11

STABLECOINS

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11.1 INTRODUCTION

What started as a niche phenomenon within the cryptocurrency community has now reached the realms of multinational conglomerates, policymakers, and central banks.

From J.P. Morgan's Jamie Dimon to Facebook's Mark Zuckerberg, stable coins have made their way onto the agenda of today's top CEOs. As projects such as Libra have enjoyed broad media coverage, they are also increasingly being scrutinized by regulatory authorities,[1] and as the term *stablecoin* spread, its meaning started to blur. This is problematic because an unclear definition may make us susceptible to deceptive innovation; that is, reintroducing existing services but with a different appearance. We ought to ask ourselves whether stablecoins are here to stay or whether they are simply old wine in new bottles.

This chapter aims to educate on stablecoins by providing historical context on their origin and by describing which key factors have been driving their adoption. Moreover, we review existing terminologies and taxonomies on stablecoins and examine their

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disruptive potential. Based on this, we propose a novel definition of stablecoins and outline an alternative taxonomy. We briefly discuss the different use cases of stablecoins as well as the underlying economic incentives for creating them. We also touch on regulatory considerations and briefly summarize key factors driving the future development of stablecoins.

11.2 MOTIVATION

Money is omnipresent in modern life, but we rarely dare to question it. It has existed for more than 5,000 years, so one is prone to misconceive it as a fixed concept when in fact it has been continuously changing. And as our society evolves, so does the way we interact with and transact with money. With new forms of money on the rise, we are being challenged to question our understanding of money and ask ourselves what the future of money will look like.

Stablecoins have been discussed as a potential candidate for a new, faster, more accessible, and transparent form of money. With Facebook's engagement in the Libra stablecoin, there has been substantial attention to the topic, but the emergence of new technologies, such as distributed ledger technology (DLT), has subtly diverted our focus away from how we can create value to how we can use this technology.

In order to keep from falling prey to deceptive innovation, policymakers, incumbents, challengers, and the general public alike should be interested in developing a sound understanding of stablecoins.

11.3 WIR: A STABLECOIN PRECURSOR

The concept of devising a supplementary currency system is not new. One of the most successful examples is the Swiss WIR Bank, formerly known as the Swiss Economic Circle. It was founded in 1934 by Werner Zimmermann and Paul Enz.[2] WIR is the abbreviation for *Wirtschaftsring-Genossenschaft* (meaning "mutual economic support circle") but also means "we" in German.[3] WIR was driven by the ambition to alleviate the negative effects of the Great Depression, solve the associated middle-class crisis, and reform the monetary system on the basis of the *Freigeld* (meaning "free money") theory.[4] To achieve these goals, WIR initiated its own WIR currency (CHW) allowing participants to exchange goods and services without using conventional fiat currencies.

Today, the WIR network comprises over 62,000 small and medium-sized enterprises (SMEs), reporting a turnover of almost 2 billion WIR in 2012. While the WIR network is now also open to private clients, its focus remains on SMEs. The main benefits of joining the WIR network are threefold. First, companies joining experience on average a 5 percent increase in business, most likely because of loyalty effects.[5] Second, participants in the WIR network can obtain loans at a lower interest rate compared to traditional bank loans. Third, members of the WIR network experience a greater sense of solidarity and community.[6]

Companies participating in the WIR system commit to accepting CHW for their goods and services at a one-to-one ratio with the corresponding Swiss franc amount. In order to join the WIR system, companies can apply for a zero-interest loan of up to

10,000 CHW.[7] If a company wishes to leave the system, surplus CHW must be spent within the system. While the WIR system bears similarities with the idea of a stablecoin, there also is a notable difference in that buying or selling CHW on a secondary market is strictly prohibited.[8] In section 11.4, we will identify the presence of a secondary market as one of the key characteristics of a stablecoin.

11.4 A BRIEF HISTORY OF STABLECOINS

It is impossible to have a well-rounded discussion on stablecoins without examining their origins. Although numerous stablecoin projects exist today, there is one stablecoin that stands out in its significance: Tether.[9] As one of the first and to this day most widely used stablecoins, Tether has played a significant, albeit controversial, role in the development of stablecoins.

As of December 2019, there were more than 4.1 billion Tether tokens in circulation. Each token is supposed to be worth $1. The issuing company, Tether Limited, claims that Tether tokens are 100 percent backed by liquid reserves. However, numerous parties have raised allegations that there is a shortfall in its reserves. These allegations have been fueled by severe deficiencies in the auditing process.[10] Doubts about Tether's reserves have repeatedly manifested themselves in lower secondary market prices. For example, at the beginning of 2017, Tether's secondary market price dropped to as low as $0.91 (see figure 11.1). Nonetheless, Tether is still by far the most actively traded stablecoin. In fact, in terms of trading volume, it can easily compete with other cryptoassets such as Bitcoin or Ethereum.[11]

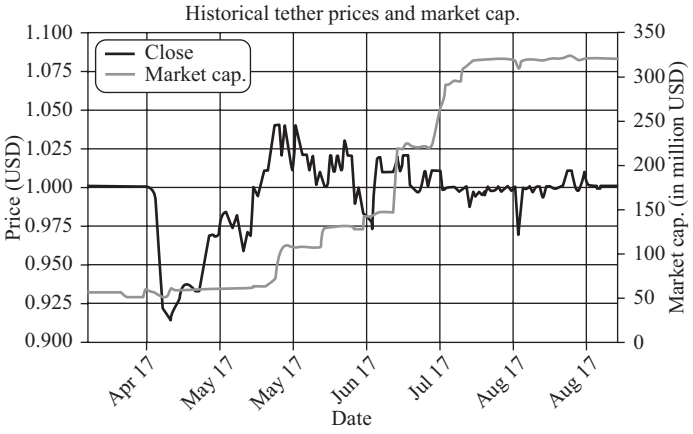

Figure 11.1
Tether prices and market capitalization.

