

An institutional approach to the custody of crypto assets: The decision making and trade-offs in crypto asset custody

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ABSTRACT

The rapid emergence of new asset classes causes many challenges that professional and institutional investors face while considering allocating funds to these assets. With the new asset class — in this case, crypto assets — challenges are often related to regulation and technological implementations. The custody of crypto assets fundamentally differs from how traditional assets — such as equities — are kept safe and sound. Because of this, it is crucial to understand the fundamental difference of crypto asset custody as institutional adoption arises and clarify different strategic, operational and regulative trade-offs between other solutions. This paper discusses different solutions for crypto asset custody and their perceived trade-offs. As the industry and the need for trust grow, it is crucial to have proper and clear regulation frameworks and operating environments for reliable custodians to thrive. To further clarify perceived trade-offs and requirements, one alternative investment fund from the Nordics was interviewed. From the interview, a few simplified assumptions were created related to the decision process of crypto asset custody solution, which institutional actors might need to consider. In addition to various strategic and operational requirements, one of the essential factors in choosing a custody solution for institutional actors (ie in the Nordics) may be the local laws and regulations related to the field of crypto assets. Local regulations

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may force institutional actors to rely on third-party solutions, which may have different trade-offs compared to other solutions.

Keywords: *crypto assets, digital assets, custody, institutional investors*

INTRODUCTION

Institutional investors, advisers and service providers engage in a new asset class called crypto or digital assets. Crypto assets have made headlines as a fast-growing asset class with high volatility. Part of the reason for the general interest may be the idea of quick and large profits. This is not the way some institutional investors approach Bitcoin and crypto assets. For them, it is about diversification, risk management and alternative investment thesis, as crypto assets are primarily perceived as digital gold (Bitcoin) and/or technology plays (crypto).

However, along with the historically high returns of crypto assets, there has also been significant downside volatility, as shown in Figure 1, which presents Bitcoin's historical market price. Although crypto assets — at least for now — are high-volatility assets compared to traditional ones, they can have various benefits from the portfolio management perspective. If properly utilised, they can improve the risk–return profile of the portfolio¹ and even provide a hedge against different kinds of tail risks.²

However, the emergence of crypto assets brings out one crucial aspect which should be considered appropriately: the reliable custody of crypto assets. The need for secure and reliable custody or control of crypto assets on behalf of others is of paramount importance. For many years, as professional and institutional interest in crypto assets has increased, many institutional investors have pointed out that crypto asset custody is one of the most pressing concerns.

Several hacks, exploits and other forms of cybersecurity-related incidents have been unfortunate. Still, a familiar part of the

landscape and various incidents have plagued the crypto asset space since the inception of Bitcoin in 2009, when its pseudonymous creator Satoshi Nakamoto bootstrapped the network.

Securities operations and custody professionals must understand the nature of open, trustless and permissionless blockchains and their native assets as they become more mainstream and adoption increases. Crypto assets are fundamentally digital bearer instruments. Therefore, if something catastrophic happens, there needs to be more the ill-prepared can do to reverse transactions or re-access the crypto assets as they are stored as ledger entries in the blockchain.

Robust and antifragile custody functions, in-house or otherwise, are crucial for the continued adoption and potential growth of crypto asset markets. Therefore, the rise of crypto asset custodians is a significant step forward in institutionalising the nascent asset class. Furthermore, the importance of crypto custody providers is expected to increase as the diversity of crypto assets and, more importantly, digital assets, grows. In addition, use cases for these assets will be likely to increase in various ways, and as some of those use cases are risky and complex, safe, secure and sound custody is of utmost importance.

This paper examines the current crypto asset custody regarding potential trade-offs between security, efficiency and reliability.

