocol to enforce the liquidation ratios of each collateral type, reliable and timely information on their dollar price must be available. This poses a significant technical and security challenge, since an app on the Ethereum blockchain only has direct access to information on the blockchain itself but is blind to real world data. In the blockchain industry, sources of information about the off-chain world are called Oracles.

The Maker Protocol employs a decentralized Oracle infrastructure to obtain price information. MKR holders decide on a set of trusted data feeds to provide the data. This data is then passed through the Oracle Security Module (OSM), which delays the price for one hour. This provides a buffer for Emergency Oracles or a Maker Governance vote to freeze a compromised Oracle in the event of an attack or a crisis.

If the value of a vault's collateral falls below its liquidation ratio an auction can be triggered by anyone. The protocol then automatically begins a process to try to obtain as much Dai as possible from the collateral. The system employed since 2021 is a Dutch style auction in which prices start high and drop over time. Exactly how high prices start, and how much and over what time they decrease, is governed by the Auction Price Multiplier, the Auction Price Function, the Max Auction Drawdown, and the Auction Duration. Kicker incentives are also provided as rewards to users for triggering liquidations, avoiding the build-up of bad debt in the protocol.

There is a possibility that not enough Dai is raised to cover the outstanding debt. In this case the deficit is converted into protocol debt. This is covered by the Maker Buffer, which contains the proceeds from the system's operations (stability fees, liquidation fees, etc.). If protocol debt reaches a certain limit set by Maker Governance, a Debt Auction is triggered where the protocol issues new MKR to cover the Dai needed (MakerDAO, 2019).

1.3.3. Surplus auctions

During the normal operations of the protocol, a surplus of Dai is generated as stability fees and other income accrue. As explained above, these build up the Maker Buffer net of debt. Once the buffer exceeds a certain limit set by Maker Governance, a surplus auction is triggered.

During a surplus auction, participants bid increasing amounts of MKR for a fixed amount of newly minted Dai. This creates enough Dai supply so that all borrowers can cover their obligations, and it rewards MKR holders for their role in governance by distributing profits through a mechanism analogous to a stock buyback. After the auction ends, the system destroys or "burns" the MKR received, thereby reducing its total supply.

The bidders in the protocol's auctions (the collateral auction, the surplus auction, and the debt auction) are called keepers, and are usually automated bots with a programmed bidding strategy. Keepers are also expected to perform arbitrage activities to keep Dai around its target price of 1USD. They are therefore key external actors necessary for the health of the system.

1.3.4. The Dai Savings Rate (DSR)

The Dai Savings Rate (DSR) is another smart contract within the Maker Protocol where users can deposit their Dai holdings and receive a return determined by Maker Governance. At the moment of writing, this was set at 1% (Conti, Ecosystem, 2023). There is no minimum amount required, and withdrawal is possible at any moment (MakerDAO, 2019).

For Maker Governance, the DSR represents an additional tool with which to defend Dai's peg to the dollar: by determining the return on Dai holdings, they can control the demand for it in the same way Central Banks use interest rates to control demand for savings. If the market price of Dai is above the target of $1, MKR holders can decrease the DSR to reduce the demand for Dai, and vice-versa.

The Dai minted to pay the DSR offsets the surplus Dai in the system available for MKR holders. Strategically, however, it makes sense because it provides an additional tool for defending the peg, thereby increasing Dai utility and adoption. There is also an expectation of an increase in the Stability Fee that would transfer the cost to CDP owners:

> "Conceptually, the Stability Fee should be comprised of two components: 1) a collateral-specific risk premium that is a value transfer from CDP owners to MKR holders, and 2) a DSR adjustment that is a value transfer from CDP owners to Dai holders. Essentially, CDP owners compensate the two distinct ecosystem actors: MKR holders for the risk of collateral, and Dai holders for the risk of Dai instability." (MakerDAO, 2019)

1.3.5. Defence of the peg

There are several mechanisms through which the Maker Protocol ensures Dai stability around its target price. On the supply side, the stability fee incentivises Dai creation or redemption from CDP owners. A lower stability fee will make opening and keeping a CDP cheaper, incentivising new supply of Dai. A higher stability fee will push some CDP owners to close their positions and redeem their collateral, reducing supply of Dai. Since opening and closing a CDP can be done at any moment, this supply decision is made every second. As described above, the Dai Savings Rate provides an additional instrument to control demand for Dai. A higher DSR will mean higher demand and upwards price pressure, and vice-versa.

In addition to these, in 2020 the protocol added another tool called Peg Stability Modules (PSM). This is a smart contract that automatically exchanges centralized stablecoins USDC, USDP and GUSD for Dai at a 1:1 ratio. The stablecoin reserves held by the PSM can be seen in figure 2 to represent a very significant portion of the collateral in the protocol. Furthermore, figure 3 shows that they back most of the Dai generated[2]:

[2] Note that the difference between figures 2 and 3 is due to the different assets' collateralization ratios. Dai is generated from approved stablecoins at a 1:1 ratio by the PSM, so they necessarily have a comparatively higher share of the generated Dai than other collateral types like Ether which generate Dai through overcollateralization in conventional CDPs.

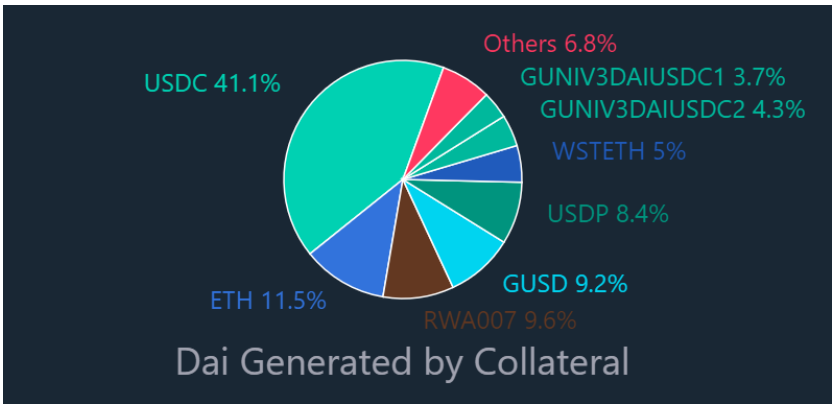

Figure 3: Dai Generated by collateral (Conti, Overview, 2023)

After its introduction in December 2020, the PSM proved very successful in stabilising Dai price, as figure 4 shows. If the price moves up, arbitrageurs can exchange stablecoins for new Dai and sell it for a profit. If it goes down, they can buy cheap Dai and exchange it for more valuable stablecoins. The PSM also has the effect of increasing Dai liquidity, which can also be seen on the trading volumes shown at the bottom of figure 4.

Figure 4: Dai Price (CoinGecko, 2023)

One drawback of the PSM, however, is that it exposes the protocol to centralization risk. Some of the main competitive advantages of Dai against centralized stablecoins is that it is permissionless and secured by automated smart contracts. Relying on centralized stablecoins for its collateral, however, exposes it to the same regulatory crackdowns and

custody failures that traditional corporations must contend with, undervaluing its value proposition.

Finally, a last resort mechanism to enforce the target price is the emergency shutdown. This mechanism can be triggered in response to an attack, malicious governance, or a similar crisis if enough MKR holders agree. Vaults are frozen and collateral is liquidated. Dai holders can therefore expect to receive the collateral backing Dai even in crisis conditions (MakerDAO, 2022).

1.3.6. Maker governance

Summarizing the description of the protocol above, MKR holders must decide through the governance process on:

- The collateral asset types, and the risk parameters associated with them (debt ceiling, liquidation ratio, stability fee and auction characteristics)
- The Dai Savings Rate
- The set of Oracle Feeds
- The set of Emergency Oracles (which can freeze individual oracles)
- When to trigger an emergency shutdown
- Updates to the system (such as the PSM)
- Allocation of the funds in the Maker Buffer (for example to pay for various infrastructure need like risk teams, security audits, etc.)

They are rewarded through surplus auctions, which distribute the profits from stability fees and other income through a mechanism equivalent to a stock buyback. On the other hand, if the surplus in the system is not enough and protocol debt reaches alarming levels, the MKR token is used for recapitalization through a debt auction, which dilutes existing MKR holders.

As described in the introduction to this section, governance rules and mechanisms are programmed into the protocol through smart contracts, which run on the Ethereum blockchain. This means that the rules are enforced by the automatic execution of the code, and not by external parties such as the legal system, which eliminates disputes over issues of interpretation.

The basic tools used by Maker Governance to operate are Maker Improvement Proposals (MIPs) and Core Units. An MIP is a “document that regulates and defines the behavior

of Maker Governance, MakerDAO, or the Maker Protocol. They are standardized documents voted upon by Maker Governance. [They] can be added, amended, replaced, and removed." (MakerDAO, 2022). There are several types of MIPs used for different purposes such as formalizing governance processes, defining Core Units, onboarding collateral, or responding to an emergency.

Anybody can introduce an MIP, which is then voted on by MKR holders in proportion to the MKR they hold. The details for consideration, submission and voting are highly formalized. Figure 5 provides an illustration of this for non-urgent proposals. Off-chain and on-chain polling serves to gauge community sentiment and determine the issues to be submitted to an executive vote. Moreover, a monthly governance cycle structures the introduction of new MIPs, while a weekly governance cycle is used for recurring decisions that require quicker action (MakerDAO, 2022).

