Sherwin Dowlat
Sherwin@satisgroup.io
Michael Hodapp
Michael@satisgroup.io

SATIS GROUP

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CRYPTO ASSET MARKET COVERAGE INITIATION: TRADING & CUSTODY
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Overview

As investors continue to learn about the cryptoasset market class, two of the biggest areas of uncertainty have thus far been 1) trading – how to acquire and exchange the assets, and 2) custody – how to securely store the assets.

While there is largely a solid market for consumer trading and custody, these products do not always meet the needs of institutional investors, whose solutions must meet higher burdens relative to security and regulatory compliance.

In this report, we will provide a breakdown of the current landscape for 1) exchanges, 2) OTC providers, 3) consumer custody and 4) institutional custody solutions.

Key Takeaways

- **We expect crypto trading volume growth of +50% through 2019,** and a 9% CAGR through 2028

- **Crypto trading volume is set to overtake U.S. Corporate Debt trading volume this year,** and is on track to be ~10% of U.S. Equity trading volume

- **We estimate exchange trading fee growth of 50%+ this year,** from $2.1B last year to well over $3B in 2018

- **The top 20 exchanges account for over 75% of total crypto market trading volume**

- **BTC is the base pair for ~1/3 of global crypto volume,** USDT 22%, ETH 12%

Name	Price	ATH	% from ATH	Days Since ATH
BTC	$6,270	$20,089	(69%)	274
ETH	$197.86	$1,432	(86%)	247
XRP	$.273	$3.84	(93%)	256
BCH	$420.06	$4,330	(90%)	271
EOS	$4.90	$22.89	(79%)	141
LTC	$52.34	$375.29	(86%)	272

* Refers to Market Capitalization estimate, calculated using 2050 estimated supply using respective network inflation schedules

Name	Market Cap ($MM)		30D % G/L	90D % G/L	52-Wk % G/L	Launch Year
	Current	2050 Implied*				
BTC	$108,304	$131,567	(3%)	(7%)	45%	2009
ETH	$20,186	$29,081	(35%)	(62%)	(30%)	2015
XRP	$10,874	$27,316	(19%)	(50%)	38%	2013
BCH	$7,290	$8,814	(27%)	(53%)	(2%)	2017
EOS	$4,438	$7,150	(6%)	(54%)	643%	2018
LTC	$3,053	$4,390	(10%)	(47%)	(4%)	2011

* Refers to Market Capitalization estimate, calculated using 2050 estimated supply using respective network inflation schedules.

This is the final of our five-piece series initiating coverage on the cryptoasset universe.

Our prior notes can be found here:
Valuation
Market Composition
**Network Creation**
Technical Underpinnings

PLEASE SEE LAST PAGE FOR IMPORTANT DISCLOSURES

As the market has matured, more exchanges have opened in a number of jurisdictions. Liquidity has remained highly concentrated amongst a small fraction of operators, with the top 20 exchanges accounting for over 75% of total crypto market trading volume.

Fundamentally, exchanges can be broken down by architecture into two main categories: decentralized exchanges (DEX) and centralized exchanges (CEX). Within each, trading support can be bucketed into: fiat exchanges (that accept fiat currency deposits, like USD, KRW, JPY, EUR) and crypto exchanges, which support crypto-to-crypto trading only. Most DEX's do not allow fiat trading, consequently allowing CEX's to hold majority of market trading volume share.

Figure 1: Exchange Market Share

DEX, 0.2%

CEX, 99.8%
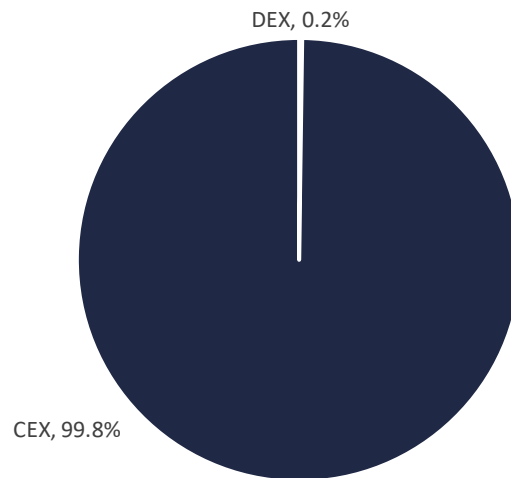
Source: Satis Research, Coinmarketcap

Decentralized Exchanges (DEX)

