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# Use of non-deterministic AI in compliance to assess the impact of regulations on cryptocurrencies market in Europe

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## Abstract

**Purpose** – The aim of this paper is to assess the attractiveness of cryptocurrencies for institutional investors domiciled in Europe. As it transpires, the growing popularity of cryptocurrencies comes with unique challenges and increased regulatory scrutiny. The paper reviews relevant regulations and their impact on institutional investors targeting crypto-assets. This paper also serves as a case study of using an artificial intelligence (AI) compliance tool by empirically validating the real-world application of such tools.

**Design/methodology/approach** – The paper states the following research question: what is the impact of the relevant regulatory developments on the attractiveness of cryptocurrencies for institutional investors in Europe? Addressing this question requires a qualitative review of the existing and forthcoming regulations applicable to cryptocurrencies. The research method uses a traffic-lights approach supported by qualitative queries with institutional investors to provide insights into the materiality of the relevant regulations that are sourced from the AI-powered integrated compliance and risk management application.

**Findings** – The qualitative findings, constrained by the number of interviews, indicate that the regulatory environment within the European Union enhances the attractiveness of cryptocurrencies for institutional investors. These findings are challenged by the application of the confusion matrix and Yule's Q to show that the perceived contribution to the attractiveness of cryptocurrencies is a false-positive, meaning that the majority of recent regulatory initiatives have immaterial impact on the attractiveness of cryptocurrencies for institutional investors. Furthermore, the findings primarily document an AI tool failure rather than a definitive signal about market or regulatory dynamics.

**Originality/value** – This paper is unique in its forward-looking view on the regulatory landscape that shapes the standpoint of institutional investors in Europe. The value of this study comes from its focus on the relevant regulations, offering a topical perspective on the compliance-driven attractiveness of cryptocurrencies. The paper adopts quantitative risk model validation metrics to challenge the qualitative findings on the impact of the relevant regulations on the attractiveness of cryptocurrencies for institutional investors. Using AI for its research purpose, the paper also warns about the use of AI-powered applications for regulatory compliance and non-financial risks without a robust governance process.

**Keywords** Cryptocurrency, Institutional investors, Compliance, Market sentiment, AI compliance solutions, Risk management

**Paper type** Research paper

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## 1. Introduction

### *1.1 Purpose and motivation*

The aim of this paper stems from the market-expressed need to assess the attractiveness of cryptocurrencies from the perspective of European investors. The focus on cryptocurrencies is motivated not only by their growing popularity, controversies and nascence, but also by the increasing scrutiny from the European regulators. The paper focuses on the regulatory developments in Europe only. This is due to the fact that the US regulations are event-driven and should be considered on case by case basis. The Asia-Pacific regulatory landscape follows the US developments, while the European policymakers appear to implement rules for cryptocurrencies as part of the overarching framework to strengthen financial stability.

In recent years, the cryptocurrency market has seen large-scale investments from the institutional investors followed by increased regulatory scrutiny. To this end, there have been several attempts to analyse if the increasing regulatory burden coupled with compliance costs would impact on concerned institutional investors.

A general opinion of the market is that cryptocurrencies offer a high return potential compared to traditional assets, attracting institutional investors searching for quick and significant gains. Moreover, they represent an innovative form of investment, leveraging blockchain technology. However, this new asset class also presents unique challenges, such as high price volatility; absence of clear regulation; and lack of a complex technical understanding of crypto-trading. Institutional investors accustomed to more stable markets and large amount of historical data may find it difficult to navigate the investment world of cryptocurrencies. The nascence of the regulatory initiatives may further increase the difficulty in understanding of the cryptocurrency market.

While addressing the concerns raised by institutional investors, the paper uses a generally accepted definition of cryptocurrencies described in both the academic and practitioner-based literature (e.g. Pernice and Scott (2021)). Hereto, cryptocurrencies are defined as digital or virtual currencies that involve cryptography for security reasons and operate in decentralised networks using blockchain technology. This nascent and innovative form of currency is distinguished by its capacity to facilitate secure, transparent and efficient transactions without the need for traditional financial intermediaries. However, the rapid evolution and the intricate mechanics of cryptocurrencies have prompted a vibrant discussion among scholars, practitioners and policymakers on the suitability of crypto-assets for investors. A recurring theme in this debate is the acknowledgment of a significant knowledge gap regarding the profitability, safety and regulatory compliance of investing in cryptocurrencies. Therefore, institutional investors signal the need for a targeted research that would assess the attractiveness of cryptocurrencies, particularly in light of the changing regulatory landscape.