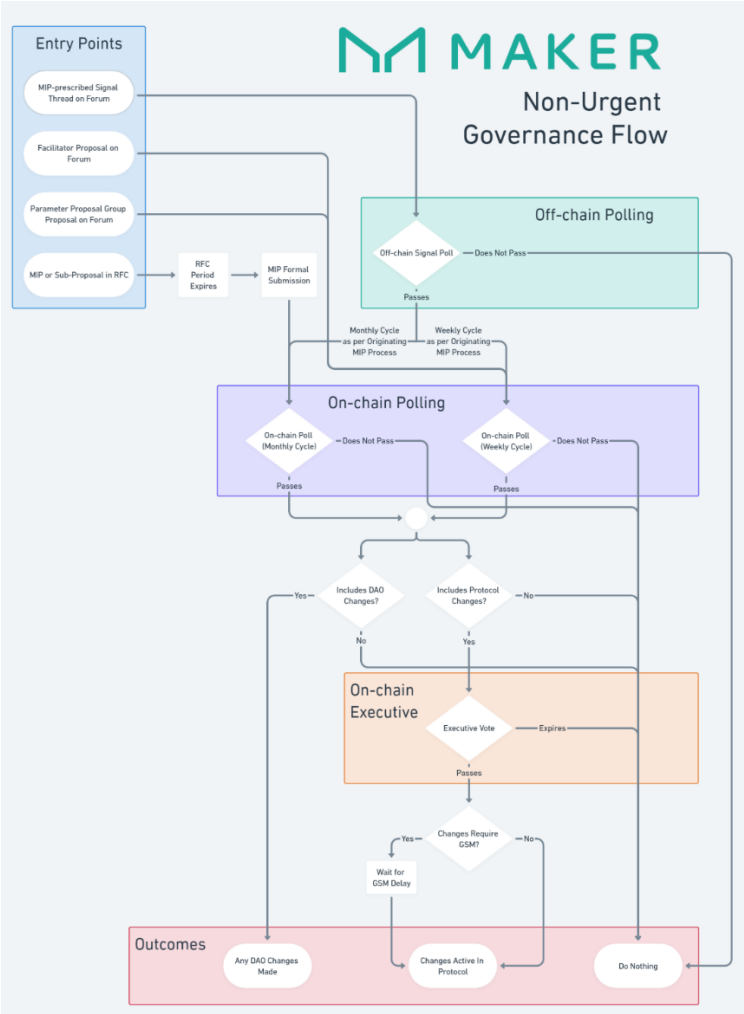

Figure 5:Maker Governance Cycle (MakerDAO, 2022)

Core Units are the other fundamental pillar of Maker Governance. They are “the basic workforce divisions that Maker Governance can oversee, manage, and prioritize. Each Core Unit has a long-term work area assigned to it that covers a broad set of responsibilities or focus” (MakerDAO, 2022). Some of the main examples are risk, governance, protocol engineering, scaling, and oracles.

To fulfil their mandate, Core Units are assigned a budget, which is administered by a Facilitator. These are individuals that are the official points of contact between the DAO and the Core Unit and are held accountable for adequately fulfilling their assigned role.

Chapter 2: Valuation method

2.1. MKR and traditional securities

MKR is a digital asset native to a blockchain (Ethereum) and a protocol (Maker), meaning that its fundamental nature is to be information on a decentralized database. In other words, the method for recording the ownership of the asset is not incidental but rather constitutes what the asset itself *is.* In this sense it is more akin to Bitcoin, Ether, and other digital assets than it is to any traditional security or stock whose ownership is determined through the traditional financial system comprised of stock exchanges, brokerage houses and other financial intermediaries.

Many digital assets can be considered commodities. Bitcoin, to provide the clearest example, is *only* a record of ownership on the Bitcoin blockchain. It is a verifiable entry in a decentralized ledger that a given address has a given number of units to its credit, but it has no fundamental value attached to it such as cash flows, governance rights or any other kind of direct utility. Its limited supply and the permissionless, censorship resistant nature of the ledger make it attractive, at least to some people, as a means of exchange and a store of value. But it is fundamentally a commodity the way that gold is.

However, the context in which MKR acquires its value and meaning, the Maker Protocol, makes it resemble stock in a conventional company. It is an asset which grants governance rights over an entity, the Protocol, through which people cooperate to produce valuable products (the Dai stablecoin, plus the lending and saving services that support it) and obtain profits as a result. The attainment of these depends on the managerial efforts of both MKR holders and of the members of Core Units contracted by them. MKR also grants rights over the profits of the protocol, after all costs and debts have been covered.

These similarities with conventional stock notwithstanding, it is important to keep in mind that the Maker Protocol is not a corporation or a legal entity[3]. There is therefore no stock to be issued. MKR is governed solely by the rules and parameters programmed into the application uploaded on the Ethereum blockchain. If the design and economics of the MKR token resemble the role stock plays in conventional enterprises, this by virtue of its programming. However, it is free to depart from traditional securities law, and the only

[3] There exists an associated legal entity, the Dai Foundation. It is a non-profit organization based in Denmark that exists to safeguard the intellectual property of the Maker Community. Before its dissolution the Maker Foundation fulfilled these tasks.

investor protections or issuance rules are those established by the code. It is an example of the "code is law" paradigm prevalent among blockchain developers (Quinn, 2022).

One widely used tool to determine whether something is a security is the Howey test, which states that it must be an "investment of money in a common enterprise with a reasonable expectation of profits to be derived from the efforts of others" (Secutities and Exchange Commission, 2019).

Buying MKR is an investment of money in a common enterprise, the Maker Protocol. There is a clear expectation of profits, since the revenue accrued to the protocol is distributed through surplus auctions. Furthermore, the wider the adoption and market share of Dai and the Maker protocol, the more valuable the governance rights associated to MKR will be, and therefore its expected appreciation. The derivation of the profits from the efforts of others is the less obvious part of the test. MKR holders are expected to participate heavily in the governance of the protocol, although they can delegate their votes to others. Furthermore, they contract third parties through the Core Units to organize governance and complete essential tasks.

There is certainly a strong legal argument to be made for MKR passing the Howey test. These considerations aside, for the purposes of financial valuation the Maker Protocol is sufficiently close to a conventional business to be able to be able to apply the same valuation methods. An MKR token represents rights over the future cash flows from a risky venture. That these "rights" are conferred by autonomous code and not by a legal investment contract is irrelevant form a financial perspective.

2.2. Comparable businesses

Having established that the Maker Protocol can be analysed the same way as a conventional business venture, the question remains to which industry or companies it is most comparable to. This issue is highly relevant to determine the most appropriate valuation models.

Maker creates and supports Dai through borrowing and saving facilities (Maker Vaults and the DSR contract, respectively). The banking industry might therefore be seen as comparable, since it is the one satisfying demand for leverage and savings options with a variety of different products in the context of traditional finance. Nevertheless, there are

many important differences between the traditional banks and Maker. The basic banking model consists of obtaining financing through deposits and lending them out in a fractional reserve system. Maker, on the other hand, creates a wholly new currency, Dai, by loaning it against high-risk collateral which is locked in non-custodial smart contracts.

Furthermore, the banking industry is regulated by central banks which exercise control over money creation and act as lenders of last resort. Depositors are also covered by government-provided deposit insurance. In Maker, Dai holders are reassured by the automatic execution of smart contracts that their funds are properly backed, although they also put their trust in Maker Governance's diligence in risk management and protocol security.

Other stablecoin issuers, such as Circle, Paxos and Tether, are Maker's most direct competitors in the stablecoin market. However, their relationship is complex, given that these centralized stablecoins have come to play a central part in securing Dai itself through the PSM. Their business model is also fundamentally different from Maker's. Whereas they hold cash and cash-equivalents and exist as centralized corporations, Maker supports Dai through a more complex system of overcollateralized borrowing against volatile assets and stands as the leading example of decentralized finance.

The risks and management of each type of stablecoin are therefore radically different. Centralized stablecoin issuers must maximise extracting yield from their reserves today without killing the goose of trust and future growth. They are also exposed to regulatory risk. With Maker and decentralised finance, the code presents significant risks, both in terms of its being secure against hacks and well designed in terms of the economics and incentives it generates. There is therefore significant technological risk, as well as the governance risk inherent in the unregulated, unseasoned model of decentralized governance through DAOs.

Finally, Maker also presents some characteristics typical of a venture investment. It is a relatively young business (6 years since the launch of single-collateral Dai, 4 since MCD) at the cutting edge of innovation, with significant technological risk and high growth prospects. One relevant difference is that, while a typical startup is usually a private company that undergoes several rounds of funding as it matures, the MKR token was tradeable and liquid on the Ethereum blockchain since the project's inception. In other

words, the market dynamics of MKR are comparable to a startup trading on public markets since day 1.

Figure 6 shows Maker's market capitalization during this time compared to the broader total crypto market capitalization. The high degree of correlation between MKR and the broader crypto market is evident at first sight. This should come at no surprise, given that the most important factor impacting both is the appetite among investors for investment in digital assets. Furthermore, a bull market for digital assets impacts the Maker Protocol in various ways. Rising prices for the assets locked as collateral mean that CDPs' collateralization ratios rise, and there is more capacity for Dai creation. Additionally, trading activity increases during bull runs, which in turn translates for higher demand for the leverage offered by Maker Vaults (traders and market makers are among the main users).