Though most exchanges, as well as the bulk of trading and liquidity, are centralized – meaning they are operated on servers controlled by a company - there has been much investment and development into Decentralized Exchanges (DEXs). A DEX is designed to operate in a trustless manner, with no centralized authority for settlement – though some aspects, such as the order book, may still be centrally operated. Trades are facilitated between users using smart contracts which are executed and recorded on the blockchain (Ethereum, WAVES, etc.). While there are a number of decentralized exchanges actively trading and others in various stages of development, they have not yet reached parity with traditional exchanges in terms of ease-of-use, liquidity, confirmation times, and community adoption. Although DEX volume remains a small fraction of overall crypto market volume, over the next 5-10 years we expect decentralized exchanges to become increasingly competitive with centralized exchanges as user interfaces/experience improve and liquidity increases.

Figure 2: Select DEX Profiles (General)

	Pairs Supported	Launch Date	Volume (24 Hr)	Volume (7d)	Volume (30d)	Ranking (All Exchanges)
iDEX	424	Sep-17	$2,029,833	$12,215,058	$67,447,535	95
ForkDelta	70	Jan-18	$213,654	$2,301,336	$7,799,138	131
Waves DEX	65	Apr-17	$178,676	$3,348,138	$11,013,414	148

Source: Satis Research, Coinmarketcap

iDEX: First launched in beta in September 2017, IDEX is a decentralized exchange built upon the Ethereum network and supporting 424 pairs. While the smart contract handles custody of funds, trade, and settlement, centralized servers currently manage certain aspects.

ForkDelta: ForkDelta is a community driven alternative that was forked from EtherDelta in January 2018, after the early decentralized exchange lost community support.

Waves DEX: The Waves DEX was launched in April 2017 and operates on the Waves (WAVES) Platform. Waves is known for having a relatively friendly user interface, active development community, and allowing users to build their own cryptoassets on its platform.

0x Protocol: Though not an exchange in itself, 0x is designed to facilitate the transfer of assets built upon Ethereum. 0x can be thought of as the foundational layer that can be utilized by any project – decentralized exchange or other application – that desires to allow the exchange of a wide variety of Ethereum based assets. With a number of projects sharing the same base protocol, higher levels of liquidity and network effects are created.

Centralized Exchanges (CEX)

Centralized exchanges allow users to deposit funds (meaning the funds are held in the custody of the exchange) and exchange a variety of cryptoassets, and in some cases, fiat (typically USD, JPY, KRW, EUR). Exchange revenue is heavily weighted towards trading fees, although they also make money on new cryptoasset listing fees and withdrawal/deposit fees. Exchanges will generally charge a maker and/or taker fee, as a percentage of the total funds exchanged (usually in the range of 0-0.3%). Compared to DEX's, a CEX offers higher liquidity and ease of use, with the caveat being that funds are held in the custody of a third party (the exchange) throughout the process and expose the user to counterparty risk. Some services, such as ShapeShift, act as an intermediary – allowing users a simple option to trade one cryptoasset for another, without advanced trading tools and without the need to custody the user's funds, although they are not decentralized (DEX) and are a centralized entity.

Exchange volume rankings vary, with foreign exchanges often popping up with fake volume (often with no fees and heavy wash trading) to pump up numbers and visibility. Below, we've profiled a select group of well-known exchanges.

Figure 3: Select CEX Profiles (General)

Exchange	Funding	Pairs	Margin	AML/KYC	Launch	Location
Bitmex	Crypto Deriv's	7	✓	✗	November 2014	Republic of Seychelles
Binance	Crypto-Only	380	✗	✓	July 2017	Malta
OKEx	Crypto-Only	507	✓	✓	January 2014	Belize, Malta
Huobi	Crypto-Only	275	✓	✓	September 2013	Singapore
Bitfinex	Fiat/Crypto	82	✓	✓	October 2012	Hong Kong
HitBTC	Fiat/Crypto	775	✓	✓	February 2014	Hong Kong
Bithumb	Fiat/Crypto	41	✗	✓	June 2016	South Korea
Coinbase Pro	Fiat/Crypto	15	✗	✓	May 2014	USA
Bittrex	Fiat/Crypto	285	✗	✓	February 2014	USA
Poloniex	Crypto-Only	111	✓	✓	January 2014	USA
ShapeShift	Crypto-Only	1,000+	✗	✓	August 2014	Switzerland

