CHAPTER 11

Blockchain and Structured Products

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11.1 An Introduction to Digital Structured Finance

Many innovative structured products have been introduced that offer digital variations of more traditional structured products such as asset-backed loans and asset-backed securities. These digital structured products differ in their jurisdiction and the number of regulatory requirements, the type of trading venue (over-the-counter or exchange), and the risks. Because the blockchain is a fundamental building block of these innovations, these products are necessarily exposed to the inherent risks in the blockchain technology such as possible attack from hackers or a potential lack of market liquidity for the underlying cryptocurrencies.

The difference between these products and their traditional counterparts vary—some are simply decentralized, digital equivalents of traditional products such as the Treasury-backed closed-end fund while others borrow concepts from traditional finance but adjust these to be suitable for the digital, decentralized environment, for example, the DAI stablecoin and decentralized lending and borrowing. The growth in structured products is driven by a investors' search for yield. The 2020 pandemic has driven global interest rates to historically low levels. Some jurisdictions, such as the eurozone, are now in negative territory and others such as the US and UK could potentially follow.

One area in cryptocurrencies attracting huge attention is decentralized finance or DeFi. DeFi refers to the development of financial services such as

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lending and borrowing using smart contracts on the blockchain, which are automated enforceable agreements that don't need intermediaries like a bank or lawyer and use online blockchain technology instead. These types of products present examples of how innovation can be used to facilitate alternatives to traditional settlement, lending, and borrowing.

The treatment below focusses on a few exemplar products in each category, but there are many others of note that are not included. Two other interesting examples of digital structured products include the Grayscale Bitcoin Trust and Short LyCi.

The Grayscale Bitcoin Trust provides a secure structure to gain exposure to Bitcoin. Eligible shares are quoted on the OTCQX®, a marketplace operated by over-the-counter markets, and registered under Section 12(g) of the Securities Exchange Act of 1934. Investors can buy and sell shares through most traditional brokerage accounts at prices dictated by the market.[1] The ShortLyci is a way to bet against a market-cap-weighted basket of the top 25 cryptocurrencies. Purchasing the LyCi token means essentially shorting a basket of cryptocurrencies because the token increases in value when the price of the underlying basket decreases. This product provides dynamic and transparent repricing and rebalancing that is available to some retail investors also.[2]

11.2 Treasury-Backed Digital Products

The Arca U.S. Treasury Fund is an innovative, closed-end fund that offers shares to investors as digital securities that can be traded on the Ethereum blockchain. The Securities and Exchange Commission ("SEC") approved the Arca fund under the Investment Company Act of 1940 on July 6, 2020.[3] The Arca CEO of Arca described the SEC's announcement as a "transformative and groundbreaking step towards the integration of digital asset investing and traditional finance as it is a new form of regulated digital investment products that are made available to investors" (Otieno 2020).

A typical closed-end fund or more specifically, a closed-end company is one type of investment company. According to the SEC, closed-end funds have some unique features that distinguish it from the other two types of investment funds namely mutual funds and investment trusts.[4] Specifically, the investment portfolios of closed-end funds generally are managed by separate entities known as "investment advisers" that are registered with the SEC. Closed-end funds do not continuously offer their shares to investors for sale but rather, sell a fixed number of shares at one time. After the initial offering, these shares can be traded on a secondary market. The price of these secondary market shares is determined by the market and may be greater or less than the shares' net asset value (NAV). Closed-end fund shares generally are not redeemable which means that a closed-end fund is not required to buy its shares back from investors upon request. Some closed-end funds, commonly referred to

as interval funds, could however offer to repurchase their shares at specified intervals.

