



WEB 3 AND CRYPTO IN FRANCE AND EUROPE

ADOPTION BY THE GENERAL PUBLIC
AND APPLICATIONS IN INDUSTRIES

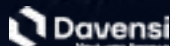
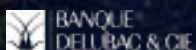


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A WORD FROM ADAN

In many regards, the year 2022 represented a major turning point for the decentralized web industry.

While France and the European Union were greatly afflicted by the Russian-Ukrainian conflict on our continent's borders, causing a political crisis and a cascading economic fallout, the decentralized web was not unscathed.

Indeed, a number of significant events endogenous to our sector reminded us vividly of the ethical requirements to which we are all bound if we are to maintain our professionalism and the paradigm shift we support.

ADAN, which for the past three years has been the voice of 200 decentralized web professionals, has been involved on a continual basis in assisting the sector during this period. This approach has been accompanied by close collaboration with French and European decision-makers to give them a better understanding of these major events, to reduce the risk of prejudice and to contribute to an improved general perception of the industry.

But the outcome of this year - coinciding with 2021's exceptional growth¹ - must be nuanced in view of the many positive signals for the sector, which are helping to structure it and encourage its adoption by the general public.

Firstly, in terms of adoption, the political agreements regarding the MiCA and TFR regulations², approved under the aegis of the French Presidency of the European Union, will provide a protective framework for users on a European scale, and will also promote the democratization of our sector among the broader population.

Then, in terms of structuring, the decentralized web continued to arouse growing interest throughout 2022 among institutional players, seeking to diversify their investments and position themselves in a rapidly

evolving market. This trend is in line with the first investments made by companies such as Tesla and Microstrategy in 2021.

ADAN, aware of these developments and historic milestones, wanted to grasp their magnitude, both in France and across Europe, where harmonization of market regulations and competition between players is well underway.

ADAN has therefore commissioned KPMG to conduct a complementary two-part study of the French and European web3 and crypto-asset sectors. This initiative is part of the Association's proactive approach to promoting understanding of the opportunities offered by the decentralized web and blockchain technologies.

The first part of the study examines the level of adoption of web3 and crypto-assets in France and Europe, providing an initial comparison with the previous year. Despite the economic crisis, the year 2022 does not seem to have deterred French citizens from continuing to adopt web3 and all its use cases on a long-term basis. Indeed, while the first edition of our first study «Crypto in France: structuring of the sector and adoption by the general public³» produced with KPMG France revealed that 8% of the French population held crypto-assets, this second 2023 edition reveals that this has increased to 10%, and demonstrates that uptake of web3 is anything but transitory and will undoubtedly take hold over the long term.

Although this increase in the level of adoption of crypto-assets in France is very promising, a comparison with some of our European neighbors shows that there is still significant potential for growth. It is therefore imperative that we seize the opportunities offered to us in order to take a leading position on the subject. By adopting a proactive approach and acquiring the necessary resources, France will be able to strengthen its market position by pursuing an ambitious development strategy, aimed at better understanding

the opportunities that emerge and seizing them in their entirety.

The second part of the study focuses on the structuring of France's and Europe's crypto-asset industry. It reveals that, although initially associated with financial activities, our industry streams into all areas of the economy representing a major stake for France, in the run-up to next September's senatorial elections, as well as for Europe, in the perspective of the 2024 parliamentary elections.

The opening of 2023, bringing continued growth and innovation to the crypto-asset markets, confirms the potential of this constantly evolving sector. To fully seize the opportunities it offers, it is essential to work together by combining our efforts, ideas and resources.

By stimulating the digital transformation led by the decentralized web, France and Europe will be able to make their mark as the major innovation territories of tomorrow, able to meet the challenges of the digital economy and contributing to economic growth and job creation.

For this second edition, I would like to express my gratitude to our partners for their contribution to the production of this study: KPMG and IPSOS; Binance France, Bitpanda, Bpifrance, Caisse des Dépôts, DLPK, LordToken and Sesterce; as well as Cryptoast, for broadcasting our presentation event. Their support and participation in the discussions were essential to the success of this second edition.

Happy reading!

Faustine Fleuret
ADAN's President and CEO

1 Adan's Strategic Vision for 2021 - Adan January 25, 2021

2 EU framework for crypto-asset markets: the French Presidency ends with political deals on MiCA and TFR - Adan July 1, 2022

3 Crypto in France: structuring of the sector and adoption by the general public - Adan February 14, 2022

A WORD FROM KPMG

The adoption of crypto-assets in France continues to progress despite a particularly eventful year in 2022 for the sector. On behalf of the KPMG team, I am proud to present this second edition of ADAN's study on the adoption of digital assets in France. This study is essential to qualify and quantify the strategic implications linked to web3 technologies. The 2023 edition has been designed to provide a more detailed understanding of the uses and expectations of consumers: their profile, average investment, investment timeframe, storage method and preferred acquisition channels. The second part of the study examines the applications of web3 technologies in different sectors. It is interesting to note that all industries are concerned by the subject.

Business applications are developing as much in the energy, culture, and luxury sectors as in the financial sector. This section will enlighten passionate readers and decision-makers alike on the scale of the transformations taking place.

Despite the many barriers to entry, adoption is making significant progress, particularly among young people. Indeed, 17% of 18- to 35-year-olds hold crypto-assets (12% last year). This observation is common to other European countries. Acquisition channels are also evolving, with the arrival of fintechs Revolut and Lydia as a new acquisition channel favored by many holders.

This exercise also highlights sensible investment strategies and cautious usage, far removed from conventional perceptions. Most of today's holders are „pioneers“ who have accumulated a degree of information and knowledge that enables them to measure risk levels more accurately than an uninformed user. For this reason, it is important that the technological evolutions that will facilitate access to these assets go hand in hand with a regulatory framework that protects users.

In this respect, 2023 is a year of great opportunity for France and Europe, with the MiCA (Market in Crypto-Assets) regulation due to be voted on in the next few days. The French and European strategy aims to provide a proportionate framework for these markets.

It allows governance of emerging risks to be implemented, while also supporting the competitiveness and sovereignty of technologies that play a central role in the modernization and digital transformation of many sectors. It's a strategy that seems relatively effective when compared with that of the United States and Asia.

Finally, I'd like to thank Faustine Fleuret, President of ADAN, and her team, as well as all the sponsors who have once again placed their trust in us.

Enjoy your reading!

Catherine Philippe
Partner Blockchain & Crypto
KPMG in France



PARTNERS

Banque Delubac & Cie, founded in 1924, is a fully-fledged independent bank offering banking services to a clientele that ranges from individuals to multinational corporations and numerous SMEs. Employing nearly 350 employees, it is present in France at 14 locations, including its headquarters in Ardèche and its Paris offices.

For almost a century, Banque Delubac & Cie has never ceased reinventing itself. Bold in its development strategies, it has chosen to focus on high value-added and niche businesses setting itself apart from systemic banks. It was the first French bank to register as PSAN. Its signature «Experts and Independents» reflects its DNA: independence, expertise and tailor-made services.

Binance France SAS has been registered since May 4, 2022, as a digital asset service provider (PSAN) with the Autorité des Marchés Financiers (AMF).

Today, Binance is the global leader in the blockchain ecosystem, with a suite of financial products including the world's largest exchange of digital assets.



PARTNERS

Caisse des Dépôts and its subsidiaries constitute a public Group, a long-term investor serving the public interest and the sustainable development of territories. Blockchain and crypto technologies are a major strategic challenge for Caisse des Dépôts, its businesses and its customers.

Created in 2015, the Blockchain & Cryptoassets Program supports the development of decentralized technologies and their ecosystems in France and Europe, to support the Group's digital transformation, through an innovation partnership approach.

DLPK. Majority-owned by its founder-managers (supported since 2018 by investment fund BlackFin Capital Partners, Europe's leading private equity firm in the financial sectors), the DLPK Group is dedicated to the design, management and distribution of financial solutions for wealth management professionals (asset managers, institutional investors, private banks, etc.). Its expertise lies in the design of innovative financial solutions, the management of savings, pension products and employee savings products, and the distribution of wealth management solutions to wealth management professionals.

PARTNERS

Sesterce builds and manages 100% Green HPC data centers (Green Energy, Cooling Fluid & Waste Heat Reuse), for the AI industry on GPUs (Stable Diffusion, Machine Learning) and blockchain security.

We implement the latest technologies from our Sesterce Lab research laboratory in our infrastructures.



Bitpanda was founded in 2014 in Vienna, Austria, by Eric Demuth, Paul Klanschek and Christian Trummer, with the purpose of democratizing the world of investing. Its easy-to-use and comprehensive investment platform enables private individuals and seasoned experts alike to invest in cryptocurrencies, crypto indices, stocks/ETFs, precious metals and commodities, 24/7. Now with over 700 employees, 4 million customers and over 10 regulatory licenses, Bitpanda has become one of Europe's most prominent regulated fintechs in Europe.



Bpifrance finances companies at every stage of their development – in credit, guarantees and equity. Bpifrance supports them in their innovation and international projects. Bpifrance now also supports their export activities through a wide range of products. Consulting, university, networking and acceleration programs for startups, SMEs and ETIs are also part of the offer to entrepreneurs. Thanks to Bpifrance and its 50 regional offices, entrepreneurs benefit from a single, close, and efficient contact to help them address their challenges.

Davensi is a Web3-based financial services platform designed for individual and private individuals investors wishing to invest in and manage digital assets. It offers tailor-made tools and advisory services, based on innovative market intelligence solutions, while offering 360° visibility of their assets, comprising both traditional and digital assets.

PARTNERS

PART 1

SECTION ON ADOPTION

METHODOLOGY

The study's sample is consistent to that of the previous edition «Crypto in France: structuring of the sector and adoption by the general public»: it covers a population of 1976 French respondents over the age of 18.

However, additional samples were added to measure the adoption of crypto-assets in France against four European countries : Germany, the United Kingdom, Italy and the Netherlands. The samples range from 1097 to 1134 respondents for the four countries. The age of the respondents range from between 16 and 70 for Germany, the Netherlands and Italy. The UK diverges with a high end at 75 years old. In consequence, comparisons between countries and particularly with France should be put into perspective in view of the difference in sample sizes or age limits.

New or modified questions were submitted to the French for this 2023 edition in an effort to specify new uses in greater detail.

We will refer to European countries in the geographical sense, considering the departure of the United Kingdom from the European Union.

The term «crypto-assets or „digital assets» is used to refer indiscriminately to crypto-currencies, non-fungible tokens (NFTs) and stablecoins. The terms «crypto» or «crypto-currencies» are used interchangeably to designate fungible assets excluding stablecoins.

The previous study was published at the beginning of 2022 based on data collected at the end of 2021 by the IPSOS polling institute. The present study is therefore conducted 14 months after the first survey.



DEFINITION OF TERMS EMPLOYED:

INVESTORS

People who hold or have held cryptos

HOLDERS

People who hold cryptos at the time of the study

ACTIVE HOLDERS

Holders of crypto-assets who wish to continue acquiring them

STATIC HOLDERS

Holders of crypto-assets who have stopped acquiring them

FORMER HOLDERS

Respondents who held these assets in the past but no longer have them at the time of the survey

INTENTIONISTS

Respondents who plan to acquire crypto-assets in the near future

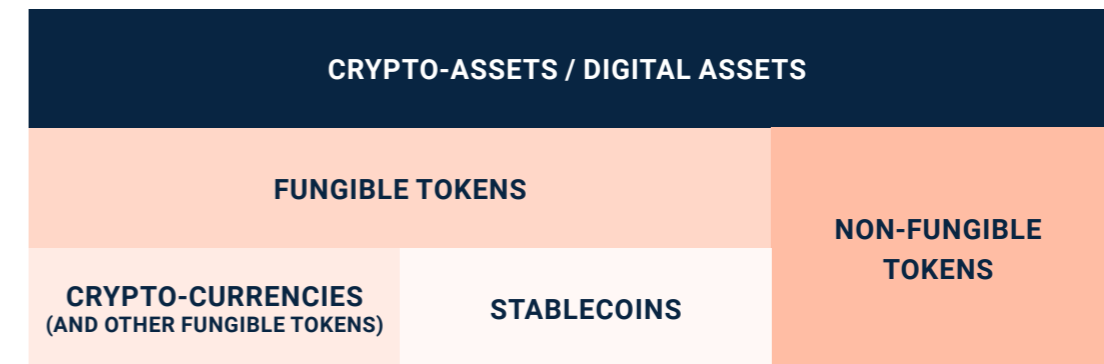
INTERESTED

The sum of investors and intentionists

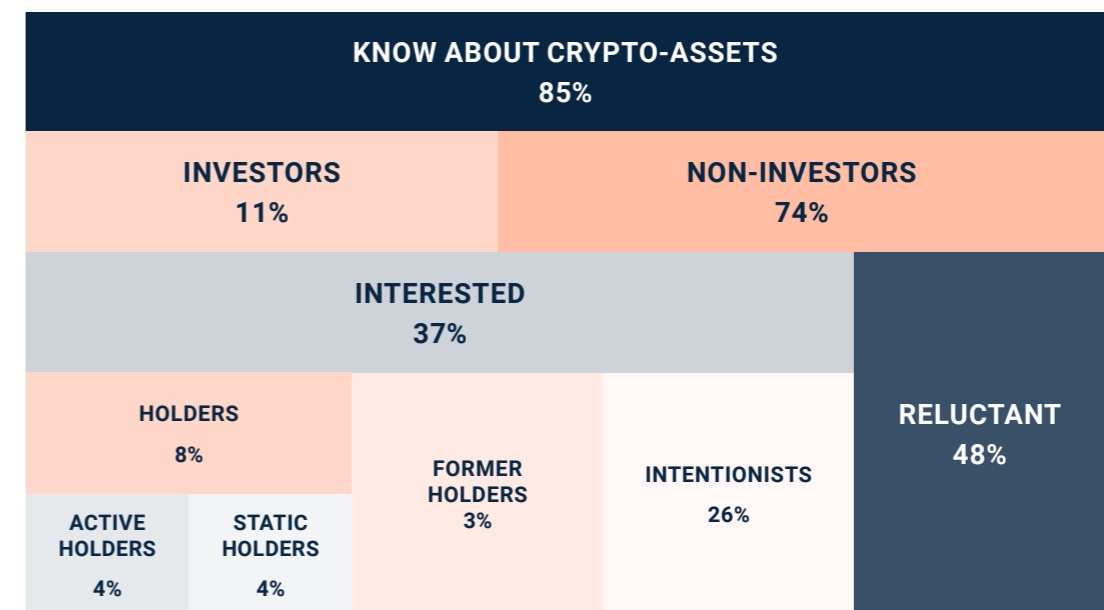
RELUCTANT

Respondents who do not wish to acquire cryptos

Terminology and classification of crypto-assets as employed in this study report



Terminology and classification of crypto-asset adoption as employed in this study report



1. GENERAL ATTITUDE TOWARDS CRYPTO-ASSETS IN FRANCE AND EUROPE

1.1 KNOWLEDGE

France

The year 2022 is a unusual year for the crypto-asset sector. It has been impacted by sharp declines in these assets' market valuations as part of a two-fold dynamic. On the one hand, macroeconomic conditions have been in turmoil, with a return of inflation in Europe and scarcer liquidity in financial markets due to tighter monetary policies, ultimately leading to a loss of interest in risky or alternative assets, including crypto-assets. On the other hand, events that are endogenous to the sector peppered the year with the bankruptcies of companies such as FTX, the investment fund 3AC or crypto projects such as Terra and Luna. These dynamics make it one of the most widely discussed financial sectors of the year.

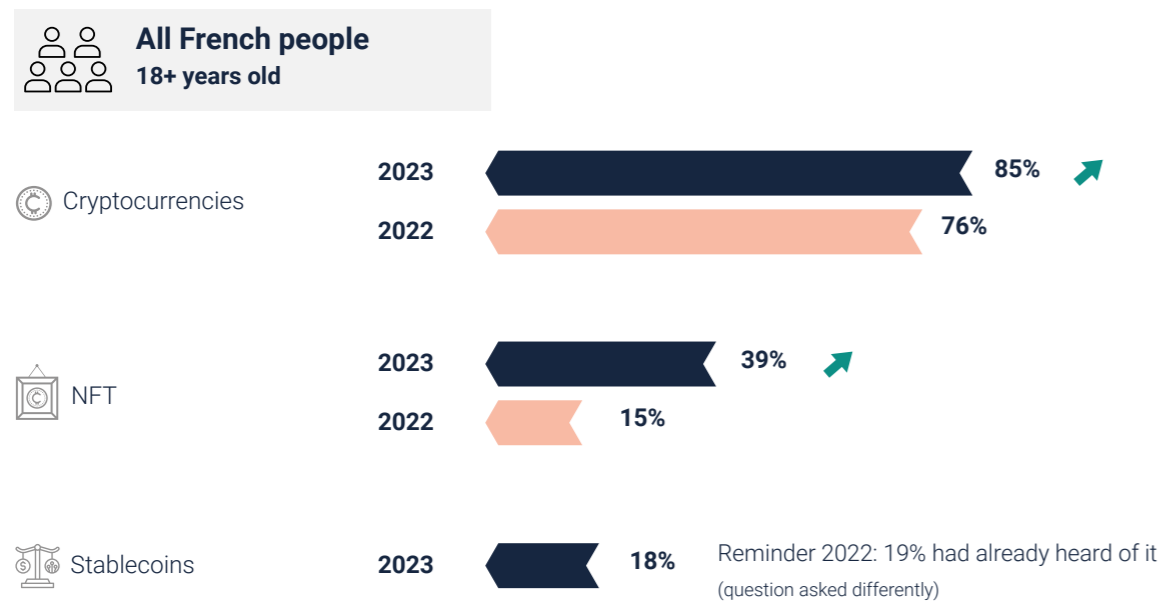
In this context, knowledge of crypto-assets continues to grow in France: 85% of French people say they have already heard of crypto-currencies, a 9% increase when compared to 2022.

Stablecoins (tokens representing fiat currencies and issued by private companies) remain less well-known with 18% of respondents. The level of awareness for stablecoins remains similar to that of 2022, which can be explained by less media exposure of these assets and their associated use cases.

Knowledge of non-fungible tokens (NFTs) shows a remarkable increase of 24 points compared to last year. 39% of respondents say they are aware of the term NFT. This is partly due to the popularity of the concept in a set of industries, including luxury goods, sports, video games and art. The issuance of NFT collections provides an opportunity to explore new marketing and customer experience tools in these sectors.

At the beginning of 2023, nearly 13% of the French surveyed said they were familiar with these three categories of digital assets.

Notoriété des cryptoactifs



86% of French people aged 18+ know at least one of the three assets ➔ +9 pts

Knowledge of Central Bank Digital Currencies (CBDC) and Decentralized Finance¹ (DeFi) remains roughly equivalent to that of year 2022 with respectively 25% and 22% of the French declaring they are familiar with these terms.

Respondents tend to mistake CBDC for stablecoins, both innovations underlying the digital transformation of money. In Europe, it will become easier for the public to distinguish them as the European Central Bank (ECB) provides more clarity on its digital euro project (the ECB's CBDC) and whether or not it will be launched in October 2023.

For this study, respondents who were aware of at least one of the three types of digital assets were asked to specify the communication channels through which they had heard about the subject. The result is a podium headed by social networks with 32%, followed by traditional national and international media with 29%. Media specializing in crypto-assets - such as The Big Whale, Cryptoast or Le Journal du Coin - come in third place.

Other sources of information for respondents are reports and articles published by public institutions or consulting firms (9%) as well as information transmitted by the companies or organizations they work for (5%). Crypto-assets are notably becoming a subject of study for financial institutions, with the dissemination of numerous reports analyzing the links between traditional finance and the crypto sector, as well as proposals for strengthening the regulatory landscape. Publications by the ECB and the Banque de France are, like for most institutions, increasingly numerous².

Finally, large companies have accumulated significant knowledge of crypto-assets, particularly through projects involving NFTs. These projects are an important vector for the development of knowledge and the democratization of these digital objects within the company. In addition, there are mandatory training courses in certain companies addressing the topic, especially in sectors with many use cases related to this technology.