Figure 6 Maker market cap (top), (CoinGecko, 2023). Global crypto Market cap (bottom) (Coingecko, 2023).

2.3. Valuation methodologies

2.3.1. DCF analysis and forecasting difficulties

Because MKR is an asset with cash flows associated to it (protocol income minus protocol expenses and debt, divided by MKR outstanding), it is possible to apply a traditional DCF analysis to it. This would require making assumptions about the protocol's future revenue streams, growth rates, and costs to project future expected free cash flows over a given period, plus a terminal value at its end. These would then be discounted using the protocol's cost of capital.

Nevertheless, applying a DCF, traditionally used to value conventional businesses, to Maker presents some important difficulties. Chief among them is that forecasting future growth over the next few years and deciding on a terminal value at the end of this period is fraught with uncertainty. The potential earnings in a best-case scenario are very high, but so are the risks involved.

The success of the Maker protocol hinges on the widespread adoption of public blockchains and digital assets, particularly the Ethereum network. Ethereum founder Vitalik Buterin laid out three different long-term futures for the ecosystem, illustrated by comparison with three other products: Esperanto, the Linux Operating System, and the Internet (Buterin, 2022).

The first scenario, the Esperanto language, represents a niche interest of a few enthusiasts that fails to achieve any lasting impact and remains a curiosity. The second, illustrated by Linux, describes a mixed scenario which falls short of widespread adoption but achieves significant impact in some important areas (Linux as a desktop OS failed to rival Windows and Macintosh, but is a crucially used by Android phones, servers, developers and other specific groups). Finally, the internet represents the third and most successful scenario, whereby global adoption is achieved and radically impacts all businesses and networks.

Most proponents of blockchain technology advocate for some version of the latter scenario. In this view the possibilities enabled by Chris Dixon's computer commitments,

such as internet native money, decentralized finance, DAOs or NFTs[4], are so large that they will come to replace many of the existing systems in finance, the internet and other networks as their value is realized and the technological barriers holding back adoption are overcome.

Nevertheless, this is still not the case today, and most of the existing dominant institutions in finance and the internet have yet to experience the radical disruption promised by the technology. Vitalik believes that the Esperanto scenario is already surpassed and no longer a possibility (Buterin, 2022). This seems to be the case, given the trillions-of-dollars order of magnitude in which the global crypto market capitalization moves, as seen on figure 6, and the increasing number of investments and adoption by both individuals and institutions (Chainalysis, 2022).

Whether digital assets will come to be an essential backbone of the economy of the 21st century or remain a useful application on some sectors of finance and the internet is still to be seen. Moreover, mainstream adoption of crypto generally is a necessary but not sufficient condition for the Maker protocol to achieve major success. For this to happen, the concept of decentralized finance must take hold. In other words, even if other blockchain applications such as digital collectibles or pure cryptocurrencies take hold, Maker could fail to grow at the same pace if conventional centralized institutions crowd it and other decentralized financial applications out and provide a better service (possibly because of capital efficiency, regulatory compliance, or superior governance).

Finally, even if decentralized finance achieved lasting success, Maker would likely find abundant competition. Today, it enjoys a dominant position as one the leading protocols in DeFi, and it has the second highest amount of Total Value Locked, a metric which is used to analyse DeFi protocols by calculating the value of the assets locked within their smart contracts (DeFi Llama, 2023). However, this does not imply that other, better protocols could appear to challenge Maker. Given the nascent nature of the industry and the frenetic pace of change and innovation within it, this is far from a forgone possibility. Indeed, the comparison with the internet provides many examples of once-dominant players that came to be displaced, such as Netscape and Internet Explorer in the browser markets, or Myspace in social networks.

[4] Non-fungible tokens, i.e. assets on a blockchain that are unique and distinguishable from all others. Actual and proposed use cases include digital art, digital objects, digital identity, certifications, etc.

2.3.2. The Venture Capital Method

These valuation challenges are routinely encountered by the Venture Capital industry, which invests in projects with a large but uncertain potential reward occurring far in the future, and that often face many years of losses before profitability is achieved. To tackle these valuation challenges, they use a variation of DCF analysis, the Venture Capital Method, laid out by William Sahlman (Sahlman & Scherlis, 2009). This methodology entails several steps:

> "First, a company's net income is projected for some terminal year, say five years from the present. The estimate of net income is typically based on a "success scenario," that is, one in which the company attains its sales and margin projections. Then a price-to-earnings ratio (PER) is determined that is deemed appropriate for a company that has achieved the measure of success implicit in the forecasted income. Often, this PER is estimated by studying current multiples for companies with similar economic characteristics (e.g., size, profitability, growth rate, capital intensity, risk). The product of the projected net income and the estimated PER is the company's projected terminal value. This terminal value is then converted to a present value by applying a very high discount rate, typically between 35% and 80% per year." (Sahlman & Scherlis, 2009)

A central part of the method is that venture capitalists use discount rates higher than what would be justified by systematic risk, lack of liquidity, or the value added they bring to the table as active investors. The reason for this is that they are using the discount rate rather than the forecasted cash flows to reflect the expectation that many of their investments will fail to meet their targets.

This contrasts with the way a traditional DCF is performed, where the forecasted figures are the expected cash flows and terminal value, which are then discounted at a rate that reflects the Opportunity Cost of Capital in accordance with the Capital Assets Pricing Model (which only expects investors to demand compensation for systematic risk and not technological or business risk) and the business' optimal capital structure (Brealey, Myers, & Marcus, 2001).

Venture capitalists identify several stages of financing as a company grows, and use different ranges of discount rates for each: seed financing (over 80%), startup financing (50-70%), first-stage financing (40-60%), second stage financing (30-50%) and bridge financing (20-35%) (Sahlman & Scherlis, 2009). As a company matures and its risk reduced, the difference between the discount rate used and what would be justified by systematic risk, liquidity and value added becomes smaller.

Here we run into an important difference between typical venture investments and MakerDAO. As explained above, MKR traded in liquid markets since its inception. An illiquidity premium is thus not justified and there is no significant liquidity event such as an IPO that investors may consider when making financing decisions. The appropriate discount rate for MKR in accordance with the venture capital method will be discussed in the next chapter.

Chapter 3: The model

The first step when performing a valuation is carrying out a historical analysis to identify the main business drivers behind revenues, costs, growth, etc. Based on the results of this analysis, on the relevant trends and expectations, and on an assessment of Maker's strategic position, sensible net income forecasts are made over a certain period, and a terminal value is assigned to the business at the end of it. These forecasts are then discounted at a given discount rate to give an estimate of the present value of the business. This value can then be contrasted with other estimates obtained by changing the projected scenarios and forecasts (sensitivity analysis).

3.1. Historical analysis

3.1.1. Dai supply and adoption metrics

Dai supply currently stands slightly above 5 billion (Conti, Overview, 2023). It has fallen from a peak of 10 billion in February 2022, although the CAGR over the past three years is still an impressive 250%. Figure 7 shows the evolution of Dai supply over this period, along with the portion of this supply that is generated from stablecoins (which generate negligible interest revenue).

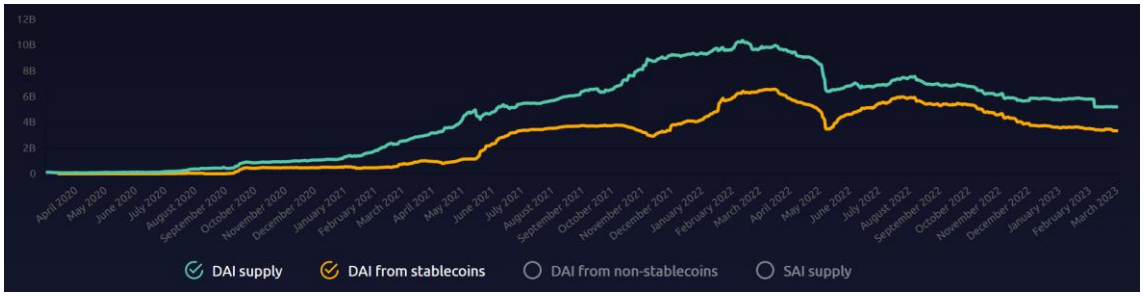

Figure 7: Dai supply and Dai Supply from stablecoins (MakerDAO Risk Core Unit Team, 2023)

Figure 1 shows Dai's position within the broader stablecoin market over time. It has the fourth largest market capitalization, representing 3.8% of the total stablecoin supply of $130 billion. The dominant players are the centralized stablecoins USDT (53%), USDC (30%) and BUSD (9%). Among the decentralized, crypto backed or algorithmic stablecoins it is by far the dominant player, representing about 70% of the supply on Ethereum (The Block, 2023).

As for the stablecoin market itself, figure 1 also shows its evolution over time. The most remarkable takeaway is its explosion in value in late 2020 and especially in 2021. During this time, as figure 6 shows, the crypto market experienced a pronounced bull run in which prices and activity skyrocketed.

According to a16z, one of the most prominent venture capital funds investing in the space, this was the fourth iteration of the "price-innovation" cycle in crypto. In each of these, rising prices generate attention and interest, which draws talented innovators and capital into the space. These seeds of innovation remain after price levels drop, and as they reap fruit a new cycle starts when optimism is again dominant, and rising prices attract even more interest, starting the cycle anew (Andreessen Horowitz, 2022).