CRYPTO ASSETS AND CUSTODY

A crypto asset simply refers to a digital representation of value in the blockchain protocol. The value is usually expressed as a form of blockchain native units such as different types of tokens and cryptocurrencies.⁴ The rapidly growing demand for crypto assets is also fuelling the need for proper custody solutions for safeguarding the use of these assets. Custody solutions, for example, increase the availability of crypto assets by importing confidence for users and investors

Bitcoin: Price [USD]

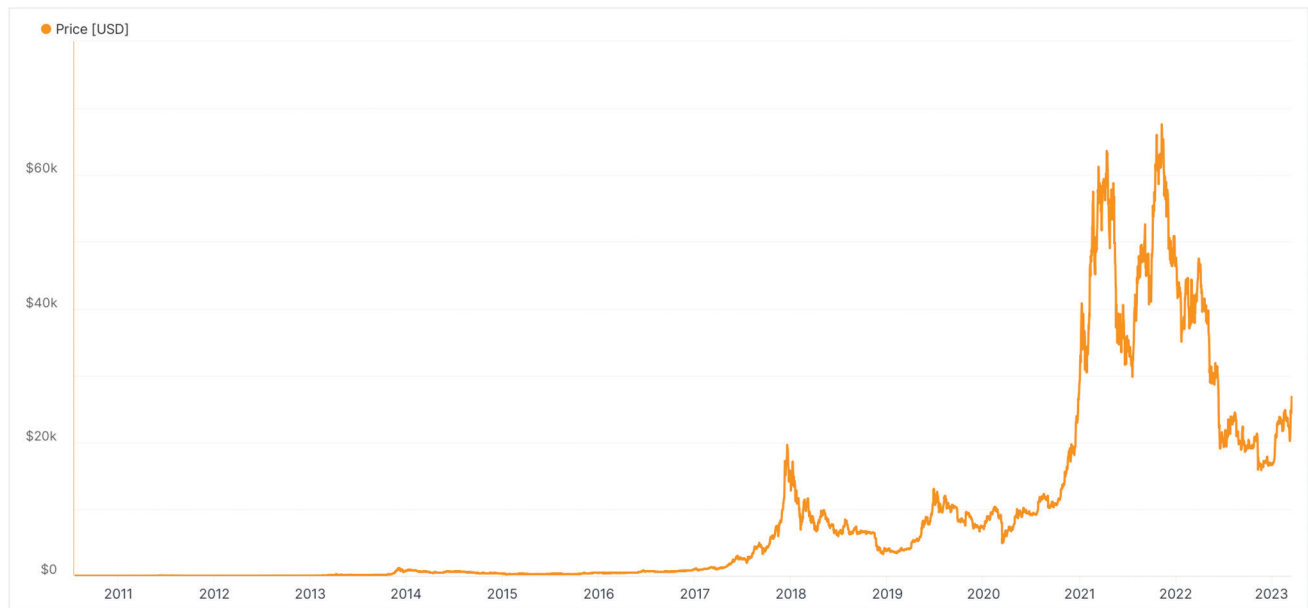


Figure 1 Bitcoin's market price (US\$) from 17th July, 2010 to 18th March, 2023³
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that their private keys for funds are kept safe. Thus, well-functioning and reliable custody solutions are the key to the broader adoption of, and demand for, crypto assets.⁵

Crypto asset custodians do not store or hold any crypto assets, to be precise. However, these actors are responsible for safeguarding their clients' private keys and deciding whether to accept or decline any transactions prompted by these private keys. Private keys are used to sign addresses' transactions; in other words, the ability to use the funds lies with the owners of the private keys. Proper private key management is crucial because private keys can be lost or forgotten. In some unfortunate cases — such as the death of the private key holder — the inheritance of crypto assets is not possible if there is no access to the private keys.⁶

To further complicate matters, there are various ways to store and manage these precious, unique private keys, as there are different signing devices (also known as wallets) to ease the storage of private keys.

There is a distinction between cold, warm and hot wallets. Hot wallets are connected to the Internet, so the main trade-off is security for liquidity, automation and convenience. On the other hand, cold wallets are not connected to the Internet at all. Consequently, they are more challenging to access and operate but provide the best level of security if managed correctly and prudently. On the other hand, warm wallets are very similar to hot wallets, but they offer better protection and more robust access control measures.