Knowledge in Europe

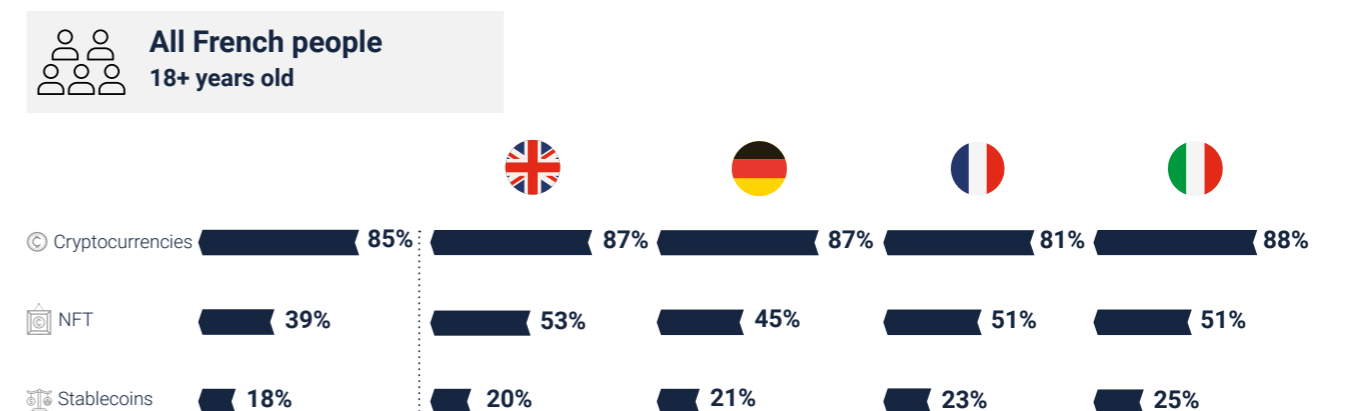
Knowledge of crypto-assets among the European countries surveyed is similar to that of France (85% of respondents declare familiarity with crypto-assets) with the following breakdown:

- **United Kingdom: 87%**
- **Germany: 87%**
- **The Netherlands: 81%**
- **Italy: 88%**

Knowledge of stablecoins in other European countries appears to be stronger than in France. Between 20% and 25% of the population say they are familiar with the subject, compared to 18% in France.

Similarly, regarding knowledge of NFTs (40% of French people), the proportion among respondents is higher in the other European countries surveyed (up to 53% of the population for the UK).

Notoriety of crypto-assets



1 Decentralized Finance: Financial applications on Blockchain such as Uniswap or AAVE
 2 Example with the Deputy Governor of the Banque de France: <https://www.banque-france.fr/intervention/le-monde-des-crypto-actifs-lepreuve-de-verite>



1.2 NUMBER OF HOLDERS AND INTERESTED INVESTORS

Acquisition and intentions towards crypto-assets in France

At the beginning of 2023, 13% of French people over the age of 18 have already held at least one digital asset among crypto-currencies, NFTs or stablecoins.

Compared to the previous edition of our study, 9.4% of French people currently own cryptocurrencies or NFTs, representing an increase of more than 18% in the number of holders compared to 2022 (8%).

In absolute terms, according to the INSEE statistics for 2023, this represents approximately 4.8 million French people over the age of 18 holding crypto-assets.

Regarding crypto-currencies, 11% of the French have held or still hold them. Of this sample, 16% are new buyers since 2022, including 3% between January 1 and March 1, 2023³. This represents approximately 130 000 new buyers on the market in two months. The slowdown in adoption in 2022 contrasts with the dynamism of the first two months of 2023 and matches the rebound in crypto-asset market valuations (of nearly 37.5%⁴). It should be noted, however, that almost 50% of current holders made their first acquisition before 2020.

For those respondents who do not hold crypto-assets, 26% do not rule out a future acquisition, which is down 3 points from 2022. This decline in respondents intending to invest may be explained by the tumultuous news surrounding the industry over 2022. We will refer to them as «potential holders» in the rest of the study. The conversion potential

of these 26% into future buyers in 2023 is estimated at 9%⁵ of this sample, i.e., more than 2% of the total French population. This trend would bring the overall adoption figure for France to 12%, excluding market factors.

At the beginning of 2023, almost 1 in 10 French people held crypto-assets, and more than a quarter of them would consider acquiring them in the future.

In contrast, in its December 2022 letter from the Savings Observatory⁶, the French Financial Markets Authority (AMF) notes less interest in stock market investments among the French. The households surveyed declared themselves less interested in these investments at the end of 2022, 25% as opposed to 29% in 2021. This slight decline is therefore shared between the different asset classes, especially since crypto-asset buyers also often hold stocks (see section on holders' sociology).

Those who do not wish to invest in cryptos, and do not declare themselves interested in acquiring them in the future, amount to 48%, increasing by 9 points in one year. Less interested audiences have for the most part discovered cryptos later in time and in a turmoil context, which has strengthened their reluctance to invest and thus needs to be put into perspective.

Therefore, three clusters emerge as follows:

- 37% have already owned crypto or may consider acquiring it
- 48% do not wish to buy and are not interested
- 15% do not know about the topic

3 1st of March being the last day of the survey

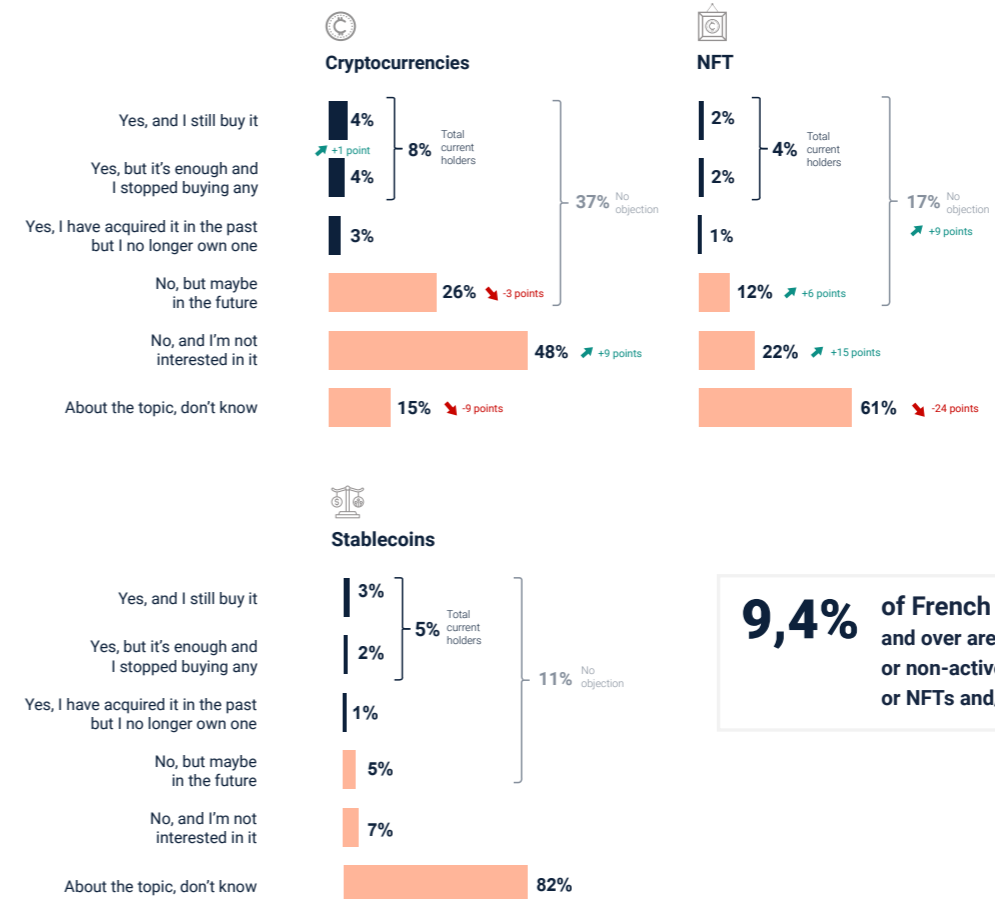
4 Source Coingecko with total market capitalization between 1 January 2023 and 1 March 2023

5 Based on the methodology advised by IPSOS, which weights 0.8 those who answer «Definitely» and 0.2 those who answered «Probably».

6 https://www.amf-france.org/sites/institutionnel/files/private/2022-12/LOE%2050_D%C3%A9cembre%202022.pdf



All French people 18+ years old



9,4% of French people aged 18+ and over are holders (currently active or non-active) of cryptocurrencies and/or NFTs and/or Stablecoins

Two phenomena are at work:

- Knowledge is increasing, and this trend is reflected in the French peoples' general attitude towards crypto-assets. Knowledge or the absence of it allows them to take a position of either interest or reluctance.
- The industry's failures have exposed and media-tized Mistakes made within the industry which have been exposed in the media have highlighted risks associated with these assets, which is impacting adoption by reinforcing the reluctant in their position.

Stablecoins represent an alternative to the volatility of crypto-currencies. To date, their use is particularly condensed around players that are active in crypto-currency or decentralized finance. They are still little used in various payment use cases for several reasons, notably the absence of a legal and regulatory qualification. The European MiCA regulation should remove doubts about the qualification of the tokens known as stablecoins (collateralized by fiat currency) by defining them as electronic money. 5% of French people hold stablecoins, 1% have held them in the past and 5% are potential holders. Knowledge remains a major obstacle for adopting a position towards this type of asset.

In the case of NFTs, the increase in knowledge, as described above, has resulted in a net growth in NFT adoption: 5% of French people have already owned them, and 4% still do, which represents a doubling on adoption. 12% could acquire an NFT in the future, which is also twice as many as last year. The proportion of those not interested is 22%. The French are therefore still forming their opinion around NFTs. Next year's results should make it possible to clarify this trend, while crypto-currencies are already a highly known subject.

Moreover, a differentiated analysis between the types of NFTs held reveals interesting results. Of the French people having bought NFTs, 41% have done so of NFTs known as PFP, i.e., profile pictures that often feature membership of a community project. 37% have acquired NFTs from brands that use them for customer loyalty purposes (such as Nike, Adidas, YSL, Mugler, Lacoste or the Casino group, among others); followed in line by NFTs in video games and art collections, with 36% and 33% respectively. For their part, **potential buyers would focus first on digital art collections with 48%, followed by branded NFTs with 31%. As in the case of crypto-currencies, these data underline the potential for NFT adoption, considering the multiplicity of use cases and industries involved.**

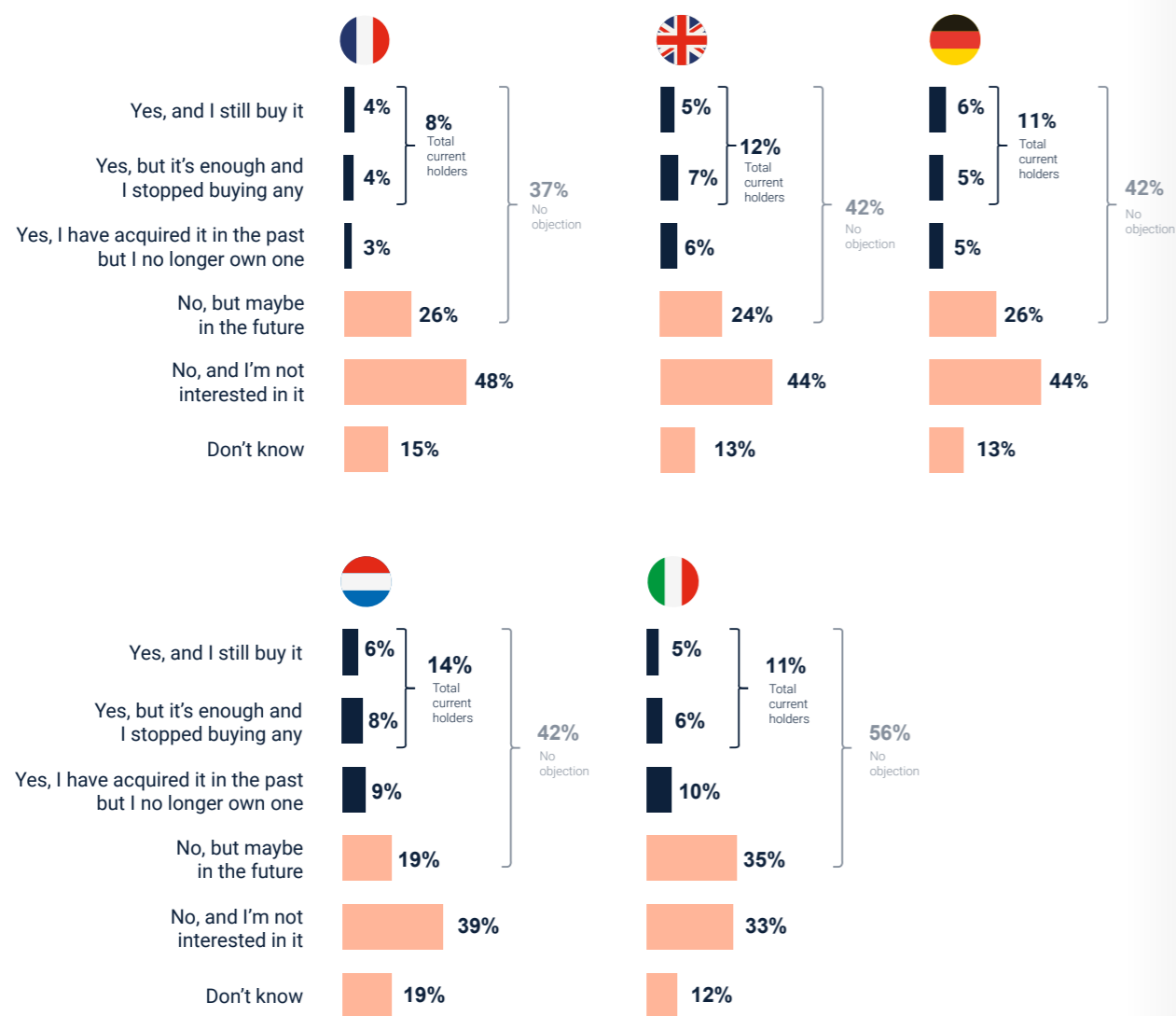
European adoption

More specifically, the Netherlands has the highest rate of current holders with 14%, compared to 12% in the UK, 11% in both Germany and Italy and 9,4% in France (these figures are detailed earlier in the study). Therefore, France has the lowest rate of holders in the panel of the European countries consulted for this study.

Another remarkable figure is that Italy has the highest rate of interested individuals (56%) compared to The UK, Germany, and the Netherlands, which have equal rates of interested at 42%. In contrast, the rate of interest in France is not set at 37%. This figure is explained by the proportion of former holders in Italy peaking

at 11% (vs 3% in France), and by a high percentage of intentional investors (35%, which scores 9 points higher than in France or Germany).

As the level of knowledge of crypto-assets is similar across countries, these figures reflect a different relationship to investment and risk, which is also reflected in the case of stock holdings (see section on the sociology of international investors).



The same observation applies to stablecoins. The rate of holders, former and potential investors is lower in France than in other European countries. Italy has the highest rate of interested parties with 20% of the population, followed by the Netherlands, Germany, and the UK (between 18% and 16% are interested), compared with 11% in France.

The same trend is observed in the case of NFTs, with 35% interested in Italy, followed by the other European countries where the proportion of the population interested in NFTs is between 26% and 27%, except for France, which is lagging behind with 17% of French people interested in crypto-assets.

1.3 INVESTOR PROFILE AND INVESTMENT PATTERNS

The sociology of French investors

In line with the previous edition, the present survey also sought to identify the profile of crypto-currency holders.

By analyzing the data collected for this edition in terms of gender, age and socio-economy category, the following findings can be drawn:

1. In terms of gender breakdown, there is an over-representation of men among respondents who have invested (63.5%) or are considering investing (55%). Conversely, women are significantly under-represented with 36.5% of investors and 45% of those considering investing, respectively. The comparison with the previous study shows a marginal change, with a decrease of 3 points for investors and an increase of 2 points for those interested.

2. Regarding age, a very pronounced generational trend persists: 48% of crypto holders and 30% of intentional investors are individuals under 35 years old (compared to 46% and 29% in 2022, respectively), while this age group represents only 25% of the French population. These proportions decrease as the age group climbs: the 35-44 age group only represents 25% of those who have invested, and 7% are over 66 years old. 15% of former holders are over 66.

Thus, while in 2022 more than one in eight French people aged between 18 and 35 (12%) owned crypto-assets, **this proportion rises to over 17% in 2023.**

Finally, respondents intending to invest are on average 45 years old, i.e., 4 years younger than the average age of the French. Those who are reluctant to invest are older on average (52 years).

3. In terms of income levels, the difference compared to 2022 is significant, since the highest proportion of holders (24%) currently belong to households with incomes above €60,000 (compared to 3%). Indeed, while 23.5% of active investors declared an annual income of less than €18,000 in 2023, they were 43% the previous year.

Only 4% of former holders belong to this upper income range (over 60 000 €). The majority of intentional owners have an average annual income of €36,000 to €60,000.

The adoption dynamic, in the wake of a turbulent market in 2022, is on the side of those in the higher income brackets and socio-economic categories.

4. Crypto-asset holders are also stock investors. Indeed, 37% of French people declare to invest in the stock market (regardless of the acquisition method). More than 78% of crypto-asset holders report owning stocks. This population also invests on average more in stocks than in crypto-assets with an average of 13% of their savings versus 11%. Conversely, those reluctant to acquire crypto-assets also own fewer stocks on average (27%). This trend shows that the French are adopting a general reluctance to invest regardless of the asset class, if anything.

5. Crypto holders are also almost twice as likely to be customers of online banks and neo-banks as the French population on average, a consistent result especially given the age of the investors.

6. Finally, as evidenced in 2022, adoption of crypto-assets affects France as whole, regardless of the geographic area, with a slight overrepresentation of the Paris region and large cities compared to rural areas for current investors. This trend fades, however, among those who plan to invest in the near future, whose geographic distribution is almost the same as the overall French sample.

Ultimately, the beginning of 2023 confirms some of the previous year's findings, while noting certain upheavals in the profile of crypto-asset buyers: investors are young, there is a stronger representation of men and a stronger adoption for the most affluent households. The profile of the average crypto-asset holder is significantly prominent, compared to intentionists who are closer to the averages on all the criteria analyzed, except for age.

Investment patterns in France

As of last year, investment volume and proportion confirm a certain caution among investors in France.

Around 70% of respondents out of the holders' sample allocate less than 10% of their investment budget to this asset class (76% at the end of 2021). 20% of holders say they allocate between 10 and 25%. Marginally, 10% of holders invest more than 50% of their savings in this asset class. It is worth noting that the increase in respondents in the higher ends (from 26% to 50% and from 51% to 75% of the overall savings in cryptocurrencies). The part of investors within these two tranches increase by 4 and 3 percentage points respectively. This results in an average share of global savings of 11% (vs. 9% in 2022). Moreover, this increase comes amidst falling valuations of crypto-assets.

To quantify the volume of investment in more detail, the equivalent ⁷ for the year 2023 breaks down as follows. 74% of crypto-asset holders invested less than €5,000. 18% have invested between €5,000 and €10,000, and 7% between €10,000 and €50,000. It will be worthwhile to watch these two indicators (percentages and volumes invested) next year to measure the evolution of investment portfolios. Focusing on current holders and amounts invested across tranches⁸, **it can be estimated that French people have invested between €20 and €25 billion in crypto-assets, or an average ticket of €4,750 to €6,000.** This is only an order of magnitude and does not represent the value of holdings at the beginning of 2023.

The frequency of operations carried out on these assets offers a new perspective. Of those who have already acquired cryptocurrencies, **88% of them make less than 2 transactions per month.** The low frequency of transactions thus undermines the image of the «speculative» investor. To offset volatility on these assets, investors may be encouraged to adopt regular, staggered investment strategies, such as the «DCA» (Dollar Cost Average, i.e., averaging the acquisition cost with periodic purchases). Only 1.4% of holders carry out more than 10 transactions per month, a volume that can be likened to trading activity.

⁷ The question is new for this edition, so there is no comparative element

⁸ Under two assumptions, 1/3 of each bracket as the average for conservative assumption and €50,000 for the highest bracket and ½ and €70,000 for the second assumption

The investment patterns observed thus make it possible to establish a portrait of the French investor in crypto-assets: on average, he, or she would own nearly 11% of their savings in crypto-assets, with an investment approaching €5,000 and making less than two transactions per month.

Details on the assets held

Bitcoin further consolidates its position as the leading cryptocurrency favored by users (64% versus 49% last year). This adoption is even more pronounced for current asset holders with 75% versus 53%. The figures are similar for potential holders, with 77% whose interest would be mainly in bitcoin if they were to invest, far ahead of ether which stands at 18%. This difference can be explained by a lack of knowledge of the crypto-currencies on the market.

This growing share of bitcoin can also be explained by the bear market, which favors the return to the «safest» projects.

Asset diversification is also observed, with the increase in assets such as ether (ETH), the binance coin (BNB) and solana (SOL) mainly among active holders:

- 48% of active holders hold ether, compared to 38% in 2022
- 38% hold binance coin, compared to 22% in 2022
- 30% hold solana, compared to 17% in 2022

The increase is more moderate for other crypto-currencies such as cardano (ADA), tezos (XTZ), polkadot (DOT) or polygon (MATIC), and negative for alternative assets or «other crypto-currencies» with a drop from 34% to 17%.