There are currently over 30,000 vaults created over Maker's existence by almost 18,000 vault creators (Haga, 2023). Figure 8 shows their rate of creation over time, which has been gradually decreasing. It was highest from the inception of the protocol until mid-2021, after which vault creation slowed down and continued to decrease slowly.

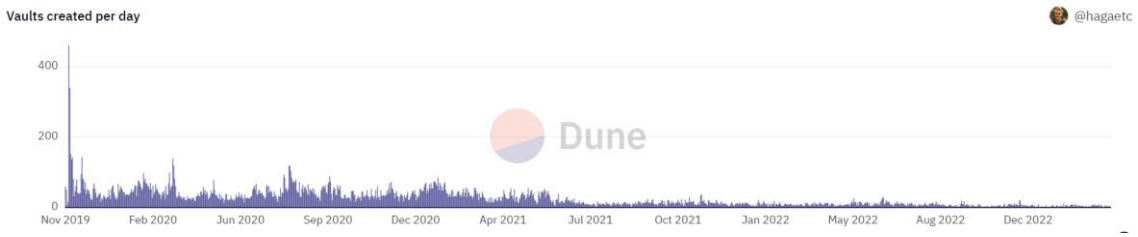

Figure 8: Vaults created per day (Haga, 2023)

However, not all created vaults are active. The number of active vaults through time can be seen in figure 9. A peak of almost 6500 was reached in early 2021, after which activity levels have been declining and are presently slightly below 2500.

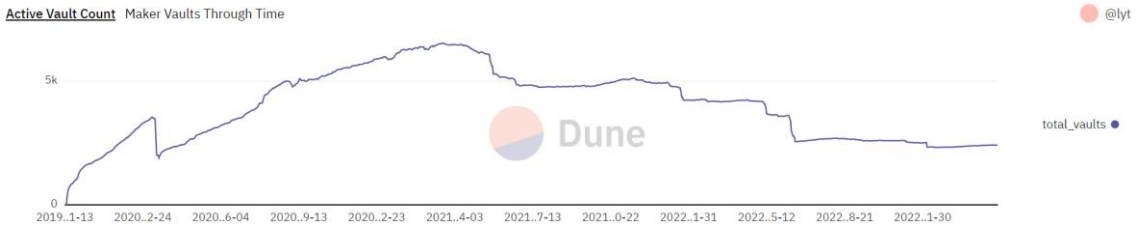

Figure 9: Active Vault Count (Lyt, 2023)[5]

[5] A significant amount of the data and graphs for this analysis have been obtained from Dune Analytics, a platform where developers can upload open-source code to obtain real-time information from the blockchain. Sometimes, the identities behind these developers are not available, such as with figures 9 and 11. However, given the open source nature of the code and the fact that it is widely used in Dune, this information can be considered reliable.

3.1.2. Balance sheet

Turning now to Maker's balance-sheet, this is comprised fundamentally of the assets deposited as collateral (to which it only has access in the event of a liquidation), the loans made against those assets, and the buffer accrued from past revenues which constitutes the funds that Maker Governance has at its disposal to spend freely.

While the value of the loans issued is essentially the Dai supply shown in figure 7, the collateral assets can be measured using one of the most widely used tools to analyse DeFi protocols: Total Value Locked (TVL). This metric registers the value of the assets locked within a given protocol's smart contracts. In the case of Maker, this would mean the value of the collateral backing CDPs. Figure 10 shows how TVL for Maker has varied over time.

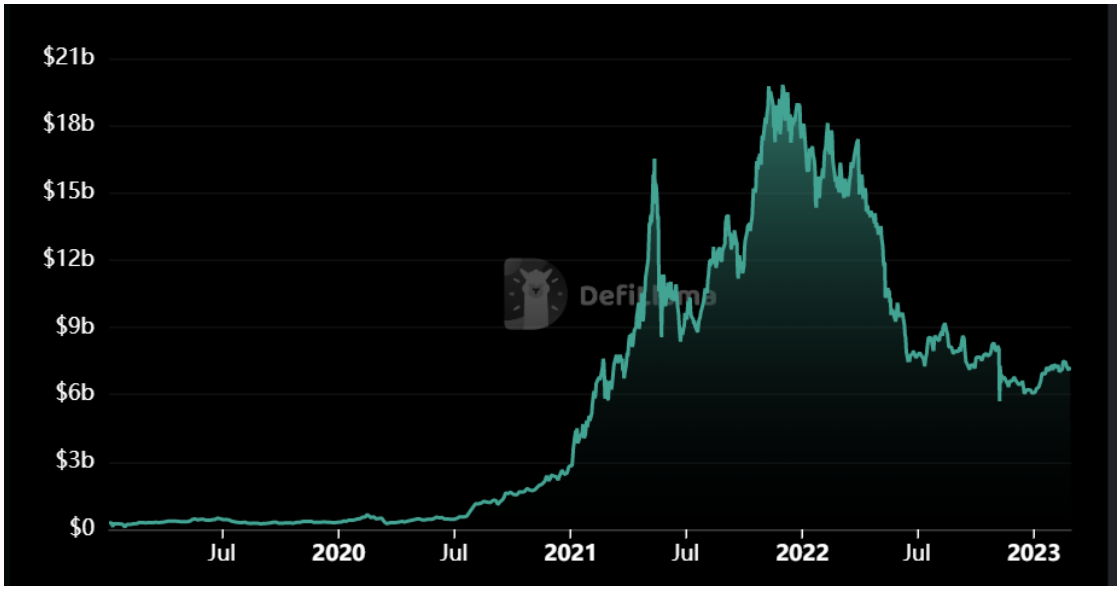

Figure 10: Maker Total Value Locked (DeFi Llama, 2023)

Again, the 2021 bull market is clearly reflected in the frenetic growth in TVL from late 2020 to its peak of almost $20 billion in November 2021. The end of the bull market and the drastic fall in crypto activity and prices in 2022 produced a steep fall in TVL for Maker, although it has remained in the 6–9-billion-dollar range since then, far above pre-bull market levels. This is an important difference with the number of active vaults, which did return to pre-bull market levels. The average collateral locked per vault is therefore greater than before the bull market.

Figure 2 shows how the proportion of the different collateral types that make up Maker's TVL. The stablecoin USDC represents the largest share given the Peg Stability Module's

importance, while Ether and Ether derivatives[6] make up the majority of non-stablecoin assets. Figure 11 shows how the amount of Dai supply backed by these collateral assets has evolved since Jan. 2021. Note that this is not equivalent to the amount of each asset locked in the protocol because their varying collateralization ratios imply varying capacity for Dai generation.

Figure 11 is the evolution over time of the data presented in figure 3, namely the proportion of Dai supply generated by each collateral type. There are several insights to be gained from this breakdown of Dai supply. The most relevant one is the importance of stablecoins and the Peg Stability Module for Maker. At the time of writing, they backed 56% of Dai supply. This illustrates Maker's exposure and dependence on centralized stablecoin issuers.

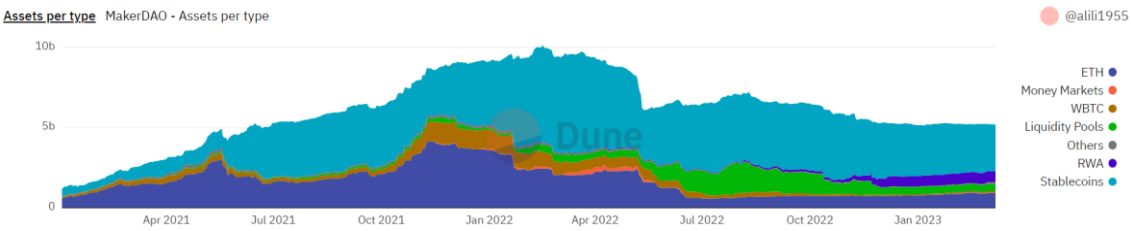

Figure 11: Dai from collateral over time (Alili1995, 2023)

Additionally, the appearance and growing relevance of Real-World Assets (RWA) is also clearly visible. This collateral is a crucial part of Maker's strategy for the future, which revolves around integrating with the traditional financial system and providing capital for off-chain projects (Dérivaux, 2021). Other takeaways include the reduction in the exposure to Bitcoin, which was significant in late 2021 and early 2022 but has now decreased to be almost negligible.

Apart from loans (Dai outstanding) and deposited collateral (TVL), the other major item in Maker's balance sheet if the Maker Buffer. Figure 12 shows its variation over the past 12 months (since March 2022). It reached a peak of more than $83.5 million in June 2022, but has since declined to $73 million. The explanation for this lies with the losses that the

[6] Mainly WSTETH or Wrapped Staked Ether. This is a digital asset issued by the Lido protocol, which takes in Ether and locks it in Ethereum's proof of stake validation mechanism (see chapter 1). The stETH token represents this staked ether, and wstETH is a version of it compatible with DeFi protocols like MakerDAO.

protocol has been sustaining since then, which will be analysed in the section dedicated to the income statement.

