7 | Stablecoins

THE philosophical cornerstone of many of today's largest cryptocurrencies can be traced back to Nobel prize-winning economist F.A. Hayek's 1974 paper called "*The Denationalization of Money*". In it, Hayek famously argues that there is ample historical evidence to suggest that governments mismanage monetary policy to the detriment of the long-run interest of their countries. He proposes that alternative currencies should be allowed and encouraged to flourish. In his view, these currencies should compete on an open market with those that best maintain purchasing power (as measured by e.g., a relatively stable price w.r.t. a basket of metals or other currencies) being more in demand. Then, the argument goes, the currencies that serve the public interest best should prevail due to market forces. In consequence, if governments are truly better placed at managing currencies they should pose no threat. What functions should a good currency aim to achieve?

1. Medium of exchange: it should be easy and convenient to exchange the currency.

2. Unit of account: money should be a standardized unit of measurement of relative worth.

3. Store of value: we should be able to store money for long periods without it losing its value.

Native cryptocurrencies like BTC and ETH do not fulfill the latter aspect due to their high volatility. If you store enough to buy a cup of coffee in ETH in your wallet, you want to still be able to get that cup next week. But as we see from the left chart in Figure 1, you may actually get 2, or none at all. Therefore, holding cryptocurrencies is inherently speculative.

The rightmost chart in the same figure shows the price of DAI over time. It is much more stable and probably a better store of value with respect to volatility. Coins like DAI are called *stablecoins* and their main purpose is to stay pegged to something else – in this case, US dollars. Stablecoins exist for most of the major currencies in the world as well as oil, gold, and even securities. In Hayek's original vision, we would ideally want something that is pegged to a consumer price index (CPI) so that our purchasing power does not change as discussed in the introductory chapters.

Why would anyone go through the trouble of holding fiat equivalents on-chain if you could just have a bank-account off-chain? There are several arguments in favor of stablecoins. Let us use a USD stablecoin as an example. First, they may offer access to USD for citizens of countries that otherwise limit foreign exchanges to USD (China, Argentina). One could also imagine a scenario in which SWIFT or another settlement layer for fiat currencies is attacked/blocked (as happened in the 2015–2016 SWIFT banking hack). Second, you may not want to hold a volatile crypto-currency but still participate in blockchain activities because they offer better returns on the dollar. Indeed, many platforms that we will see in the following chapters offer financial products that are built on stablecoins. Others love holding native cryptocurrencies, and speculating against fiat currencies using compli-
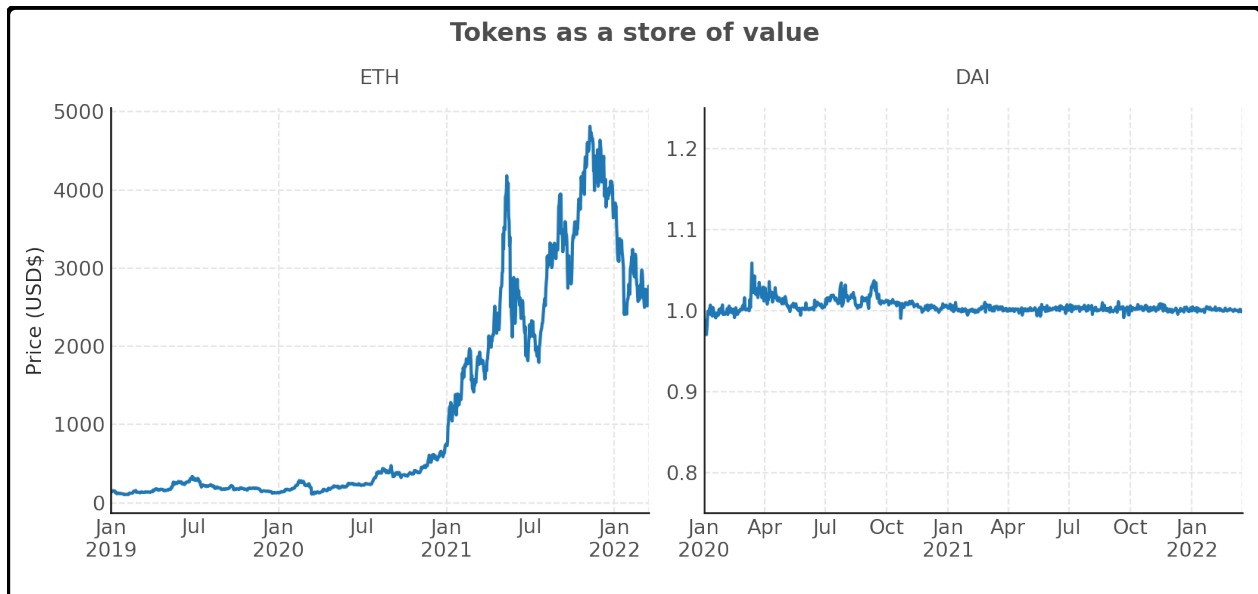
**Figure 1: Which would you choose to store your precious savings?**

cated financial products which require stablecoins to function. Lastly, it's still quite cumbersome and expensive to on- and off-ramp currencies. Stablecoins allow users to experience less friction in doing so by e.g., leaving a portion of their portfolio on-chain and taking out a loan against it off-chain.