The Arca U.S. Treasury Fund has many of these features albeit issuing digital assets and offering the benefits and efficiency of blockchain technology. The Arca U.S. Treasury Fund invests 80% of its investment portfolio assets in interest-bearing, short-duration, U.S. Treasury securities. Like their traditional counterparts, the investment portfolio is managed by an investment advisor, the Chief Investment Officer of Arca. The Arca U.S. Treasury Fund entered into a custody agreement with a third-party custodian.[5]

The investment objective of the Treasury Fund is to maximize total return consistent with the preservation of capital. The fund issue shares to investors that differ from the shares of traditional closed-end funds in that these shares are digital securities tradable directly between investors on the Ethereum blockchain. The ArCoin is a special type of digital token based on the ERC-1404 protocol which places several restrictions on the token's activity and embeds additional measures of security over other tokens based on the ERC-20 protocol. For example, unlike Bitcoin that can be freely used in peer-to-peer transfers on the blockchain, ArcCoin can only be transferred to white-listed wallet addresses which in the case of the Arca U.S. Treasury Fund, that this means anti-money laundering/know your customer (AML/KYC) and other documentary clearance. The ArCoin can be purchased directly from fund using U.S. dollars but it can also be purchased directly from another ArCoin holder using any digital or fiat currency agreed upon by both parties.

The redemption price of ArCoin will be the net asset value of the Fund as of the close of regular trading on the New York Stock Exchange on the repurchase pricing date. In addition to selling their ArCoins, investors also earn period cashflows in the form of dividends and other distributions. Dividends are the net investment income on the Treasury securities in the investment portfolio and distributions are the net realized capital gains earned annually by the fund. An investor could also select to have their period distributions reinvested in additional ArCoin under the Fund's distribution reinvestment plan.

11.3 Cryptocurrency-Backed Products

A particular example of a cryptocurrency-backed product is the stablecoin Dai. Like other stablecoins, Dai seeks to reduce price volatility against a reference basket of assets with only a soft peg to the U.S. Dollar. Most stablecoins are backed by fiat currency such as the U.S. Dollar or a basket of fiat currencies but Dai is collateralized by the cryptocurrency Ether.[6] The name Dai is a transliteration of the Chinese character meaning to "lend or to provide capital for a loan."[7] The stablecoin Dai can be traded and exchanged for other cryptocurrencies but it can also be used to generate interest on cryptocurrency through lending.

The Dai stablecoin is decentralized and based on a set of smart contracts referred to as Maker Vaults supported on the Ethereum blockchain.[8] Dai can be generated by anyone by depositing Ether collateral into Maker Vaults. The cryptocurrency becomes the collateral for a Dai loan to the user. The interest rate on this loan is known as the stability fee. This mechanism of Dai creation effectively means that the user effectively borrows Dai using cryptocurrency collateral to establish a collateralized debt position ("CDP"). Once created, Dai can be traded or exchanged for other cryptocurrencies or fiat currency. Initially, Maker Vaults only accepted the native cryptocurrency of the Ethereum blockchain, Ether but toward the end of 2019 introduced the idea of allowing other types of collateral also. The amount of collateral deposited is greater than the amount of Dai generated. For example, the loan-to-collateral value is currently 50% which means that the user needs to deposit $150 worth of Ether for $100 worth of Dai. If the collateral falls below 150%, the collateralized debt position is automatically liquidated.

The Maker protocol has several build-in mechanisms to guarantee that Dai remains stable against the dollar such as the Target Rate Feedback Mechanism ("TRFM"). For example, "if the Target Price of Dai is below $1, the TRFM increases so that it can push the price of Dai back up. This causes the price of Dai to increase, which then causes the generation of Dai through CDPs to become more expensive."[9] The feedback mechanisms require the smart contract to know the price of Ether at any point. The Dai stability mechanisms have performed well, with Dai reaching an all-time high price of $1.11 on March 13, 2020, during the peak of the Covid-19 global market uncertainty.[10]

Several use cases of Dai have emerged. For example, investors that want to reduce the risk and volatility of their cryptocurrency portfolio could exchange Ether for Dai on a cryptocurrency exchange. Users could also deposit Ether in a Dai smart contract and receive a Dai. Dai lending, whereby the Dai holders lock their Dai into a Dai Savings Rate smart contract, is an alternative way to use Dai by earning interest. The interest accrues at a variable rate referred to as the Dai Savings Rate ("DSR") and set by the Maker.[11] The Maker protocol uses the level of the DSR as a means to influence the demand for Dai. When the DSR is high, it would create demand for Dai but when DSR is low it would stimulate supply.[12] Historically, DSR varied between a high of 8.75% on February 4, 2020, to a low of zero percent on March 17, 2020, when the demand for Dai exceeds the supply.