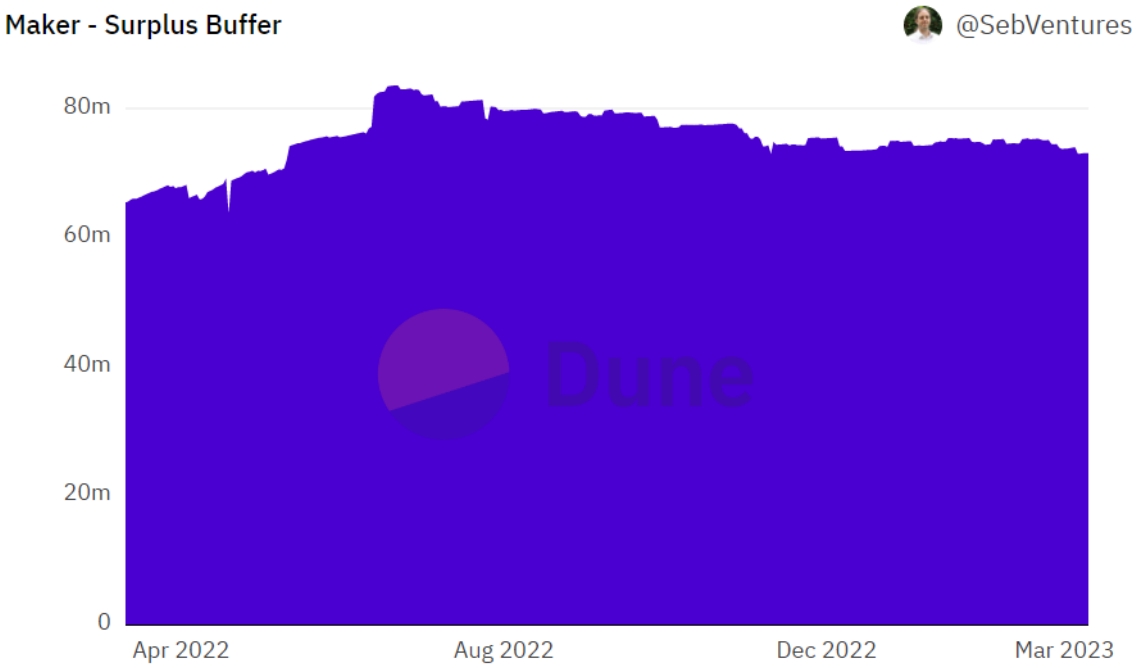

Figure 12: Surplus Buffer (Dérivaux, MakerDAO - Dashboard, 2023)

3.1.3. Income statement and cash flows

Figure 13 shows the monthly P&L for the Maker protocol since its inception. The Maker protocol has been profitable for most of its existence, and the 2021 bull market spelled record profits. However, for the past 9 months expenses have been greater than income, mainly due to the collapse of revenues as the bull market gave way to a bear market of reduced prices and activity.

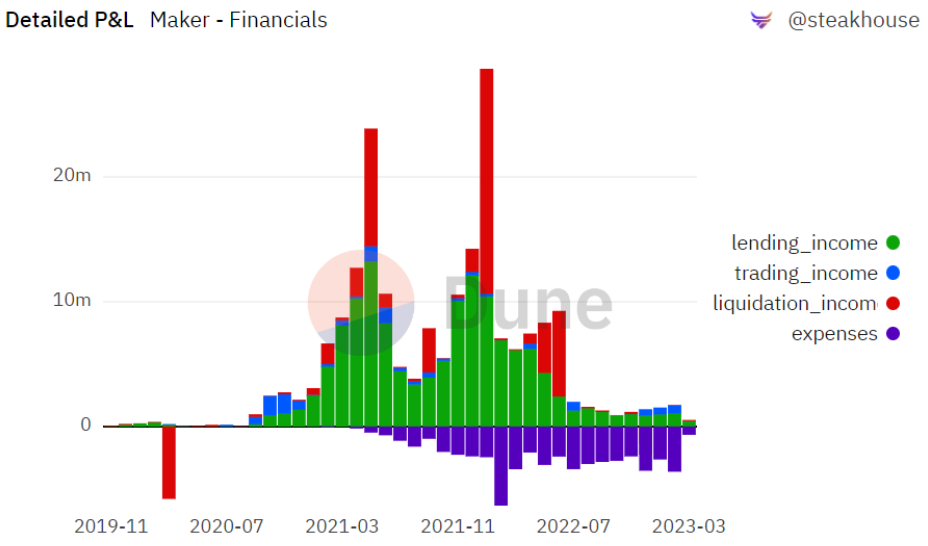

Figure 13: monthly Maker P&L (Dérivaux, MakerDAO - Dashboard, 2023)

The main revenue categories are lending income, trading income and liquidation income. The most fundamental one for the protocol is lending income: the interest (i.e., stability fees) paid by borrowers of Dai. Liquidation income is comprised of the fees accrued from executing collateral auctions, net of the losses from failed liquidations. This is a more unstable revenue stream, tied to volatility levels and rapid market downturns. As can be seen in figure 13, it skyrockets in certain months, surpassing even lending income, while being negligible in others.

Finally, trading income is comprised of the fees charged by the PSM for exchanging Dai and other stablecoins 1:1, as well as by the conventional vaults containing stablecoins. It is a significant revenue stream, especially when lending income is depressed, but it is far from being the mainstay of the protocol.

Figure 14 shows a breakdown of annualized revenues by the assets from which they were generated since Jan. 2022 (roughly the peak of the bull market). The revenue decline owing to the onset of the bear market and the corresponding decline in TVL and Dai supply is evident at first sight. However, other important changes have occurred in the composition of revenue-generating assets. Whereas Ether and Bitcoin (WBTC) generated 93% of protocol revenues at the start of 2022, as of 11/03/2023 they generate merely 26%. Conversely, stablecoins and especially Real-World Assets have stepped in to fill the gap, and to fuel an increase of revenues of 280% from late October 2022 to today.

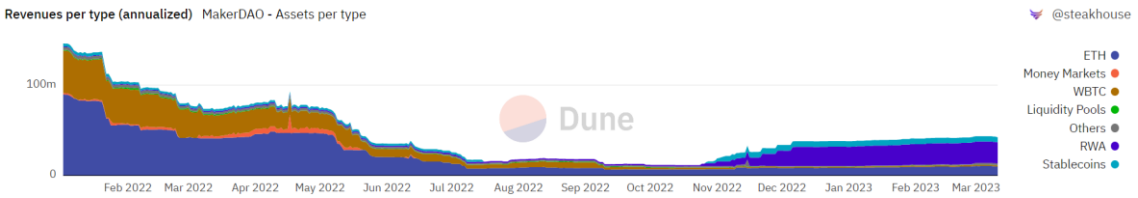

Figure 14: Maker Revenues per asset (Dérivaux, MakerDAO - Dashboard, 2023)

This illustrates the importance of RWAs to Maker's strategy. Although they back around 10% of the Dai supply and represent merely 6.1% of the collateral (Conti, Overview, 2023), they generate about 56% of revenues since December 2022 (Dérivaux, 2023). This is the fulfilment of one of the strategic goals of Maker when introducing RWAs, namely the diversification of revenue sources (Dérivaux, 2021). As the asset class of digital assets (led by Bitcoin and Ethereum) has plunged, Real-World Assets have supported and boosted Maker's revenues.

Because of their strategic importance, it is worth discussing exactly how Maker integrates with RWAs, since the mechanisms for this are more complex and carry different risks than the usual on-chain locking of digital assets in smart contracts. The borrowers of Dai for off-chain finance are entities approved on a case-by-case basis by Maker Governance.

This stands in contrast with on-chain borrowing, which is open to anybody with an Ethereum address and the funds to deposit as collateral. Usually, these entities are asset-backed lenders which issue senior secured loans for various purposes such as construction, home acquisition and renovation, working capital, Revenue Backed Finance, and others. There is also a legal structure created by MakerDAO, called Monetalis Clydesdale, which borrows Dai and invests it in short-term US bond ETFs (MakerDAO, 2022).

The result of these off-chain lending activities is the creation of Dai backed by an array of different assets such as US treasuries, real estate, and future contracted business cash flows such as revenues, trade payables and receivables. This is managed through the creation of off-chain legal entities and contracts that try to replicate the operation of Maker protocol's design. MakerDAO is responsible for manually triggering liquidations, which are enforced off-chain by a third party (MakerDAO, 2020).

Turning now to expenses, figure 15 shows the Core Unit expenses of the Maker protocol since the beginning of 2021. Core Units are the teams contracted by Maker Governance to carry out specific tasks such as facilitating governance, risk management, oracles, protocol engineering or scalability (see chapter 1). Funds are transferred to them via direct transfers or via vesting mechanisms whereby a smart contract is set up that allows Core Units to withdraw funds only as time passes and according to certain conditions. Furthermore, payment can be either in Dai or in MKR, which is analogous to stock compensation as it dilutes MRK holders participating in governance but aligns the incentives of workers and collaborators.

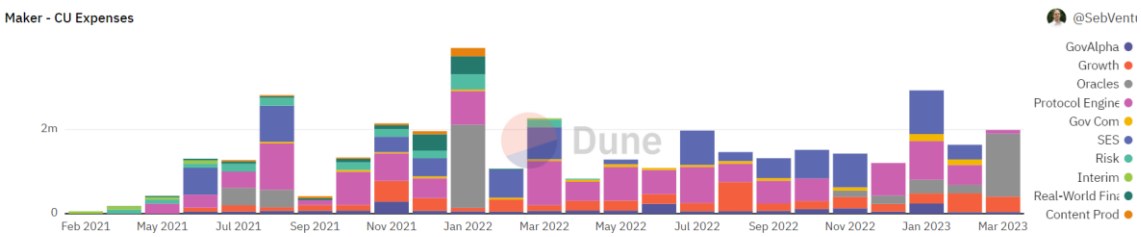

Figure 15: Maker CU expenses breakdown (Dérivaux, Maker - CU Expenses, 2023)

The main expense item is protocol engineering, followed by growth and Sustainable Ecosystem Scaling (SES). It is important to remember that, because Maker is not a company, it does not produce financial statements. The data presented records outflows of funds, but presumably many of those could be considered capital expenses rather than costs. The figures can therefore be taken to represent cash flows more accurately than they represent costs. A much more detailed and in-depth analysis than is here possible would be necessary to identify the amount of capital expenses and arrive at conclusive income and cash flow statements.