Considering the group of intentionists, there is a substantial increase in the proportion of people who might acquire BNB, from 4% to 11% over one year. Binance's strong presence in France since 2022 could explain this jump over the past year.

Bitcoin still dominates crypto-portfolios, followed by some diversification into larger assets at the expense of lesser-known or lower-valued assets.

The sociology of European investors

In line with the sociological profiles analyzed for France, it is interesting to draw up the profile of investors in the other countries for comparative purposes. Generally speaking, there is a common underlying trend across these different countries, in terms of gender, age, level of education and average income regarding crypto-asset investors. Indeed, we observe an over-representation of individuals under 35 years of age, the vast majority of whom are men, with household incomes of over €60,000 and a relatively high level of education. These profiles are also the least reluctant to acquire crypto-assets with a level of interest in this asset class varying by country.

Here is a quick overview of the highlights for the surveyed countries:

In Germany:

- **Rate of current holders:** 11%
- **Gender:** 61% of active holders are male.
- **Age:** In 2023, more than one in four Germans between the ages of 18 and 35 (25%) own crypto-currencies, which represents 50% of current holders overall. Of those aged 35 and over, 59% are reluctant and only 5% are active holders.
- **Income level:** Among those with an income above €60,000 (11% of the population), 16% are active holders and 35% plan to acquire it in the near future. Globally, they represent 46% of current holders.
- **Education :** 14% of individuals with a higher level of education⁹ are active holders compared to 3% of those with a lower level of education.

In Italy:

- **Rate of current holders:** 11%
- **Gender:** 66% of active holders are men. Nonetheless, there is some equilibrium for holders no longer planning to invest, with 7% of men and 6% of women.
- **Age :** In 2023, 17% of those aged between 18

and 35 (21% of the total population) own crypto-currencies, which represents 39% of current holders overall. There are only 29% of individuals in this age group who are reluctant. Finally, 11% of those surveyed previously had cryptos but no longer own them.

- **Income level:** of those in the income range above €60,000 (5% of the population), 18% are active holders. In total, they represent only 12% of current holders. In the range between €18 000 and €36,000, 31% are current owners and 42% plan to buy in the future. The non-reluctant represent an overall rate of 56%, and a large proportion of them could correspond to the aged 18-35 who, as analyzed, are much less resistant than the other age groups but potentially do not have the purchasing power to invest.
- **Education:** 10% of individuals with a higher level of education¹⁰ (18% of the total population) are active holders compared to 2% of those with lower education.

In the Netherlands:

- **Rate of current holders:** 14% (highest rate in the panel)
- **Gender:** 83% of active holders and 67% of static holders are men. 56% of women do not intend to invest in this asset class.
- **Age:** In 2023, 27% of 18–35-year-olds (21% of the total population) own crypto-currencies, representing 53% of current holders overall. For the 35+ age group, there are only 5% active holders and a 59% reluctance rate.
- **Income level:** those in the €74,000¹¹ range represent 29% of current holders overall and 30% of active holders, compared to 4% for those earning less than €30,000 (17% of the total population).
- **Education:** 23% of those with higher education¹² are current holders compared to 2% of individuals with a higher level of education, with over 70% of reluctant.

⁹ The qualification of «higher», «medium» or «lower» education is not comparable between countries, each having its own definition and terminology.

¹⁰ The qualification of «higher», «medium» or «lower» education is not comparable between countries, each having its own definition and terminology.

¹¹ Even if the salary range is not the same as with the other countries, the sociological profile analyzed remains similar

¹² The qualification of «higher», «medium» or «lower» education is not comparable between countries, each having its own definition and terminology.

For the United Kingdom:

- **Rate of current holders:** 12 %
- **Gender:** Similarly, active and static holders are heavily represented by men, 72 % and 75 % respectively.
- **Age:** In 2023, 29% of the aged 18-35 (20% of the total population) own crypto-currencies, representing 62% of current holders overall. The 35+ age group has almost 63% of reluctant, confirming the low rate of active holders in the country (3%) for this age group.
- **Income level:** of the population in the €60,000 range (20% of the total population) are current holders, and 14% are active holders, while less than 2% for those below €22 000.
- **Education:** Of those with a degree¹³, 11% are active holders compared to 4% of those without a degree.

Investment patterns in Europe

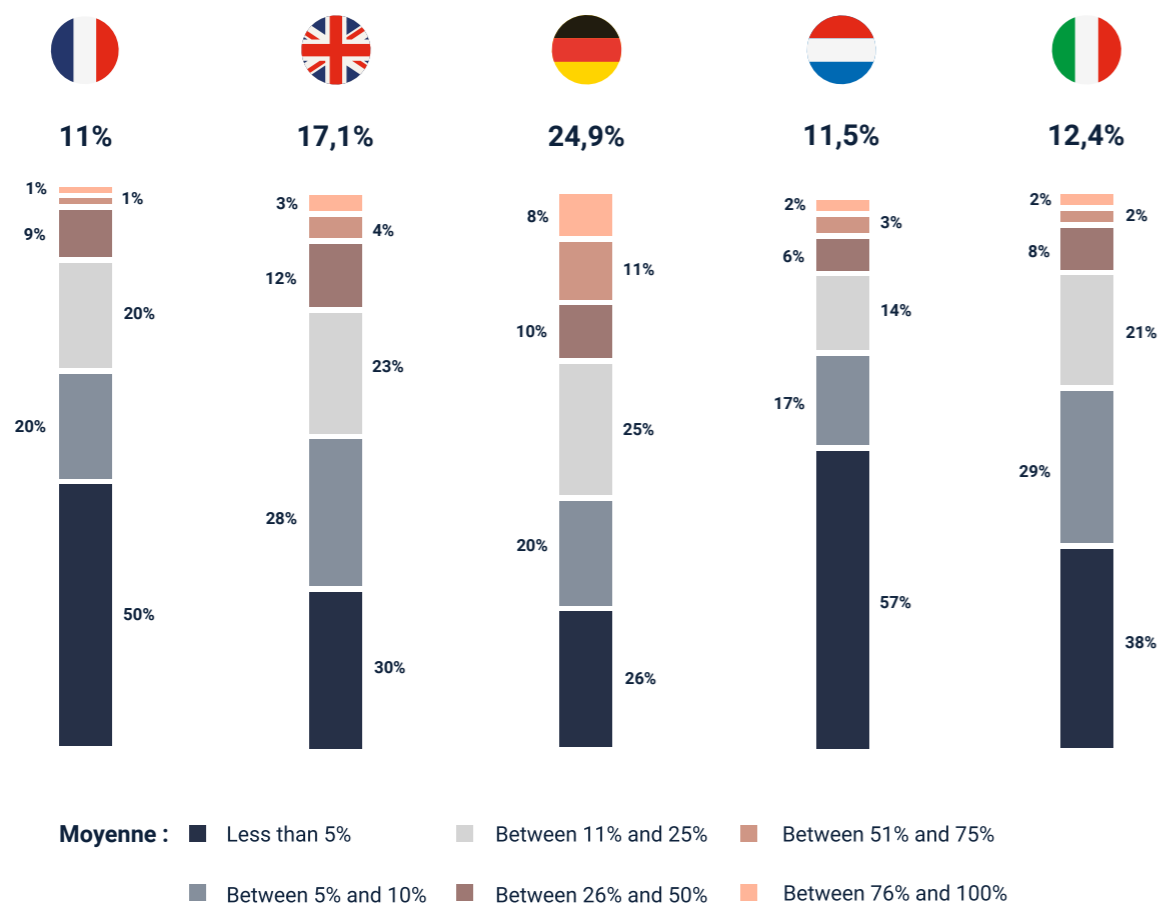
France has the lowest average savings rate invested in crypto-assets of the European panel on this study, considering the sample of crypto-asset holders.

The differences are significant between, on the one side Germany and the United Kingdom which have higher the average investment rates in digital assets (24,9% of total savings and 17,1 %, respectively), and on the other side Italy (12,4 %), The Netherlands (11,5 %) and France (11 %) where these results are more moderate.

The distribution between the different age and education ranges is more homogenous in Germany and the UK.



SHARE OF SAVINGS INVESTED



13 The definition of a level of education for 'graduates' or 'non-graduates' is not comparable to a higher or lower level as in other countries, each with its own specific qualification and terminology.

2. INTENTIONS REGARDING CRYPTO-ASSET INVESTMENT AND RELATED POLICIES IN FRANCE

2.1 FINANCIAL CONSIDERATIONS FIRST, IDEOLOGICAL REASONS SECOND (AND ONLY OCCASIONALLY)

The financial element is as evident as in the results of the study published in 2022. This confirms, as it did last year, that the acquisition of crypto-assets is carried out more from an investment perspective¹⁴ than for ideological reasons or for immediate use as may be the case in distressed economies or countries at war.

For holders, the motivation for investing in these assets is to seek a return on investment both in the short and long term, with respectively 40 % and 38 % of responses associated with these reasons. The third factor motivating investment is the belief that these assets could provide protection against inflation (30% of holders).

In this regard, when asked whether crypto-assets are considered safe-haven assets against euro or dollar inflation, the overall respondents (for those who have an opinion on the subject) answer positively by 49% (9% less than in 2022). Among French people who have already owned crypto-assets, 68% agree with this, while only 11% of those reluctant adhere to this idea.

At the time of writing the previous study, inflation forecast for 2022 was 2,7 %. Ultimately, actual inflation almost

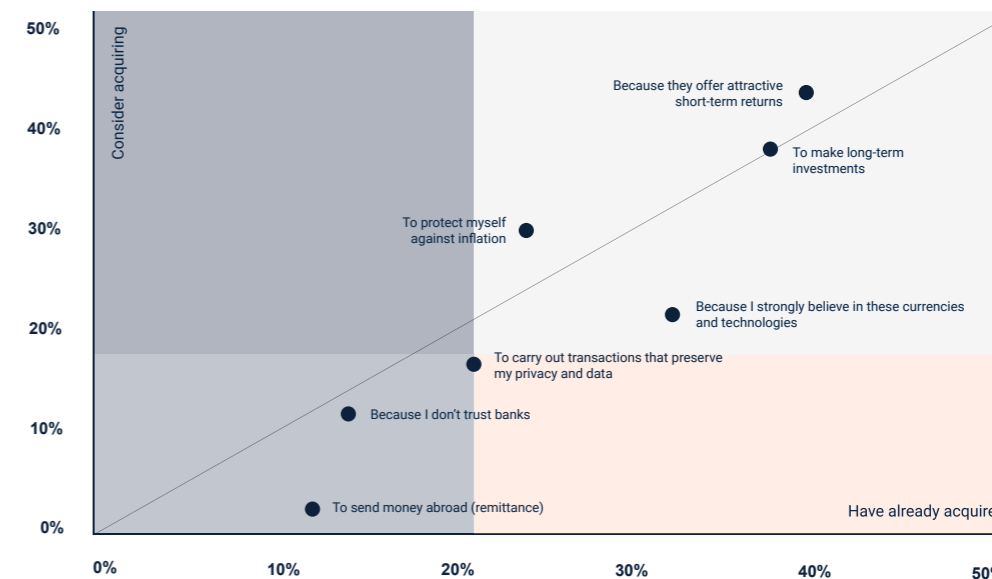
doubled to 5,2% in a context of falling crypto-asset valuations. The aforementioned 9% decline on the «safe-haven assets» subject can be explained in light of this, a decline seeming nonetheless quite limited considering the price drop of 60% from bitcoin's all-time high. This conviction therefore remains quite strong, despite the short term price volatility. The response is consistent with the approach of crypto holders to investing, more focused on long-term hoarding. The year of acquisition is also a key factor on answering this question, with pre-Covid crash holders (before 2020) accounting for more than 50% of respondents, amidst valuations that were low then, relative to early 2023.

Other factors motivating investment in digital assets include:

- Lack of trust in banks, accounting for 12%
- The desire for privacy on transactions, 15%
- The ability of sending money abroad, 4%

As of last year, it is noteworthy to observe that the distribution of these motivations among French people who have made a crypto acquisition has evolved, showing a gradual progression in their considerations.

Reasons for acquiring cryptocurrencies



14 Change in responses, so no comparison between the two surveys

Although the search for returns on investment remains the primary criteria mentioned, the investment time span seems to be shifting towards the long term, since there has been an increase in the motivation for long-term investment among active holders compared to potential first-time investors (from 38% to almost 49%), i.e., in the same proportions as the previous year. This difference in approach to the timeframe marks a clear dividing line between current active holders, non-active holders who are more interested in the long-term perspective, and former holders, who refer to the short term at 52%, compared with the long term at 27%. The return of a possible bull cycle could therefore trigger a return to acquisition.

Crypto-assets in all their variety, whether they are protocol tokens like bitcoin or ether, governance tokens, such as AAVE or Maker, or payment tokens for a service, have a diverse range of uses or utilities. Acquisition is not just for financial purposes. For example, 76% of respondents agree with the statement: «Cryptocurrencies (such as bitcoin, ether ...) have other uses beyond investment (such as participation in governance, use as means of payment, etc.)». This affirmative answer reaches 80% among current or past holders. This response underlines the uniqueness of this asset class and its very real relevance to everyday life.

This year's edition provides data on the reasons for acquiring stablecoins. Unsurprisingly, two motivations stand out across all samples, with the first being the desire to hedge against the volatility of other crypto-as-

sets (more than 50% of current, past and potential holders). The second reason, which is much more pronounced among holders, is the ability to avoid triggering a tax event¹⁵, while remaining in the digital assets' domain. This feature is expected to disappear with the adoption of the European MiCA (Market in Crypto Assets) regulation and the qualification of the main stablecoins as electronic money. Other reasons include using stablecoins as a means of payment and fund transfers, with 30% of the public surveyed having already acquired these tokenized currencies, tied to a use in Decentralized Finance.

As such, Decentralized Finance is a subject of interest to crypto-asset holders, with a total potential of 38% of holders aware of DeFi, meaning that about 3% of French people could place or use crypto-currencies and/or stablecoins in DeFi protocols in 2023.

FOCUS: Central Bank Digital Currency in 2023

For this second edition of the survey, 35% of French people over the age of 18 say they are interested in a Central Bank Digital Currency. In detail, the intentionists and the French owners who already own crypto-currencies declare themselves to be in favor of an CBDC project (70% and 75% respectively). Conversely, 88% of the reluctant are against the concept of CBDC and digital currencies in general. Similar to the observations regarding the reluctance to invest, this figure may be a more general sign of opposition to the digitalization of exchanges.

15 The tax event triggering taxation is the transition from crypto to fiat currency



2.2 Reasons for non-investment

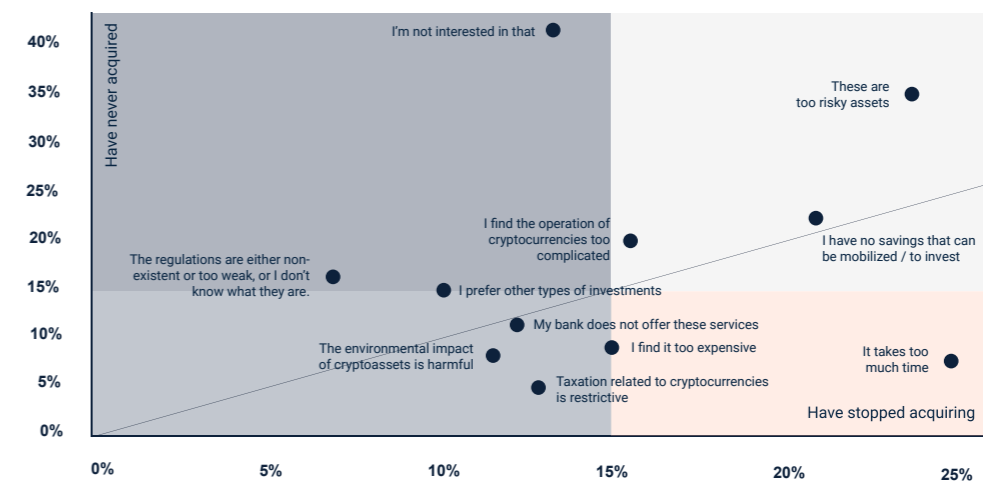
Among the reasons given by those who are reluctant to invest in crypto-currencies, the responses broadly give the following reasons in 2023¹⁶:

- I am not interested (41%)
- They assets are too risky (34%)
- I have no savings to invest (22%)

The main reason given by former holders is that it takes too much time (29%), followed by the same explanations as for reluctant individuals (24% and 22%).

Volatility or the lack of available savings are therefore the main factors why these two populations are unwilling to invest.

Reasons for non-acquisition of cryptocurrencies



16 modified compared to 2022

2.3 CONSIDERATIONS ON FRANCE'S POLICIES ON CRYPTO-ASSETS

The French doubt the country's ability to be a driver on the subject of crypto-assets with 45% responding with one of three statements, «France provides little incentives to develop the crypto-currency industry», «France is a bystander and absent on crypto-currency matters», and «France imposes too many regulatory constraints on the crypto-currency industry». Only 3% support the idea that «France already supports and develops the crypto-currency industry.» 52% have no opinion on this topic.

This opinion is increasingly held by French people who have already acquired these assets.

Nevertheless, of all the French people who have an opinion, 5% thought that France was already the leader in the sector, 42% that France could be well positioned, however there was still a long way to go and 53% said that France was too far behind. The main opportunities for France that were mentioned on the survey are the ability to have more influence in the world, to radiate, to achieve digital sovereignty, to create jobs and to become a greater economic power. These responses

fluctuate on a 23% to 28% approval rate in the overall sample, and over 50% for those who have already acquired crypto-currencies.

The question of perception is evidently crucial! The regulatory framework with the Loi Pacte in France in 2019, then the European MiCA regulation (voted in April 2023) offer a framework in France and by extension in Europe that is seen as an opportunity by the industry. This perception has been strengthened by the recent positions taken by the SEC in the United States.

There are obviously still certain challenges for the players in the ecosystem, such as access to bank accounts or insurance for companies in the sector.

The prospect of France being a preferred location in Europe for major international players is becoming apparent in light of the announcement by Binance, Crypto.com and Circle to set up operations in France, hence the contrast with the perception of respondents.

3. INVESTORS' PERCEPTION ON INSTITUTIONAL AND ON CRYPTO MARKET PLAYERS

3.1 INTERMEDIARIES AND DISTRIBUTION CHANNELS

The 2023 edition of this report provides new information on the main acquisition platforms used in France. Note that the answers to these questions can be multiple. Indeed, it is common for a crypto-asset holder to have several accounts with parties offering buying, selling and custody services for various reasons, including disposing of crypto-assets or the services offered.

Three acquisition channels are proposed in the study:

- Crypto players such as centralized exchange platforms, that are the historical drivers of adoption
- Fintechs operating traditional services and more recently providing a new acquisition channel to crypto-assets
- The banking channel with traditional and online banks: the study measures the existing traction on this third channel, which is still hypothetical.

Of the 11% of French people who have held crypto-assets, the top two distribution channels stand out.

Thus, among a suggested list of intermediaries, Binance and Coinbase come out on top with 39 and 28% of respondents declaring to rely on this intermediary, i.e., 2.2 and 1.6 million customers for the two platforms. Revolut and Lydia came third and fourth, with 20% and 13%. The presence of the latter two in the top ranks, which also offer other traditional financial services, underscores the appeal of crypto-asset holders to other assets such as stocks.

Other answers show that Coinhouse, Bitpanda, Kraken and Bitstamp stand out with 11, 10, 10 and 6% respectively.

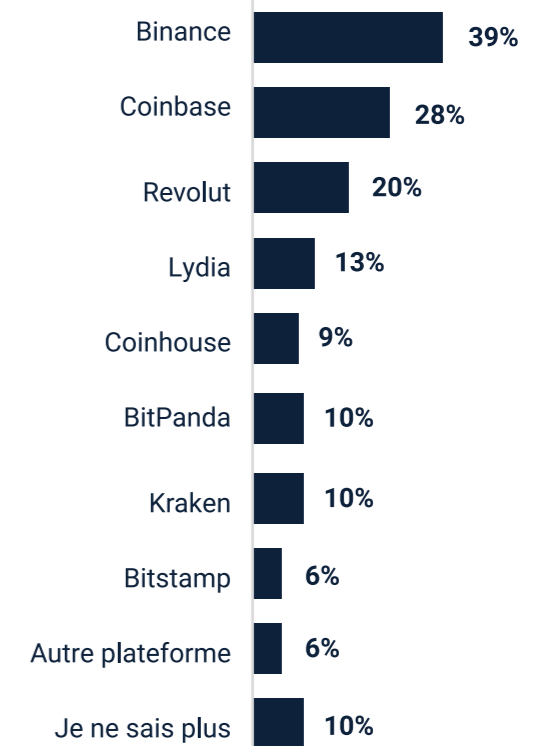
It is worth noting that while Bitpanda is chosen with 10%, it is at the same time a «white label» provider, particularly for Lydia, which is chosen with 13%. The same is true of Bitstamp with 6% and 20% indirectly via Revolut's offer.