Source: Satis Research, Coinmarketcap, Company Publications

Figure 4: Select Exchange Profiles (Regional, Security)

| Exchange	Regions Excluded	Security incidents
Bitmex	USA, Québec (Canada), Cuba, Crimea and Sevastopol, Iran, Syria, North Korea, Sudan	--
Binance	--	--
OKEx	USA (and all territories), Hong Kong, Cuba, Iran, North Korea, Crimea, Sudan, Malaysia, Syria, Bangladesh, Bolivia, Ecuador, and Kyrgyzstan	--
Huobi	--	--
Bitfinex	USA, Cuba, North Kore, Iran, Syria, Pakistan, Venezuela, Crimea	August 2016: 120k BTC stolen August 2016: 36% haircut across all accounts to cover loss August 2016: Debt token "BFX" issued in exchange for loss April 2017: Loss repaid in full to customers
HitBTC	--	--
Bithumb	All regions outside of South Korea	June 2018: $30M stolen
Coinbase Pro	All regions outside of US, Europe, UK, Canada, Australia, and Singapore	--
Bittrex	North Korea, Iran, Crimea, Syria, and Cuba	--
Poloniex	New Hampshire, New York, Washington, More Countries	March 2014: 77 BTC stolen
ShapeShift	New York, Washington, Cuba, Crimea, North Korea, Syria, and Iran.	March/April 2016: $230,000 stolen, no customer funds affected

Source: Satis Research, Coinmarketcap, Company Publications

Figure 5: Select Exchange Profiles (Volume)

| Exchange	Volume (24 Hr)	Volume (7d)	Volume (30d)	Ranking (All Exchanges)
Bitmex	$2,260,260,124	$18,504,066,048	$92,169,072,384	1
Binance	$876,218,217	$5,903,365,056	$32,309,851,776	2
OKEx	$732,563,694	$5,265,509,760	$27,059,448,384	3
Huobi	$529,787,152	$3,476,090,528	$20,103,853,728	4
Bitfinex	$366,680,293	$2,724,266,784	$14,188,508,432	5
Bithumb	$318,051,270	$2,238,254,816	$7,779,424,912	6
HitBTC	$291,721,101	$1,599,759,104	$7,792,861,360	7
Coinbase Pro	$121,243,508	$858,811,264	$3,958,070,820	14
Bittrex	$55,084,047	$277,978,428	$1,436,372,412	25
Poloniex	$44,713,961	$248,630,394	$1,130,397,965	28

Source: Satis Research, Coinmarketcap, Company Publications

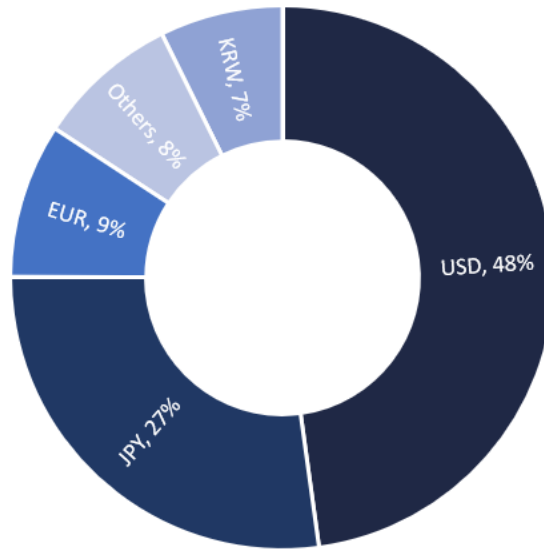**Figure 6: Volume (30D) by Exchange, Share of Top 100**
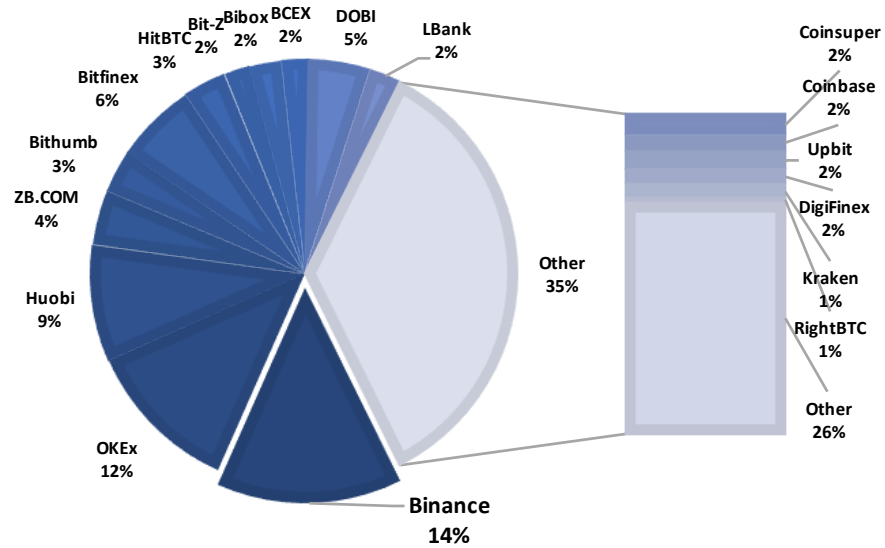
Source: Satis Research, Coinmarketcap