Tether, known initially as Realcoin, was founded in 2014 by Brock Pierce, Craig Sellars, and Reeve Collins. Before founding Tether, two of the three cofounders worked on a project called Mastercoin (later rebranded as Omni). Mastercoin's mission was to allow users to create their own virtual currencies on top of the Bitcoin protocol.[12] For this purpose, the Mastercoin Foundation developed an additional layer on top of Bitcoin, which would later serve as the technological foundation for issuing the first Tether tokens, in October 2014.

One of the key drivers for Tether's growth was its listing on and distribution through cryptocurrency exchanges. Bitfinex, as one of the largest cryptocurrency exchanges, played a pivotal role in promoting Tether. Although denied by both companies' officials, multiple indications suggest that Bitfinex and Tether have been closely affiliated.[13]

When Tether tokens first started trading on Bitfinex in 2015, their turnover was rather insignificant. However, as cryptocurrencies gained traction, so did the Tether stablecoin. By mid-2017, Tether's market capitalization had surpassed $100 million (see figure 11.1). At the same time, Bitfinex users were starting to experience substantial delays in their US dollar withdrawal requests.[14] Shortly thereafter, rumors spread that Bitfinex had been cut off from its US dollar wire transfers.[15] At the same time, numerous cryptocurrency exchanges, such as Kraken, Binance, and Huobi, decided to list Tether trading pairs.[16] This support allowed Tether tokens to spread quickly across the cryptocurrency trading ecosystem. Tether allowed users to circumvent traditional wire transfers by providing an alternative settlement mechanism. Although token users were unable to withdraw their US dollars, Tether allowed them to transfer their tokens pegged to the US dollar between exchanges without being exposed to the price volatility of cryptocurrencies.

After the 2018 cryptocurrency crash, a paper was published claiming that Tether was used to inflate and manipulate Bitcoin prices.[17] It has been suggested that cryptocurrency exchanges may have had a vested interest in continuing the distribution of Tether and generally promoting the use of stablecoins to increase trading volumes. Moreover, stablecoins posed an opportunity for cryptocurrency exchanges to become less dependent on unstable banking relationships.[18]

Given the strong demand for a stablecoin like Tether, it comes as no surprise that new players rushed into the market from late 2017 onward. For example, in 2018, TrustToken, Paxos, Gemini, and Circle all launched stablecoins pegged to the US dollar. These projects promoted their stablecoins as being more reliable and

trustworthy, providing higher transparency in their reserve management.[19] Note that all these stablecoins were primarily designed to work within the cryptocurrency space. The surge in projects also sparked creativity in terms of how to design a stabilization mechanism for a stablecoin. For example, a project called Maker DAO built a decentralized stablecoin (DAI) whose reserve would be comprised of other cryptocurrencies and completely governed on-chain through Ethereum smart contracts. Another project, called Basis, raised $133 million with the goal of launching an algorithmic cryptocurrency protocol that claimed to create a stable digital currency without requiring any asset backing whatsoever. However, it is noteworthy that the Basis team decided to shut down the project because it would have faced US securities regulation.[20]

In parallel with the stablecoin developments from the cryptocurrency community, large corporations started to experiment with blockchain technology—mainly for large-scale transactions. For example, UBS published a paper introducing the so-called Utility Settlement Coin in 2016, which financial institutions could use to facilitate cross-border payments and settlement.[21] In 2018, MIT developed the idea of Tradecoin, in which multiple "sponsors" form a consortium where they can tokenize their assets and build a system of digital cash on top of that. The sponsors contribute assets to a collectively owned asset pool and in exchange receive tradecoins from the consortium. The safekeeping of the consortium's asset pool is managed by a narrow bank to guarantee that the tradecoins are fully backed by the actual asset base. The consortium can then use its tradecoins as an asset base to issue e-cash tokens to retail users.[22] At the beginning of 2019, J. P. Morgan announced that it would become the first US bank

to create a digital coin representing a fiat currency. While these projects are not necessarily comparable to a stablecoin like Tether, they do appear to have been fueled by the associated rising interest in novel digital currency forms.

In June 2019, Facebook officially revealed its plans to launch a new global digital currency called Libra.[23] The Libra project immediately triggered strong headwinds from regulators. For example, France's finance minister, Bruno Le Maire, said that "no private entity can claim monetary power, which is inherent to the sovereignty of nations."[24] Publications from the European Central Bank (ECB) and Bank for International Settlement discussing potential risks associated with stablecoins followed shortly, in August and October 2019, respectively.

11.5 TERMINOLOGY

In this section, we first briefly discuss the etymology of stablecoins and then review the strengths and weaknesses of standard stablecoin definitions. We then point out some of the difficulties surrounding stablecoin terminology. We continue by briefly reviewing Christensen's theory of disruptive innovation in the context of stablecoins and finally provide a new definition of stablecoins.

11.5.1 Etymology: From Bitcoin to Stablecoin

Before 2008, the term *coin* was unambiguously associated with actual physical coins. The advent of Bitcoin, however, led to a recontextualization of the word. One can only wonder why Bitcoin was not named Bitcash or Bitmoney at the time,[25] but as

Bitcoin emerged, the word *coin* experienced a semantic change. Its usage was now broadened to the digital economy.