The result of Maker's activities is seen in figure 16, which shows monthly net income since the launch of Multi-Collateral Dai. The high profits from late 2020 to mid-2022 have been followed by monthly losses in the $1-2 million dollar range, which have caused the roughly $10 million decline in the Maker Buffer.

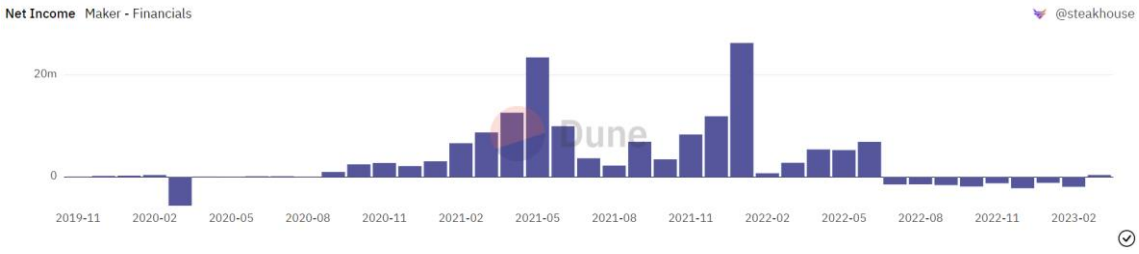

Figure 16: Maker Net Income (Dérivaux, MakerDAO - Dashboard, 2023)

3.1.4. Analysis of competitive position

The Maker protocol offers two value propositions to different sets of customers. On the one hand, it creates the Dai stablecoin, which competes with other fiat backed, crypto-collateralized and algorithmic stablecoins. On the other, it provides the lending services which support Dai, as well as the saving facility of the DSR. Here it competes with other lenders in the DeFi space such as Compound or Aave, as well as with the traditional financial system more broadly, especially as it relates to RWAs.

Beginning with Dai's value proposition; stablecoins are an established product with proven demand and utility. They eliminate the volatility typically associated with digital assets while still delivering on the benefits of blockchains and distributed, automated ledgers: users can transfer value across the world 24/7 through the internet without need for intermediaries, and with almost instantaneous settlement. This makes them ideal for use as a payment mechanism in e-commerce and in decentralized applications (Haidar, et al., 2022).

Furthermore, they allow investors and owners of digital assets to close their positions and manage their risk exposures without exiting the blockchain. Since the on-off ramps between blockchains and the traditional financial system are often cumbersome, this is a valuable service to the ecosystem.

If blockchain technology continues to be adopted and built on and decentralized computing systems like Ethereum come to host an increasing share of the world's value, then stablecoins are almost certainly going to be a key part of the technological infrastructure of this transformed financial system.

A different question is Dai's position within the stablecoin market. As described above, it is the leading decentralized stablecoin, but it is dwarfed by centralized, fiat-backed competitors USDT, USDC, and BUSD. Their capital efficiency allows them to increase supply by accepting dollars from the traditional financial system 1:1. Dai, on the other hand, faced significant upward pressure on its peg because it could not increase its supply as quickly to respond to market demand. This is because, to create Dai, it depends on demand for leverage from holders of digital assets such as Ether or Bitcoin. This demand is limited since large regulated financial institutions, where most of the global capital lies, are hesitant to invest in digital assets due to their risk and regulatory uncertainty. Maker can increase this demand by lowering the stability fees on vaults, but this approach has a limit since they cannot be reduced beyond 0%.

As figure 4 shows, it was able to overcome this problem through the introduction of the PSM, which allowed it to issue Dai backed 1:1 with other stablecoins. However, this represented a strategic shift that caused Dai to lose one of its main competitive advantages: the absence of centralization risks. By backing a large portion of Dai with centralized stablecoins it exposed itself to the regulatory, credit, and systemic risk of their issuers in exchange for Dai stability and growth.

This does not necessarily mean that Dai has lost all its competitive advantage or value against other stablecoins. It is still a stable currency backed partly by USDC and other stablecoins, and partly by leverage demand in the crypto ecosystem. Its decentralized governance through MakerDAO has the advantages of transparency and openness, and its smart-contract infrastructure is an extra layer of security and safety.

The single biggest factor determining the future of MakerDAO (aside from the widespread adoption of permissionless blockchains like Ethereum to support the

exchange and creation of value) is regulation. There are two main reasons for this. The first is the regulatory uncertainty holding back institutional capital. The permissionless, anonymous nature of DeFi means that Money Laundering or Terrorist Financing concerns abound. Until these and other regulatory barriers are overcome, for example by introducing KYC[7] checks to DeFi, the capital and liquidity in the crypto ecosystem will remain limited.

The second reason behind regulation's heavy impact on Maker is that the future of centralized stablecoin issuers and their relationship with DeFi also lies in regulators' hands. Their decisions will impact their capital requirements, necessary disclosures, and even to what extent their activities will be allowed. In the US, Circle has announced its intention to apply for a bank charter (Miller, 2022). Additionally, many central banks are issuing or plan to issue Central Bank Digital Currencies (CBDCs), which are digital tokens issued by central banks and pegged to their respective currencies. They offer the same value proposition as stablecoins, and it is unclear how much they will displace them as they are rolled out.

Furthermore, regulators have proven that they can force centralized stablecoin issuers to freeze specific addresses suspect of illegal activities (Avan-Nomayo & Keely, 2022), which makes them unable to receive or transfer funds on-chain. States could therefore come to regulate centralized stablecoin's relationship with the Maker Protocol and have the power even to blacklist it and freeze the funds in the PSM, which would prove devastating. These drastic measures are not a likely outcome, but they show that decentralized finance does not exist in a vacuum devoid of regulatory risk.

Maker's lending and saving services, the demand for which backs Dai, can also be expected to face competition in the future. Other decentralized protocols, such as Aave or Compound, also offer decentralized lending. To date, they have done this through a different design and business model, although recently Aave has announced the launch of Aave GHO, a decentralized, collateral backed stablecoin pegged to the USD which closely resembles Dai (AaveCompanies, 2022). In the strategic vertical of providing capital from DeFi into RWAs, Maker faces competition from other protocols such as Goldfinch, as well by the increasing trend of RWA tokenisation by both startups and large financial institutions (OECD, 2021).

[7] Know Your Customer

3.2. Valuation

3.2.1. Success scenario and risks

In accordance with the venture capital method outlined in chapter 2, valuation models are built using net income projections based on a success scenario. The expectations of systemic and non-systemic risks such as technology and regulatory risk are then factored in through a high discount rate. The success scenario for Maker would involve the fulfilment of several developments which have been analysed in this paper. First, blockchain technology and digital asset adoption would have to resemble something like Vitalik Buterin's "internet" scenario where they are widely adopted and become deeply ingrained in businesses and networks, helped by Andreessen Horowitz's price-innovation cycle. More specifically, adoption of public smart contract platforms such as Ethereum would be necessary, which is not a forgone conclusion.

The alternative to a public blockchain where anybody can anonymously participate is a "permissioned" or private one such as Corda, which attempts to deliver the benefits of distributed ledger technology through a blockchain that does not broadcast all information to anonymous nodes but trusts a limited and controlled number of known participants (for example banks and other regulated financial institutions). This is anathema to Maker, which is a protocol developed on a public blockchain (Ethereum) with openness, transparency, and decentralization as some of its main value propositions. For it to succeed, the transformation of the financial system must happen through public blockchains.

Additionally, not all public blockchains deliver the same benefits. The beginning of chapter 1 described the differences between Bitcoin and Ethereum. The former keeps a record of ownership of Bitcoins but has limited programmability, whereas the latter is specifically designed for abstraction and unlimited design possibilities for developers. Because of this, Ethereum and similar blockchains are called "smart contract platforms". Maker is a prime example of how developers can take advantage of these platforms to build decentralized applications (Dapps) using smart contracts. A future where Bitcoin is adopted as the basis of a new monetary standard, but smart-contract applications fail to deliver lasting value (as predicted by many in the space (Ammous, 2018)) is not a successful one for Maker, even if one or more digital assets achieve Internet-like adoption.

This is why the digital asset revolution must happen through public smart contract platforms for Maker to succeed. Preferably, this would be Ethereum, which is the most dominant today and where the Maker Protocol is deployed. However, if competitors emerged that made it obsolete, it could be deployed there, and its long-term future could still be successful.

Given that an internet-scale adoption of digital assets through public smart contract platforms occurs, the next step in Maker's success scenario is that, among all the possible applications and uses of smart contracts, DeFi proves a successful one. To date, it is one of the main but not the only successful set of applications leveraging the technology. Web3 social networks, digital art, digital identity, Web3 gaming or decentralized storage are other important use cases being explored and built on. However, Maker's competitive strategy is a bet that the automatic execution, openness, and transparency of the blockchain will deliver value that can't be replicated by centralized providers of leverage and stablecoins.