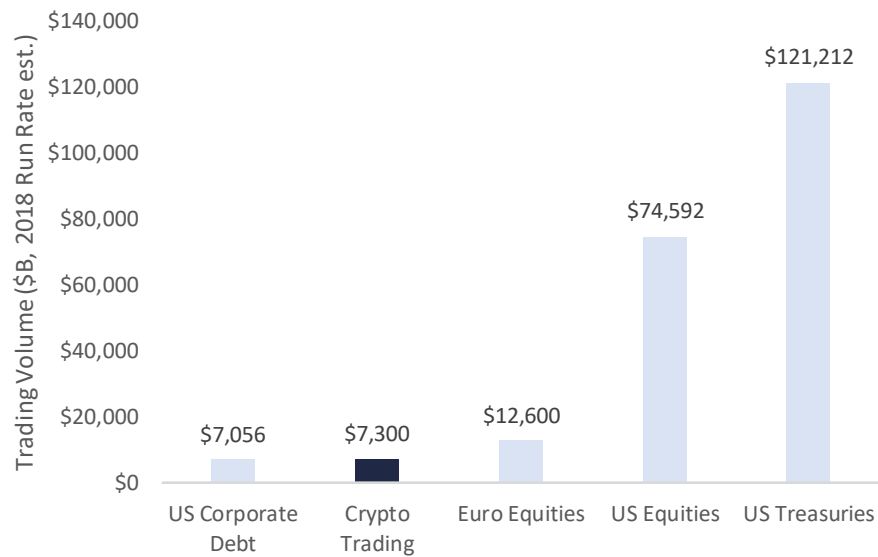**Figure 7: Volume (30D) by Cryptoasset Pair, Share of Total Volume**
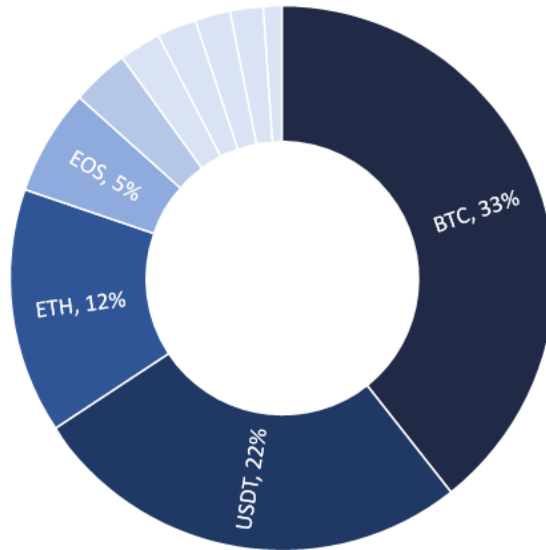
Source: Satis Research, Coinmarketcap
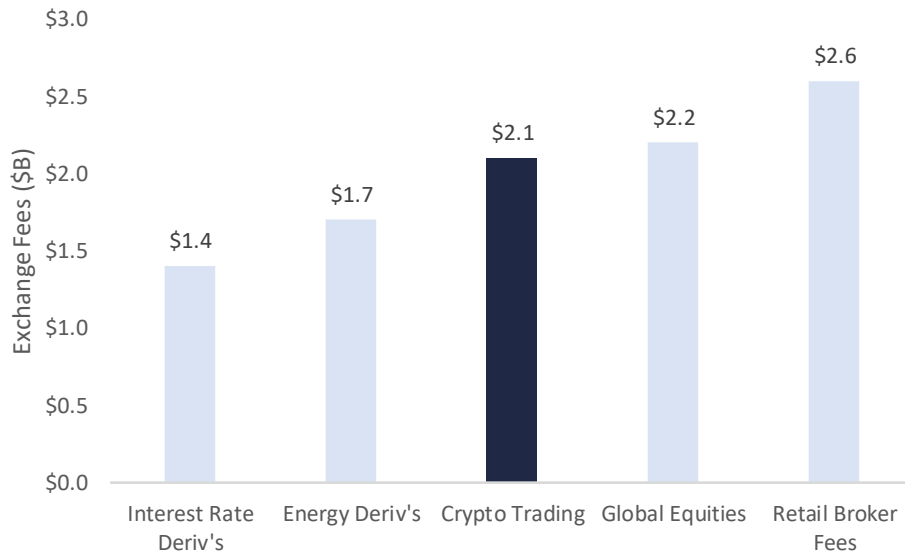
Figure 8: Volume (30D) by Fiat Pair, Share of Bitcoin Volume

