PENN BLOCKCHAIN

Stablecoins and Maker DAO

Alex Miao

Overview

Background Information

Single Collateral Dai

Multi-Collateral Dai

Maker Governance

Risk, Modeling, and Valuation

Background Information

What is a Stablecoin?

A stablecoin is a cryptoasset that maintains a peg to another less volatile asset

USD, Gold, basket of goods/currencies

Why is this useful?

https://stablecoinindex.com/

Question: How do we link the price of a physical asset to the price of some digital representation?

Types of Stablecoins

Off chain collateral:

Tether, Libra

On chain collateral:

Dai

Uncollateralized (algorithmic, seigniorage shares):

Basis (Defunct), Carbon

What is Maker?

Project to create a stablecoin pegged to the US dollar

Started by Rune Christensen

Single collateral Dai - released December 2017

Multi-collateral Dai - in development

Two tokens

- Dai - Stablecoin
- MKR - Governance token

Single Collateral Dai

Single Collateral Dai Stats

~2% of all ETH locked in Maker

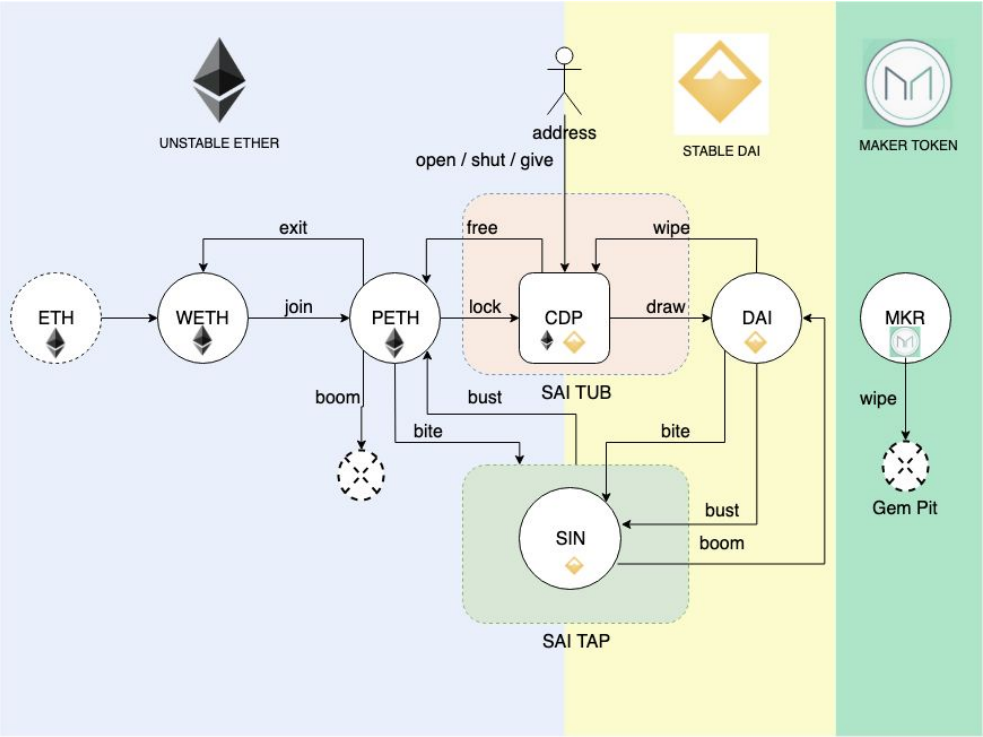
~21 million Dai in circulation

https://mkr.tools/system

Dai


Dai Price Charts (DAI to USD)
* Non-trusted exchange volume data removed 3/23
Zoom
1d
7d
1m
YTD
All
From
Dec 26, 2017
To
Aug 18, 2019
1.05
1
0.95
0.9
Price
Volume
0
Jan '18
Mar '18
May '18
Jul '18
Sep '18
Nov '18
Jan '19
Mar '19
May '19
Jul '19

System Overview



Mechanism

Individuals create collateralized debt positions (CDPs)

- Lock up a collateral in a smart contract (*lock*)
- Get Dai tokens in return (*draw*)
- Return Dai to close CDP (*wipe*/*shut*)

3 important parameters: collateralization ratio, liquidation penalty, stability fee

Collateralization ratio: USD value of locked ETH to DAI

Stability fee - annual percentage yield, continuously compounded, paid in MKR, MKR burned

Mechanism

Smart contracts need to be called, cannot “continuously scan” for undercollateralized CDPs

If a CDP is undercollateralized (*unsafe*), anyone can *bite* the contract, which triggers its liquidation, for a small payment.

System sells collateral to cover debt

The CDP owner is returned Collateral - Dai debt - Stability Fee - Penalty

Example

https://cdp.makerdao.com/

Create CDP with 1 ETH (valued at $200) for 100 DAI for a collateralization ratio of 200% (minimum collateralization ratio of 150%)

If at any point ETH falls below $150, I will be liquidated

How do we Lock ETH?