7.1 COLLATERALIZATION TYPES

Stablecoins come in three kinds depending on their collateralization (e.g., how the stability of the value is guaranteed): (a) off-chain collateralized, (b) on-chain collateralized, and (c) algorithmic non-collateralized.

Each of these has its own distinct advantages and disadvantages. A recent development has been the creation of hybrids that combine the properties of the aforementioned. Examples include:

- Off-chain: CBDC, Tether, TrueUSD

- On-chain: BRC, DAI, SNX

- Non-Collateral:

    – rebase
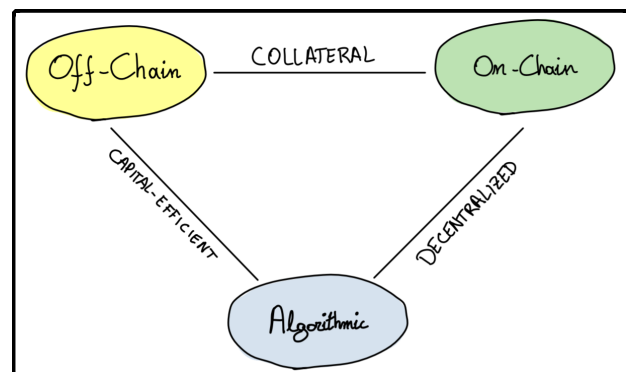
    – seignorage

    – basis, NuBits, rebase etc

Of course, hybrids exist as well.

7.2 OFF-CHAIN COLLATERALIZED

Off-Chain Collateralized stablecoins are 1-to-1 backed by assets in the real world. While USD fiat-backed stablecoins are the most popular, a wide variety of classes is on offer:

Peg	Class	Example
Fiat	USD	USDC, Tether, TrustToken
	EURO	ERUS, xEUR, sEUR
	GBP	Binance GBP
Commodity	Gold	PAX, DGX, OneGram
	Oil	Venezuelan Petrol

For a USD-backed stablecoin like USDC, for every 1 USDC on the Ethereum blockchain, there should be the equivalent of 1 USD somewhere on a bank account that is managed by the issuing company. They are simple, stable, and rather hack-resistant as the actual value is stored off-chain. They are also one of the most popular types of tokens on Ethereum, with the top two (USDT and USDC) having market caps of 51 billion USD and 14 billion USD respectively at the time of writing. Even so, as a holder, you should be aware of the fact that these assets are highly centralized.

This means among other things that you must completely trust the custodian of the off-chain assets. As it is often not cost-effective to leave assets under custody uninvested, speculation is the rule rather than the exception as is shown in Table 1 (snapshot from 2021).

Therefore, despite numerous claims to the contrary, a "stablecoin" like Tether's USDT is in fact not backed by 1 dollar per USDT issued. In reality, you are holding a share in a basket of securities. As you are only allowed to exchange your USDT for a maximum of 1 actual dollar you will not be able to profit from the appreciation of the basket of securities. When push comes to shove, however, you may have to be happy with a lower-valued share of the securities basket in case of a bank run in a downturn. One of the mysteries of the crypto economy has been the - so far - stable value of USDT, whose peg is currently mostly maintained by the belief from investors that it is indeed equal to 1 dollar.

As discussed in the previous chapters, another downside of the collateralization being centralized off-chain is that you now run counterparty risks (the company running off with the custo-

dial assets), and censorship risks (the company blocking your exchange to dollars). The latter case has happened in the past with the SEC freezing certain USDT tokens which were thought to be involved in illegal activity.

At the extreme end of the spectrum lie Central Bank Digital Currency (CBDC) - consumer-facing digital currencies which will soon be issued by central banks all over the world. While incredibly secure in the sense that central banks can provide full backing, they are also incredibly centralized thereby potentially defeating the purpose of using DeFi altogether.

7.3 ON-CHAIN COLLATERALIZED

In on-chain collateralization we can use custodial assets which are completely decentralized (like ETH or BTC) and are held inside a smart contract governed by smart contract logic, thereby avoiding some of the aforementioned issues. The difficulty with using something like ETH is cryptocurrencies are volatile and therefore tend to require (a) complicated mechanisms to keep the peg in order and (b) require over-collateralization to avoid underfunding issues. The canonical example here is MakerDAO's DAI stable token which is pegged to keep the dollar value in a complicated interaction between speculators and stable-value seekers.