Institutions, whether crypto-native or not, tend to use a mix of various wallet solutions to maximise the utility of their crypto storage solution. Crypto custodians offer a broad scope of solutions, from straightforward private key protection to full-suite technology solutions enabling non-custodial setups.

There are various forms of custodial arrangements; in most cases, these are some type of direct custody or sub-custody. In any

case, where a third party is, in some form or another, responsible for the private key management, the client assumes at least some residual counterparty risk. These custodians offer quality customer service and a wide range of value-add services. In some jurisdictions, these operators are also regulated on the state or federal level. At the same time, to minimise undue risks, their offerings also tend to be limited, and asset selection and support are narrow. Therefore, institutional clients relying on high-frequency trading or complex trading strategies might be better served by a more pure-play crypto custody technology company instead of a custody service provider.

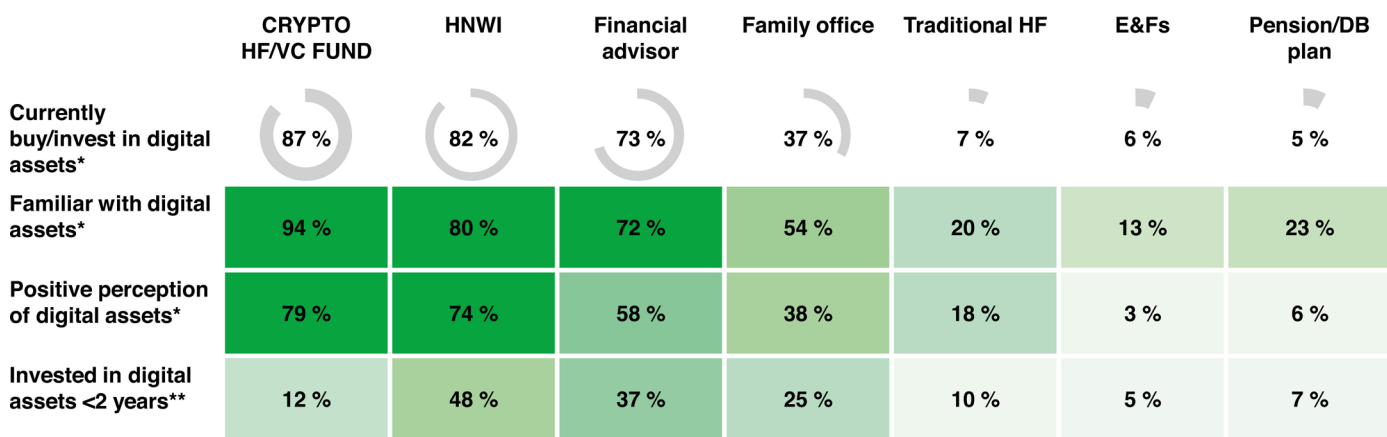
The rise of crypto custody technology players has been swift. Pure technology providers introduce new forms of risks as the client is ultimately responsible for safeguarding and protecting the private keys. However, at the same time, these technology companies offer a wide range of supported assets and access to various services, such as decentralised finance and staking. They often have some unique features, such as an off-chain settlement network for clients.

Generally, the two top categories of crypto asset custody are *self-custody* and *third-party custody*. Self-custody — as the name suggests — means that the crypto assets are held by the owner of these assets who also has custody of them. The owner is entirely responsible for these assets (see: private keys), and no third parties are involved in the decision making and risk management. Self-custody is often used for such persons and entities that require complete control of their funds (eg in the field of trust or for other practical reasons). Self-custody can be implemented, for example, with the previously presented solutions such as cold wallets, hot wallets etc. The most trivial type of self-custody is to store your private keys in some form, such as in a paper (paper wallet). Third-party custody means that a third party manages the private keys of

funds either entirely or together with the owner of funds. These kinds of custody solutions can be implemented differently, but custodians often use other multi-signature wallet and platform solutions.⁷ Such solutions include, for example, exchange-based wallets (funds are stored in the crypto exchanges or their platform wallets) and various wallet-as-a-service solutions.