The proportion of active investors is more pronounced for Binance and Coinbase with 47% and 37%. Coinbase has made significant progress, as only 23% of former holders were using the platform.

Acquisition platforms



Have already acquired cryptocurrencies



Traditional and online banks could become a third acquisition channel in the coming years. Nearly 45% of French people agree with the opinion that «Banks will one day take over the crypto-currency market» and 30% with «Traditional financial services could be offered by players that only offer crypto-currency-related services today».

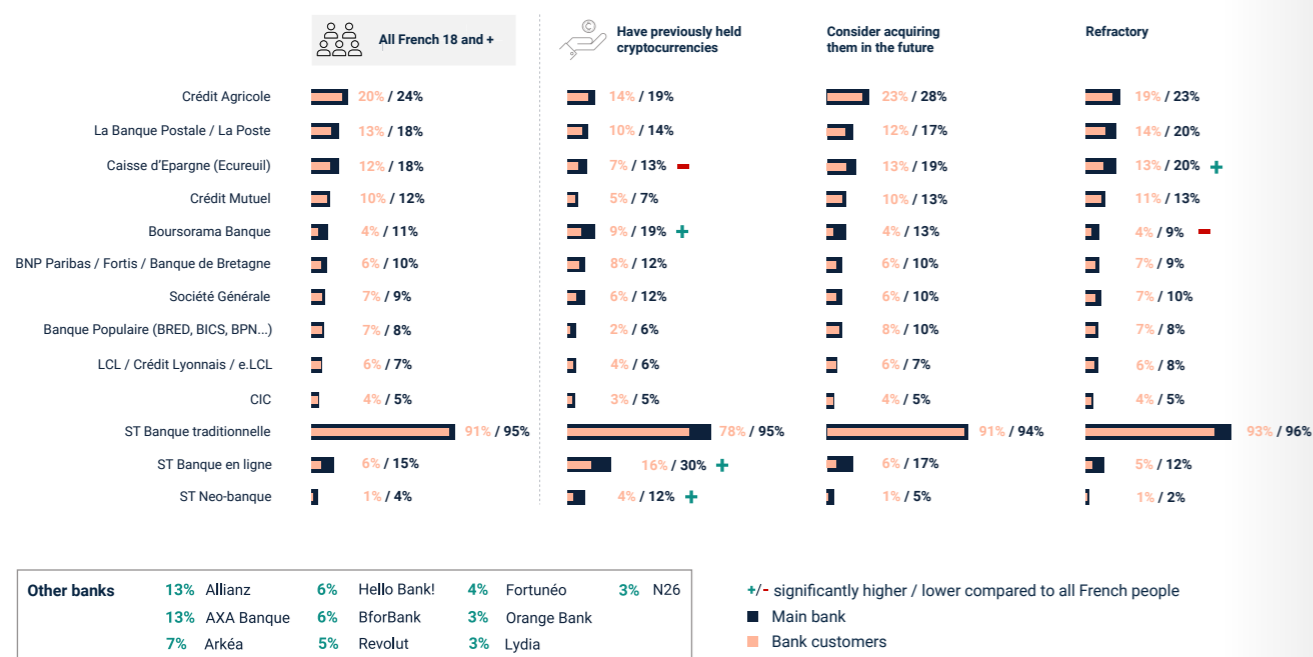
These figures illustrate the contest between crypto players and traditional players in the conquest of new markets.

In line with this, 35% of French people say they are interested in the idea of a bank offering services involving cryptocurrencies, a drop of 2% compared to last year. This proportion rises to 70% for investors and potential holders. This expression of interest thus concerns both existing investors and potential buyers.

This is reflected in the willingness to join an institution that offers crypto services for more than 6% of the total participants (compared to 7% last year), and 24% on the investor category.

The breakdown of respondents sorted by their banks (both primary and secondary) is consistent with last year's results. The only difference lies in the growing adherence to online banks and neo banks as primary and secondary banks for those who have already acquired cryptocurrencies and for potential holders. For example, 20% of potential holders have their main account in online banks compared to 7% in the last edition.

Primary and secondary bank



3.2 DIGITAL ASSETS SERVICE PROVIDERS ("PSAN" IN FRANCE)

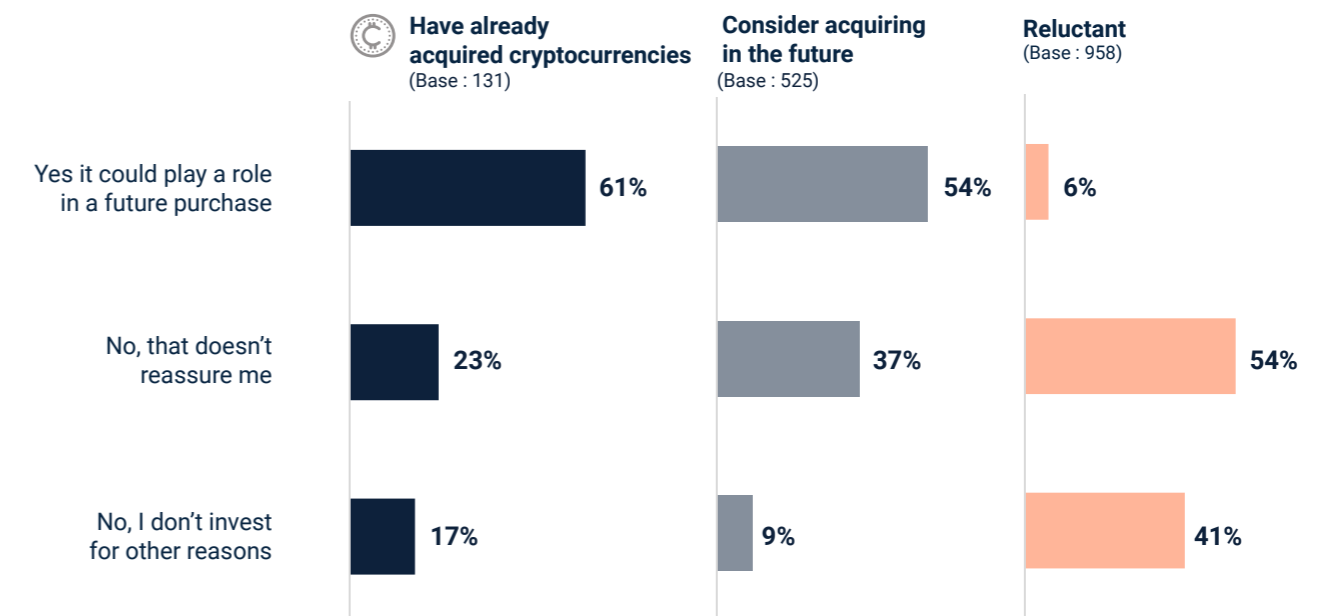
In 2023, awareness of registered PSANs¹⁷ is still low. 10% of French people are aware of the existence of an AMF registration for Digital Assets Service Providers (compared to 9% in 2022). Yet, without knowing it, the majority of crypto holders rely on companies that are registered as PSAN. 96% of acquirers who are aware of the registration say that it is a hallmark of trust and security in the choice of platform.

After providing respondents with a definition of the PSAN registration, the following three categories:

-non-active holders, former holders, -intentionists, the majority (between 53% and 64%) state that it could be relevant in their future investment decision.

These findings reveal the need for better information on France's national approach to digital assets, and for communication of the policies being deployed such as the PSAN registration. This would enable users to give priority consideration to service providers who respect the regulatory framework established by France and, in the future, by Europe.

Reassuring aspect of PSAN



17 PSAN stands for "Prestataire de Services sur Actifs Num riques" and corresponds to the registration or listing by the AMF, the French financial markets authority, of service providers. It aims at converging towards the CASP registration as defined in the framework of the European regulation MiCA (Markets in Crypto Assets).

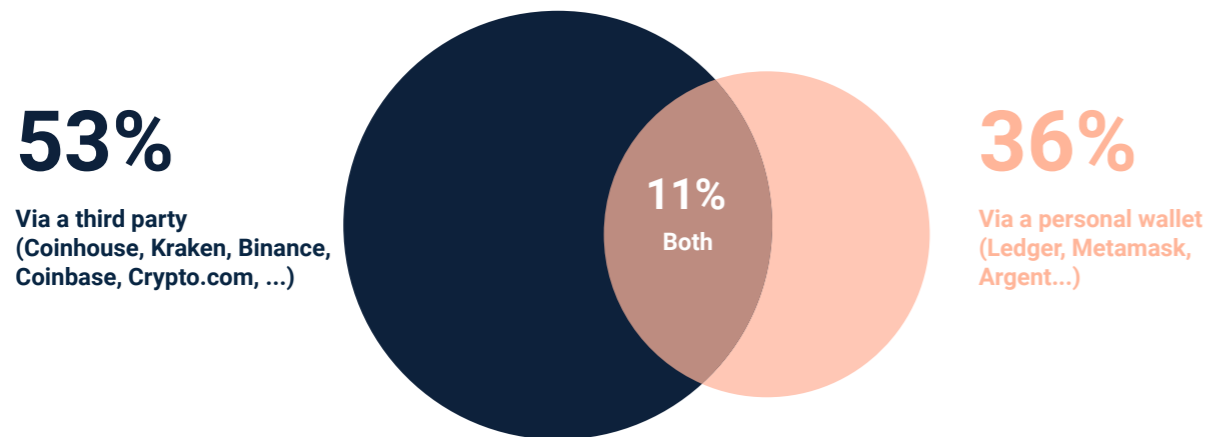
3.3 Custody of digital assets

In France

Custody behaviors have changed over the course of 2022 with holders turning to self-custody solutions in greater measure. This trend is accelerating as a consequence of the recent events mentioned earlier, as well as the persistent doubts about the soundness of intermediaries and the risk of potential loss of assets. Record sales by custody players such as Ledger¹⁸ also testify to this trend.

Thus, concerning active investors, only 53% of respondents declare having secured crypto-assets via a third party (against 62% for the previous edition). This difference is explained by a shift towards those who combine two ways of safekeeping their assets (11%), via a third party as well as via a self-custody solution like Ledger, Metamask or Argent.

Custody of cryptocurrencies



In Europe

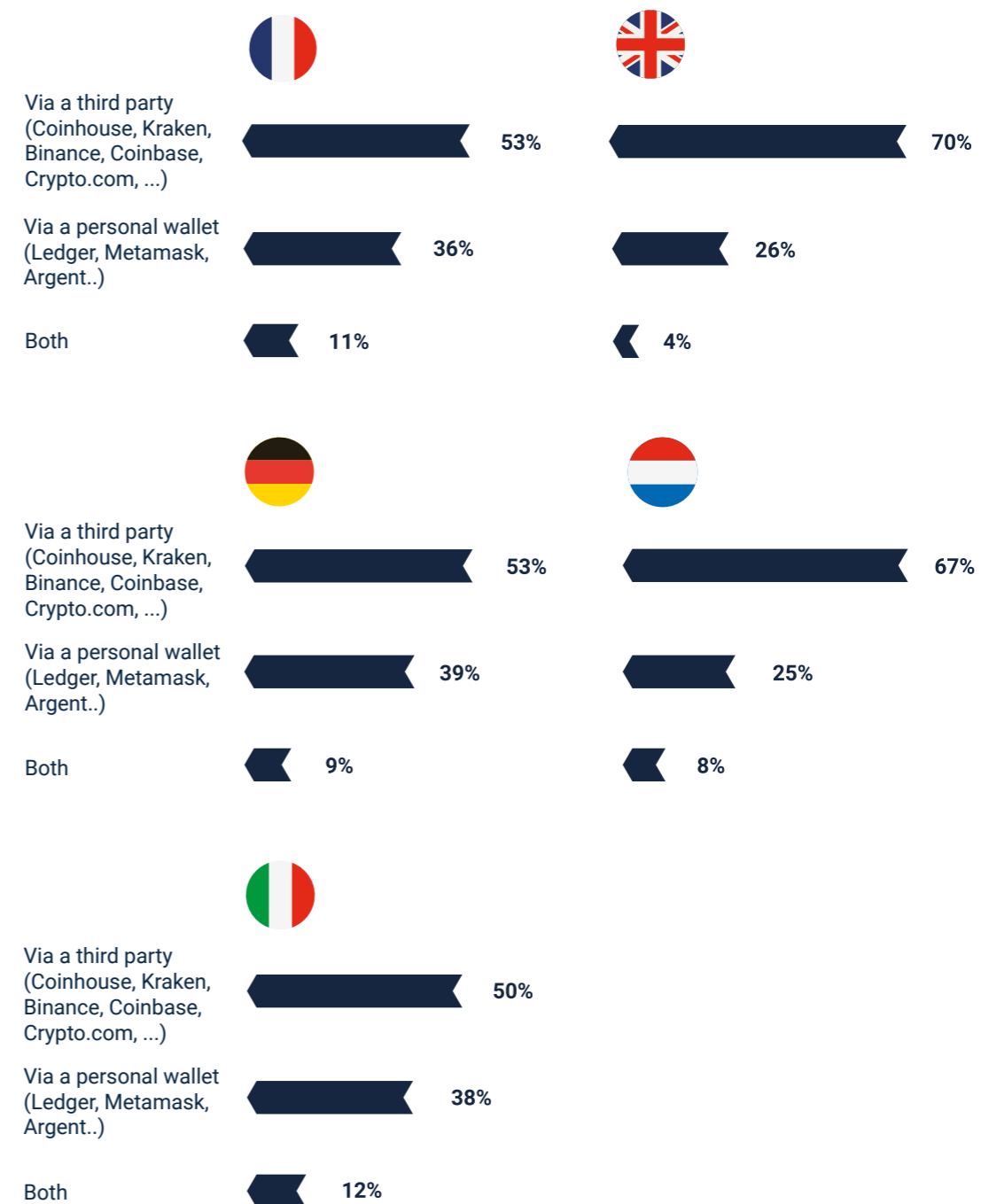
At the European level, the situation is relatively similar to that in France, where active holders in Germany (53%) and Italy (50%) rely on a third party for managing and securing their assets. In the latter two countries, 39% of respondents are also willing to use self-custody solutions.

Interestingly, static holders in Germany and Italy tend to use self-custody solutions to store and secure their crypto-assets, respectively at 44% and 45%. These figures likely reflect a mindset for long-term custody.

Active owners in the UK (70%) and the Netherlands (67%) strongly favor centralized third-party solutions.

For intentionists, there is a greater willingness to move towards third-party custody solutions, with over 50% of individuals in each country preferring this option.

Acquisition platforms



18 <https://www.maddyness.com/2023/03/22/ledger-pascal-gauthier/>

PART 2

APPLICATIONS IN INDUSTRIES

1. BANKING AND FINANCE SECTOR

Context

Bridging the gap between two worlds

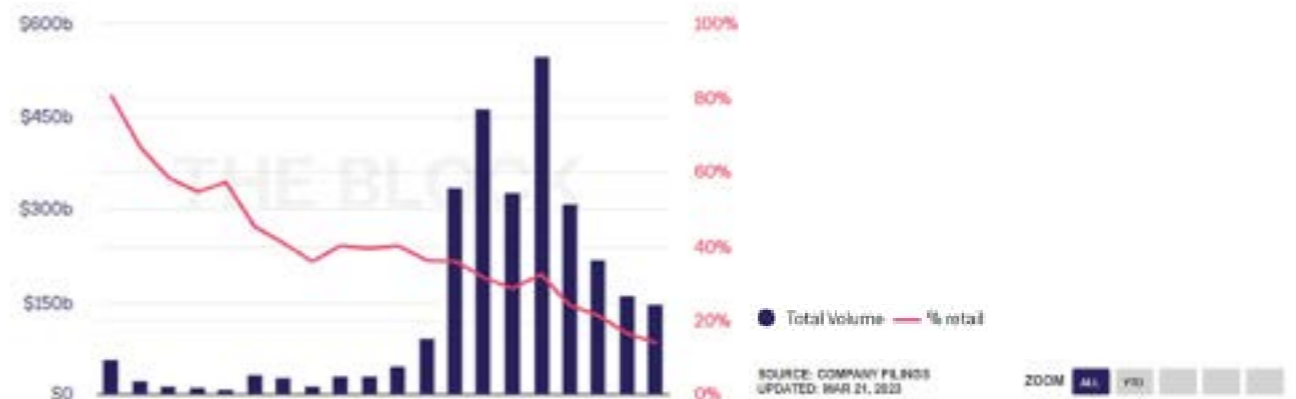
Despite a year 2022 impacted by a drop in the digital assets market value¹⁹ (and more generally the negative performance in financial markets), adoption in France has **grown by almost 20%**, with one in 10 French people having already acquired digital assets by early 2023 (see part 1: adoption).

Meanwhile, the markets' institutionalization is progressing, as evidenced by the trading volumes of digital assets, which are now mainly institutional (86% of the

exchange volumes on Coinbase are carried out by companies²⁰). Also, the PSAN listing - Digital Assets Service Providers - by the AMF of two CAC 40 groups through their subsidiaries: AXA Investment Managers (AXA) and Forge (Société Générale). Gradually, the **convergence of traditional finance and the digital asset industry is intensifying**. Financial institutions see this as an opportunity to take position in a market that is still being structured, by addressing the demand for new products and services (custody, investment, management) or by integrating into the value chain new asset classes (tokenization²¹, stablecoins²²).

Figure 1:

Figure 1 Total volume of trade on the Coinbase platform



19 In this study, we will use several terms interchangeably for the same meaning: crypto-assets, digital assets, tokens.

20 Coinbase's Total Volume (theblock.co).

21 **Tokenization** is the process of representing any asset, tangible or intangible, as a token on the blockchain. Registration on the blockchain guarantees the uniqueness and ownership of this token and more generally, allows it to benefit from all the characteristics of crypto-assets.

22 A **stablecoin** is a type of crypto-currency designed to maintain a stable value in the market. Although the mechanisms vary for each stablecoin, these crypto-currencies are meant to be resistant to market volatility, and the refore should not experience significant price fluctuations. It combines the benefits of a crypto-currency with the price stability of traditional fiat currencies. It does this by tracking the price of a traditional financial asset. In most cases, this asset is a fiat currency.

Levers for traditional financial players for offering services related to digital assets

There are various interesting drivers that traditional financial players (banks, fintechs, «neo-banks») can leverage to offer services based on blockchain and crypto-asset technologies:

- **Trust:** how customers perceive the reliability of providers influences their willingness to acquire digital assets. Today the market is poorly addressed by some players in the ecosystem who lack maturity, while existing institutions are already established as trusted partners, able to manage liquidity and to secure assets.
- **Accessibility:** access to digital assets is still complex and there is some friction in the customer experience. This remains a significant barrier to entry, particularly for less technologically-savvy investors. Traditional institutions can leverage their existing client base and their access to communication channels and services.
- **The need for regulated institutions:** finally, there is a strong need for compliance and internal control, underpinned by the emerging regulation, which contributes to the rise of re-intermediation. Incumbent players are perceived to be better regulated than new entrants to the crypto-asset markets.



REGULATION BOX

THE PSAN REGISTRATION

The **PSAN** (Digital Assets Service Provider) **registration** with the AMF (Autorité des Marchés Financiers) and the ACPR (Autorité de Contrôle Prudentiel et de Résolution) is **mandatory for all digital assets market companies** established in France and/or addressing the French public. Created in 2019 by the PACTE law, this registration aims to regulate the market by authorizing and supervising parties who offer services on digital assets, services such as the purchase, sale or custody of digital assets on account of their clients. In particular, it requires strict compliance with **current EU anti-money laundering and anti-terrorist financing (AML/CFT) regulations**.

THE REINFORCED REGISTRATION

The **reinforced registration** stems from the DDADUE bill voted by the French National Assembly on 28 February 2023. As of 1 July 2023, all new companies wishing to establish operations in France and obtain AMF approval to launch their business will be required to have adequate security and internal control systems and a conflict of interest managing system. The reinforced registration will therefore substitute the «simple» registration. There are new rules for custody firms on the segregation of funds between clients and the firm, among other things. In addition, there are cyber security requirements

PSAN LICENSE

The license created by the PACTE Law is originally optional and adds different requirements in terms of organization, financial resources and conduct of business compared to the «simple» and the reinforced registration. However, its optional nature is to be conditioned by the MiCA regulation coming into effect in 2024. Registered PSANs will have to be a CASP (Crypto-asset service provider) in order to have the right to address the European market, i.e., the equivalent of a PSAN license. The parties concerned have until 2026 to comply.