DAI'S COLLATERALIZED DEBT POSITIONS

DAI is minted through a mechanism of Collateralized Debt Positions (CDPs). Essentially, DAI is minted by someone who deposits collateral of an equivalent value into a smart contract (Figure 2). The DAI can be freely used on-chain for other purposes, but to get the assets back, the user must pay back the DAI. To fully grasp the system, let us investigate its three main use-cases.

Use-case 1: DAI as a stable store of value

You are holding 1 ETH which is worth $1000. You do not want to be exposed to ETH's volatil-

Backed By	USDC	Binance USD	Tether USDT
Cash & Equivalents	61%	96%	2.93%
US Treasuries	13%	4%	2.22%
Commercial Paper	9%		49.59%
Corporate Bonds	5%		9.96%
Fiduciary Bonds			18.35%
Municipal Bonds (US)	0.20%		
Crypto Assets			1.64%
Reverse Repo Notes			2.73%
Secured Loans			12.55%
…			

Table 1: Collateral for popular stablecoins.
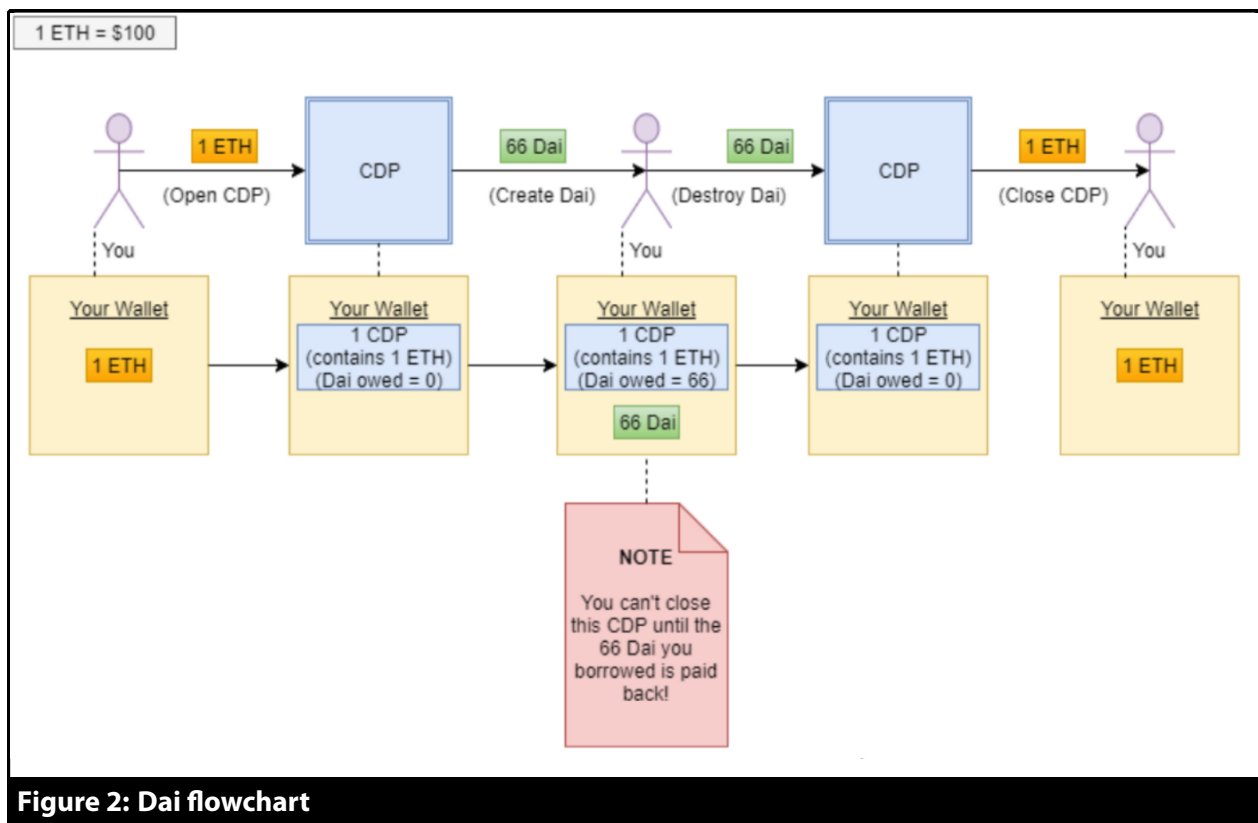
Figure 2: Dai flowchart

ity so you decide to swap it for DAI. When the volatile period ends, you swap your DAI back into ETH. Let us look at what happens when the ETH price drops:

Event	ETH price	Holdings	Value
Start	$1000	1 ETH	$1000
Swap	$1000	1000 DAI	$1000
Price drop	$500	1000 DAI	$1000
Withdraw	$500	2 ETH	$1000

By swapping you have been able to keep the value of your portfolio in dollar terms despite the drop in ETH price. Note that in this case, you ended up doubling your ETH holdings at the end because of the devaluation of ETH.