INSTITUTIONAL ACTORS IN THE CRYPTO ASSET SPACE

In recent years, crypto assets have made headlines with countless news stories regarding euphoria and market rallies. As crypto assets become more common and widely adopted, institutional actors have become even more interested in this emerging asset class phenomenon. Although the year 2022 has been unfortunate for the entire investment industry regarding macroeconomic and geopolitical situations, it is fair to say that crypto assets are not disappearing anywhere — not even from the view of institutional investors. According to a survey conducted from 2nd January, 2022 to 24th June, 2022 by Fidelity Digital Assets,⁸ despite the market turbulence, institutional investors' knowledge and overall interest in crypto assets have grown, especially in the USA and Europe. For example, in the USA and Europe, familiarity with crypto assets and investment activity has grown, and the perception of crypto assets has improved. According to Fidelity Digital Assets, at the moment, Europe and Asia are generally on par in terms of institutional adoption, but the USA is behind them. According to the survey respondents, approximately 81 per cent of the respondents feel that digital assets have their place, to some extent, as part of the investment portfolio. From the perspective of the institutional investors who responded to the survey, the most attractive features of digital assets can be found in, eg



* Total base: 1052

** Total base: 883

Figure 2 Findings of Fidelity Digital Assets' 'Institutional Investor Digital Assets Study', October 2022⁹

the asset's high potential upside, innovativeness, and potential for portfolio diversification. Most interestingly, 74 per cent of those surveyed plan to buy or invest in digital assets at some point in the future. This is about 71 per cent higher than in 2021's survey. The survey's overall findings are presented in Figure 2.

On the other hand, only a few institutions have dared to decide on allocating crypto assets. According to the investor answers to Fidelity Digital Assets' survey, at the moment, the three biggest potential obstacles to broader adoption are price volatility (approximately 50 per cent of respondents), lack of fundamentals to gauge appropriate value (approximately 37 per cent of respondents), security concerns by institutions (35 per cent respondents). In addition to these, custody also came up in the answers; approximately 27 per cent of respondents feel that lack of clarity around qualified custody is an obstacle to investing, and approximately 22 per cent of respondents think that concerns around self-custody are a problem. In part, general security concerns may also sidestep custody uncertainties. Among the other reasons, to

gain significant institutional adoption, it seems crucial to have valuable and practical information about the possibilities and risks around different custody solutions.

CHOOSING THE RIGHT CUSTODY SOLUTION

While considering the right custody solution for institutional actors, it is necessary to consider each potential solution by requirements and needs. Usually, crypto asset owners have to face different trade-offs between practicality, security and ease of use while considering the proper custody solution. It is often thought that the best solution balances the properties of ease of use, security, safety and universality. In other words, the use and access of the funds must be accessible, funds need to be safe from outsiders, the system should have recovery accessibility to the funds and the solution should have comprehensive support of different crypto assets. On the other hand, some operating in the field of crypto assets — such as institutional actors — may have more sophisticated and more detailed

requirements for custody besides these fundamental properties.¹⁰

Each institutional actor has different needs and conditions related to operational, strategic or regulatory features — or all of the above. For example, actors who actively operate in the field of investment management and deal with different end-users are usually obligated to fulfil regulatory needs, such as KYC (know your customer) and AML (anti-money laundering) procedures. Such institutional actors are, eg AIFs (alternative investment funds), mutual funds, asset managers, etc. On the other hand, some actors are not obligated to know all the end-users (eg business-to-business-to-consumer [B2B2C]), and some actors do not even have so-called end-users (eg foundations). Because of these, it is evident that the first thing to do when an institutional actor is considering choosing a custody solution for its crypto assets is to recognise the needs and requirements of their business.