In March 2023²³ a total of **65 companies are registered as PSAN** in France. The vast majority of these companies are native players in the digital assets' ecosystem.

Fintechs and «neo-banks» have partnered with PSAN players in several ways to offer digital asset services to their customers:

- By aggregating a white-label solution;
- By referring the customer to a broker partner or a centralized exchange;
- By sourcing liquidity from different brokers or trading platforms.

More recently, traditional financial players have also acquired their registration as a PSAN: the Caisse des Dépôts et des Consignations, Banque Delubac & Cie, Société Générale Forge and AXA Investment Managers. In parallel, non-crypto native fintech players - such as eToro and Trade Republic - have also joined the AMF's whitelist of PSAN providers to offer their service to the French public.

Given their compliance and cybersecurity resources and experience, these institutions should be able to **address regulatory constraints better than the native digital asset actors**. Conversely, traditional players still have less understanding of digital asset technologies and markets than the industry natives, as well as greater susceptibility to negative preconceptions on the subject and less agility to transform their existing businesses.

Initiatives in the traditional financial sector across several segments

En B2C and B2B: In the French market space, Banque Delubac & Cie is the first bank registered as a PSAN (in spring 2022) to offer investment services (purchase/sale of digital assets for fiat currency, and the exchange of digital assets for other digital assets) and custody of digital assets to its retail, corporate and institutional clients.

En B2C: Within the Fintech sphere, Lydia has been integrating a white-label PSAN solution, Bitpanda, since the end of 2021, which allows Lydia to offer investment and custody services on digital assets to its retail customers (in addition to the listed stocks offering). These services are also available at Revolut, which sources liquidity from several brokers or exchange platforms on behalf of its clients.

En B2B: The fintech Qonto also provides its services to customers (companies and businesses) who wish to invest their cash, in this case by referring them to broker partners (namely Coinhouse and Stackinsat, both registered as PSANs). In turn, by fully outsourcing this service, Qonto is not constrained to be registered as a PSAN itself.

En B2B2C: The French broker Aplo (formerly Sheeldmarket) targets financial institutions (family offices, wealth managers, etc.) wishing to offer digital asset exposure strategies to their end clients, and is also registered as a PSAN. Similarly, the approval obtained from the Financial Sector Supervisory Commission authorizes Aplo to provide banking services (IBAN) in other EU countries through its partnership with the «neo-bank» Olkypay.

Ancillary services Some online banks also offer alternative services without allowing the purchase and sale of crypto-assets. Boursorama, Société Générale's online bank, enables its customers to aggregate their external crypto accounts on its application for consulting balances. This allows Boursorama to measure its customers' interest in digital assets without taking the risk of intervening in their management or custody.

Other players are moving further into their offering, such as Delubac bank, which provides access to other financial services related to digital assets, such as staking²⁴, a so-called «market neutral» investment that generates passive income. In France, the institutional staking market is being covered by a small number of players such as Kiln, Meria, or else Exaion, a subsidiary of EDF Group dedicated to web 3 solutions and blockchain node hosting.

23 Obtaining PSAN registration / approval | AMF (amf-france.org)

24 Staking is a process of locking up crypto-currencies to contribute to the correct functioning and security of a blockchain, operating on the Proof of Stake consensus system. In return, the investor recovers gains over the long term, generating passive income in the form of yield.

USE CASES

Custody of digital assets: the first functional component for offering services on digital assets

The expansion of use cases based on digital assets and the introduction of new digital financial assets (such as stable tokens used for payment known as «stablecoins», CBDC²⁵, tokenized financial securities, etc.), require, first and foremost, a custody layer.

Custody of digital assets is a new business and an opportunity for financial institutions to create new services for individuals, institutions, and other entities.



The custody of digital assets is carried out through a digital wallet, which in concrete terms represents the coupling of a public address (the ID) and a private key (the password to validate transactions). Wallets are supplied by technology providers that differ mainly in the private key management method. There are two key components to consider when providing a digital asset custody service:

- The technical expertise to ensure the security of digital wallets (hence of private keys). Specialized technology providers exist such as Fireblocks, Ledger (French Tech unicorn), Metaco, Taurus, etc., which do not have the capacity to freely move funds from the wallets but do provide the underlying technology to secure the assets by deploying an adequate governance of private keys. To this end, they are not PSANs in the current sense of the Monetary and Financial Code, nor of the future MiCA regulation.
- Responsibility for the management and custody of digital assets on behalf of third parties. In France, it is necessary to be registered as a PSAN to be able to manage and hold digital assets on behalf of third parties.

There are two models followed by financial institutions to provide digital asset custody services:

1. By internalizing all functions (and hence managing all clients' private keys). This implies I) integrating a service provider to supply the technology needed to secure digital wallets; and II) being registered as a PSAN, to comply with regulations for the management/custody of digital assets on behalf of third parties (or integrate a PSAN as a service solution). This allows to build an in-house service and implies full responsibility over the clients' digital wallets. Since funds can be accessed and managed, this model resonates to the idea of bank deposits or even of cash management services for corporates. As part of the PSAN registration, this approach requires implementing customer identification (KYC for Know you Customer) as well as transaction analysis and tracking tools (KYT for Know Your Transaction) such as Chainalysis or Cyphertrace for AML/CFT compliance purposes.

INITIATIVES

This strategy seems to be preferred by banking institutions. Indeed, in 2022, several French banks announced partnerships with technical providers of custody solutions, such as the alliance between Delubac and the Swiss provider Taurus.

Société Générale (via its subsidiary Forge) and BNP Paribas have chosen the technology provider Metaco, while Crédit Agricole (via CACEIS) has partnered with Taurus. It should be noted that the initiatives of Société Générale, BNP and Crédit Agricole currently only involve custody of security tokens, i.e., traditional financial securities running on a blockchain (more details in the next part of this section).

2. By outsourcing all functions and integrating a white-label custody solution (the management of the clients' private keys is externalized). These providers are mainly digital asset exchange platforms, such as Binance, BitPanda, Coinhouse, etc., which are registered as PSAN and externalize the security of the keys to a technical provider. For financial players, this is akin to distributing a custody solution by delegating responsibility over the customers' digital wallets.

INITIATIVES

This option seems to be popular with Fintech players and «neo-banks» such as Lydia or N26, which integrate Bitpanda's solution to offer custody services to their customers.

Investment products on digital assets that meet institutional requirements

Some investors - especially professionals - are more constrained by regulation or risk governance policies and do not seek direct exposure to digital assets. Indirect exposure and/or through more traditional investment vehicles allow investors interested in this new asset class to have access to the market.

Some of these solutions include:

1. Specialized funds and life insurance funds

Following their recent registration as a PSAN (March 2023²⁶), AXA Investment Managers currently have the opportunity to open this new asset class to retail and institutional clients through dedicated funds, thus constituting a new adoption driver for digital assets. Thanks to a decree amending the Pacte Law of December 2022, it is now possible to gain exposure to digital assets via life insurance contracts. Following this, the asset manager Tobam has structured a multi-asset fund composed of securities indexed to the price of bitcoin (with up to 10% allocated to direct exposure to bitcoin) and other digital assets. This fund is now available to retail investors via life insurance channels.

Nortia, a marketplace dedicated to wealth solutions within DLPK Group, offers its 1,200 wealth management advisors access to investment products from Coinhouse, a French centralized exchange platform registered as PSAN.

2. ETFs or Exchange Traded Funds

ETFs allow investors to be exposed to the value of an index or bundle of assets without directly owning the underlying assets. US asset manager BlackRock launched the iShares Blockchain Technology UCITS ETF in September 2022, which is composed of stocks of companies active in the blockchain ecosystem, such as exchange platforms, technology infrastructures and investment funds (e.g., Coinbase, Nvidia, Galaxy Digital, etc.). The UCITS Blockchain ETF is listed on Euronext and therefore accessible to French and European investors. ETFs in Europe are regulated products with diversification requirements, which limits the issuance of thematic ETFs focused on a single digital asset (such as bitcoin). Despite this, the management company Melanion Capital, registered by the AMF, has issued the first UCITS ETF that replicates the performance of bitcoin. The vehicle incorporates shares of 30 bitcoin-related companies and aims to achieve a 90% match with its price²⁷, without being directly indexed to the asset.

3. Thematic funds

In addition to ETFs, asset managers are also launching funds focusing on the blockchain theme. This is the case, for example, of Rothschild & Co Asset Management, which launched a blockchain-themed international stocks SICAV fund in July 2022²⁸. And Arquant Capital, proposing professional investors²⁹ active and passive management funds in bitcoin and ether (the Ethereum blockchain's native asset)³⁰.

25 CBDC or Central Bank Digital Currency is a new form of book money, issued by central banks on blockchain networks.

26 Obtaining PSAN registration / approval | AMF (amf-france.org)

27 Melanion BTC Equities Universe UCITS ETF

28 The fund consists of stocks and bonds of 10 companies in the blockchain and digital assets ecosystem. R-co Thematic Blockchain Global Equity - Our Funds - Rothschild & Co Asset Management Europe (rothschildandco.com)

29 Institutions, private banks, family offices and corporates

30 Interview with Eron Angele, CEO of Arquant, in Token Magazine - Arquant

4. Financing through private equity

Moreover, there is a strategic opportunity for companies and investment players who, ahead of MiCA requirements, anticipate the growth of certain segments and services in the ecosystem, such as custody, brokerage, blockchain-based flow analysis tools, etc.

There are several ways in which they can take action to contribute to financing the innovation in the ecosystem:

- Minority shareholdings, in line with Bpifrance's strategy. In particular, the public investment bank participated in the fundraising of technology provider DFNS, which develops custody solutions.
- The creation of joint venture capital funds, such as the one launched by Cathay Capital and Ledger, with the contribution of Bpifrance.
- Strategic participations, such as Credit Suisse and Deutsche Bank, which both contributed to a \$65 million Series B round for Taurus (a technology provider for custody services), or even Oddo BHF, participating in Coinhouse's latest €40 million fundraising round³¹.
- Corporate Venture Capital and incubation programs, such as EDF Pulse (EDF Group's in-house incubator) and its subsidiary Exaion, which develops Web 3 services.

Tokenization of financial assets: the intersection of traditional finance and digital assets

According to a study by BCG and ADDX, asset tokenization will reach \$16 trillion by 2030, or 10% of global GDP³². HSBC and Northern Trust³³ estimate that 5% to 10% of all assets in 2030 will be tokenized, roughly equivalent to \$20 trillion.

Tokenization is a process that allows the digital representation of an asset (either tangible or intangible) on a blockchain. The assets represented on-chain thereby acquire the characteristics of other digital assets: liquidity, divisibility, and accessibility, among others. These attributes can thus apply to traditional financial securities such as shares or stocks, bonds or real estate, but also to other types of assets such as legal

tender currencies. These on-chain representations of fiat currencies, which benefit from both the characteristics of digital assets and the stability of legal tender, bridge the gap between traditional finance and the digital world.

Stablecoins: tokenizing legal tender

There are several ways to represent fiat money on a blockchain network. The most secure one is to deposit fiat reserves in bank accounts as collateral, and then issue the same amount (1:1) as tokens on the blockchain. Today, the main stablecoins (BUSD, USDC, USDT) are backed by the dollar and are issued by private players in the digital sector (Binance, Circle, Paxos, etc.). Together, these stablecoins represent a market capitalization of approximately \$112 billion, a value that has increased by a factor of 2.8 since March 2021 (approximately \$40 billion then).³⁴

In the financial sector, stablecoins present several opportunities:

- **For investors, the possibility to hedge against price volatility** while remaining within the digital asset ecosystem, thereby avoiding triggering a tax event.
- **For financial players, but also for corporate treasurers, it is a fast, transparent, borderless, and low-cost means of payment that remains indexed to fiat currency.** Specifically for interbank payments, transfers between financial institutions, foreign exchange (FX), settlement of financial securities, etc.
- **Finally, for banking players, who are perfectly suited to manage the stablecoins' collateral reserves in fiat** (which need to consist exclusively of cash and near-cash securities), this is an opportunity to provide their corporate clients with new payment instruments.

Nevertheless, there are currently very few issuers of euro stablecoins in Europe (Tether (EURT), Stasis (EURS), Circle (EUROC), Angle (agEUR), Lugh (EURL), Celo (cEUR), Monerium (EUR) etc.). The ecosystem is therefore mainly dominated by the dollar, as are the traditional markets.

31 ODDO BHF - Independent Franco-German Financial Group (oddo-bhf.com)

32 bcg_ADDX_report_Asset_tokenization_trillion_opportunity_by_2030_de2aa41a4.pdf

33 Beyond Asset Tokenisation | Northern Trust

34 Top Stablecoin tokens by market capitalization | CoinMarketCap



In response, the MiCA regulation, which supervises and qualifies stablecoins, introduced restrictions on stablecoins that are not backed by the euro (or other legal tender in the EU), and provide with **some regulatory clarity that may ultimately encourage the growth of euro stablecoins.**

Simultaneously, MiCA exclusively authorised the issuance of euro stablecoins collateralized with euro (the so-called «electronic money tokens») to credit institutions and e-money institutions, opening up opportunities for certain parties such as banks, but limiting competition in this sector.

Some companies, such as Circle, the US-based issuer of USDC stablecoins, have been able to meet the regulator's requirements. Indeed, Circle has been issuing its Euro Coin (EUROC) stablecoin since June 2022 and has launched its European strategy: first by announcing its installation in Paris, then by applying for an e-money license and a PSAN registration with the AMF. Similarly, the US company Tether, best known for its USDT stablecoin, is issuing the euro stablecoin (EURT) with the largest market capitalization, of about \$210 million (March 2023), still far behind USDT (\$70 billion).

As a result, EURT is available on major cryptocurrency exchange platforms such as OKX, Huobi, Bitget or Bitfinex.

Tokenizing financial securities

Extending the characteristics of digital assets to financial securities (listed stocks, bonds, commodities and currencies), but also to private securities (unlisted shares³⁵, private debt, funds), presents several major opportunities for the financial sector³⁶:

1. Lowering barriers to entry: tokenization makes financial assets **much more liquid, fractional, and accessible** to new investor categories, especially in private capital markets where assets are difficult to fractionate, investment tickets are often very high and restricted to an accredited audience.

For instance, Access Equity has taken this approach, enabling the shareholding management for unlisted companies, with tokenized and hence more granular units of shares to promote access to a broader base of shareholders. BlockPulse, a tokenization-based platform also enables unlisted companies to raise funds and manage their shareholdings. In parallel, operations such as the verification of investors' identity, are simplified thanks to the automation of regulatory compliance and governance processes.

2. **Interoperability with the digital world:** when tokenized, financial securities co-exist with other digital assets on a single infrastructure. Thus, beside their direct use in payments, stablecoins also have great potential in the settlement of tokenized securities. **It is also an opportunity to overcome the issue of legacy siloed registers.** Today, financial intermediaries need to reconcile registers when settling securities, which is costly and entails significant risks and delays. Operating the trade or the exchange on a single infrastructure/register eliminates the delivery-settlement process.

For example, it takes about 15 seconds to execute a transaction on the Ethereum network. .

3. **Transaction traceability and analysis:** the use of blockchain technologies, and of transparent and immutable registers, allows to deploy much more **accurate, agile, and automated monitoring tools and alert mechanisms.**

35 Shares in the capital of an unlisted company (pre-IPO shares)

36 The tokenization of assets in reality concerns all sectors of the economy, being «assets», a broad term referring to resources, tangible and intangible objects. This section of the report deals with financial assets, excluding some of them such as real estate assets which will be analyzed in another section.

INITIATIVES

Examples of initiatives taken by institutional entities over the last two years:

- In April 2019, Société Générale SFH, a subsidiary of Société Générale, together with SG Forge, issued the first bond (100 million euros) as security tokens on a blockchain network. One year later, they carried out a new intra-group bond issued on the Ethereum blockchain. The group subscribed to 40 million euros of bonds issued as security tokens by its subsidiary, which were in turn settled in digital euros issued by the Banque de France. For the Banque de France, this test is the first step in working towards the use of a future «tokenized» euro in interbank transactions.
- In April 2021, the European Investment Bank (EIB) issued on-chain bonds for 100 million with a 2-year maturity, underwritten by Société Générale, Banco Santander and Goldman Sachs. These EIB bonds were then bought back on a secondary market by AXA Investment Managers and Generali Asset Manager.
- In April 2022, BNP Paribas brokered the on-chain issuance of EDF bonds aimed at financing renewable energy projects and bought by BNP Asset Management.
- In September 2022, securitize tokenized units of a KKR investment fund dedicated to the health-care sector.
- At the beginning of 2023, DekaBank, DZ Bank and Union Investment purchased a 60-million-euro digital bond issued by Siemens on the public Polygon network in accordance with the German Electronic Securities Act (eWpG).
- In an experimental framework, JP Morgan, in association with the Monetary Authority of Singapore (MAS) issued in September 2022 a series of on-chain securities to trade Japanese and Singaporean currencies and treasury bills over blockchain networks.

37 Markets in Financial Instruments Directive
38 Regulation on Central Securities Depositories



In March 2023, the Pilot Regime for DLT market infrastructures came into effect in Europe to remove barriers in existing financial regulation on the use of blockchain technologies, for the issuance and trading of tokenized financial assets (stocks, debt, and fund shares). The Pilot Scheme should enable participants, primarily financial institutions, to experiment with the tokenization and trade of these assets by benefiting from the necessary exemptions to the current regulations (namely in relation to MiFID³⁷ and CSDR)³⁸. Planned for a minimum duration of three years, the DLT Pilot Regime may be renewed once, or be completed, or even become permanent.

PUBLIC POLICY MAKERS' ACTION SPAN

- **Work towards the completion of the MiCA texts** in order to facilitate the transition of the French regime to the European regulation.
- **On the reinforced PSAN registration:** the framework and conditions for the PSAN registration, as well as the cybersecurity requirements for providers, should be further clarified.
- **On the Pilot Scheme, to avoid contradicting its intended goals:** allow the settlement of on-chain securities with fiat money (stablecoins), in order to be able to operate end-to-end transactions on the blockchain (both the cash leg and the securities leg), thus reducing the time and resources dedicated to experimentation.
- **On the prudential treatment of banks' exposure to digital assets and the position of the Basel Committee and the European Parliament on this subject:** to ensure that capital requirements and the impact on the various prudential ratios do not hinder the development of current experiments (namely tokenized financial securities) and related assets.

2. ENERGY AND ENVIRONMENT

Context

France, along with much of Europe, plunged into an **energy crisis** in 2022. The war in Ukraine is driving European countries out of their dependence on Russia, especially for gas imports. Simultaneously, **the increase in overall electricity consumption** requires a greater supply of electricity in the country. **The climate issue** also calls for a reduction in the share of fossil fuels, and more specifically hydrocarbons (oil, gas, and coal) accounting for almost 46% of gross energy consumption in France³⁹ in 2021. As part of the revised Renewable Energy Directive (RED II), the European Union Member States have also agreed on a target 42.5% of renewable energy in the Member States energy mix by 2030.

In this context, **promoting France's energy independence and sovereignty** through the development of « green » energy has become a fundamental issue.

Renewable energies play an increasing role in the French energy mix, representing more than 19% of gross consumption in 2021⁴⁰. Nevertheless, to replace other energy sources and reach a less carbon-intensive mix in the future⁴¹, renewable energies must become more profitable and accelerate their deployment. The transition to this new energy model therefore faces several challenges, the most significant of which is **managing the renewable energy network**.

39 Key energy figures - 2022 edition | Statistical data and studies (developpement-durable.gouv.fr)

40 *Ibid.*

41 Energy futures 2050: the production mix scenarios under study to achieve carbon neutrality by 2050 | RTE (rte-france.com)

42 Mining (or Proof-of-Work - PoW) consists of mobilizing significant computing power to guarantee the integrity of a crypto-currency. Participating in these operations is remunerated by creating money and charging a transaction fee in the relevant crypto-currency. Mining is an operation that mainly involves the network Bitcoin network today.

43 Bitcoin Mining Council Survey Confirms Year on Year Improvements in Sustainable Power Mix and Technological Efficiency in Q3 2022 - Bitcoin Mining Council

44 The Proof-of-Stake (PoS) or Proof-of-Stake is an alternative way to guarantee the integrity of a blockchain network. Unlike mining (or Proof-of-Work), it does not require mobilizing computing power, but relies on an economic mechanism that consists of locking a share of capital. This is the method used by Ethereum, among other blockchain networks.

45 Delegated Proof-of-Stake (DPoS) is a variant of the Proof-of-Stake (PoS) consensus mechanism, whereby delegates choose intermediaries (nodes and/or validators) and entrust them with capital to participate in securing a blockchain network.