ETH is not an ERC-20

Solution - Wrapped ETH (WETH)

- 1:1 correspondence to ETH
- Developed by Radar Relay

Deposit WETH to contract for Pooled ETH (PETH)

PETH doesn’t have a 1:1 correspondence to WETH!

- What’s actually happening?

PETH and Liquidation

The PETH:ETH ratio started out as 1:1, so you join with 1 WETH gets you 1 PETH.

But, what happens in the case a CDP is undercollateralized?

- The PETH gets sold by Liquidity Providing Contract for Dai
- Uses Dai to cover debt, excess is used to buy PETH and PETH is burned.
- If selling collateral is not enough, mint PETH and sell it.

How does Maker Maintain the Peg?

Controlling the stability fee has been the best way to control the peg

- Higher stability fee means less incentive to open CDPs, decreases Dai supply
- Voted on by governance

How does Maker determine the price of Ether?

14 Oracles that pull ETH/USD price off of major exchanges and submit the value to a smart contract. The official price is the median of these 14 values.

Updates values when:

Price changes more than 1%

It has been over 6 hours since last price change

https://makerdao.com/feeds/

MKR Tokens

MKR tokens can broadly be thought of as governance tokens, but serve a variety of roles in the system

Value is tightly coupled with the success of the network

Fees on closing CDPs are paid in MKR (more CDPs open increases demand of MKR)

Eventually (multicollateral dai) MKR will be minted to back the value of Dai if the system is ever undercollateralized (incentivizes MKR holders to prevent undercollateralization as they would be diluted)

MakerDAO as a Leverage Tool

Suppose 1 ETH is priced at 100 Dai, we use collateralization of 200%

We put up 1 ETH (worth 100 Dai) up as collateral, and receive 50 Dai.

We can then use this Dai to buy 0.5 ETH. We can then put this 0.5 ETH up as collateral for 25 DAI, and repeat

MakerDAO as a Leverage Tool

$$\sum_{i=0}^{\infty} A(\frac{1}{c})^i = \frac{A}{1-\frac{1}{c}} = \frac{c}{c-1}A$$

$c :=$ collateralization ratio
$A :=$ initial amount of ETH

We end up with 2 ETH held as collateral, 100 Dai created, MakerDAO still overcollateralized. 2x long ETH position.

Is there a limit to how much leverage we can use?

Where did the risk go?

How is this different from going leverage long on a traditional exchange?

When does Single Colateral Dai Break?

If the price of ETH drops really quickly, what happens?

The collateralization ratio of the entire MakerDAO system would drop, potential to be undercollateralized.

Governance

Maker**DAO**

DAO - decentralized autonomous organization

A decentralized governance structure on the blockchain to allow for members to vote on rules of the system

MKR Token

Governance token that gives holders power to vote

https://vote.makerdao.com/

Stability fees paid in MKR and burned, decreasing supply

Want MKR value to grow with the network, align interests of MKR holders and improving the protocol

MKR token is lender of last resort

Multi-Collateral Dai

Multi-Collateral Dai

In the process of being developed

- On Kovan Test Net

Expected 2019 Release?

Initial MCD Collateral Types

Distribute risk across “uncorrelated” assets

- Augur (REP)
- Basic Attention Token (BAT)
- DigixDAO (DGD)
- Ether (ETH)
- Golem (GNT)
- OmiseGo (OMG)
- 0x (ZRX)

More can be added through governance vote

Auctions and Keepers

Surplus Auction

Stability fee can be paid in either MKR or Dai.

The Dai used to pay the stability fee accrues in the contract. When the accrued Dai goes over a limit, remaining gets auctioned off for MKR in a Surplus Auction, where the MKR gets burned.

Fixed Dai put up for auction, bid in increments of MKR

Auctions and Keepers

Collateral Auction

Triggered when CDP is bitten

Collateral is put up for auction

First bidder bids an amount that covers the Dai debt, then a reverse auction for anyone willing to cover the Dai debt but willing to take less collateral.

Auctions and Keepers

Debt Auction

Last resort where if CDP still undercollateralized, MKR is minted and sold off for Dai to collateralize the system

Reverse auction: how little MKR is bidder willing to receive for Dai to cover collateral?

Dai Savings Rate (DSR)

Dai holders have the option to lock up Dai in the Dai Savings Rate contract to earn interest

Stability fee modulates Dai supply, DSR modulates Dai demand

- Higher DSR means higher demand for Dai to earn interest
- Rate determined by governance

Where does extra Dai come from?

- Surplus Dai from stability fees
- Mint MKR to create new Dai

Emergency Shutdowns

Set of emergency oracles chosen by governance vote that have the capability to pull a kill switch and shut down the system.

Modeling Risk and Valuing MKR

How do we value MKR?

Modeling cryptoassets is hard

Need to derive a new model for every new type of token economics

Discounted Cash Flow of MKR

https://medium.com/coinmonks/cryptoasset-research-maker-mkr-a0e89fccb985

Markov Chain Model of Risk

https://www.placeholder.vc/blog/2019/7/10/risk-management-in-makerdao