KRW, 7%

Others, 8%

EUR, 9%

USD, 48%

JPY, 27%

Source: Satis Research, Coinmarketcap

Figure 9: Volume Comparison, 2018 (Est.)

Source: Satis Research, CBOE, SIFMA, FESE

Figure 10: Fee Comparison, 2017

Source: Satis Research, Company Filings, FIA, CME

Figure 11: Fee Schedule

Exchange	Maker/Taker Fees (bps)
Bitmex	3.5/5.5*
Binance	8.75/10
OKEx	9/12.5
Huobi	20/20
Bitfinex	10/20
Bithumb	4.25/4.25*
HitBTC	5/5
Coinbase Pro	0/30
Coinbase	149/149
Bittrex	25/25
Poloniex	0/20
ShapeShift	--/50

Source: Satis Research, Company Publications
* volume weighted average fee, est.

In our last report (pg. 5), we forecasted crypto trading volume growing from an estimated $7.3T in 2018 to $17.8T in 2028 (CAGR of ~9%). Assuming blended fees based on volume of the top 20 exchanges by size, we estimate over $2.1B in trading fees gathered last year across global exchanges. We estimate this number to grow to well over $3B in 2018, aided by: 1) trading support from larger exchanges, 2) increasing institutional participation, and 3) growing retail adoption through developing inlets such as mobile apps, with fees slightly outpacing volume growth driven by higher fee regions like the U.S.

OTC Providers

For those seeking to buy or sell large positions (ranging from $100,000 to $100,000,000+), a number of OTC desks now offer significant levels of liquidity, without imposing the risk of causing a major price swing on a conventional exchange. A majority of OTC crypto transactions are facilitated manually, with Skype being a popular means of communication. While there are dozens of OTC trading providers, ranging from one-man shows to full-fledged, regulated desks – we have listed a handful of the most well-known.

Figure 12: Select OTC Desk Profiles (General)

Desk	# of Assets	Minimum trade	Monthly Volume	Fees	Launch
IBC Group	3+	--	--	--	2018
Jump Trading	--	--	--	--	2018
Galois Capital	70+	$100,000	--	Baked into spread	2018
Kraken	17	$100,000	--	Baked into spread	2015
Cumberland Mining	30 - 35	$100,000	--	Baked into spread	2014
BitStocks	3	£5,000	N/A	--	2014
Circle Trade	--	$500,000	$2b+	--	2013
ItBit	5	$100,000	--	Flat Rate	2013
Genesis Trading	7	$75,000	--	Baked into spread	2004

Source: Satis Research, Company Publications/Personnel

Local Exchange

In addition to the exchanges listed above, there are also platforms and services which enable users to **trade crypto locally (similar to Craigslist)**, namely LocalBitcoins.com, with participants in over 16,000 cities and nearly 250 countries.

Figure 13: LocalBitcoins Volume

Source: Satis Research, Coindance

ATM Exchange

Additionally, **crypto ATM machines** are present across 3,700+ sites and 75 countries, with nearly 500 independent operators who control the (typically higher than exchanges) machine fees.