The digital asset industry: a complementary means of reducing the carbon footprint

The « bitcoin mining⁴²» business has undergone a paradigm shift: although mining is an energy-intensive activity, its environmental footprint depends primarily on the source and type of energy used. As of Q3 2022, the mining industry's energy mix is composed at 60% from sustainable sources⁴³ (growing at 3% per year) making bitcoin mining a low-carbon industry with a high decarbonization rate.

Mining is a mechanism for securing blockchain networks, but other mechanisms exist to meet the same objective (Proof-of-Stake⁴⁴, Delegated Proof-of-Stake⁴⁵, etc.). Globally, these mechanisms require the use of computer hardware, known as «HPC» for high performance computation. This same hardware is used, for instance, in the video game industry, artificial intelligence or film animation due to the need for high computing power.

However, **energy companies have identified footprint reduction drivers in the use of hardware to secure blockchain networks** (through mining, PoS, etc.). This practice promotes a more efficient management of the electrical grid, the decarbonization of oil production and the recycling of underused hardware.

USE CASES

Finding a balance on the renewable energy grid by using HPC technology infrastructures

One of the main challenges of the energy transition to renewable and decarbonized energies (RE) is the risk of overload on the RE network. Unlike electricity from coal or gas, power from RE sources is not easily pilotable and is produced intermittently, being dependent on meteorological hazards (e.g., sun, wind, etc.). In order to prevent peaks in power demand, production for renewable energy is higher than real demand, which eventually saturates the network. In addition, storing this type of energy is complex and expensive, especially for a large-scale deployment. Methods for stocking RE include the production of batteries or the production of hydrogen by the electrolysis of water⁴⁶.

The consequence is unequivocal: the mismatch between supply and demand causes an energy overload of the RE network. This leads to tension in the lines that transport the energy and, eventually, a «leakage» of the excess produced.

Demand response strategies allow for shifting or reducing electricity demand to provide flexibility in wholesale and ancillary markets, which helps to balance the grid⁴⁷. **Diverting energy during periods of RE grid overload to HPC computing centers allows to intermittently modulate distribution. The HPC hardware thus consumes the so-called unavoidable energy⁴⁸ at times of grid congestion.**

Proof-of-work mining is one of the few energy consumption industries that is controllable (instant interruption is possible), mobile (requires little hardware to be deployed) and monetizable (immediate financial gain by the service provider). As an example, HPC machines used to secure certain blockchain networks can be unplugged in less than 15 seconds during peaks in electricity demand. **This activity is rewarded (through value creation on the blockchain of reference) which ensures the profitability of the RE infrastructure at times of low demand.**

This activity has helped to balance the grid in the north of Norway⁴⁹, where hydroelectric power is abundant but distribution constraints between regions are high⁵⁰ and population density is too low to cope with production supply.

This alternative strategy appears to be easily implemented. It is also in line with the IEA's recommendations⁵¹ to favor demand response solutions for the RE grid as part of its zero net emissions goal by 2050.

INITIATIVES

One of the first French project leaders to seize this new opportunity is the company **Big Block Green Service or BBGS** (formerly Big Block Datacenter, created in 2017 in Nantes). BBGS installs mobile hardware centers and datacenters near renewable energy plants with overcapacity. BBGS thus enables power to be diverted to datacenters when the grid is overloaded, and for these datacenters to be unplugged when energy demand increases.

Sesterce, founded in 2018, also deploys scalable HPC data and computing centers that are powered exclusively by green energy. These infrastructures serve as an IT base for players wishing to participate in securing blockchain networks; their electricity consumption can be interrupted as soon as local demand increases. Participants, particularly from the public sector (e.g., local authorities), **can finance renewable energy plants in exchange for preferential access to surplus energy.**

In Texas, authorities have encouraged the development of this practice as a demand response strategy. It has already proven effective in July 2022, when data centers instantly reduced their consumption, following ERCOT's request to meet the population's needs⁵².

46 Note from the Senate on the subject of hydrogen production: Les Notes Scientifiques de l'Office (senat.fr)

47 International Energy Agency (IEA) definition of Demand Response strategies

48 Unavoidable energy is residual energy that is inevitably produced by certain processes or products and is often considered lost but can be partially recovered or reused.

49 Cryptocurrency miners seek cheap energy in Norway and Sweden | Reuters

50 Bitcoin Mining Around the World: Norway (hashrateindex.com)

51 IEA, target of 20x by 2050 in the value of demand response solutions to promote grid flexibility from RE.

52 Bitcoin (BTC) Miners Shut Off Rigs as Texas Power Grid Nears Brink - Bloomberg

Capturing wasted energy to power HPC infrastructures

The loss of energy units also affects the production of fossil fuels, the surplus of which is partly dissipated because of the difficulty and cost of inserting it into the grid. This loss is in turn responsible for a significant negative impact on the environment.

Specifically, methane gas, a natural gas released during the oil production process at the extraction and refining sites, is now largely burned into the atmosphere. This practice, known as gas flaring, converts the methane⁵³ into carbon dioxide, which is said to be 25 times less harmful in terms of greenhouse gases⁵⁴. This reduces emissions to some extent, but other toxic gases are still released into the atmosphere.

In 2021, 143 billion cubic meters of methane gas was « flared », which is roughly equivalent to the total volume of natural gas imported into Germany, France, and the Netherlands in the same year, according to the IEA⁵⁵.

This causes 270 mega tons of CO₂ to be released directly into the atmosphere, along with methane, black soot, and other greenhouse gases. This practice is therefore extremely polluting and represents a significant waste (up to 55 billion dollars per year according to the IEA⁵⁶). Reusing this energy for other purposes would reduce the environmental footprint of these toxic gases.

The Bitcoin network could be powered more than five times by the energy generated from the global volume of methane burned in a single year⁵⁷. Operating HPC centers with converted methane energy provides an economic incentive for oil extractors. The latter are thus able to sell the pressurized gas recovered at the oil extraction site. This natural gas is converted into electrical energy using mobile conversion containers that are already supplied by service providers.

Figure 2:

Components of the energy conversion system that powers HPC infrastructures, according to the system implemented by Crusoe Energy Systems



53 Methane (CH₄) is a gas with a much greater greenhouse impact than carbon dioxide (CO₂) in the atmosphere, leading to more penalties for oil operators. Through its combustion, methane is partly transformed into carbon dioxide, which is one of the reasons for this practice in the sector.

54 Greenhouse gases: CO₂ or methane, which is worse (futura-sciences.com)

55 Flaring Emissions - Analysis - IEA, International Energy Agency Gas Flaring Report, September 2022

56 *Ibid.*

57 Cambridge Bitcoin Electricity Consumption Index (CBECI) (ccaf.io)

Oil production plants are often located in relatively isolated geographical areas, where re-injection into the natural gas network or even into the electricity grid (after conversion) is very costly. For example, **15 billion m3 of flared gas could be captured in North African countries, where pipeline connections to Europe⁵⁸ are underexploited.**

HPC computing centers can meet this challenge given their fundamental characteristics. In addition to hardware, securing the Bitcoin network requires a simple Internet connection and a power supply. These features make the mining industry **geo-independent and mobile**, in search of the most advantageous energy prices.

INITIATIVES

In an attempt to reduce their carbon footprint⁵⁹, major US oil producers such as **Conoco Phillips** and **Exxon Mobil** have embraced this strategy, diverting natural gas to containers at their sites in North Dakota. A system provided by specialized players such as **Crusoe Energy Systems** allows the containers to convert this energy into electricity, which is then used to power HPC computing centers.

Similarly, when HPC computing centers are operative, they release heat that can be recycled as thermal energy to heat homes, buildings, or even used in industries such as food processing. Conversely, innovative and competitive solutions have been developed to reduce the heat generated from the use of HPC centers, such as immersion cooling, a technique that is now being sought by other, more traditional industries.

INITIATIVES

The French company **Sesterce** recovers part of the heat released by HPC computing centers in order to redeploy it as thermal energy. This effort could prove beneficial in a context of energy crisis and rising prices in France and in Europe.

58 *Ibid.*

59 In an Effort to Reduce Emissions, Exxon Is Looking at Bitcoin | Nasdaq

60 The nodes of a blockchain are units of the chain that ensure the operation and security of the network as well as the storage of historical data in the registry.

61 Crypto-currency staking refers to the practice of blocking a share of capital in order to participate in the known as Proof-of-Stake mechanism, the purpose of which is to guarantee the integrity of the blockchain network. This is the method used by Ethereum, among other blockchain networks.

62 Equivalent to 32 Ether, according to the current security mechanism of the Ethereum chain

Leveraging and maximizing profits from French energy players' technological assets

Some operators and large corporations in the energy sector own IT equipment (data centers and computer centers) which is often used under capacity or temporarily inactive. This includes both French energy players and large industrial or commercial corporations with a large stock of IT infrastructure and servers.

These data centers can be optimized by providing cloud solutions and services related to blockchain networks, as well as leveraging the synergies between the two.

More specifically, the Ethereum network (the second largest blockchain on the market), like other blockchains, relies on cloud solutions and computer servers to host the ledger of on-chain exchanges.

Hosting a blockchain ledger is equivalent to hosting nodes⁶⁰. The major French groups that are able to do so through their IT infrastructure can benefit in several ways:

- To have direct access to the blockchain and to the **recorded data on value exchanges**, by means of newly-created tools to analyze this data.
- Being able to manage and **deploy applications directly** on the blockchain. With the growing adoption of the Internet of value, particularly by institutions and companies, the creation of application layers for new uses in France will **strengthen its digital sovereignty**.
- **Participating in the security of the network**, especially through the activity of *staking*⁶¹, by which Ethereum node operators are able to generate **a passive income of 4% to 6% annually** against an initial investment⁶². In France, financial services based on blockchain technologies (such as staking, among others) and progressively adopted by the public could therefore be directly provided by French players.

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This is particularly the strategy adopted by **Exaion⁶³**, a subsidiary of EDF, uses a strategy of leveraging EDF's computing and datacenters. Exaion has chosen to develop its blockchain activities using cloud infrastructures. EDF's subsidiary is thus able to offer services to institutional clients by hosting nodes on several infrastructures, including Ethereum and Bitcoin.

iExec⁶⁴, on the other hand, commercializes the computing resources of French industrial companies and large groups by creating a decentralized marketplace that brings together those requiring computing power (players in Web 3, AI, Big Data, etc.) and those with the capacity to provide it (computer and IT sites).

Mugi (or Metis)⁶⁵ manages and optimizes the use of HPC computing centers in France (in the Yonne region), selling shares of the computing power of its infrastructures to secure blockchain networks (in particular bitcoin), on a cooperative model.

Finally, the purpose is to promote the creation of a sovereign technological environment and capitalizing on French expertise. In practice, hosting Ethereum nodes, among other blockchain networks, is still mainly done through the American AWS⁶⁶. **By owning a significant part of the infrastructure, the major French groups would assert their independence from the GAFAMs and emancipate themselves from the Cloud Act⁶⁷**, which would be an asset for players in the French and European ecosystem who share this principle. This would help secure the network by bringing a healthy geographic diversity to node hosting.

63 Exaion Node

64 The Web3 Marketplace - iExec

65 Mètis | Home (metis-mining.com)

66 Amazon Web Services, the data storage and cloud arm of Amazon

67 The Cloud Act (2018) allows the US to access data hosted on GAFAM servers upon request of a judge, even if that storage is located outside the territory of the US.

68 TEO - about us (theenergyorigin.com)

Using blockchain technologies for tracing both renewable energy and financing in the sector

Information of any kind can be encrypted and immutably recorded on the blockchain network, allowing renewable energy certificates to be digitized, becoming transferable and verifiable digital assets ensuring the provenance of energy. **This provides a guarantee of both security and transparency, as stakeholders can verify the authenticity of the data at any time.**

INITIATIVES

This is the objective of the **Volterres** project and the **R.E.D.S. system**. Launched in 2019, this system certifies the origin and destination of the RE distributed within the network. **Certification through the blockchain allows to meet three constraints: a scalable, energy-efficient, and RGD-compliant production solution.**

Engie's partnership with Ledger (a French unicorn and digital wallet provider) created in 2018 The Energy Origin⁶⁸ or TEO platform with the aim of certifying the provenance of the green energy used. The initiative relies on the installation of connected boxes on devices at green energy production sites, which send data to the TEO platform.

Tokenizing carbon credits also allows for more transparency in trading, by tracing issuers and buyers and ensuring a single use per actor. However, there are still few initiatives for tokenizing carbon credits, which can encounter regulatory issues.

Finally, further up the value chain, project finance in the sector can also benefit from the advantages of asset tokenization (see asset tokenization in the Finance section).

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In 2022, **BNP Paribas and EDF ENR**⁶⁹, a subsidiary of the French group, deployed the first tokenized bond for a renewable energy project.

The decentralized platform **CarbonABLE**⁷⁰ aims to promote liquidity and access to investment in climate change projects that generate carbon credits, right from the early stages of the project. By representing participation in these projects and the carbon credits received through digital tokens (NFT⁷¹), CarbonABLE intends to bring traceability to a market where the issuance of credits is often opaque and decoupled with project monitoring.

In addition, **We Fundia** is setting up an industrial project finance platform, where companies can finance each other through loans and other tokenized financial instruments (represented as tokens on a blockchain), securities that can then be traded on a dedicated secondary market (Re Fundia). The platform targets in particular the energy sector and assets such as carbon credits, energy company debt securities, etc.

Key benefits and externalities:

- **Circular energy consumption**, by harnessing unavoidable energy from oil production (natural gas) and from the use of IT equipment (heat).
- **ESG compliance and environmental impact:** Optimizing the use of technology assets and decarbonizing the power generation industry has a positive impact on the ESG rating of companies. It is of interest to large energy players who are looking for virtuous solutions to limit the impact of their activities on the environment.
- **Promoting France's technological sovereignty**, namely by securing an influential place in the growing ecosystem of digital assets and the Internet of Value.
- **Making energy production infrastructure profitable** by operating a revenue-generating infrastructure.

69 BNP Paribas and EDF ENR cooperate on the first «tokenization» of a bond for a renewable energy project

70 Carbonable - Web3 powered end-to-end carbon removal platform

71 Non-Fungible Tokens are unique and indivisible digital assets, certifying the ownership of an asset - material (artwork, real estate and others) or digital (collectibles, digital avatars, digital artworks and others) - to its holder and registered on the public blockchain registry.

PUBLIC POLICY MAKERS' ACTION SPAN

- **The French regulator must take care of the transposition of the European directives regarding the reinforcement of extra-financial reporting obligations.** If certain types of companies (such as PSAN players) are concerned by this regulation which will be applied progressively (between 2024 and 2028), it is advisable to anticipate including crypto-assets and mining in the scope:
 - The Taxonomy Regulation, which makes reporting obligatory on key sustainability performance indicators.
 - The Corporate Sustainable Reporting Directive (CSRD), and the more detailed reporting requirements on environmental, social, and human rights impacts.
 - The Corporate Sustainability Due Diligence Directive (CSDD) and environmental and human rights due diligence for financial and non-financial companies.
 - The SFDR (Sustainable Finance Disclosure Regulation), which applies to financial market participants, i.e., asset managers, investment, and pension funds, etc. and thus investors in crypto and/or PSAN companies.
- **Regarding MiCA enforcement:** token issuers and CASPs will have to share information on the environmental footprint of the protocols on which they issue and/or provide services.
- Recognize the compatibility of digital assets and mining with the **national energy and environmental strategy, as announced by the French President in February 2022 in Belfort**⁷². Indeed, the objective is to massively develop RE in order to decarbonize energy production and to establish France's energy sovereignty. At the same time, the challenge is to develop technologies that will enable this intermittent energy to be stored.
- **Propel the development of the digital environment** by supporting the initiatives of institutions of the sector on the use cases described, through:
 - Direct investign in projects
 - Granting tax and research credits
 - Reducing rates in energy purchases for data center operators for the installation and expansion of certain RE facilities
- **Gaining ground internationally**, in face of authorities and organizations already active in the development of these solutions, including the Omani sovereign wealth fund which is financing Crusoe Energy Systems⁷³; or the Tokyo Electric Power Grid (TEPCO) which is collaborating with HPC center suppliers.
- **Establish a regulatory framework favorable to the representation of assets on blockchains** (asset tokenization), such as credits, bonds and other products promoting transparency and liquidity in financing the energy transition.

72 Pronounced on 10 February 2022 - Emmanuel Macron 10/02/2022 Energy policy | vie-publique.fr

73 Crusoe Energy Systems is a global player in the use of waste energy for HPC computing dedicated to securing blockchain networks. Crusoe (crusoeenergy.com)



3. CULTURE AND ENTERTAINMENT

Sector context

The culture and entertainment industries, and particularly the subfield of art, are among the first industries that have been impacted by the emergence of non-fungible tokens (NFTs). NFTs are first and foremost technical standards with an assigned use and function. They make it possible to record any digital object on a blockchain: an image, a GIF, a video, a clip, etc. **The digital scarcity enabled by NFTs paves the way for many new use cases and opportunities in the world of art, culture, and entertainment.**

NFTs in the world of culture and entertainment thus cover two different realities.

- On the one hand, they can represent a native digital object - which exists exclusively on-chain - and encapsulate in the NFT the work itself. Thus, the work is the data (the image or png, for example) and the NFT is its digital medium.

- On the other hand, NFTs can represent physical objects, meaning they represent a right or property certificate on the blockchain. In this case, the NFT is a certificate of uniqueness and ownership of the work, registered in public, immutable and unforgeable blockchain networks.

Despite this native affinity between art and digital scarcity, a slowdown in the sector was observed during 2022 after two years of euphoria. Indeed, the monthly trading volume of NFTs on all platforms⁷⁴ fell by almost 55% between February 2022 and February 2023.

74 Monthly volume of Ethereum blockchain NFT trading on all dedicated platforms, such as OpenSea, Looksrare, Foundation, Rarible, etc. Ethereum NFT Marketplace Monthly Volume (theblock.co)

USE CASES

New cultural objects and new collecting strategies

The representation of a native digital object, through an NFT, paves the way for a new form of art as well as new distribution channels for artworks.

NFTs have enabled creators to offer their production in a new form - exclusive and digital. New categories of artworks, such as collectibles, are thus emerging in the art world.

Some NFT collections have led to the creation of a digital art market and movement called Crypto Art like the Crypto Punks⁷⁵, Crypto Kitties⁷⁶ and the Bored Ape Yacht Club⁷⁷.

INITIATIVES

The Crypto Punks are the perfect example of this new digital art form. Created in 2017 by Larva Labs, they are uniquely and algorithmically generated NFTs. They each encapsulate an image of unique punk characters and a series of data describing its attributes (hood, cigarette, etc.).

These digital artworks have a collecting purpose. Specifically, they are used for building a digital identity, serving as profile pictures on social networks and other online platforms. In a way, **they create the first piece of a digital identity and lay the foundations for other uses and services based on this identity** (creating and accessing exclusive communities, private sales or art galleries; coupling them with a video game identity, etc.).

The transactions that the NFT has undergone since its inception are traceable, making it possible to know the token's owner, who is the sole person who can transfer it. Today, six years after their creation, the Crypto Punks are sold for an average of \$107,000⁷⁸ and owned by approximately 3,650 addresses⁷⁹.

75 CryptoPunks (larvalabs.com)

76 CryptoKitties | Collect and breed digital cats!

77 BAYC (boredapeyachtclub.com)

78 CryptoPunks NFT floor price and value (nft-stats.com)

79 CRYPTOPUNKS () Token Tracker | Etherscan

80 CP_NFT_Acquisition_February_2023_1_.pdf (centrepompidou.fr)

Figure 3:
Crypto Punk n°110, acquired by the Centre Pompidou in February 2023



The first wave of NFTs took place in 2020 and 2021, with a significant increase in valuations and trading volumes. This wave, fueled by significant speculation, saw the rise of the first platforms dedicated to the sale, purchase and exchange of NFTs, such as OpenSea or SuperRare. These platforms, representing the preferred distribution channel for NFTs, not only allow for their trading on the primary market, for example via auctions, but they also **create a secondary market favoring the trade between users and thus considerably increasing the liquidity of the work.**

Beyond the speculative effects, some institutions show an artistic interest in these new digital works. For example, in early 2023 the Centre Pompidou acquired NFTs from various collections, including a Crypto Punk. The Centre Pompidou's intention is «not much to be interested in the cultural phenomenon of collectibles but to explore the most daring creative uses of this technology».⁸⁰ Spaces like the NFT Factory in Paris highlight these artists and provide with a meeting place for all the stakeholders in this new ecosystem.

This trend is indeed observed within the general public, since a third of the NFTs owned by the French correspond to collectible NFTs, and of the French people considering acquiring NFTs in the future, 48% mainly favor *collectibles*.

