

ASSIGNMENT #4
CSBC1020 – Blockchain Applications for Industry
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Submitted by :
Gazi Mohammed Ashab Hossain
Student ID: 219019231

Submitted to :
Victor Li

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1. Compare and contrast how Maker and Basis price stabilization mechanisms work when their stablecoins, DAI and Basis, are below US\$1.00?

Why do we need price stability? - For currencies like Bitcoin or Ethereum, there are no central authorities that implement any sort of monetary policy to reduce the volatility of the currency. It simply fluctuates in price due to changes in demand and supply. Users will be hesitant to adopt a cryptocurrency as a medium of exchange because it projects such volatile properties. Without price stability, it is difficult for markets to form proper policies and regulations. If the value of a currency changes drastically along the way, it would lead to outrageous repercussions for everyone involved.

Lack of price stability could prove to be the stumbling block for adoption of cryptocurrencies in our day to day lives. With stability, any cryptocurrency would satisfy the three fundamental monetary functions: A store of value, A medium of exchange and a unit of account. Systems like Maker and Basis have worked to address this issue. Both of these systems have implemented their own unique protocols to maintain stability concerning their currencies (stablecoins); which are DAI and BASIS respectively. How these mechanisms work to stabilize the currency is described below :

Maker protocol:

Maker has its own protocol that's known as the Multi-Collateral Dai (MCD) system. This allows users to generate Dai by leveraging collateral assets approved by the governing body of Maker. This governing body is the community organized and operated process of managing the Maker Protocol. This protocol is one of the largest dapps on the Ethereum blockchain; eventually becoming the first Decentralized Finance (DeFi) application to witness significant progress.

The Maker Protocol's governing body consists of people who hold its governance token, MKR. They vote and decide on the regulations of the protocol to ensure Dai's stability and transparency. Users can access the protocol and create Vaults which act as smart contracts in the blockchain. Vaults are used to generate Dai that can be leveraged to all accepted crypto-collateral assets.

The Dai stablecoin, as backed by the Maker Protocol, is an unbiased and collateral-based cryptocurrency. It is soft-pegged to the US dollar; which implies that it has a set level of trade

allowance with the USD (1 DAI= 1 USD).

Dai Stability Mechanisms:

- *The Dai Target Price* is used to determine the value of collateral assets Dai holders receive, in case of Emergency Shutdown. The Target Price is set as 1 USD.
- *Emergency Shutdown* is used firstly as a last-resort mechanism to protect the Maker Protocol against all attacks on its infrastructure and enforce Dai Target Price. It is also used to facilitate Maker Protocol system upgrades. Only the Maker Governance can control the Emergency Shutdown process.
- In the first phase of the shutdown, the protocol freezes the price feeds along with Vault (CDP) creation and manipulation. This makes sure all users can withdraw the net value of assets they're entitled to. After the shutdown is triggered, Collateral Auctions begin and must be done within a specific amount of time. At the end of the auction processing period, Dai holders use their Dai to claim collateral directly at a fixed rate that corresponds to the calculated value of their assets based on the Dai Target Price.
- MakerDAO also has a key external actors known as '*Keepers*' who are incentivized to provide price stability of Dai. They sell and buy Dai according to the market price, in relation to the Target Price which is \$1 USD.

The 'Keepers' constantly keep adjusting the supply and demand curves. It is assumed here that the market is acting rational, and price of DAI is the only thing that is turbulent.

Case: *DAI value falls under \$1USD*

In the event that Dai price falls under the Target Price, the system incentivizes users to bump up the price. Assuming the market is acting rational, the users can benefit from the price deviations.

Moreover, the Dai coins are over-collateralized. This is done by Maker Collateralized Debt Positions (CDP); also known as 'Vault' which is a smart contract leveraged to uphold the underlying system in escrow.

Target Rate Feedback Mechanism or TRFM is another mechanism that is used to ensure price stability. The Target Price is 1USD, and the Target Rate determines the required change of Dai price to eventually reach the Target price during market instability. Any sort of market fluctuation triggers the TRFM, which breaks the fixed peg of Dai, but maintains the same denomination. Activated TRFM either makes the prices appealing enough to make users hold Dai, or makes sure users want to borrow more Dai. The TRFM pushes the market price of Dai towards the target price, decreasing its volatility and providing liquidity, as per the Dai whitepaper. Activated TRFM during a fall in target price does the following:

-The Target rate increases, hence the target price increases at a higher rate.

- Generating Dai via Vault becomes more expensive, which lowers supply
- Increased target rate also boosts the demand of Dai
- Reduced supply and increased demand pushes Dai back to its original Target Price.

This is known as a negative feedback loop: where deviation from the Target Price towards one direction pushes it back from the opposite direction.