While looking at the more sophisticated requirements of custody features, some obvious needs that institutional actors may have can be seen. Aite Novarica¹¹ has mapped out institutional investors' custody requirements into three sections: minimum requirements, competitive differentiators and next-generation requirements. Mirroring Aite Novarica's material about different requirements, these requirements have been looked at from a different angle. For example, institutional actors — such as an AIF — could recognise some strategic needs:

1. Investment and trading strategy;
2. Risk management;
3. Size of the AUM (assets under management);
4. Insurance.

Also, an AIF could identify some operational needs:

1. Proper private key management;
2. Cyber and asset security needs;

3. Transaction authorisation mechanisms;
4. Cost-effectiveness;
5. Client support;
6. Post-trade functionalities.

Finally, it is possible to recognise some regulatory needs, as follows:

1. KYC, KYT (know your transaction) and AML procedures;
2. White-listing of on-chain addresses;
3. Service provider licences.

When the minimum requirements are met — in respect of strategic, operational and regulatory needs — in the decision making, an AIF could weigh and assess the custody solution's competitive features that support its strategic and operative attributes. For example, AIF may seek features such as:

1. Broad coverage of crypto asset support;
2. Features that enable smooth trade flow and post-trade processing (eg API [application programming interface] connectivity);
3. Performance and risk calculations and reporting (eg P&L);
4. Potential on-ramp to on-chain activities if needed (eg staking, decentralised finance);
5. Cost efficiency.

If these previously mentioned needs and requirements are examined, it is possible to simply outline what trade-offs different existing solutions have when the features of the solutions are viewed.

First, if 'self-custody' is looked at, it may have potential security and/or practical trade-offs which should be considered. As mentioned earlier, self-custody is relatively secure if adequately used. Also, self-custody gives complete control and access to the underlying assets.

Nevertheless, the practical implementation of self-custody of institutional actors' support may be complex regarding technology and comprehensive resources. As the previously

mentioned potential strategic and operational needs are examined, many self-custody solutions (by themselves) do not fulfil these obligations, and some technical integrations are needed. Institutional actors, such as AIFs, may need to build and integrate required operational properties to their hot and/or cold wallets — for example, post-trade functionalities, trade flow monitoring and investment management systems.

In the case of different exchange-based wallets, the ‘ease of use’ and asset liquidity are offset by counterparty risks, asset pooling and lack of native on-chain activity possibilities. As the history is looked at, the asset commingling and/or pooling and counterparty risks are serious concerns to assess (eg cases of FTX, Mt. Gox). Although an exchange-based wallet solution could fulfil and support the trading liquidity and asset rotation speed needs, if an institutional actor, such as a mutual fund, must trade multiple times during the day, the exchange-based wallet might offer some solutions.

On the other hand, if institutional actors would, they could fulfil their trading needs through various on-chain exchanges if this fits the actor’s strategic and operational goals. However, in this situation, the actor would also need an independent wallet solution granting access to the on-chain (eg hardware or software). Of course, this is another complexity layer that is not currently easily solvable in a professional setup without considerable effort before moving to trade execution.

Finally, multiple pros and cons could be defined if the third-party custodians are examined (that store actors’ private keys on their behalf). Pros are definitely, in the case of regulated and audited service providers, the strict operation rules, professionalism that may enhance operational efficiency and the potential broad custody infrastructure with easy on-chain on and off ramps. In the case of cons, third-party custodians may not always be cost efficient for every actor, risk

management is outsourced to the custodian and there may be some latency in on-chain settlements — especially if they are compared to self-custody. Also, in some cases, the private keys of the funds might be possessed only by custodians, which might give rise to new risk factors. In general, though, third-party solutions’ user and technological security depend on the underlying technical implementation. Some institutional-grade services use, for example, MPC (multi-party computation) solutions to scale the wallet and custody services. In contrast, some might use essential multi-signature wallets to provide custody support. To summarise, it is crucial for institutional grade actors to also weigh the various features of technological implementations before deciding to choose a third-party custodian.