Fractionalizing cultural works

NFTs also allow for the digital representation of physical works of art, their purpose being the certification of digital ownership. These certificates enable the fractionalization of ownership, allowing to open up the works of art to the global market. Indeed, some high-value works are not quite accessible to a wider range of collectors. The digital fractionalization of these works brings the opportunity to own only a portion of the work for collection or investment purposes.

Nevertheless, there are certain limits on the legal grounds of these fractionalized works and their new distribution models.

In addition to financial benefits, dividing works of art has also an impact on creation: several artists can issue NFTs in a collective creation process, for both physical and digital goods. Indeed, the technical standard of an NFT allows to attach a set of programmed governance rules to the ownership certificate, rules that can determine the distribution of sales revenue (royalties, initial and secondary sales), the level of access to the asset (exclusive or open sale), etc.

Simultaneously, the communities of creators as well as the management of their digital works can be governed by new systems: the DAOs (Decentralized Autonomous Organizations⁸¹) are emerging as a new form of governance. The DAOs structure the collective decision-making through voting and a set of standards predefined by their members. For example, NYX (a subsidiary of L'Oréal in the United States) has launched its DAO «GORJS», which brings together a community of creators and enables them to distribute their digital works.

Entertainment: enhanced engagement and game monetization with NFTs

Gaming, a natively digital sector

Video games are increasingly integrating the purchase of objects and build the game experience on the perspective of earning rewards, making this sector particularly sensitive to the development of digital assets. Indeed, NFTs constitute a technical standard that can be used between different games, thus allowing to overcome the silo logic of virtual platforms and objects, with the latter only existing today within the servers maintained and developed by the game producers.

NFTs open up the way to new possibilities in video games, allowing for asset trading, their use in different games, their collection, posting on social networks as a digital identity, etc.

The concept of game identity also takes on a new dimension with digital assets thanks to the transparency of infrastructures and their open-source nature. Indeed, as user activity is made accessible through public blockchain technologies, gamers can easily «prove» their experience and expertise to third parties. Conversely, some game producers or creators can target specific communities of gamers using data, which is available thanks to the transparency of blockchain networks.

A new perspective of financial gain in games

The use of digital assets in video games (through NFTs and fungible tokens) makes it possible to monetize the time spent on a game, leveraging rewards or by selling the assets owned by the gamer.

In addition, game producers promote the distribution of fees and winnings to attract players and increase their engagement. Some game models go further and rely on decentralized platform management. For example, governance tokens allow players to influence strategic decisions (investments, features, etc.).

The prospect of financial gain within video games can thus become an advantage to foster developing communities and engage audiences, provided that the game always remains entertaining.

Challenges on accessing gaming platforms

Despite some frictions when onboarding web 3 platforms (in terms of user experience (UX) and user interface (UI)), gamers are used to a natively digital world and have an appetite for virtual goods. For instance, among French NFT owners, more than a third own video game NFTs, relative to other NFT categories.

Many NFT projects have emerged based on collectible card games inspired by the more traditional card games, such as Pokémon or Hearthstone.

81 DAOs are new organizational primitives created within the Web3 ecosystem, based on autonomous contracts, known as smart contracts (computer code) deployed on blockchain networks. The system is conceived to define, automate, and execute all the governance rules of an organization.

INITIATIVES

In France, **Sorare** leverages on the properties of NFTs to offer a new game experience: collecting cards and using them within a Fantasy Football game. Football player cards are issued with different levels of scarcity giving different levels of rewards.

Sorare became a «unicorn» in 2021, after having raised \$680 million⁸² on one of the largest funding rounds within the French Tech. One of the keys to its success has been **the introduction of players with no prior affinity for crypto-assets**. Sorare has managed to disengage its users from certain technical aspects linked to crypto-assets and the Web3, by offering an intuitive experience and avoiding users having to pay transaction fees (necessary to make exchanges on a blockchain network), which the platform covers. The game has also developed an ecosystem of side games, notably in partnership with the French game developer and distributor Ubisoft.

Similarly, **Oval 3** has secured the rights to commercialize the National Rugby League (NRL) NFTs for the 2022/2023 season. This allows Oval 3 to launch the NRL NFTs in its Fantasy Rugby card game.

At the beginning of 2023, **PMU's Stables** entered the world of horse racing with a similar logic.

French studio **Unagi**, co-founded by former Ubisoft employees, continues to develop its fantasy football game (Ultimate Champions) by forging partnerships with European clubs. On the other hand, it has signed an agreement with the Euro League, thus entering the basketball field.

Magic Chess Online is an interactive online chess game that uses NFTs as a means of collecting chess boards, game pieces, player avatars, rewards, etc.

Gaming, culture, and art: blurring boundaries in the virtual worlds

NFT gaming projects have often also emerged on open metaverse worlds based on digital assets.

The Web 3⁸³ metaverses are virtual worlds where the barriers between industries are fading. Indeed, there is a convergence of finance and gaming, art, real estate, fashion and social networks. Metaverses are different from independent and «siloed» virtual reality platforms. **Their value is based on digital scarcity and the interoperability provided by digital assets.**

82 Source Crunchbase

83 Web 3 metaverses integrate NFTs and digital assets into all their services: buying and owning land, in the player experience, in payment, governance, etc.

84 Inside The Australian Open's Successful Integration Of NFTs And The Metaverse (crunchbase.com)

There was a widespread enthusiasm for certain metaverse projects in 2021, greatly enhanced by strong media coverage and by a number of large companies announcing their initiatives (Casino, Carrefour, Axa, La Française des Jeux, etc.). To date, adoption by the general public remains very limited. Nevertheless, when built on resilient and interoperable infrastructures, metaverse projects have the potential to bring significant transformations in many sectors.

INITIATIVES

In the cultural sector, NFTs representing ownership of an asset can be used in metaverse platforms, some of which are specifically designed as virtual playgrounds (i.e., The Sandbox).

On the other hand, these virtual spaces can also host events and art exhibitions: for instance, the auction house Sotheby's, has reproduced its historic London headquarter building in Decentraland, where collectible NFTs are displayed and on sale.

The Australian Open⁸⁴ has chosen to extend the competition into the digital realm, by reproducing its stadium within the Web 3 metaverse platform Decentraland. Simultaneously, the project added a gaming dimension based on the matches' results: NFTs representing areas of the tennis court were up for sale, and the owner of an NFT received a prize when the ball fell on its area during the match. This cultural experience, usually only visual for the public, becomes interactive as well, a model that can be easily exported to many sporting events, cultural and artistic exhibitions, concerts and others

Certification of authenticity and intellectual property

Certifying a physical asset

Like certificates of authenticity in the luxury sector, works of art are directly impacted by the need to prove uniqueness and provenance. **NFTs are used to guarantee this authenticity and to provide proof of ownership of these goods, in particular to prevent the counterfeiting and smuggling of art and cultural goods.**

For physical cultural goods, however, the link with their digital NFT certificate is fraught with complex technical issues. Some approaches are being tested today - QR codes, specific signatures, chips, etc. - but the solutions have yet to prove their reliability. Nevertheless, innovation in this field is highly active, and both private and public institutions have launched initiatives and pilot projects. These innovations are also in line with the work initiated by the European Commission on the Digital Product Passport (DPP), which aims at providing certification of the authenticity of a physical product, as well as tracking its life cycle (see section on the luxury industry for further detail).

On the other hand, the European Union Intellectual Property Office (EUIPO) is exploring the use of NFTs in the fight against counterfeiting, particularly of works of art. The objective of the initiative - Anti-Counterfeiting Blockathon⁸⁵ - is to leverage a blockchain infrastructure to I) allow any interested party (creators, consumers, and authorities) to verify the authenticity (and origin) of a cultural good, and II) to raise an alarm when a counterfeit or illegal activity is detected. In this roadmap, public networks should therefore be explored as the primary means of ensuring transparency and resilience of the ledger, as opposed to authorised networks.

Intellectual property of digital assets

Regarding the intellectual property of NFTs, there is still no clear regulation or legal protection for consumers. In terms of copyright protection, the European Court of Justice has tried to harmonize the term «original work» in relation to the image associated with a NFT, but no legal framework has been established.

A key issue in this regard is the responsibility of NFT exchange platforms in ensuring the respect of the artistic property. Some platforms, such as Opensea or Rarible, expressly state in their legal notices the possibility for rights holders to denounce and have removed potentially infringing NFTs. In particular, platforms include in their terms and conditions the main cases for infringement of intellectual and industrial property rights, as well as trademark rights.

Copyright in the music and audiovisual industries

The CSPLA⁸⁶ recognizes the complexity of NFT qualification in the field of cultural and creative goods but emphasizes their potential uses in the cultural sector, as well as its funding, which can particularly be extended

to music, film, photography and audiovisual.

Copyright in the music and in the film/audiovisual sectors is a complex subject to address and highly regulated (copyright distribution with SACEM and SACD). These two worlds have important challenges in terms of intermediation and revenue distribution, especially with the advent of streaming models. Some actors are evaluating digital assets as opportunities to address these issues. Specifically, by representing the intellectual property of rights holders with digital assets, namely NFTs, for the purposes of transparency and fairer distribution of the rights associated with a cultural work.

INITIATIVES

In the film industry, the **Centre National du Cinéma (CNC)** issued a call for projects in October 2022⁸⁷ for the «transparency of revenue reporting and collection in the cinema and audiovisual sector». The objective is to create a system - potentially based on blockchain technologies - that provides better revenue transparency and enables an optimized payment of rights between stakeholders.

Other solutions are emerging, particularly in music production, with some seeking to find business models that meet the needs of both artists and consumers. For example, the **French startup Pianity**, which has formed a partnership with SACEM, allows artists to issue music NFTs and receive royalties for secondary sales.

Other players such as **Spotify**, who have already transformed the revenue distribution model in the past, are also beginning to integrate NFTs to foster the interaction of the artist with the audience. This strategy could represent Spotify's first step in a roadmap aiming at using NFTs as a means of fair rights distribution, or even for the development of new sources of funding for cultural works.

85 Intellectual Property Rights and Distributed Ledger Technology with a focus on art NFTs and tokenized art (europa.eu)

86 Conseil Supérieur de la Propriété Littéraire et Artistique (Ministry of Culture), in its report «Mission du CSPLA sur les jetons non fongibles (JNF ou NFT): sécuriser le cadre juridique pour libérer les usages» of July 2022.

87 Call for projects «Transparency of revenue collection in the film and audiovisual sector» | CNC



Conclusion

The drop in value of the main NFT collections during 2022 has revealed the NFT projects that move away from merely speculative utility and provide real added value, through relevant use cases, such as the above-mentioned examples. In the gaming, art, and broader cultural and creative industries, NFTs appear as a technological tool representing the uniqueness of the object and allowing to better monetize cultural goods.

Regulation and accessibility (in terms of user experience), while there are still barriers today, are levers that need to be activated to encourage large-scale adoption of new standards that bring value to the sector.

In this context, the cultural and entertainment industry can see new collaborations being formed between native players and established companies which will lead to the emergence of tomorrow's models.

PUBLIC POLICY-MAKERS' ACTION SPAN

First, the question of the legal qualification of NFTs needs to be resolved, to clarify the application of existing regulations and to create new frameworks that would provide more legal certainty for companies and better protection for users.

Two hypotheses were considered by the European regulator for qualifying NFTs. According to the first hypothesis, NFTs would be assimilated to crypto-assets; to the second, they would be treated as the underlying asset or good (the artistic good, for instance).

During 2022, this question has been the subject of intense discussion, as legal status and treatment of NFTs fall under the regulatory framework of MiCA (Markets in Crypto Assets, scheduled to come into force in 2024). Thus, in the final version of MiCA, NFTs are not considered crypto assets by default. However, some NFTs could be qualified such as the size of collections, or their utility as financial assets. European authorities should work to clarify the treatment of digital assets as financial instruments, including NFTs, to anticipate and prepare guidelines.

Fractional NFTs, on their part, are not considered non-fungible, and will now be treated as crypto-assets.

4. LUXURY AND BRANDS

Sector context

In recent years, there has been a change in consumer trends, particularly in the luxury sector. The sanitary crisis has accelerated the digitization of this industry, with a clientele increasingly oriented towards the virtual worlds and an appetite for experience-based purchasing. Brands have thus developed new capabilities to meet this new target, the highly tech-savvy Generation Z⁸⁸.

However, for brands, dematerialization comes with a significant challenge. Some of the digital world values, such as democratization, accessibility, and multiplicity, go against the very identity of the luxury sector, which is built on desirability, exclusivity, and scarcity.

Although some brands have already experimented with blockchain technology, most used infrastructures known as «closed» or «permissioned»⁸⁹, limiting the added value that public networks could provide. Public networks are resilient, transparent, immutable, and interoperable. They also support the exchange of value across multiple structures and for many use cases.

Initially, this approach may have been exploratory and focused on optimizing upstream processes rather than creating new services or overhauling customer relationships. However, today, sector players have adjusted by adopting the transition to Web 3 as a strategic model to address the new challenges of relational marketing, circularity, and new immersive experiences.

Digital assets provide brands with many tools to rethink customer engagement and relationships. In addition to their usual characteristics (liquid, transferable, interoperable, programmable), they introduce a new concept: digital scarcity. This scarcity aligns perfectly with the DNA of luxury and lays the foundation for a multitude of use cases.

88 Generation Z includes people born between 1997 and 2010. According to a report published by the Pew Research Center, it represents people who have always known a world with a strong presence of computers and the Internet. Compared to previous generations, Generation Z would be defined by their relationships through virtual platforms rather than real relationships.

89 A private or «permissioned» blockchain is a blockchain that is based on a private network and requires permission to access it. It allows companies to guarantee a certain level of security, privacy, compliance, and performance. Only predefined users have the right to read the registry, and to participate in the operation of the network and modify its rules of use.

USE CASES

Interests and applications of NFTs for the luxury sector and for brands

NFTs: new technological tools for customer relations and marketing

According to a report published last October⁹⁰, **the luxury industry has the highest number of brands having launched NFT strategies.** 51% of luxury players are already in testing phase or are planning to launch NFT-related projects before 2025. This is the most important projection of innovation projects in the sector, all technologies combined⁹¹.

Similarly, loyalty programs with NFTs in the luxury sector are among the most popular for French people planning to acquire NFTs in the future⁹².

INITIATIVES

NFTs are digital assets - liquid, transferable, interoperable, programmable – and non-fungible, i.e., they differ from other assets (called fungible) by their scarcity and uniqueness: each non-fungible token has specificities that distinguish it from other tokens. Moreover, like all digital assets, they permanently encapsulate information and data (an image, a message, etc.), and can represent rights that only the owner holds

These new tools appear **as unique levers of value in customer relations, improving brand notoriety or deploying marketing campaigns. Various services capitalize on NFTs, one of the most interesting being the use of these tokens as keys to access exclusive advantages and devices.** Brands generally distribute these NFTs either for free in limited editions (to targeted audiences), or by selling them on dedicated platforms (often through auctions). They often allow a hybrid physical and virtual experience.

Each NFT grants the customer who owns it different rights, depending on its purpose:

- The right to **obtain rewards or incentives:** this can be other NFTs (digital art collections), physical products, access to limited collections or discounts on certain products.
- The right to **access exclusive communities and content**, (token gate identities): these NFTs give the holder access to special spaces or privileged services such as community-exclusive sales.
- The right to access events (both physical and virtual) organized by brands. **NFTs are used as digital accreditations** to access events. Thanks to the unique, transparent and traceable nature of these assets, it is possible to track the origin of the ticket, its owner and its validity, making it more difficult to falsify or duplicate. These NFT tickets also have the potential to facilitate access to the secondary market and fight the black market. The owner of the ticket can transfer it, and the artists and event organizers can program and set up rules for the resale of their tickets, by setting up royalties or even by adding all sorts of utility to the NFT.

In addition, the traceability feature of digital assets allows brands to exploit data on the trade and use of these tokens. This gives brands the ability to have a much more dynamic view of their customers and the products and services they are interested in. Ultimately, this allows for a **finer analysis of the performance of marketing strategies** implemented with these new tools.

90 Coingecko: Which industry has the most branded NFTs?

91 Luxury & Technology - The beginning of a new era | Bain & Company

92 IPSOS study - ADAN 2023 - Part 1: Adoption of digital assets by the general public

Several examples show the interest of brands for this technological tool in France and in Europe:

INITIATIVES

- **Yves Saint Laurent Beauty** has launched several collections of NFTs associated with different beauty themes including the «Beauty Blocks»⁹³. For the customer, holding some of these NFTs gives access to communities and exclusive content. Generally, the brand offers these NFTs when making an online purchase, participating in an event or a marketing operation. Recently, on the launch of a perfume, a sale of 100 NFTs allowed the brand to collect funds, which were then donated to associations or local authorities involved in social issues.
- **Mugler** sold a collection of 300 NFTs designed by 3D artist Marc Tudisco on the occasion of the brand's 30th anniversary. Buyers had the opportunity to claim a representation of their NFT as a physical collectible.
- **Guerlain, LVMH Group**, organized an auction of «Cryptobees» NFTs, the proceeds of which are intended for wildlife reintroduction projects near Paris.
- **Within the L'Oréal group**, the make-up brand NYX has announced the creation of a community platform to promote new artists. NFTs are used here as a pass or digital key to access this platform and its community. Through the parallel deployment of a DAO (a decentralized autonomous organization⁹⁴), the brand also allows its holders to participate in the governance of the community.
- **Paris Fashion Week** has also adopted NFTs as a digital pass to give accredited members access to exclusive content and experiences. The NFT produces a QR code, which verifies the participant's right to access the event.
- **Le Bristol Paris** is exploring a new playground in the **luxury hotel industry** with the creation of a private club accessible only to holders of the 11 NFTs on sale. These NFTs open the door to unique physical experiences within the hotel: exclusive dishes and cocktails, access to reserved rooms and spaces, etc.

93 NFT - YSL Beauty

94 DAOs are organizational systems based on smart contracts (computer code) deployed on blockchains, allowing to define and execute all the governance rules of an organization.

95 France - PR_SPRING_CAMPAGN_2021-FINAL_EN.docx (europa.eu)



FOCUS PLR⁹⁶

The Digital Product Passport (DPP) is an initiative of the European Commission (EC) to create a digital passport linked to a physical product.

The aim is to ensure product compliance by providing transparency to both consumers and regulatory authorities, namely on:

- Their origin
- Their environmental impact
- Their safety

The products concerned would cover a wide spectrum of the economy – consumer products, food, textiles, electronics, construction, industrial products - and would largely impact the luxury industry and brands.

The DPP would consist of several building components: a certificate of authenticity and ownership, a product life cycle management tool, and a virtual replica of the physical object.

Thus, a tokenized DPP, with embedded NFT features and issued on a blockchain network, would maximize the desired utility of this large-scale project. In addition, it would make it interoperable with many use cases / services related to digital assets (digital passport of products, payment, resale on a secondary market, marketing strategies, customer relations, ...).

INITIATIVES

Several French and European brands are taking this approach and exploring **coupling the physical product to the digital certificate (digital twins)** using chips, fingerprints, QR codes or connected objects.

Liquor brands such as **Rémy Martin and Ricard** use NFTs as digital doubles of their bottles. They are sold directly on dedicated platforms managed by the brand. This new distribution strategy represents an opportunity for brands to **disintermediate the value chain** and reach the end consumer directly, by reducing distributors.

Luxury brands such as **Vacheron Constantin** (Richemont), **Awake, Bremont** and **Breitling** are already exploring the potential of digital product passports.

Another interesting initiative is that of the **luxury group Kering**, which combines several strategies at once: offering an NFT that gives its holders access to the Kering marketplace and some exclusive products; enabling customers to buy these products directly with digital assets; and delivering a digital duplicate of each physical product purchased, as an NFT.

Alongside the big French names, **Prada and Gucci** are taking the same approach by launching clothing and collectibles accompanied by NFTs as proof of ownership.

Furthermore, **industrial partnerships** are emerging to meet this new need: the start-up **Ariane** has partnered with IBM to provide **digital passports in the form of NFTs associated with a luxury product**. Ariane is a French company focused on Web3 services and is developing a standard for digital identity for valuable products.

Yves Saint Laurent is partnering with **Owne** to track the product supply chain via responsibility trackers represented by NFTs.

Finally, the **Parisian jeweler Courbet**, along with the service provider Goods ID, is exploring the possibility of integrating theft insurance into the certificate of authenticity delivered with each piece of jewelry.