As the number of cryptocurrency projects increased, so did the excitement for digital coin jargon. From Litecoin to Dogecoin, digital coin minting proved very popular. With a plethora of inherently volatile digital coins, the blockchain community started exploring whether blockchain could also be used to create more stable cryptocurrencies or, in other words, *stable coins*.

Data from Google Trends shows that the term *stablecoin* first emerged in late 2013. Its appearance coincided with a spike in searches for Mastercoin (see figure 11.2). As described in the previous section, Mastercoin laid the groundwork for Tether and

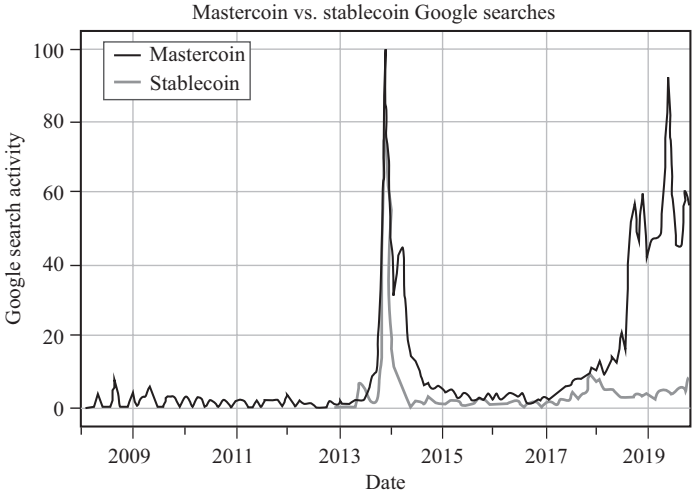

Figure 11.2
Google searches going from "Mastercoin" to "stablecoin."

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made the previously vague concept of a stablecoin a reality. Thus, Mastercoin and stablecoins are closely intertwined, both from a conceptual and from an etymological viewpoint.

11.5.2 Introduction to Stablecoin Terminology

While many different definitions of stablecoins exist, we highlight the one given by the ECB: "[Stablecoins are defined as] digital units of value that are not a form of any specific currency (or basket thereof) but rely on a set of stabilization tools which are supposed to minimize fluctuations of their price in such currency(ies)."[26]

Although a rather broad definition, it reflects three important aspects:

1. First, it is technology neutral and excludes already existing distinct forms of currencies that simply use DLT for recording purposes. This fact helps differentiate between stablecoins as a genuinely new form of money (e.g., DAI) and commercial bank money that is powered by new technology (e.g., JPM Coin).
2. Second, it highlights that there must be some form of stabilization mechanism to reduce volatility relative to an existing currency.
3. Third, it points out that a stablecoin has a market price of its own, implying that its price expressed in the target quoted currency is not necessarily equal to one.

Other definitions are often phrased in a way that blurs the lines between the stablecoin and the "linked" asset. For example, the Bank for International Settlement states that "stablecoins have many of the features of cryptoassets but seek to stabilize the price of the 'coin' by linking its value to that of a pool of assets." The word

link suggests a form of equivalence between the stablecoin and the "linked" asset when in fact both need to be conceived of as separate assets and can potentially be decoupled. In this respect, a stablecoin is to its "linked" asset as a derivative is to its underlying asset. In particular, most stablecoins introduce some counterparty risk.

11.5.3 Motivation: Why New Terminology?

As already pointed out, there is a blurring line between stablecoins that are a genuinely new type of asset and those that represent existing forms of currency. We advocate avoiding introduction of new terminology for already well-understood and existing concepts (e.g., commercial bank money). Instead, we endorse using the term *stablecoin* to label and identify genuinely innovative forms of money that are outside the established monetary system (potentially beyond the control of central banks) but have the potential to fundamentally change and disrupt it.[27]

Christensen's theory of disruptive innovation provides a useful tool to help identify potentially disruptive stable coins and distinguish them from rebranded traditional financial services. According to Christensen's theory, there are two forms of innovation: sustaining innovation and disruptive innovation.[28]

Sustaining innovation is aimed at improving existing products for an incumbent's established customer base. Typically, higher-quality products are introduced to satisfy the high end of the market, where profitability is highest.

Disruptive innovation, on the other hand, is initially considered inferior by most of an incumbent's customers. It either starts in low-end or new markets. In the first case, a disruptor introduces a good enough product for otherwise underserved low-end customers. In

the second case, a disruptor introduces a genuinely new product in a market where none existed, basically turning nonconsumers into consumers. As shown in figure 11.3, the disruptor then moves upmarket, providing the quality that mainstream customers require while preserving the advantages that drove its early success. When mainstream customers start adopting the new product, disruption has occurred.

Putting Christensen's theory of disruptive innovation into practice, let us consider four examples: Tether, J. P. Morgan Coin, Tradecoin, and Libra.