An institutional actor may also consider a different type of platform-based wallet ecosystems that have useful integrations (eg for exchange and decentralised finance) and other properties. These kinds of platform-based wallet ecosystems are usually provided as ‘wallet-as-a-service’. They tend to try to fulfil and scale actors’ high-level strategic, operational and regulatory requirements. These are, at the moment, usually costly and may not be a strategic and operational necessity for all institutional actors. For example, actors such as foundations and different corporations, that mainly hold and trade their crypto assets intermittently, may not find these solutions interesting.

All in all, there are some significant trade-offs between essential custody solutions. It might be a good idea to mitigate the risks and diversify custody of assets according to needs. For example, some actors may find justification in holding some percentage of the funds in exchanges due to urgent liquidity needs and the rest in their cold wallets due to the security needs. However, it is good to remember that actors can also use different combinations of these solutions within the limits of their liabilities.

It must be noted that crypto asset custody is one of the crucial elements in the overall crypto asset engagement project. Selecting an appropriate crypto custodian is a crucial business decision. Still, anyone operating with crypto assets should know that there might be many other stakeholders, from banks to auditors, as legal counsel should be engaged in this process. Understanding that selection of an appropriate custodian is just one piece in the puzzle is of paramount importance as not every jurisdiction demands a third-party crypto asset custodian, ie partial or complete self-custody might make sense in the case that the institutional investor or crypto fund is deeply involved with decentralised finance (DeFi).

So, as said, the right and suitable custody solution for institutional actors depends entirely on actors' own strategic, operational and regulatory requirements. To assess the requirements and the qualities of different custody solutions, institutional actors should first identify their crypto asset-related business and/or operating models — as has been discussed.

CASE: NORDIC ALTERNATIVE INVESTMENT FUND

To further clarify the perceived trade-offs in the decision of custody solution for institutional actors, one anonymised crypto asset-related alternative investment fund from the Nordics has been interviewed. In this case example, questions were asked about choosing custody of AIF's crypto assets; the requirements and needs that influenced their current custody arrangement.

The questions were categorised into two main parts: basic requirements and sophisticated requirements. The basic needs included enquiries about the main divisions — self-custody versus third-party custody — and their socio-technical trade-offs. The sophisticated requirements section contained different operational, strategic and regulatory questions.

For acknowledgment, the interviewed AIF has outsourced its crypto asset custody to a third-party custodian, and they have a hybrid solution for custody.

INTERVIEW: QUESTIONS AND ANSWERS

Question 1: If we look at the main categories of custody of crypto assets (self-custody and third-party solutions), which factors influenced your decision to choose a third-party solution over self-custody? What were the significant trade-offs while choosing the current third-party custodian?

Answer 1: Three main reasons:

- (1) Using a professional third-party (often under a licence) custody provider is often a requirement by the local FSA (depending on the fund type and size).
- (2) The above requirement often comes from sophisticated LPs (limited partners that are investors in the fund) who want to ensure that the custody is arranged correctly.
- (3) If a third-party custody provider arranges custody, fund managers can put all focus on their investment operations.

Regarding trade-offs, you will need to find the right provider and the right person from that firm to trust for the long term.

Question 2: Why did you prefer a hybrid solution that includes multi-signature-based cold storages and hot wallets? Why didn't you choose, eg different exchange-based wallets or different platform ecosystems as primary custody?

Answer 2: We don't have material holding in hot wallets. The reasoning behind hybrid solutions, we wanted to diversify risk as much as possible, not only by diversifying the assets to multiple institutional exchanges (and their respective custody solutions) but also by diversifying in terms of the technical custody solution.

Question 3: If we look at the fund's strategic needs at a general level, did some factors influence the decision making? These can be, for example, the fund's investment and trading strategy, risk management, size of the AUM and insurance.

Answer 3: Yes, all of the above. This is especially relevant for investment strategies that include frequent trading.