Finally, even if smart contract platforms disrupt the world, and even if DeFi becomes a key part of that disruption, Maker must maintain its position within the industry and face off competition from other Dapps. At the moment it is the leading DeFi protocol measured by TVL, second only in the whole ecosystem to Lido, which is not a competitor. Compund or Aave are the closest competitors, and they provide lending through a different model where they connect borrowers and lenders without maintaining a stablecoin (until Aave's coming launch of GHO).

The success scenario also implies that regulation is friendly in enough relevant jurisdictions that institutional capital comes into the space and interacts with DeFi protocols, greatly expanding liquidity and demand for leverage.

3.2.2. Forecast

The forecast period will be 5 years (2022-2027). Given the success scenario described above, the key issue is how fast it could materialize and how big of an opportunity it represents. A way to quantify this is to project what percentage of US money supply will be represented by the stablecoin market. In a world where a sizable portion of the economy and finance has moved on-chain, US-pegged stablecoins will also represent a significant portion of the dollar money supply.

The figure used in this calculation is the M2 money supply, which includes cash and deposits, as well as other types of highly liquid deposits and investments. Unlike some of these forms of money, stablecoins do not provide yield, although Columbia Business School professor and former head of portfolio management at Paxos, Austin Campbell, believes they will in the future, and that their structure is very similar to MMFs (Campbell, 2023), which are included in M2.

Figure 17 shows the expansion of the M2 money supply since 1959. It's compounded rate of growth over this period has been 6,96%, or 6,79% if the period after January 2020, when an unprecedented monetary stimulus was deployed in response to the covid 19 pandemic, is excluded (Federal Reserve, 2023). For forecast purposes, we can assume that over the next 5 years the growth rate of M2 dollar supply will be 6,80%.

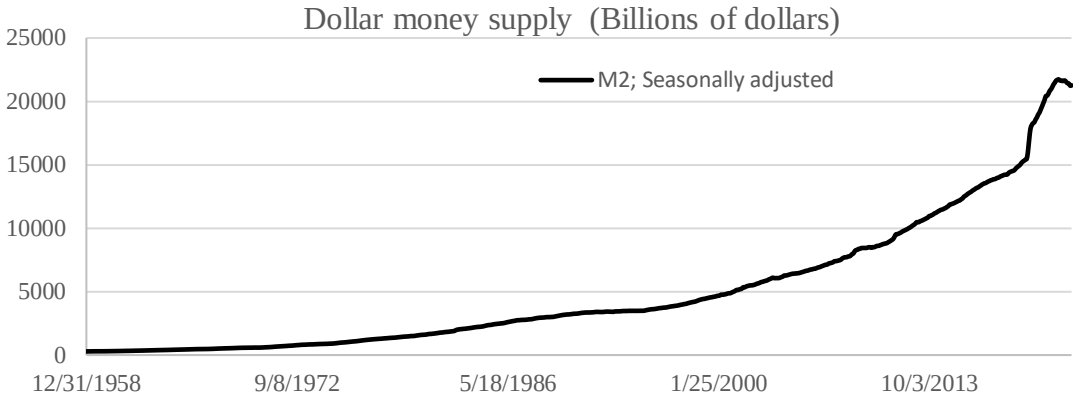

Figure 17: US Dollar M2 supply (Federal Reserve, 2023)

The projected share of this supply that will be represented by the stablecoin market at the end of the forecast period in 2027 is 5%. This is a significant share of total supply that implies a 61% CAGR for the total stablecoin market capitalization (51% if the effect of the increase in money supply is taken out). The high growth rate is justified by the success scenario in which DeFi disrupts the world of traditional finance and stablecoins are widely adopted as a means for storing and transferring value in the new technological rails of finance. It is nevertheless conservative compared to the 250% CAGR exhibited by Dai supply (MakerDAO Risk Core Unit Team, 2023) since March 2020. This is justified by the fact that stablecoins, though a nascent technology, have already found product-market fit and experienced a first phase of intense growth from near-zero levels. The growth rates from this period cannot be expected to continue into the next phase of their adoption.

Dai currently has a 3,76% market share among stablecoins (The Block, 2023). The projected share for 2027 will be slightly lower at 3%. This is to reflect two factors. First, the entrance of institutional capital in the success scenario after regulatory barriers are removed. Presumably, many large financial institutions would launch their own centralized, fiat backed stablecoins (For example, the blockchain equivalents of deposits at commercial banks). This would reduce the share of decentralized, crypto backed stablecoins like Dai. Second, the emergence of competition from a burgeoning DeFi space such as Aave GHO and other future projects.

These figures lead to a forecast of $ 44,3 billion of Dai supply in 2027. To obtain net income measures, the first step is to forecast what percentage of this supply will be backed by stablecoins (which generate little revenue). Since the start of the bull market in the fourth quarter of 2020, the share of Dai supply backed by stablecoins has oscillated between 25% and 85% (MakerDAO Risk Core Unit Team, 2023). The model will assume a 65% ratio in accordance with this historical trend.

To forecast lending revenues, the model will assume an average stability fee of 1%, applied to the non-stablecoin-backed portion of Dai supply. Today, the weighted stability fee is 0,88% (Conti, Collateral, 2023). The 1% projection reflects a stronger demand for Dai and leverage services in an active and growing DeFi ecosystem.

Liquidation and trading revenues are harder to forecast because they are not directly associated with Dai supply and depend on volatility and other market conditions. To arrive at an estimate, the income figures from April 2020 to February 2023 will be aggregated and considered as a unit. The reason for this is that this period contains a complete crypto market cycle, with bullish and bearish phases and extended spans of more stable prices and activity. If adoption and growth of Maker and crypto follows Andreessen Horowitz's theory of price-innovation cycles (as the success scenario predicts it will), the period considered is the best available proxy for how liquidation and trading revenue streams will behave through it.

Liquidation and trading income represented 26% and 6% respectively of total revenue for the period between April 2020 and February 2023 (Dérivaux, MakerDAO - Dashboard, 2023). Expressed as a percentage of lending income, they are equivalent to 38% and 9% of it. The model will therefore assume liquidation and trading revenues of 40% and 10% the size of lending revenues each year.

The result of this forecast is a revenue figure of 233 million in 2027, and a revenue growth rate of 54%. As for expenses, they started growing in mid-2021 and have stabilised themselves at levels between 2 and 4 million each month (see fig. 13). As analysed above (see fig. 15), the bulk of these are fixed costs such as protocol engineering and other investments and expenses for the future of the protocol, as well as oracle and governance expenses. There are few variable costs since the programs and smart contracts on Ethereum can operate with more users with negligible marginal cost.

The model starts with a forecast of $3 million of monthly expenses in 2023 in accordance with the historical trend depicted in fig. 13, which adds up to $36 million annually. From then on, it projects a yearly increase of 30% for expenses, arrived at in comparison with the 54% revenue growth rate. This reflects the fact that expenses will grow as revenues and adoption grows and as the DeFi ecosystem evolves (needs will include more protocol engineering and design to ensure safety and adapt to new assets such as RWAs, more complex governance work, etc.). However, the difference in revenue and cost growth rates responds to the significant economies of scale that these expenses are likely to have.

The resulting net income is negative in 2023 and in 2027 is $99 million. In reality, the price-innovation cycle and the natural volatility of digital assets would make this a far bumpier ride, with most of the gains concentrated in bull markets of excitement and hype. Table 1 summarises the assumptions and implications in the model discussed thus far. Table 2 shows the resulting net income forecast. Figures are in billions of USD.

Assumptions and Implications	
M2 USD money supply growth	6,80%
Stablecoin share of M2 money supply in 2027	5%
Implied rate of growth for stablecoin market share	51%
Implied rate of growth for stablecoin market cap	61%
Dai market share of stablecoins in 2027	3%
Implied rate of growth of Dai market share	-4,42%
Dai supply backed by stablecoins	65%
Weighted average stability fee	1,00%
Liquidation income as % of lending income	40%
Trading income as % of lending income	10%
Implied rate of revenue growth	54%
Costs in 2023	0,036
Rate of growth for costs	30%

Table 1

FORECAST MODEL	2022[8]	2023	2024	2025	2026	2027
M2 money supply	21267,1	22713,26	24257,76	25907,293	27668,99	29550,48
Stablecoin share of supply	0,64%	0,97%	1,46%	2,20%	3,31%	5,00%
Stablecoin market cap	136,11	219,29	353,30	569,22	917,08	1477,52
Dai market share	3,76%	3,60%	3,44%	3,28%	3,14%	3%
Dai supply	5,12	7,88	12,14	18,69	28,79	44,33
Fee-generating Dai Supply	1,79	2,76	4,25	6,54	10,08	15,51
Lending income	0,018	0,028	0,042	0,065	0,101	0,155
Liquidation income	0,007	0,011	0,017	0,026	0,040	0,062
Trading income	0,002	0,003	0,004	0,007	0,010	0,016
Total revenue	0,027	0,041	0,064	0,098	0,151	0,233
Costs	0,036	0,047	0,061	0,079	0,103	0,134
Net income	-0,009	-0,005	0,003	0,019	0,048	0,099

Table 2

3.2.3. Multiple

The value to be discounted is the net income forecasted in year 5, multiplied by the adequate Price to Earnings (PER) ratio. Typically, since startups are private companies with illiquid stock, "this PER is estimated by studying current multiples for companies with similar economic characteristics" (Sahlman & Scherlis, 2009). This is very challenging to do with MakerDAO since, as explained above, it resembles banks and centralized stablecoin issuers, while also being fundamentally different due to its decentralized structure.