Limitations: MakerDao is one of the leading stablecoin strategies. However, it sometimes requires external audits which might involve a third-party trust triangle. Another huge concern for over-collateralized currency like Dai is that the returns to their investment is lesser due to the assets leveraged and various governing tokens. Stablecoins like Dai can offer potential stability for corporate clients (if they choose to migrate), however, trading on a basic level might be pointless as the price of other cryptocurrencies (which can be held as collateral in Dai) can take a significant hit if extensively implemented. It will certainly be intriguing to witness how it might affect the cryptocurrency world as a whole.

Basis:

Basis is a stablecoin that was aiming to maintain price-stability by algorithmically adjusting supply. The network would issue more tokens when demand is rising and buy back the tokens when the supply increases to balance Basis price. A single Basis can be pegged to the USD, a basket of assets or an index i.e. the Consumer Price Index(CPI). The plan was to use a three-token system to achieve stability. These tokens include:

Basis: Core tokens of the system. Pegged to the USD. Supply of these tokens are managed to maintain stability.

Bonds: Bond tokens were supposed to be auctioned off when Basis supply needs contraction. These bonds follow certain conditions before they can be redeemed.

Shares: These tokens were designed to have fixed supply at the genesis of the blockchain. Their value stems from their dividend policy. Shareholders receive these tokens when Basis goes up and new supply is required, as long as outstanding bond tokens had been redeemed.

Case: BASIS value falls under \$1USD

According to the Basis protocol, whenever the value falls below \$1 USD,

-the protocol generates and sells *bonds* in an open auction to decrease the Basis coin circulation. *Bonds* cost less than 1 Basis.

-They have potential to be redeemed for exactly 1 Basis when Basis is created for expanding supply.

-This works as an economic incentive for users to participate in bond sales and marginalize Basis in the market for the potential that bond tokens will payout in the future.

Limitations: The Basis stablecoin has been discontinued as of late 2018 because of unfavorable regulatory requirements of the US government. Additionally, the three token system is massively dependent on how much trust there is between the investors and the company, since the token values and issuance all depend on the company. As the stabilization mechanism would require constant issuance of bonds and shares, a centralized whitelist to enforce transfer restrictions would be required indefinitely. This directly affects the liquidity and the censorship resistance of the blockchain.

To summarize, we can say that, Dai and Basis's stability mechanisms follow similar principles as fiat money where they contract/expand currency circulation to control inflation or deflation. However, the way they achieve this stability is different from each other – as explained above.

2. How does the Basis protocol adjust its token supply different from US Federal Reserve adjusting money supply via open market operations?

- Adjusting money supply for any entity is related to The Quantity Theory of Money.

The Quantity Theory of Money refers to the phenomenon when an item X is priced higher when there is an economic boom (meaning people have more money to spend) and the same item X price falls when there's less savings. It implies that the price of goods is directly proportionate to the currency in circulation. However, the value of the goods remains the same.

A central bank or an entity like US Fed Reserve tackles this issue by implementing the following methods:

- If a central bank determines that the prices are going down, it can expand the money supply to bring them back up.
- If they determine that prices are rising, they can limit the money supply to restore the prices.

Central banks achieve this by executing open market operations (OMO). Such situations are predicted by Quantity Theory of Money to determine long-run price levels at the desired peg.

Now, for a stablecoin currency like Basis, OMO is accomplished via the Basis protocol as in the protocol defines the mechanisms Basis follows to manage the restoration of value.

- Firstly, by growing or shrinking supply of tokens in accordance to how far the running exchange rate is compared to the peg (If the peg is 1 USD)
- *Aggregate Demand* is a concept in stablecoins that describes the demand for the currency in aggregate,
 $\text{demand} = (\text{coin price}) * (\text{amount of coins in circulation})$
- Suppose A is the amount of coins in circulation. If the demand has risen and the trading rate is 1.10 USD, $\text{demand} = A * \$1.10$

- Assuming demand stays constant, suppose B is the desired amount of supplied coins to restore the peg.

$$\text{demand_before} = A * \$1.30$$

$$\text{demand_after} = B * \$1.00 \text{ (desired peg)}$$

$$\text{demand_before} = \text{demand_after}$$

$$B = A * \$1.30 / \$1.00$$

By solving for B, we can determine the factor by which supply needs to be extended. In this case, $B = 1.3 * A$ which implies that, if we increase supply by 1.3 times of current supply, it should put us on our way to achieve price-stability.

As we can see, in Basis, to maintain a peg in the long term, it is required to measure the price of Basis and adjust the supply of coins accordingly. The Basis protocol has some additional features also, such as a defined target asset to stabilize against (USD) and a blockchain managed feed of the exchange rate via an oracle system. The feed is externally managed by the oracle system where various mechanisms are applied i.e. trusted, delegated, and decentralized feed, Decentralized shelling point scheme. Basis also has a three-token system that helps in the contraction or expansion of coin supply.

To simplify, the Basis blockchain network, like the US Federal Reserve system, monitors price levels and adjusts money supply by performing open market operations(OMO). For Basis, OMO refers to the creation/contraction of Basis or Bond tokens in accordance with the Basis protocol. These operations are predicted by the Quantity Theory of Money as in the central bank systems.

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