96 New proposals to make sustainable products the norm (europa.eu)



Conclusion - Main challenges to be addressed by brands

- **User experience:** some brand loyalty programs based on NFTs mostly target an audience already familiar with Web3 technologies. To reach a broader audience, brands and their technology providers must focus on user experience and easy access to these tools. Particularly when it comes to the custody of NFTs, which falls under the owner's responsibility (and not an intermediary). This can be frightening and ultimately discourage their use, which undermines the purpose of client engagement and inclusiveness.
- **Interoperability with existing infrastructures:** to capitalize on all the possibilities NFTs can offer, and specifically regarding the traceability of tokenized physical products, an important challenge to overcome concerns coupling technology, i.e., finding an appropriate mechanism that harmonizes the physical identifier and the *on-chain* representation of the product.
- **Change management:** the use of these new tools also implies for brands to deploy new internal skills and devices, and to offer new services related to the management of these assets

(custody, payment, etc. see Finance section).

- **Risk management:** to control the risks associated with these new technologies, brands need to establish key partnerships with companies capable of delivering services adapted to the brands and their challenges.

PUBLIC POLICY-MAKERS' ACTION SPAN

- **Encourage national and European-scale projects in line with the Digital Product Passport,** to provide a regulated path for brands for the use of blockchain infrastructure and digital assets. This would provide trust to industry players, and prevent resource dispersion by establishing verified, secure, and actionable usage standards.
- **The legal status of NFTs (see Culture and Entertainment section)** needs to be clarified to improve the clarity of the rules applicable to players and promote adoption by building more trust for users. Only a sufficiently granular approach focused on usage rather than technological support, avoiding the assimilation of NFTs into a homogenous class of assets, will lead to appropriate and proportionate regulations. Ultimately, it would encourage the emergence of new innovative projects.

5. OTHER SECTORS OF THE ECONOMY

PAYMENTS

Infrastructure optimization

Blockchain technologies and digital assets bring added value to the payment industry. These innovations aim to transform the existing model by enabling **near-instantaneous cross-border value exchange and peer-to-peer** transactions on an **open, interoperable, and auditable infrastructure**.

While the volatility of digital assets has hindered their use as a means of payment, the rise of **stablecoins**⁹⁷ - tokens that maintain parity with a fiat currency like the euro or any other type of asset- has overcome this barrier while benefiting from the characteristics of digital assets.

Simultaneously, transaction costs were under pressure due to the saturation of blockchain networks, especially during bull markets. The emergence of **new, more scalable blockchain infrastructures**⁹⁸ (i.e. Layer 2) also allow for the minimization of transaction costs, which is essential for building projects that are capable of attracting the interest of the general public, combining near-instantaneous nature with minimal costs.

Use cases for payment and digital assets

- **Retail payments:** digital assets allow individuals to make peer-to-peer payments in the digital

space, otherwise impossible given risks of double spending, which make intermediaries indispensable players in the payment industry. In return, existing payment players are given the opportunity to offer more efficient infrastructures for online payments, remittances, and international payments. These players can also offer additional services by leveraging the composability and interoperability of blockchain applications.

Stripe enables the conversion of fiat payments into digital assets and sending money to stablecoin recipients without acquiring or storing digital assets.

Apple Pay has partnered with Circle to allow businesses that accept USDC to reduce friction with traditional payments.

Wholesale payments: Using digital assets for payments between banking institutions or between international corporate treasuries allows for the reduction of management and reconciliation costs and significantly reduces foreign exchange and liquidity risks. The FOREX market seems to be particularly impacted by these new infrastructures. In this respect, the BIS⁹⁹ has launched a new project with the central banks of Singapore, France and Switzerland to study the automation of foreign exchange markets and operations through decentralized finance based on the innovation of crypto-assets.

⁹⁷ See section on financial services for more details

⁹⁸ Scalability is the ability of a blockchain network to handle a large number of transactions, which has become an issue for some key networks such as Ethereum. Some solutions address this issue, either by developing alternative networks to the main chain, or by building secondary layers on top of the main chain; the latter being Layer 2 technologies, such as rollups.

⁹⁹ Bank for International Settlements, «Mariana» project announced in November 2022

MasterCard has partnered with Consensys to experiment with rollups (Layer 2) for several use cases (CBDC, DEX, micropayment applications).

Visa is also working on Layer 2 infrastructures for stablecoin transfers

New challenges to consider

- **Data transparency:** it raises questions about privacy and compliance with the General Data Protection Regulation (GDPR). Some technological services address this challenge, for instance by storing identity-related data within digital wallets, allowing certification of specific information (e.g., the owner's age) without revealing more information than necessary, and preserving privacy.
- **Compliance** with the requirements of anti-money laundering and the financing of terrorism (AML/CFT) and Know Your Customer (KYC): these requirements can be reached by forging strategic partnerships, such as Mastercard's acquisition of the on-chain analysis and tracking tool Cyphertrace.
- **Managing scalability:** promising technical solutions are emerging but are still under development, namely those known as «Layer 2» infrastructures.
- **Accessibility:** there are still frictions in terms of customer experience, and payment players must achieve technical abstraction for the end customer, especially in the transition from traditional financial systems to blockchain infrastructures (the on- and off-ramps).

- **The transformation of the payment business:** it is essential that the companies concerned develop skills and complementary infrastructure components, such as for custody of digital assets¹⁰⁰.
- **Still cumbersome procedures:** this is the case, for example, for obtaining regulatory authorization to issue stablecoins. Lydia has recently been approved as an electronic money institution (and can issue e-money) providing payment services.

APPEALING TO PUBLIC DECISION-MAKERS

- It is essential for the development of the sector to continue clarifying the regulatory framework (similar to the MiCA regulation) around the use of stablecoins, to attract innovation and stimulate competitiveness in the payment sector.
- Both stablecoins and CBDCs¹⁰¹ are intended to serve as a medium of exchange to settle transactions, which can be done instantaneously on public blockchains. The choice of a resilient, secure, and scalable infrastructure is crucial, as is the existence of a clear regulatory framework. The many CBDC pilot projects are essential sources of information and feedback.

100 See section on financial services for more details.

101 CBDM or Central Bank Digital Currency is a new form of book money, issued by central banks on blockchain networks.

REAL ESTATE

A paradigm shift in accessing the real estate market

According to a study by HSBC and Northern Trust¹⁰², 5% to 10% of all assets in 2030 will be tokenized by 2030. This process, which allows any type of asset to be represented on the blockchain and to be attributed the characteristics of digital assets, presents many opportunities, especially in the real estate sector.

Real estate is one of the sectors where tokenization¹⁰³ and blockchain infrastructures can indeed have the most impact. Despite a global real estate market of \$3.69 trillion in assets in 2022¹⁰⁴, these assets are less liquid than other asset classes. Real estate transactions are also often slow and costly, creating friction and barriers to entry.

Use cases in the real estate sector

- **Tokenizing real estate assets lowers the barriers to entry to this market by making them more easily divisible and accessible, thus more liquid.** The increased fluidity in the secure exchange of assets opens up the market to new categories of investors who are currently excluded due to high **investment costs**. Ultimately, their representation on a blockchain infrastructure makes them natively interoperable with other assets circulating on the same infrastructure, paving the way for many uses (re-mortgaging, collateralization, etc.).

RealT offers fractional real estate investments, representing real estate ownership with tokens, each generating guaranteed passive income.

- **Access to a secure, transparent, and immutable ledger to optimize real estate investment procedures.** The use of blockchain technologies allows for the registration of documents and the automation of operations related to the life cycle of real estate securities (purchase, sale, payment of rents, ...), to reduce intermediaries and ultimately minimizing operational expenses. It also makes these documents easily available to investors, thereby reducing the risk of fraud.

Georgia was the first country to register property ownership on the blockchain in 2016.

Emerging markets, particularly Africa, are the preferred field of application for this type of use case.

Brazil, Ghana and Honduras present many examples: in Ghana, it is possible to register one's land with the city's land registry by filling in a form available on the Internet. The data is then recorded on a blockchain developed by the NGO Bitland to prevent data hacking.

In Sweden, the Land and Real Estate Authority uses a distributed ledger based on a private blockchain to safeguard all real estate-related documents. These are thus accessible to all market participants (banks, brokers, owners).

Finally, in Ukraine and Vermont, properties have already been sold via the Propy marketplace on the Ethereum blockchain. All stages of the purchase cycle have been fully managed via the blockchain from property transfer to electronic contract signing¹⁰⁵.

102 Beyond Asset Tokenisation | Northern Trust

103 Tokenisation is a process that allows the digital representation of an asset (tangible or intangible) on a blockchain.

104 Real Estate Market Size, Trends and Global Forecast To 2032 (thebusinessresearchcompany.com)

105 How will blockchain revolutionise real estate? - PWC

Virtual real estate in crypto-metaverses¹⁰⁶:

the concept of private property in the digital world, introduced by the rise of digital assets, has made it possible to democratize the use of metaverses and the sale of virtual land parcels. *In fine*, it is a simple extension of the real estate market and its businesses (investment and property management), which represents a diversification opportunity and a new distribution channel for operators in the sector.

Many players have already started to own virtual spaces within the two main metaverse platforms, Decentraland and The Sandbox: HSBC, JP Morgan, AXA, Casino, and many others.

Virtual real estate investment funds, which acquire virtual parcels and then operate and develop real estate, such as Republic Realm, which for example built a shopping center in the Decentraland metaverse and leased out the space inside the center.

New challenges

- Lack of legal clarity on how to reconcile a blockchain-based registry with the notarial property register, as well as the mechanisms for managing the tokenized securities (distribution of capital gains associated with real estate, related taxation, investor protection, guarantees on securities, etc.). Such a situation creates friction for investors and issuers.

- Lack of dedicated and secure platforms for the exchange of these assets.
- To date, there is a lack of skills and training on blockchain that enable those concerned by the use cases to leverage on these technologies. For notaries or lawyers for instance, it is the evolution of their activities that must be anticipated, rather than the elimination of their expertise.
- Limited accessibility to land in the metaverse for the general public due to high real estate prices. Moreover, the selected cadastral model has a limited number of parcels, which is to be challenged: while limited land creates an effect of scarcity, it is both a barrier to entry and an easily surpassed obstacle as virtual space is unlimited. Ultimately, virtual real estate represents an important opportunity, but its democratization still has some way to go.

APPEALING TO PUBLIC DECISION-MAKERS

- Clarify MiCA's requirements on tokenized financial securities, their issuance (e.g., via STO, «security token offering»), prospectus requirements, etc.
- Establishing a specific legal framework is essential before being able to consider large-scale use, given that real estate is a highly regulated sector, particularly in France.

106 Crypto-metavers integrate NFTs and digital assets into all their services: land buying and holding, player experience, payment, governance, etc.

INSURANCE

New insurance needs related to the use of digital assets

The increasing adoption of digital assets (10% of the population hold digital assets in France in 2023, see adoption section) and the need to cover against new associated risks creates an interesting market opportunity for the insurance industry. Initiatives and pilot tests are emerging in the industry, leveraging the benefits of blockchain infrastructures (transparency, immutability, programmability, etc.) in an aim to optimize traditional insurance services. However, most of these initiatives have failed due to underestimated barriers to entry (costs, regulations, etc.).

Use cases in the insurance sector

- **Optimizing insurance services and products with blockchain infrastructures:**
 - **Parametric insurance:** the programmability of blockchains makes it possible to automate compensation following an insurance event. To deploy it, it is necessary to reconcile a source of data external to the blockchain (known as off-chain) with a program written on a blockchain (smart contracts).
 - Certifying the **authenticity** of data in insurance, for example in the car and health segments.
 - **Premium payment in digital assets**

East Assur and l'Assurance du Lion, two insurance brokers based in Mulhouse, have opened up premium payment in digital assets

Axa Switzerland offered its policyholders the possibility of paying their premiums in bitcoins on non-life insurance products. The broker Bitcoin Suisse received the payment in bitcoins and converts it into CHF.

These initiatives were suspended in April and June 2022 due to lack of demand and a desire to take time to assess the implications of these initiatives.

- **Creating new insurance products tailored to digital assets:**
 - **Coverage against the risk of loss or theft of a digital wallet's private key**, for instance as an option within an existing insurance product (e.g., home insurance).
 - **Other coverage for new risks associated with digital assets and gradually institutionalized uses:** risks of smart contracts, volatility affecting savings or deposited collateral, loss of token indexing to the underlying reference asset, etc.

Marsh, in collaboration with Arch, offers a «Blue Vault» insurance product against the loss of digital assets caused by theft, damage or destruction of private keys.

Lloyd's insures Coincover which develops technologies to secure digital assets against theft and fraud for businesses and individuals.

Sompo and Munich RE, through their jointly developed product Chainproof, offer an insurance product for smart contract liquidity funds, available on certain decentralized finance platforms. This product targets asset management funds and corporates.

Chainproof also offers a fund management tool that alerts users if a risk is identified in a protocol, in a liquidity fund, or a bridge (i.e., a smart contract powering the transfer of digital assets between different blockchains).

- **Providing insurance products to Web3 players:**
 - **Professional civil liability insurance: (RC-pro in France) for PSAN-registered companies.** This insurance is a prerequisite for obtaining PSAN approval and represents an opportunity for insurers to capture a target group of crypto companies accounting for a significant part of the innovation ecosystem in Europe. The lack of availability of this type of insurance remains one of the main barriers for players wishing to obtain PSAN approval.

Challenges

- Parametric insurance has the potential to penetrate already established and competitive insurance markets with strong pricing pressures, but **its legal implications and implementation costs need to be strongly considered**. On the other hand, the use of a reliable data source and a resilient, scalable, and secure infrastructure that enables automated payment is crucial to deliver parametric insurance products.
- Lack of perspective due to the youth of the sector, which implies **better management of associated risks (particularly in terms of cybersecurity)** via the development of new skills and key partnerships.

APPEALING TO PUBLIC DECISION-MAKERS

- **Structure a regulatory framework to encourage insurers to participate in this market.** Indeed, the current regulation is not mature enough to achieve full potential, particularly regarding STOs and parametric insurance.

INDUSTRIAL, TECHNOLOGICAL, AND RETAIL SECTORS

Addressing traceability issues in value chain

Large industrial or commercial groups - in sectors such as tech, agriculture, construction, infrastructure, telecom, aeronautics, manufacturing, etc. - are designing and experimenting with solutions built on **blockchain infrastructures in an aim to optimize their existing processes and resources and/or to enhance data management within value chains, supply chains and product life cycles**.

Similarly, in the retail sector, blockchain presents many opportunities for addressing **product traceability**, as it constitutes a secure, immutable, and transparent information storage and transmission technology. Furthermore, digital assets stand as valuable tools for rethinking customer relations, loyalty mechanisms and the deployment of marketing campaigns.

Cas d'usage

- **Leveraging existing technological assets (e.g., datacenters) for Web 3 services:** some large industrial groups in France own IT infrastructure and server parks (data and computer centers) that are often under-utilized, and can thus be optimized by providing cloud solutions and services based on blockchain and Web 3 networks (see energy sector):

Exaion, a subsidiary of EDF, is leveraging EDF's datacenters and computers to build services on several blockchain infrastructures, including Ethereum and Bitcoin, targeting institutional clients.

- **Traceability, transparency, and certification of industrial and production data**, by registering data on public blockchain infrastructures. This allows, in addition to the benefits associated with public blockchains, to strengthen trust among all stakeholders in the product value chain, consumers, as well as the regulator, for compliance purposes. In the food industry, for instance, where multiple intermediaries take part on value chains, data transparency and traceability are essential to avoid food scandals or food losses.

The use case echoes the European Digital Product Passport project (see DPP on the Luxury & Brands sector), set to be implemented first for industrial materials (car batteries, textiles, construction, and electronic products, etc.).

Worldwide, several large retail groups are leveraging blockchain tech to meet this demand, such as Walmart (since 2018), Nestlé and Unilever. IBM, in turn, created the IBM Food Trust platform. In France, the pioneer was Groupe Casino, which aimed at tracing the provenance of products such as chicken, eggs, milk, and tomatoes.

Nonetheless, these initiatives are for the most part built on private networks, which pose several limitations (see Challenges)

- **Optimizing the exchange of value (payments and settlements) on an international level, between subsidiaries, with suppliers and distributors, etc.** for instance by using payment systems based on stablecoins or even programming payments (invoices, guarantees, etc.). (See section on Payments)
- **Enhancing loyalty programs and customer relations through tokenization:** when tokenized, loyalty points become digital assets and thus are attributed will all their characteristics and benefits, such as the interoperability with other applications and other assets existing on blockchain networks. The use case is all the more interesting if a larger number of stakeholders agree on a same token standard and/or infrastructure. Beyond loyalty points, a growing number of retail players are using NFTs to deploy marketing campaigns. NFTs present numerous opportunities to rethink customer relations, foster engagement with new customer segments and create communities.

The retail industry is launching NFT projects for customer relation purposes, in line with the strategies followed by some luxury brands (see more on the Luxury section). Monoprix, for instance, has launched its NFT Vanilla 2.0 dessert, and Groupe Casino has offered 1,000 tokens as loyalty rewards, representing characters in the retail industry (baker, delivery man, winemaker, etc.) with discounts linked to the figurines.

- **Virtual events:** metaverses have also become a tool for brands to attract or engage customers by organizing events and putting emphasis on digital experiences.

Carrefour has launched the sale of Bee NFTs in the metaverse platform «The Sandbox» to raise awareness on the importance of bees.

Challenges

- Initiatives on product traceability are, for the most part, built on private networks. While this type of infrastructure may meet some requirements in terms of privacy and security, its added value is substantially limited as opposed to public blockchains, more secure, immutable, and transparent.
- There is a lack of robust tools and systems at the supply chain level to ensure the traceability of physical products via blockchain infrastructures, especially regarding coupling technologies.

- As virtually all stakeholders in the value chain need to onboard the infrastructure for the system to be effective, the barriers to entry remain relatively high.

APPEALING TO PUBLIC DECISION-MAKERS

- Support industries interested in these new technologies and the creation of new industrial jobs in cutting-edge sectors (data center maintenances and servers, recycling of computer hardware, etc.)
- To legally qualify NFTs
- To preserve France's technological sovereignty by attracting the web 3 industry (developers, companies, financing, etc.) via legislation, grant distribution, international exposure, etc. In addition, by encouraging initiatives on using existing technological resources, French entities can develop services at the infrastructure level (e.g., through hosting Ethereum nodes in France) and directly compete in a global playfield.

LAW, EDUCATION, HEALTH AND THE PUBLIC ADMINISTRATION

Addressing the challenges of securing personal and/or sensitive data

These sectors face a major challenge: managing and securing personal and sensitive data on citizens. Public blockchain infrastructures ensure data integrity as the technology is an immutable and secure ledger. Simultaneously, this new technology fosters the emergence of a decentralized identity, which, albeit not yet widely used, paves the way for citizens to own and control their digital data.

Use cases

- **Data certification and digital identity:** personal data provided by or for citizens would thus be archived in a single immutable register, assuming the form of a digital passport, for instance.
 - This application concerns every type of stakeholder as long as they manage or generate citizens' data: namely public administration (regarding tax and social security data, birth certificates), legal administration (criminal register), health (treatment follow-up, medicines), schools and universities (diplomas), etc.
 - First, this would make it possible to mutualize information within the public administration, given data providers who often tend to create their own data silos and information management protocols. Second, it can automate both the access and the governance of data: the programmability of blockchains allows data to be shared automatically with third parties when predefined conditions are met.
 - For the legal sector, it can help to optimally manage legal documents, property, and notaries' registries, currently sometimes still archived in paper version or in highly centralized databases.

- **New education for a new industry:** the emergence of the digital assets market, with all the use cases and challenges that stem from it, encourages both traditional and native crypto players to recruit profiles trained in these subjects. This is particularly the case for technical profiles (i.e., developers) which are still scarce given the novelty of these technologies. It is therefore essential to spread knowledge to ensure the sovereignty of France and Europe in the management and knowledge of these infrastructures.

Challenges

- Lack of legal framework for the recognition of legal documents on blockchains, with significant friction in reconciling blockchain registries with notarial records.
- The need for adoption by all stakeholders for these use cases to be genuinely valuable, which at this stage leads to barriers to entry.
- The need to control the risks, particularly in terms of cyber security, associated with these technologies, through key partnerships delivering the necessary services.

APPEALING TO PUBLIC DECISION-MAKERS

- It is essential to define a legal framework regarding the recognition of legal documents on blockchains.
- Promote the development and adoption of a digital identity standard, which would considerably reduce data replication and empower citizens to control their personal data.
- **Promote France's technological independence,** by securing an influential place in the growing ecosystem of digital assets and the Internet of Value. Public authorities can make France a forward-looking territory and a breeding ground for innovation, by creating jobs, establishing a flexible regulatory framework for experimentation and competitiveness, funding research and training (particularly in technical skills), etc.

CONTACTS

Faustine Fleuret

ADAN's President and CEO

Catherine Philippe

Partner Blockchain & Crypto
KPMG in France

www.kpmg.com



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