However, MKR trades in liquid exchanges for digital assets, which makes it possible to calculate its own PER. Net income in 2022 was $37,5 million (Dérivaux, MakerDAO - Dashboard, 2023). Given that the market capitalization of MKR has been hovering around $600 million during 2023 (Coingecko, 2023) this implies a PER of around 16. This is higher than the multiples typically associated with banks. Large banks have a PER of around 7-9, whereas for regional banks it's slightly higher. For the Brokerage and Investment banking sector (which, like Maker, also offers collateralized leverage and trading facilities) it's between 13 and 16 (Damodaran, 2023), in line with MKR.

A high multiple like 16 therefore seems reasonable, given the high growth prospects and the other PE ratios in the comparable industries. Multiplied by the forecasted earnings of $99 million in 2027, the expected market capitalization of MKR in 2027 is $1.58 billion.

[8] 2022 figures are not historical (net income was 37.5 million), but modelled.

3.2.4. Discount rate

The next step in the valuation process is to decide on the adequate discount rate to be used for calculating the value of MKR today. In the venture capital method, the discount rates used are not purely derived from the CAPM model plus justified premiums for liquidity or value added. They are also the part of the model which incorporates the high expectations of failure given the riskiness of the investment. The other side of the coin is that forecasted figures respond to a success scenario, not to their true expected value.

Typical venture capital practice dictates different discounts according to financing stage. According to Sahlman and Scherlis (2009), these are:

- Seed financing: A small investment to support an entrepreneur's exploration of an idea. Often no business plan or management team. Typical discount rates are over 80%.
- Startup financing: More significant funding to start the company's operations. "A start-up should be able to demonstrate a competitive advantage. Most high-technology firms should have a product in prototype form embodying a proprietary technology". Discount rates are in the range of 50-70%.
- First stage financing: Provided to on-going businesses. The company is generally not profitable, but it normally has an established organization, a working product, and, preferably, some revenues. Discount rates are between 40-60%.
- Second-stage financing: "typically provided for working capital and fixed asset needs to support the growth of a company with active production, sustainable sales, and, preferably, some profits. Whereas earlier-stage funds were largely dedicated toward proving a venture's viability, second- and later-stage capital is oriented towards the expansion of a tested contender". Discount rates vary between 30-50%.
- Bridge financing: intended to carry a company to its IPO when it is not appropriate due to size or market conditions. Discount rates range from 20-35%
- Restart financing: Raised for a troubled firm at a significantly lower price and high expected rates of return.

The challenge is therefore to determine exactly where along this spectrum sits MakerDAO. After more than three years of operations and having gone through a complete crypto market cycle while onboarding thousands of users and billions in TVL

and positioning itself as a leading DeFi protocol, it is certainly far from a seed or a startup investment. The concept of bridge financing is not applicable, since MKR is not private stock but a digital token already trading in open exchanges.

It is probably closer to second stage financing. There is a working product (Dai and CDPs, along with the rest of the Maker Protocol such as the DSR and the PSM) with tested adoption and strong R&D efforts. It can well be said of Maker, as one of the most trusted and widely used protocols in DeFi, that it is a "tested contender".

There are nevertheless many risks, questions, and obstacles. The section above explains the conditions that would have to take place to arrive at Maker's success scenario, and therefore the many risks and points of failure along its path. For example, if crypto's internet adoption does not take place in the specific way which is advantageous for Maker, or if its leading position within DeFi and decentralized stablecoins is challenged, or if regulatory barriers are not overcome, or if the DAO model for decentralized governance proves to be a competitive disadvantage rather than an advantage.

A discount rate of 50% therefore seems appropriate. This is, of course, a highly uncertain number. The actual process by which Venture Capitalists arrive at discount rates is through experience: "The successful venture capitalists are those who have demanded rates high enough to compensate for a venture's likely performance shortfall relative to forecast, but not so high as to force the managers of too many potential investments to seek alternate funding" (Sahlman & Scherlis, 2009). A sensitivity analysis will be carried out to determine how different discount rates might alter the resulting valuation.

Using a discount rate of 50%, the present value of the Maker Protocol is:

$$NPV = \frac{\$1{,}584{,}000{,}000}{(1+0{,}5)^5} = \$208{,}592{,}592.6$$

This is roughly a third of the current market capitalization of ≈$600,000,000, which suggests that the maker protocol is overvalued. A sensitivity analysis will now be carried out to examine how varying some of the key parameters of the model affects the end valuation

3.2.5. Sensitivity analysis

The valuation model requires a number of different assumptions and projections. The three most important ones are the projected percentage of money supply that the

stablecoin market will represent, the multiple and the discount rate. They are both highly uncertain and critical to the result of the valuation. It is therefore useful to conduct a sensitivity analysis to illuminate the range of plausible valuations.

The model was built under an assumption that the market capitalization of stablecoins would be 5% the size of the M2 USD money supply. This analysis will also consider scenarios where 10% and 30% are attained (much more radical, quick and profound adoption of digital assets, which would increase the value of MKR today).

For each of these, discount rates of 40% and 60% will be considered, as well as PE ratios of 10 and 20, which could be true in cases where Maker's growth prospects in 2027 are significantly lower or higher than today. Tables 3-5 show the results (figures in billions of USD).

Maker valuations: 5% stablecoin share of M2 USD supply in 2027		PER		
		10	16	20
Discount rates	60%	0,094	0,151	0,189
	50%	0,130	**0,209**	0,261
	40%	0,184	0,295	0,368

Table 3 (the result of the model with the original inputs is highlighted)

Maker valuation: 10% stablecoin share of M2 USD supply in 2027		PER		
		10	16	20
Discount rates	60%	0,316	0,506	**0,633**
	50%	0,437	**0,699**	0,874
	40%	**0,617**	0,987	1,234

Table 4 (figures close to current market valuations are highlighted)

Maker valuation: 30% stablecoin share of M2 USD supply in 2027		PER		
		10	16	20
Discount rates	60%	1,204	1,927	2,408
	50%	1,663	2,660	3,325
	40%	2,348	3,756	4,695

Table 5

As could be expected, modifying these fundamental parameters can make the outcome of the valuation wildly different. Estimates range from less than $100 million to $4.6 billion. The most significant question is the growth of stablecoins, and the percentage of dollar supply they will reach. The model would justify Maker's current valuation best under a stablecoin market projection of 10% of the M2 money supply in 2027.

Conclusion

Results

The objective of performing the valuation exercise is less about coming up with a definitive number than it is about developing a structured process for thinking about the future of the business and asking intelligent questions about its reasonable present value in relation to this future.

The results of the model and the sensitivity analysis can be used to justify a very wide range of valuations, from $94 million to $4.7 billion. However, the tools are provided for each investor to decide where along this range they are most comfortable. The most important belief that they must form to make this judgement is regarding the future size of the stablecoin market. What is the most reasonable expectation for the future adoption of stablecoins? What number best expresses this expectation as a percentage of M2 USD supply? 5%, 10%, 30% or a different figure? This far from a straightforward answer in a space with such a high rate of innovation and change.

At the very least, contrasting the model proposed here with market prices provides the insight that today's valuations require the expectation of a stablecoin market around 10% the size of the M2 USD supply in 5 years. This paper used a 5% number as a first conservative approach. However, much depends on technological and legal breakthroughs that are highly uncertain. At 30%, the growth rate for the stablecoin market is 131%. This is a very high number, but still shy of the 250% attained by Dai over past 3 years including the bear market, so many investors might indeed argue for a similar or even higher target.

Of course, deciding on the appropriate multiples and discount rates is also critical and can double or halve the value estimate. These judgements must be informed by an understanding of the comparability of Maker with other businesses, its future growth potential, and its risks.

In any case, Maker will continue to be an exciting new project on the frontier of financial and technological innovation. Even if one concludes that it is currently overvalued, it has found product market fit and shown that the new possibilities enabled by blockchains and smart contracts can be used to deliver real, differentiated value to its users.

Future lines of research

More detailed research could be carried out to arrive at a better estimate of the potential size of stablecoin adoption. This could comprise a deeper analysis of the trends within the stablecoin market, the regulatory regimes currently applied or being discussed for them (such as the EU's MiCA rules), the trends within the fintech space for saving and payments services, and the ongoing developments in blockchain usability and scalability.

Estimates for the multiple and the discount rate could also doubtless be refined with deeper understanding of the risks, expectations, and comparable businesses and startup lifecycle moments. Seasoned ventured capitalists could bring much value by applying their experience to make informed judgements in this regard.

Finally, a detailed analysis of MKR issuance could help determine the value of one MKR token, rather than the market capitalization which this paper has focused on. MKR issuance and elimination is a core element of Maker's operations. Not only is it the mechanism through which governance participants are rewarded and the protocol recapitalized, but many of the expenses to Core Units are also paid out in MKR to align incentives. Furthermore, even if the overall profitability is positive, momentary spikes in protocol debt can trigger issuance events. A detailed study of these factors, which exceeded the space available, would be needed to estimate the value of a single MKR token.

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