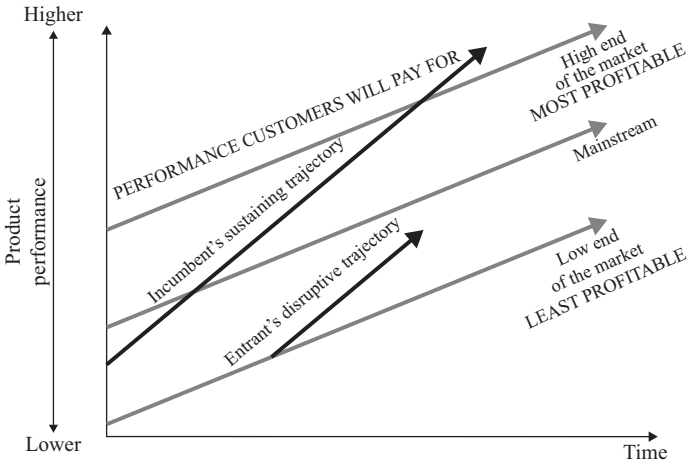

Figure 11.3
Disruptive versus sustaining innovation trajectories. *Source*: C. M. Christensen, M. E. Raynor, and R. McDonald, "What Is Disruptive Innovation?," *Harvard Business Review*, December 2015, https://hbr.org/2015/12/what-is-disruptive-innovation.

1. Tether exhibits characteristics of a disruptive innovation. The reasons are as follows. First, it originated in a low-end market that was otherwise neglected by incumbents (see section 11.4). Tether provided a good enough product to help cryptocurrency users transact in something that is close enough to the US dollar without requiring access to traditional payment systems or banking services. Second, Tether started moving upmarket. Because it is listed on over 100 exchanges, including conservative ones such as Coinbase, both mainstream and high-end institutional customers (e.g., proprietary trading firms) have started using Tether. Tether is also scaling up to support additional blockchain networks (e.g., Ethereum, Liquid, Tron) and currencies (e.g., euro, Chinese yuan).
2. JPM Coin displays the qualities of a sustaining innovation. There are two reasons to support this view. First, the coin is aimed at improving interbank clearing and settlement. Such services were available before JPM Coin, but the coin was introduced to make the process faster and more efficient. Second, the target customer base is clearly in the high end of the market (as JPM Coin is available exclusively to institutional clients) and not geared toward mainstream or low-end customers. Therefore, JPM Coin follows an incumbent's sustaining innovation trajectory (see figure 11.3).
3. Tradecoin represents a disruptive innovation. Its main objective is to give asset-backed currencies a new lease on life. In its mature state, the DTC can serve as a much-needed counterpart to fiat reserve currencies of today.
4. Libra's innovation quality depends on its go-to-market strategy. It may be considered a disruptive innovation if it indeed

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initially focuses on the low-end market and subsequently moves upmarket. According to its website, Libra's vision is to provide payment services for the 1.7 billion people who are unbanked. The unbanked population is a low-end market that traditionally has been neglected by incumbents. With each of Libra's founding members having a global reach and substantial financial resources, they are best equipped to turn their vision into reality. If Libra delivers on its promise and someday dominates the unbanked market, it has strong potential to move upmarket and eventually disrupt traditional payment services.

While missing out on a potential sustaining innovation may only have minor repercussions, failing to detect a disruptive innovation poses an existential threat to an incumbent's business. With the rise of DLT, the financial services space has been overcrowded with seemingly innovative payment solutions. At the same time, it has become increasingly difficult to separate genuinely new payment solutions from reengineered legacy systems under the guise of innovation. We therefore advocate using the term *stablecoin* more carefully to label genuinely new forms of money that possess disruptive potential. At the same time, we suggest avoiding use of the term to relabel existing products or minimally improved ones.

11.5.4 A Novel Definition

We aim to provide a compact definition for stablecoins that captures their essential characteristics and is easy to use. We identify three fundamental properties that characterize a stablecoin and set it apart from other forms of money.

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A stablecoin is a digital unit of value with the following three properties:

1. It is not a form of currency.
2. It can be used without any direct interaction with the issuer.
3. It is tradable on a secondary market and has a low price volatility in terms of a target quoted currency.

There are three advantages of using this definition. First, it is technology neutral, focusing on the underlying conceptual elements of a stablecoin instead of its implementation details. Second, it is mutually exclusive with existing forms of currency (similar to the ECB definition). This property makes the definition useful in identifying genuinely new forms of money with disruptive potential. Third, it highlights the unique features that make stablecoins distinct from previously known payment systems. Stablecoins can be used without requiring any direct interaction with the issuer (e.g., for peer-to-peer transfers) and can be exchanged on a secondary market at a somewhat reliable and "stable" price.[29]

11.6 TAXONOMY

In the following we briefly discuss existing taxonomies and provide a tripartite classification.

11.6.1 Review

Most taxonomies classify stablecoins based on differences in their collateralization mechanics. For example, some authors suggest differentiating between fiat-, commodity-, crypto- and uncollateralized stablecoins.[30] Others suggest grouping them as on-chain-,

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off-chain-, and uncollateralized stablecoins.[31] Still others distinguish between fully fiat collateralized, partially fiat collateralized, crypto-overcollateralized, dynamically stabilized, and asset-collateralized stablecoins.[32] Since taxonomies focused on collateralization types are already well known, we will refrain from repeating them. Instead of focusing on collateralization setups, we point to a simple yet revealing dichotomy of stablecoins: whether the stablecoin represents a legal claim and therefore requires a functioning legal system or whether it works even in the absence of any institutions. The former are issued as an IOU, and the issuers may be held responsible if they fail to deliver on their promise. The latter are self-sustained in the sense that the stabilization mechanism does not rely on any institutions or a functioning legal system. Frequently examined features such as the degree of decentralization and openness of a stablecoin system are highly correlated with the existence or absence of a coin holder's legal claim. For example, if there is no legal claim associated with a coin, the system is most likely to be decentralized, with low accountability and high openness. As a stablecoin system works through its network effects, it is unlikely to be restricted for its own sake but rather because of regulatory and legal constraints. If, on the other hand, the legal and regulatory structure allows the system to be open, it most likely will be.