Figure 14: Global Crypto ATM Map
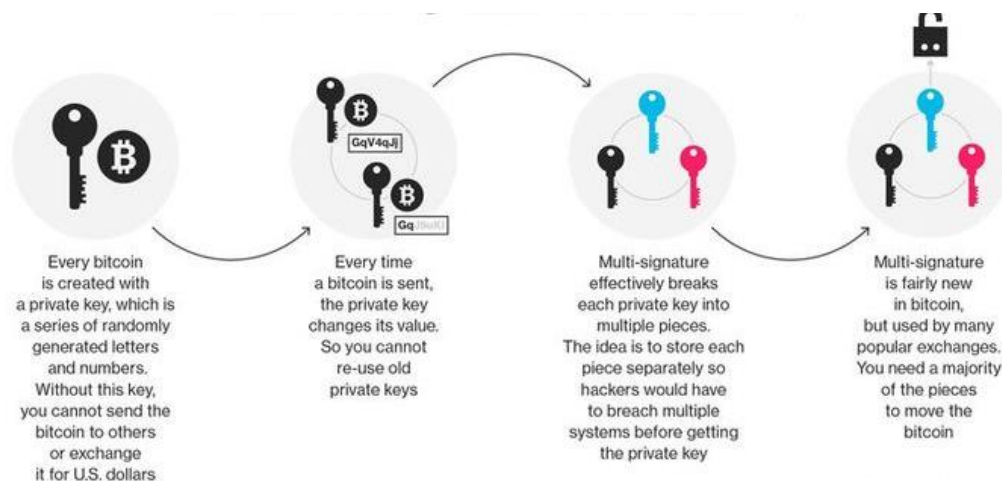

Source: Satis Research, CoinATMradar

Consumer Custody

All cryptocurrencies, from Bitcoin to Ethereum, have one thing in common - assets are stored in addresses/wallets, with every address being connected to a unique "private key" that grants a user access to that wallet. At their core, all cryptocurrencies rely on Public Key Cryptography, in which a user can sign (approve) a transaction with their private key without revealing that private key to any third party.

There are two basic types of wallets: **single signature**, as well as **multisignature** (multisig).

- A **single signature** wallet, as the name implies, requires only one private key to access the assets and approve a transaction.

- A **multisig** wallet, on the other hand, can be created using *n* number of keys, with a transaction requiring all, or a portion of the keys, to be used to authorize the transaction.

Figure 15: How Multisig Security Works

Every bitcoin is created with a private key, which is a series of randomly generated letters and numbers. Without this key, you cannot send the bitcoin to others or exchange it for U.S. dollars.

Every time a bitcoin is sent, the private key changes its value. So you cannot re-use old private keys

Multi-signature effectively breaks each private key into multiple pieces. The idea is to store each piece separately so hackers would have to breach multiple systems before getting the private key

Multi-signature is fairly new in bitcoin, but used by many popular exchanges. You need a majority of the pieces to move the bitcoin

Source: Bloomberg

These wallets are referred to as "*m of n*", where a "*2 of 3*" wallet would have *3* private keys and require the authorization of any *2* of those keys to approve a transaction. Multisig wallets ensure that, given keys are stored separately and access is properly controlled, no one person can authorize a transaction, and a wallet is not lost permanently if one key is lost or destroyed. Multisig wallets are supported natively by the Bitcoin network. Ethereum requires specialized third-party implementations, adding to the risk of bugs that have the potential to lead to loss of funds – with the most well-known example being the Parity Wallet (hacked not once, but twice).

When considering consumer custody implementations, there are three general options: software & web wallets, hardware wallets, and exchange wallets. Each solution carries its own set of trade offers regarding ease of use and security.

Exchange wallet: A wallet built into an exchange (e.g. Coinbase), where a user's crypto holdings are stored by the cryptocurrency exchange. This allows users a high level of flexibility to trade for alternative currencies offered by the exchange, but is amongst the least secure options as the user must fully trust a third-party service to securely hold their assets. In recent years, there have been multiple significant breaches resulting in loss of users cryptoasset holdings, most notably the Mt. Gox failure, when 850,000 BTC went missing in 2014. In addition to breaches of exchange infrastructure itself, users can also fall victim to phishing schemes (where a third-party gains access to their login credentials), and SIM card attacks (where a malicious actor uses social engineering to take control of their phone number, defeating 2-factor authentication.)

Software & Web wallets: A step up in security compared to an exchange wallet, a software or web wallet is the simplest way for a user to individually control their assets, without relying on a third party for custody. Software wallets are available on a variety of platforms including PC, Mac, Android, and iOS. Importantly, while most mainstream crypto wallets are reasonably secure and built with open source code open to the scrutiny of the community, users must also be comfortable that their device itself is secure - as a computer infected with malware has the ability to compromise the user's private key. Due to the inherent difficulty of guaranteeing security on a device, software wallets are only suitable for holding or exchanging small quantities of assets; sizeable holdings and trades should be conducted using a hardware wallet. A "seed phrase", typically a collection of 12-24 random words in a certain order, can be used to restore a wallet in the event access to the wallet is lost.