Use-case 2: taking on leverage

Let's say that the price of ETH is $1000 and you are holding 1 ETH. You think the price will go up and are looking for a way to leverage your trades so you can profit more. You deposit your 1 ETH into a CDP and in return, you mint 1000 DAI. You are only allowed to get your ETH back by giving the CDP back its 1000 DAI.

Event	ETH Price	Holdings	Value
Start	$1000	1 ETH	$1000
Deposit		1000 DAI	$1000
Price change	$2000	1000 DAI	$1000
Withdraw		1 ETH	$2000

By depositing and then withdrawing you ended up with $2000 dollars. Of course, you could have just held your ETH in the first place! Why go through the trouble of using this CDP? While you have your collateral in the CDP, you are free to do whatever you want with the 1000 DAI that you minted. What would happen if you bought ETH with the DAI you just minted?

Event	ETH Price	Holdings	Value
Start	$1000	1 ETH	$1000
Deposit		1000 DAI	$1000
Buy ETH		1 ETH	$1000
Price change	$2000	1 ETH	$2000
Swap ETH		2000 DAI	$2000
Withdraw		1 ETH + 1000 DAI	$3000

Wow, this time you have tripled your money! Before you decide to quit your day job, do consider the downside of this strategy as well. In the case of a price drop, you risk losing all of your initial assets … Let us assume that you own 2 ETH and that you do the same procedure as before (depositing 1 ETH):

Event	ETH Price	Holdings	Value
Start	$1000	2 ETH	$2000
Deposit		1 ETH + 1000 DAI	$2000
Buy ETH		2 ETH	$2000
Price change	$500	2 ETH	$1000
Swap ETH		1000 DAI	$1000
Withdraw		1 ETH	$500

In this case, you would probably have not even done the last step and just kept the 1000 DAI instead. Even by keeping the 1000 DAI, you would still have lost 100% of your initial 1 ETH investment in dollar terms.

In reality, there is a serious risk for DAI to be undercollateralized in such downturn events. Therefore, MakerDAO requires that you deposit more collateral (in USD terms) than you are allowed to withdraw. At the time of writing, the required collateral ratio for ETH was 145%. This means that we would only have been allowed to withdraw $1000/1.45 = 689.65$ DAI for our 1 ETH deposit[1]. If at any point in time our position drops below this collateralization ratio (e.g., if ETH drops by 1%), our position is at risk of being liquidated in which case the collateral (1

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[1]If we repeat this process at nauseam, we can get up to $\sum_{i=0}^{\infty}(1+r)^i = \frac{1}{1+r}$.

ETH) is auctioned off at below-market rates and a penalty is subtracted.

CAVEATS

MakerDAO's DAI is a cornerstone of DeFi as it is a building block for many other applications that we will see later in this book. Even so, there are a couple of downsides to its complicated economic incentivization scheme.

First, it requires that people are willing to speculate and leverage up as in use-case 2 shown above. The upper limit to the supply of DAI is the amount of speculation that counter-parties are willing to undertake and this is certainly lower than the total stablecoin demand. Furthermore, bullish sentiments work well while in an upward cycle, but large downward price movements of the underlying assets can cause many CDPs to go into (near-)default at the same time. This, in turn, puts a lot of buying pressure on DAI as everyone is trying to close their position which they can only do by buying back DAI. DAI therefore often trades above 1 dollar after severe downward movements.

> **Example: Black Thursday**
>
> On March 12th 2020, both traditional and crypto markets suddenly collapsed with all major cryptocurrencies (ETH, BTC, …) dropping between 50% and 60%. As a result this caused ecosystem-wide shortages of DAI. As a result, at one point in time DAI traded for USD$1.12!

To alleviate both of these problems, MakerDAO has decided to allow 1-to-1 swaps between DAI and USDC. This increases the total volume at the price of increased centralization risk.

7.4 RESOURCES

- "A Note on Cryptocurrency Stabilisation: Seigniorage Shares", Robert Sams

- "Beware the Coupon Clipper: The Insurmountable Flaws of so-called Algorithmic Stablecoins"

- DAI collapse: https://blog.makerdao.com/the-market-collapse-of-march-12-2020-how-it-impacted-makerdao/