11.4 Decentralized, Digital Lending

Genesis Global Capital ("Genesis Capital"), a registered broker-dealer started offering lending of digital assets to institutional investors on March 1, 2018 (Genesis 2018) as a complement to their existing over-the-counter digital assets trading. Genesis Capital allows institutional investors such as hedge funds and trading firms the opportunity to borrow or lend Bitcoin, Ether, and other digital assets in large quantities over fixed-terms. Genesis capital

further launched fiat currency lending toward the end of 2018 whereby institutional investors can borrow cash against their cryptocurrency holdings. Genesis Capital lending grew from cumulative originations of $1.11 billion on December 31, 2018, to over $6 billion on March 31, 2020. Figure 11.1 shows a breakdown of their cumulative loan originations between borrowing and lending of digital assets. The amount of lending in digital assets continues to exceed the amount of borrowing in digital assets. Figure 11.1 also shows the number of active cash loans against institutional cryptocurrency holdings which is still smaller than the digital asset lending.

Digital asset loans are comparable to more traditional types of asset-backed loans, but the underlying cryptocurrency assets have relatively high volatility. The salient features of cryptocurrency-backed loans are compared to other asset-backed loans in Table 11.1. The interest rates on cryptocurrency-backed loans, represented here by loans against Bitcoin, are typically on the higher end when compared to loans against more traditional collateral such as future sales, fixed company assets, or equity or debt securities. The lender directly controls the cryptocurrency collateral in contrast to the traditional collateral which is not transferred but only pledged to the lender. The lender can therefore generate an additional return on the cryptocurrency collateral over the lifetime of the loan. Since the amount of collateral often exceeds the loan amount, as shown in Table 11.1 the loan-to-value of Bitcoin-backed lending was between 50 and 80% which creates a leverage effect further enhancing the return.

The high loan-to-value of Bitcoin-backed loans is commensurate with the relatively high volatility of Bitcoin (and other cryptocurrencies). The loans are also subject to margin calls in the event the loan-to-value ratio decrease

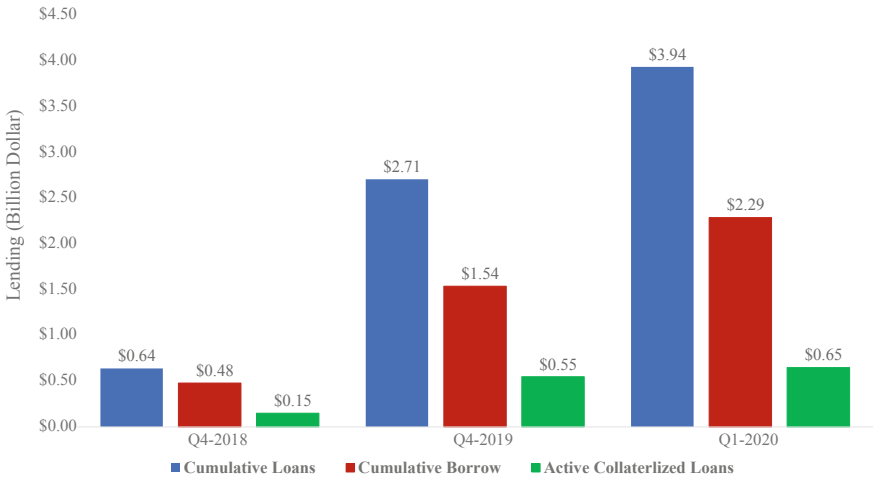

Fig. 11.1 Growth in Genesis Capital digital asset borrowing and lending

Table 11.1 Comparison of asset-backed securities and digital asset loans

Description	*Asset-backed cash loans against*			
	Bitcoin	*Future cashflows from sales*	*Fixed assets such as property, equipment and inventory*	*Securities such as equity or debt*
Return on cash (spread to LIBOR)	5–8%	3–6%	7–9%	2–4%
Usability of the collateral assets	Usable	Unusable	Unusable	Usable
Return on collateral	3–5%	N/A	N/A	LIBOR + spread of between 2 and 4%
Loan-to-value ratio	50–80%	75–85%	50–75%	50–95%
Volatility of collateral	High	Low to medium	Low	Medium to high
Liquidity of collateral	Highly liquid	Generally illiquidy	Generally illiquidy	Highly liquid
Duration	0–2 years	1–5 years	1–5 years	0–5 years