11.6.2 A Tripartite Classification

The fair value of a stablecoin should be equal to its expected redeemable amount. The trust in the redeemability of a stablecoin may be based on different rationales. As an expansion of existing taxonomies, we provide an additional classification to

reflect these different redeemability rationales, grouping stablecoins into three categories:

1. *Claim based* These coins can come in two forms. First, coin holders can have a direct legally enforceable right to personally redeem their coins against a predefined amount or value of a reference asset (e.g., fiat money or commodity). For example, Circle states in its terms for USDC that "sending USDC to another address automatically transfers and assigns to that Holder, and any subsequent Holder, the right to redeem USDC for U.S. Dollar funds."[33] Moreover, coins that are structured as electronic money or commercial bank money in prepaid payment systems would also fall under this category. Second, coin holders may benefit from a transitive claim, meaning they may not be entitled to redeem the coin themselves but instead have to go through a third party. For example, two-tiered stablecoin systems, such as proposed by Libra, where some privileged users ("authorized resellers") have a right to redeem while other users do not, are based on the idea of a transitive claim.
2. *Good faith based* These are coins where the holder believes in the good business practices of the issuer, assuming redeemability of its coins without having any legal right. The issuer typically promotes the coins as being backed by reserves but excludes any right of redemption in its terms and conditions. For example, TrustToken states in its legal terms that "the Company itself does not guarantee any right of redemption or exchange of TrueCurrency tokens for fiat currency."[34]
3. *Technology based* These are coins where technology is used to autonomously induce price stabilization (e.g., using smart

contracts to store and manage cryptoasset collateral). These systems do not rely on a legal claim or a user's faith in the good intentions of the issuing entity. Instead, the user's expectations of redeemability are driven by their trust in the underlying technology and implementation. For example, on-chain collateralized and algorithmic stablecoins belong to this category.

To put our view into a broader context, we refer to the International Monetary Fund's money tree (see figure 11.4). The money tree identifies five different means of payment: B-money, E-money, I-money, central bank money, and cryptocurrency. According to our definition (see section 11.4) and taxonomy, claim- and good-faith-based stablecoins would comprise I-money and partly E-money. Technology-based stable coins are congruent to the IMF's definition of "managed coins."[35] We can see that our framework is at least partially congruent with the IMF's categorization—in particular with respect to differentiation based on the existence or absence of a claim.

11.7 USE CASES

Of the many use cases that have been discussed for stablecoins, the following have materialized so far:

- *Cross-border payments and arbitrage* Stablecoins have been used for cross-border payments, especially between cryptocurrency exchanges, giving traders a tool to take advantage of arbitrage opportunities and thereby improve market efficiency.
- *Trading and settlement* Stablecoins have been used as a trading instrument to quickly convert from volatile cryptocurrencies

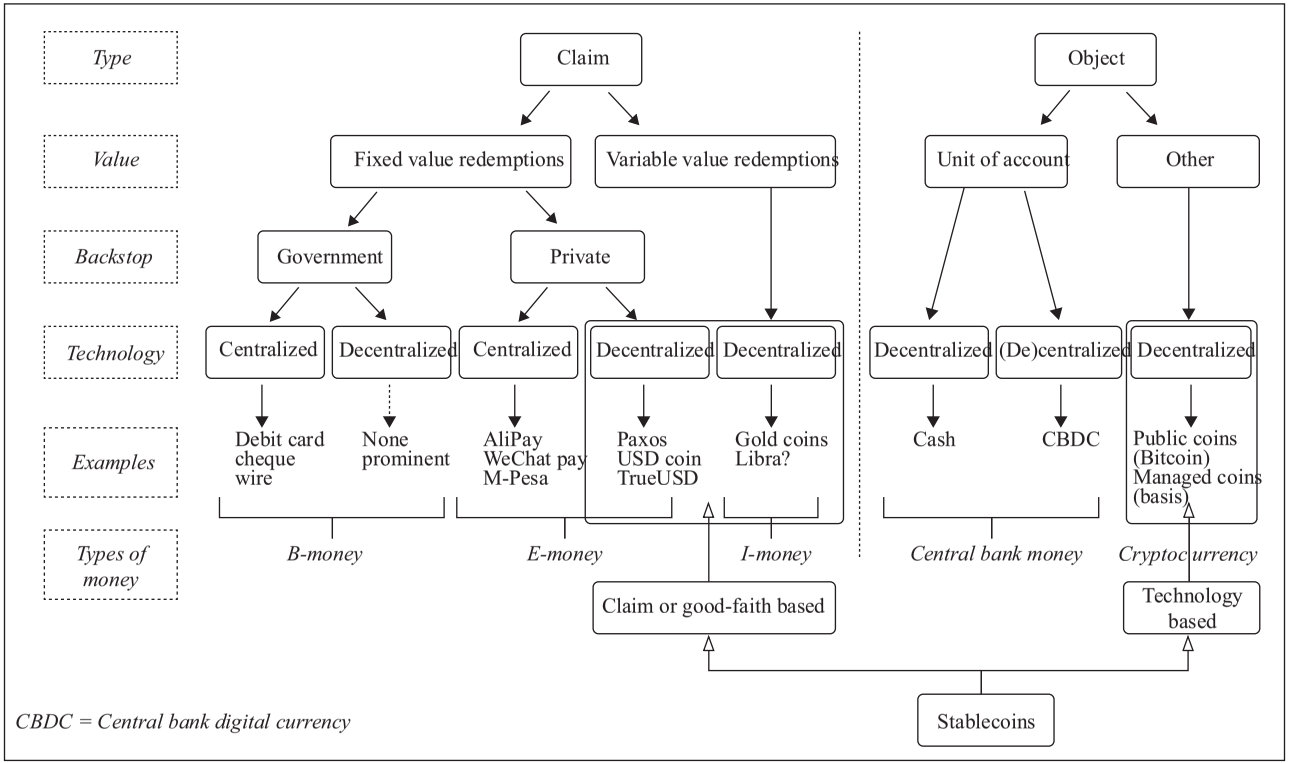

Figure 11.4
Placing stablecoins into the IMF's "money tree." *Source*: T. Adrian and T. Mancini-Griffoli, "The Rise of Digital Money," July 2019.