> **MyEtherWallet (Web):** Amongst the first wallets to support Ethereum, MyEtherWallet (MEW) is an open source web wallet that supports Ethereum (ETH) as well as any Ethereum standard tokens. As a web wallet, MEW simply serves as a method of interacting with the blockchain – it does not store user assets itself. Users have reported that MyEtherWallet has been targeted multiple times, including where users were redirected to an imitation website, and another occasion when the wallet was targeted by a malicious version of the Hola VPN app.

> **Electrum (Software):** An open software wallet available on Windows, OSX, Android, and Linux, Electrum is often recommended for its ease of use, speed, and innovative features. Features include two-factor authentication, multisig wallet support, and an invoicing feature for requesting payments. The wallet has a good security record, though a

vulnerability patched in January 2018 could have allowed hackers to steal funds had a user visited a malicious website while running a non-password-protected wallet.

Jaxx (Software): A software wallet available on multiple platforms and popular due to its support of more than 65 currencies, including Bitcoin, Bitcoin Cash, Ethereum, Ethereum Classic, and many Ethereum-based tokens. A unique feature is built-in Shapeshift integration, which allows users to quickly exchange their assets. Because of its ease of use, Jaxx is popular amongst beginners. Hacks have occurred when user's devices have been compromised, with one widely publicized incident leading to the theft of ETH valued above $300,000.

Exodus (Software): A desktop only software wallet that supports over 80 assets, Exodus also integrates with the ShapeShift exchange service. As with other software wallets, Exodus is vulnerable to key extraction attacks on compromised systems.

Figure 16: Seed Phrase via Software Wallet (Example, Electrum)
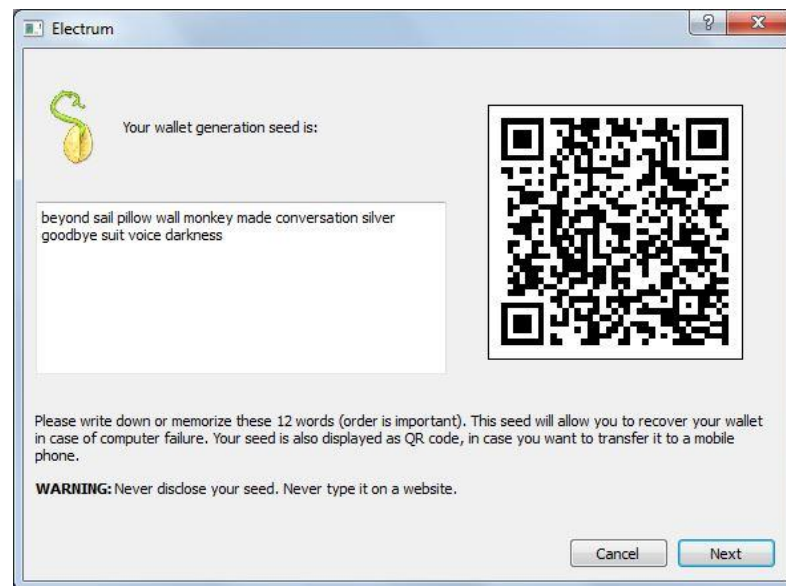
Source: Sovereign Bitcoin

Hardware Wallet: Generally, the **most secure** choice for consumer custody, hardware wallets are dedicated, physical devices that connect to a computer (typically over USB) and store the user's private key on a secure chip. The private key stays on the hardware wallet at all times, which makes trading on a computer that is compromised safer, as the user does not have to directly input their private key. Like software wallets, hardware wallets typically support a Seed Phrase – meaning that a user can recover their funds in the event the wallet is lost or stolen.

Ledger Nano S: Supporting 48 coins and hundreds of ERC-20 tokens, the Ledger Nano S is currently the most popular hardware wallet on the market.

Trezor: The first Bitcoin hardware wallet, the Trezor has remained popular in part due to a fully open-source design. It currently supports 14 coins plus hundreds of ERC-20 tokens.

KeepKey: Released in 2015, the KeepKey supports a total of 7 coins and dozens of ERC-20 tokens.