Soucrce Genesis Global Capital, Q3 2019, "Digital Asset Lending Snapshot," *Genesis Quarterly Insights*

below the required levels. As explained by Genesis Capital, "[t]he attractiveness of bitcoin as collateral relies heavily on the lender's competency with both holding bitcoin and managing margin calls and forced liquidations. If the price of bitcoin decreases rapidly, the lender needs to ensure the borrower adds more bitcoin collateral to back the loan or have a systematic selling solution in place if the price continues to fall" (Genesis Capital Q3 2019).

Cryptocurrency has characteristically high volatility which raises questions about the sufficiency of using that as collateral. One way to protect against high volatility is to require over-collateralization, which is what Genesis Capital did in their structure by requiring a high loan-to-value, of between 50 and 80%. For example, borrowing $100 against Bitcoin, at a loan-to-value of 70% would require a deposit of $170 work of Bitcoin collateral. But, using over-collateralization as a means to counter high volatility, implicitly rely on a liquid market for cryptocurrency so that lenders and borrowers can freely trade should margin calls arise. Should the price of Bitcoin decrease to the point where loan-to-value is below the required ratio, the borrower would have to add more Bitcoin collateral, or the lender would need to have a systematic solution in place to sell the collateral.

The 2020 COVID-19 pandemic presented a natural stress test for digital lending. In March 2020 the global market conditions were uncertain and

volatility, including volatility for cryptocurrencies spiked. Digital asset lending however continued to grow, during the first quarter of 2020, Genesis Capital had over a billion in $1B in active loans outstanding while experiencing no defaults, capital losses, or delinquencies at any point over the period (Genesis Capital Q1 2020).

Short-term lending would allow arbitrageurs to capitalize on short-term price dislocations in the cryptocurrency markets but as the cryptocurrency-backed lending matures the potential use cases are also expanding.

11.5 Conclusion

While digital structured products are still in their infancy, there is a growing interest in these products in particular from investors searching for higher-yielding assets in a low-interest-rate environment. Structured digital products such as Arca U.S. Treasury Closed-End Fund or the Genesis Capital cryptocurrency-backed lending are grounded in traditional financial principles enhanced with the efficiency of the blockchain. Others are novel applications of innovative blockchain technology, such as the Ethereum smart contract in the cryptocurrency-backed Dai stablecoin.

Notes

1. https://grayscale.co/bitcoin-investment-trust/#market-performance.
2. https://dailyfintech.com/2019/11/11/innovative-crypto-structured-products-the-shortlyci-case/.
3. https://arcoin.arcalabs.com/arca-offers-the-first-sec-registered-fund-issuing-digital-securities.
4. The distinguishing features of closed-end funds are from the SEC Closed-End Fund Information, https://www.sec.gov/fast-answers/answersmfclosehtm.html.
5. This section draws heavily from information on the ArcCoin website, https://arcoin.arcalabs.com/faqs.
6. Stablecoins are discussed in more detail in Chapter 20.
7. https://www.reddit.com/r/MakerDAO/comments/5q98b1/%E8%B2%B8_dai/.
8. https://community-development.makerdao.com/makerdao-mcd-faqs/faqs/vault.
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10. Coinmarketcap, https://coinmarketcap.com/currencies/multi-collateral-dai/historical-data/?start=20130428&end=20200920.
11. https://community-development.makerdao.com/makerdao-mcd-faqs/faqs/dsr.
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Otieno, Nicholas. July 8, 2020. "Arca Digital Asset Investment Firm Gets Approval from SEC to Tokenize US Treasury Bonds," *Blochchain News*.