into more stable currency substitutes and vice versa. Conversely, from the perspective of the cryptocurrency exchanges, stablecoins allowed the exchanges to offer their users trading and settlement functionalities like that of the US dollar but without depending on traditional wire transfers. Therefore, stablecoins enabled exchanges to become less reliant on often fragile banking partnerships. It is noteworthy that most stablecoin wallets are controlled by cryptocurrency exchanges, suggesting that users mainly transfer stablecoins between exchange omnibus wallets and rarely withdraw them. For example, a recent report found that only about 300 entities control over 80 percent of Tether tokens, with many of these being cryptocurrency exchanges.[36]

- *Decentralized finance applications* These offer a broad variety of use cases, including decentralized exchanges, lending markets, derivatives, and on-chain asset management.[37] For all these applications, stablecoins play an important role. Additionally, stablecoins like DAI allow users to take on leveraged trading positions.[38] Moreover, users can also lock up their DAI tokens to earn interest (e.g., on Aave, Compound, and dYdX).

Other use cases, such as payment, payroll, and remittance, have not received much attention so far. Similarly, integration of stablecoins into decentralized applications or as a cash leg handling in financial contracts based on smart contracts has yet to find wider adoption.

11.8 REVENUE STREAMS AND COST STRUCTURE

Stablecoin issuers may profit from multiple revenue streams. The composition of revenues may vary greatly depending on the exact

stablecoin setup. For example, technology and claim-based stablecoins are likely to exhibit very different revenue stream structures. Regardless of the different stablecoin types and their different revenue focuses, we identify the following five revenue streams:

- *Interest earnings* Stablecoin issuers typically allocate all interest earnings generated from the reserve fund to themselves. Issuers are not required and, in some instances, are even prohibited from passing on interest earnings to coin holders. For example, electronic money institutions (EMIs), such as Circle, are prohibited from paying interest. Depending on the legal structure of the stablecoin, issuers may have varying degrees of freedom in reserve fund management. Generally, issuers have an incentive to issue stablecoins for currencies that offer positive interest rates. For example, TrustToken supports stablecoins for US dollars, British pounds, Australian dollars, Canadian dollars, and Hong Kong dollars, all of which used to provide positive interest rates, ranging between 0.75 percent and 3.95 percent.[39] However, most of these rates have been cut to almost zero lately. Depending on the size of the reserve funds, interest earnings may be substantial. For example, let us assume Tether has $4.1 billion in reserves. According to Tether, "The composition of the Reserves used to back Tether Tokens is within the sole control and at the sole and absolute discretion of Tether."[40] Let us further assume that Tether's liquidity management allocates 80 percent of its reserves into US dollar money market funds with an annual percentage rate of 1.7 percent. The float would generate earnings of $55.8 million per year.[41]
- *Transaction fees* Stablecoin issuers may charge fees for every transfer. For example, Tether's smart contract has a feature that

allows it to charge up to 20 basis points of the transaction value with a maximum fee of $50 per transaction.[42] Let us assume an average daily number of transactions of 100,000, with an average size of $5,000.[43] If Tether were to charge a 1 basis point transaction fee, this would result in revenues of $18.2 million per year. However, Tether has not charged any transaction fees so far, because doing so would disincentivize using Tether coins, potentially leading to a shrinking reserve fund and diminishing interest earnings. Moreover, the transaction fee would only apply to on-chain transactions (excluding any intraexchange transactions). So far, interest earnings seem to have outweighed potential earnings from transaction fees. As commented in their code, Tether most likely sees transaction fees as a means of last resort ("if transaction fees ever became necessary"[44]).

- *Issuance and redemption fees* Stablecoin issuers may charge fees for the issuance (minting) and redemption (burning) of stablecoins. For example, Tether charges 0.1 percent per deposit and the greater of 0.1 percent or $1,000 per withdrawal.[45] Obviously, the issuer may use fees to steer the inflows and outflows to its stablecoin. This may become necessary if the issuer has limitations in terms of the reserve fund size or balance sheet (e.g., considering capital requirements for EMIs or restrictions given by an issuer's banking partner). Similarly, in the case of liquidity shortages, an issuer may discourage outflows by imposing higher withdrawal fees.
- *Cross-selling* Stablecoin issuers may cross-sell additional services that build on their stablecoin. For example, some cryptocurrency exchanges are closely affiliated with stablecoin issuers (e.g., Bitfinex and Tether, as described in section 11.4). Stablecoins may serve as a means to attract and facilitate trading on their

platforms. Moreover, exchanges may also make a market in their own stablecoins, providing additional revenue potential.