Question 4: If we look at the operational needs of the fund at a general level, did some factors influence the decision making? These can include, for example, proper private key management, cyber and asset security needs, transaction authorisation mechanisms, cost efficiency, client support and post-trade functionalities.

Answer 4: Not to a significant extent. Proper reporting is naturally needed.

Question 5: If we look at the fund's regulatory needs at a general level, did some factors influence the decision making? These can include, for example, the fund's KYC, KYT and AML procedures, white-listing of on-chain addresses and service provider licences.

Answer 5: Yes, all of the above are important factors.

Question 6: Generally, has the current custody solution brought some competitive benefits to the fund? If so, what kind of benefits?

Answer 6: Seamless and high-quality customer support allows us to move fast and meet any requests (from us directly or our LPs) without delays.

CASE RESULTS

A few simplified assumptions can be made by looking at the answers. They emphasise that local regulations and laws are one of the main impetuses of why this Nordic AIF chose a third-party custodian. This makes sense because the AIF operates as per the

legislation, and to be licensed, it must meet the requirements. In addition to regulatory features, AIF emphasises strategic features: the solution should meet, eg trading needs and other strategic goals. On the other hand, the AIF says that, for example, proper reporting is needed. Thus, various post-trade functionalities can also be weighed (eg P/L, regulatory reporting).

When AIF looked at the competitive advantages of the current solution, seamless and high-quality customer support came up. The operational and practical features did not significantly affect the final decision. The customer support adapts to AIF's needs, allowing for quick decisions and fulfilling requests. Without a third party, this is impossible, as the operator needs to internalise these operations in one way or another.

It seems that the emergence of local regulatory requirements and needs — in the field of institutions — brings out a paradox. It is generally thought that crypto assets and those operating with crypto asset fields could operate without a third party. After all, it is a run-in value proposition for crypto assets. However, operators seeking to do business in crypto assets must comply with regulations. This increases the importance of trust, as an institution such as AIF is usually forced to trust a third party. This is also clearly emphasised in the interviewee's answers: *'You will need to find the right provider and the right person from that firm to trust for the long term'*. On the other hand, the need for trust in the industry emphasises the need for transparent and predictable regulation; the relatively new industry needs a suitable operating environment where reliable actors can be born and thrive.

Finally, diversification is a significant impetus among those previously mentioned, not only by diversifying the custody of assets but also by diversifying the underlying technological implementation of the custody. After all, it makes sense that asset and technical risks are controlled and mitigated.

CONCLUSIONS

Institutional actors have recently demonstrated an increasing interest in the crypto asset space in various forms. At best, crypto assets allow for potential diversification benefits between asset classes and a potential risk–return aspect to investment portfolios. However, as crypto assets become more common, the private key management and custody become even more critical. How should custody of institutional crypto assets be implemented? How should private keys be stored? There are no correct and precise answers to these questions because each actor has different needs and requirements.

Often, for example, self-custody is not possible for regulatory reasons, and thus institutional actors must map out their own needs and requirements and how to manage funds. Also, other possible requirements may be found; some may need different operational functions, and some may require the fulfilment of strategic requirements — whether it is about the easiest possible trading experience, trading strategy or client support. Every custody solution also contains essential trade-offs that everyone should consider before making final decisions. Eventually, it may be a good idea to diversify the solution to have a so-called ‘hybrid solution’ to mitigate asset and technological risks. This research also noticed an interesting paradox relating to institutional crypto asset custody. It is usually thought that the built-in value proposition of crypto assets is that it is possible to operate without third parties. However, this is not usually the case with institutional actors, as they are often forced to rely on a third counterparty in the custody of crypto assets due to regulatory pressures.

In summary, crypto assets are an exciting nascent asset class. There are endless paths to explore. It is essential for both traditional finance and the crypto asset industry to have fruitful dialogue, whether it is about the ultimate investment thesis or just the differences

in custody. All securities operations and custody professionals are encouraged to learn more about Bitcoin and crypto assets, so that they are prepared for the advent into their lives of these investment forms.

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