Figure 17: Hardware Wallet (Example, Ledger Nano S)

Source: Ledger

Above all, all consumers attempting to self-custody assets should take reasonable security precautions considering the nature of the asset, particularly holding high value hardware wallets or private keys to software wallets in a secure location remote from their primary residence, and where appropriate, seeking specialized security advice.

Institutional Custody

While hardware wallets are generally more than adequate for consumer custody, they do not meet the needs of most institutional investors, who often prefer – and are sometimes required by law – to have their assets stored by an independent third party.

Most institutional custody providers use varying methods of the same fundamental method of storage; cold storage. The irony of cold storage is it takes digital assets and converts them essentially into bearer bonds, a class of asset that originated during the Civil War. The less accessible they are to the owner, the less accessible they are to would-be thieves.

In the early days of blockchain development, cold storage worked well. It was the most obvious answer to crypto asset storage, in light of the modern uneasiness that arose from rampant cybersecurity breaches. Storage of private keys deep in the side of a mountain keeps it out of reach, and away from exposure.

However, in recent years, two things have happened:

- **Trading activity has soared**. Frequent, rapid access to funds is a critical survival requirement for many crypto investors.

- **Passively holding assets is increasingly penalized**. As cybercriminals intensify attacks on protocols, project creators have turned to participative crypto-economics to secure their networks. Inflation pools, staking gains, and other mechanisms increasingly incentivize active participation in networks. Being inactive carries the risk of losing 1-7% in value every year.

Anchor Labs has come out with the first **"crypto native"** solution, where digital assets are accessed without human touch. Crypto native solutions interact directly with blockchains, in an asynchronous, on-demand manner (effectively offline until necessary). This means speed possibilities are far and above that provided in cold storage, and security is not reduced down to a person holding a key in his/her hands. It also means that active participation in networks is possible, resulting in increased asset yields. Some investors believe that at some point LPs will consider non-participation a breach of fiduciary duty. Safety of assets comes from verifying the intent of the organization through time-tested security designs, rather than verifying that someone holds a particular key (or a group of individuals, in the case of multi-signature signing). Third party institutional custody ultimately is not about checking that someone holds the key to the vault, but proving that the organization intends for its assets to move.

Mistakes can happen when touching sensitive private key material, and they have happened within servers and exchanges that relied on cold storage. Depending on fallible humans to follow complex protocols, time after time, works a majority of the time - except when it doesn't.

For these reasons, we believe this discrete alternative in custodial technology will be a compelling differentiator in the space.

Figure 18: Custodial Offering Profiles (General)

Provider	Technology	Chains Supported	Launch	Live	Fees
Prime Trust	Cold Storage	2+	Aug-18	Yes	.05-.1% per month
Ledger	Cold Storage	17	May-18	Yes	--
DACC	Cold Storage	10+	Feb-18	Yes	--
Anchor	Crypto-Native	4+	Oct-17	No	--
Gemini	Cold Storage	3	Oct-15	Yes	0-.964% annually, minimum $100,000 annually
Xapo	Cold Storage	1	Mar-14	Yes	Free
BitGo	Cold Storage	8+	Jul-13	Yes	--
Coinbase	Cold Storage	5+	Jun-12	Yes	$100,000 set up, .1% monthly
itBit	Cold Storage	5+	Apr-12	Yes	--
Kingdom Trust	Cold Storage	9+	Jan-10	Yes	$20/month + .07%/month

Source: Satis Research, Company Publications/Personnel

Additionally, a frequently asked element of institutional custody offerings is insurance. Generally, insurance availability on assets in custody has varied, with some providers offering no insurance, and others offering insurance that covers only a portion of assets in certain scenarios. Recently, Kingdom Trust, who holds $12B assets in custody, announced that they have secured insurance through Lloyds of London, a sign that this market may grow as insurers gain a better understanding of the technology and risk levels involved.

Conclusion

As the cryptoasset space has continued to mature (with new consensus algorithms, scaling solutions, and technologies that make crypto more useful and accessible to the general public), the solutions that facilitate widespread trading, adoption, and investment have continued their expansion in parallel.

Despite the prolonged bear market, **investment in the ground level foundation continues unabated**. With evolving understanding of the fundamentals of the market, increased regulatory certainty in the US and abroad, and fiscal policies that continue to make alternative assets more attractive, the crypto market's underlying infrastructure is continuing its expansion.

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