▪ *Secondary tokens* Technology-based stablecoin systems are often designed as a twofold token model, where one token serves as the stablecoin and the second provides some special functionality to interact with the stablecoin system. The second token is typically designed to increase in value with stablecoin usage. The initiators of the stablecoin system regularly allocate a proportion of these tokens to themselves so they benefit from such value appreciation. For example, DAI has a special governance token (MKR), which is also needed to close a collateral debt position (see section 11.7). Whenever users want to regain access to their locked cryptoassets, they need to pay interest in the form of MKR tokens, which subsequently get burned. As the supply of MKR tokens decreases over time, there will be a lower supply that may ceteris paribus lead to higher prices.

As with revenue streams, a stablecoin's cost structure differs across stablecoin types. In particular, the cost structure will heavily depend on whether the issuing entity is regulated. In general, we identify the following seven cost components:

▪ *Legal, regulatory, and compliance* Various legal and regulatory clarifications may become necessary. Depending on the regulatory status of the issuer (e.g., EMI), licensing costs may be incurred. Licenses may be necessary for every jurisdiction in which the stablecoin will be made available. Moreover, compliance efforts (e.g., to ensure adherence with know-your-customer (KYC) regulations and applicable anti-money-laundering (AML) requirements) need to be considered.

- *IT development* When a public DLT is used, the stablecoin issuer benefits from the openness and interoperability of the underlying DLT. Development costs would mostly comprise setting up the smart contract. In contrast, integration into third-party systems such as wallets or exchanges does not involve additional efforts (e.g., by adhering to standards such as ERC20 token standard on the Ethereum platform).
- *IT audits* When a stablecoin is based on a public DLT, the proper functioning of the corresponding smart contract is of critical importance. Typically, a stablecoin issuer mandates that security experts audit the smart contracts in order to assure that the contracts do not have any security flaws and work as expected.
- *Financial audits* Depending on the regulatory status of the stablecoin issuer, audits of its financial statements may be mandatory. Some issuers may voluntarily conduct financial audits to assure users that the reserves are managed responsibly.
- *Banking services* Depending on the nature of the stablecoin, the issuer may rely on banking services to store its reserves.
- *Key management* The issuance and redemption of stablecoins involve some form of approval workflow. Especially for stablecoins that use a public DLT, secure management of potential administrator/issuer keys is of utmost importance.
- *Insurance* When a stablecoin is backed by physical assets, such as gold or bank notes, the corresponding storage would typically require insurance coverage.

Depending on the stablecoin category, the cost structure may tend to involve higher fixed costs than variable costs, providing an attractive, scalable business model. It comes as no surprise that some stablecoin issuers are incorporated in offshore locations to

evade regulatory requirements while still benefiting from the global scale that borderless DLT systems provide.

11.9 REGULATORY CONSIDERATIONS

From a regulatory standpoint, no unified definition of stablecoins exists so far. In order to reflect the current situation, we briefly review the Swiss Financial Market Supervisory Authority's (FINMA) statement on stablecoins, the United States' proposed Managed Stablecoins Are Securities Act of 2019, and the ECB's position.

FINMA points out that no specific regulation currently covers stablecoins. However, following a technology-neutral approach, FINMA states that many proposed stablecoin projects give rise to licensing requirements under the Banking Act or the Collective Investment Schemes Act. Moreover, because stablecoins are regularly intended to serve as a means of payment, the Anti–Money Laundering Act is almost always applicable, resulting in strict KYC requirements, transaction monitoring, and other safeguards. Lastly, if a payment system of significant importance is to be created, a licensing requirement under the Financial Market Infrastructure Act is probable. FINMA identifies eight categories of stablecoins, with most falling under existing regulations. For example, if a stablecoin is linked to a fiat currency, this likely constitutes a deposit-taking business under banking law (e.g., Tether). If a stablecoin is linked to a basket of fiat currencies, as proposed by Libra, the applicable regulation depends on who bears the market risk associated with management of the currency basket. If the issuer bears it, this constitutes a

deposit-taking business under banking law. If the token holder bears it, the stablecoin is considered a collective investment scheme.[46] The fact that FINMA subsumes most of the stablecoins under existing regulations substantiates our view that in many instances stablecoins are not a new form of currency (see subsections 11.5.4 and 11.5.3 and section 11.6). Similar to FINMA's substance over form attitude, US policymakers have advocated a "same risks, same rules" approach toward stablecoins. In the newly proposed Managed Stablecoins Are Securities Act of 2019, they define "managed stablecoins" as a digital asset whose value is determined by reference to the value of a basket of assets and where the holder is entitled to obtain payment based on the value of that basket. These "managed stablecoins" will be considered securities under the existing Securities Act of 1933.[47]

Lastly, the ECB has formulated a stance toward the regulatory treatment of stablecoins that is similar to that of FINMA and US policymakers. While the ECB does acknowledge that some stablecoins may fall outside current regulatory regimes, in many cases the risks that they entail are "the same as for their non-DLT competitors." In particular, the ECB states that stablecoins issued as tokenized funds are likely to qualify as electronic money and as such are already covered by the existing second Electronic Money Directive (EMD2) in the European Union. The ECB also points out that the use of a new technology may often be mistaken for the introduction of a new asset class. However, those stablecoins that are truly part of the new phenomenon of cryptoassets may still involve major uncertainties related to their governance and regulatory treatment.[48]

It is noteworthy that the regulatory treatment of stablecoins is not only relevant for potential licensing requirements but may

also have an impact on their accounting treatment. For example, concerning the asset side of a bank's balance sheet, FINMA has suggested applying an 800 percent risk weight to cryptocurrency assets regardless of whether these assets are held in the bank or in a trading book.[49] Depending on its specific nature, a stablecoin may be seen as a cryptocurrency and thus induce higher capital requirements. Since no official statement has been given so far, it seems that every bank intending to transact in stablecoins is best advised to check the coin's regulatory qualification with the regulator. Similarly, from the perspective of a stablecoin issuer, the accounting treatment on the liability side of the balance sheet may vary greatly depending on the exact nature of the stablecoin. While stablecoins construed as electronic money may be straightforward to account for, more exotic stablecoin formats may be rather challenging.

11.10 POSSIBLE SCENARIOS AND OUTLOOK

Factors from within and outside the stablecoin universe are going to drive further development of stablecoins. Incumbents and policymakers, as well as challengers and users, are going to influence stablecoin evolution.

Within the cryptocurrency universe, the creation of a new prominent decentralized application (DApp) or cryptoasset may lead to a sudden demand shock in stablecoins. For example, if stablecoins are required to interact with such a DApp or represent the only access point to purchase a promising new cryptoasset, the demand for stablecoins would likely surge. Similarly, the adoption of decentralized exchanges may also lead to increasing demand for stablecoins in order to facilitate trading. In contrast, in the case of

a major incident such as the detection of a critical vulnerability in a DLT system or a large-scale security breach on one of the dominant cryptocurrency exchanges, stablecoin use would likely diminish. Depending on the severity of such an incident, policymakers may see themselves forced to impose stricter rules on businesses interacting with stablecoins. A policy shock, such as the introduction of specific licensing requirements, may make stablecoin projects less attractive and, in the worst case, bring further development to a halt. Aside from the regulatory circumstances, the overall economic environment may impact stablecoin adoption. For example, if interest rates were to normalize, the demand for more risky asset classes could recede and lead to higher opportunity costs for users when holding stablecoins bearing zero interest. On the other hand, in the case of a financial crisis, users may suddenly find themselves attracted to alternative forms of currency such as cryptocurrencies. Increased trading activity on cryptocurrency exchanges could positively affect the popularity of stablecoins. Lastly, the overall monetary system may be fundamentally changed through the introduction of a central bank digital currency (CBDC), potentially upstaging stablecoins.

11.11 SUMMARY AND CONCLUSION

Stablecoins are an ambiguous concept of money. While they first originated in the world of cryptocurrencies, they have now become an independent concept of their own. Nonetheless, in order to develop a deeper understanding of what problems they currently solve and may address in the future, it is vital to understand how and why they first came into existence.

As described in section 11.4, stablecoins developed initially from the idea of democratizing the issuance of private currencies. At the same time, cryptocurrency exchanges needed a fiat currency substitute that would allow them to become less reliant on typically fragile banking partnerships. Stablecoins proved to be an elegant solution for growing the cryptocurrency trading ecosystem while minimizing dependence on traditional banking services. As Tether grew popular, so did the general enthusiasm for stablecoins, and as the usage of the term stablecoin spread, its meaning started to blur.

Imprecise terminology may make us susceptible to deceptive innovation, overestimating the significance of reengineered legacy payment systems and potentially overlooking more profound changes in our monetary system. As described in section 11.5, Christensen's theory of disruptive innovation provides a useful tool for distinguishing between stablecoins as a genuinely new asset type and old wine in new bottles. Building on those insights, we provide a new definition that distills the essential characteristics of a stablecoin. Specifically, we claim that it is not an existing form of currency, it does not require any direct relationship with the issuer, and it is tradable on a secondary market at a relatively stable and predictable price.

In section 11.6, we proposed an easy-to-use yet expressive taxonomy that focuses on the absence or existence of a legal claim, distinguishing between claim-, faith-, and technology-based stablecoins. We also put this classification into a broader context by comparing it with existing taxonomies and found a strong congruence with the IMF's money tree.

In section 11.7, we briefly reviewed current use cases of stablecoins, highlighting cross-border payments, cross-cryptocurrency

exchange settlement, and decentralized finance applications. We claimed that the idea of stablecoins has outgrown its cryptocurrency origins. However, their use is still very much rooted in the cryptocurrency space.

In section 11.8, we examined the revenue and cost structure of stablecoins. We found that interest earnings on the reserve funds provide substantial upside potential for stablecoin issuers. Given their predominantly fixed-cost structure, stablecoins constitute highly scalable business models. Unsurprisingly, to reduce costs, many issuers are incorporated in offshore locations while still benefiting from the global reach of today's DLT platforms.

In section 11.9, we briefly considered the regulators' perspectives by reviewing statements given by the FINMA, US policymakers, and the ECB. We found that most regulators have a technology-neutral view, aiming to subsume stablecoins under existing regulations.

In section 11.10, we completed our stablecoin examination by briefly outlining potential future scenarios. We find that claim- and faith-based stablecoins build on existing money forms, whereas technology-based stablecoins are decoupled from the traditional money creation circle.

All in all, we conclude that stablecoins are a moving target with tremendous potential to fundamentally change the financial system. With DLT providing a borderless and easy-to-integrate infrastructure, stablecoins have the potential to scale rapidly on a global scale and disrupt existing payment systems. Stablecoins are challenging our notion of money, creating a paradoxical situation in which they may be used like a currency without actually being labeled one. It remains to be seen whether stablecoins are going to coexist, complement, or take over existing payments,

but in any case we should aim to use a more concise technology-neutral language, allowing us to focus on the truly disruptive potential of future money forms and on applying new technologies such as DLT in a more purpose-driven way.

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