### *1.2 Key events*

Focusing on recent regulatory developments, the paper acknowledges the fact that the cryptocurrency landscape has undergone a major transformation since 2020 and the key events are not limited to Europe. Recent years have witnessed institutional adoption of cryptocurrencies coupled with fast-paced regulatory evolution in this space. Stojanović (2024) argues that the crypto regulations are fuelled by the geopolitical strategy. Indeed, the El Salvador's Bitcoin adoption in 2021 as a legal tender was backed by the claims of financial inclusion and the reduction in remittance costs (Alonso *et al.*, 2023). Although Alonso *et al.* (2023) also warns about the fiscal instability and low adoption rates for cryptocurrencies, the El Salvador's Bitcoin case is regarded by the scholars as a success, because it allowed the country to introduce an alternative to the US dollars and some

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protection from the foreign monetary policy implications. Regardless of the outcome of the adoption of Bitcoin in El Salvador, according to the free banking theory developed by Adam Smith in 1776, cryptocurrency market participants should bear any consequences, both positive and negative (Simon, 2024).

Unlike the case of El Salvador, the Terra-LUNA collapse in 2022 has received an extensive academic research coverage. The Terra-LUNA also directly triggered the emergence of new regulatory proposals worldwide that propagate a stricter oversight of cryptocurrencies (Benson, 2024). Using the DCC-GARCH model, the study of Santiago *et al.* (2025) indicates increased volatility during the Terra-Luna crash, but no increase in the volatility correlation between digital and conventional assets during this period. For policymakers and regulators, the reported findings on the volatility correlation between the traditional assets and cryptocurrencies can inform the design of the regulatory stress testing exercises and the development of appropriate oversight frameworks. Similarly, to conclusions made by Santiago *et al.* (2025) and Priem (2022) reports that cryptocurrencies markets and the Terra-LUNA case present a complex challenge for regulators while operating outside of the traditional ecosystem. Although the Terra-LUNA collapse in 2022 has marked the advent of regulatory initiatives in this space (e.g. STABLE Act), Santiago *et al.* (2025) concludes that no notable regulatory advancements have been achieved yet.

Other post Terra-LUNA regulatory initiatives for cryptocurrencies evolved in different jurisdictions. For example, South Korea has adopted the Digital Asset Framework Act in 2023 that requires the issuers of crypto assets to disclose the associated data and inform about risks. However, as noted by Jon and Yang (2025), the cryptocurrencies market in South Korea is regulated by the enforced Electronic Financial Transactions Act and the Act on Reporting and Use of Specific Financial Information. There are no event-driven regulatory responses for cryptocurrencies in South Korea. Similarly, in 2023, Japan has introduced laws requiring stablecoin issuers to be licenced banks (Ochiai, 2025). This is due to the fact that cryptocurrencies are regarded as assets with monetary value in Japan. Going furthermore, the Monetary Authority of Singapore announced in 2023 the introduction of a new regulatory framework that seeks to ensure a high degree of value stability for cryptocurrencies (Phang, 2024). The new regulatory initiatives enable the market participants to distinguish between the regulated cryptocurrencies (stablecoins) and other digital tokens.

Another key event is the collapse of the FTX in 2022. In fact, Arner *et al.* (2023) states that the entire 2022 was an *annus horribilis* for the cryptocurrencies worldwide. Hereto, the existing literature refers to this year as the Crypto Winter (Arner *et al.*, 2023; Bernbrock *et al.*, 2023). The FTX was one of the leading cryptocurrency exchanges that went bankrupt in November 2022 amid allegations that its owners embezzled and misused customer funds (Jalan and Matkovskyy, 2023). In the aftermath of the FTX collapse, regulators have called for increased scrutiny of the cryptocurrencies market (Jalan and Matkovskyy, 2023). Conlon *et al.* (2023) point to the ensuing cryptocurrency discussions were held at the US Congress demanding more protection of investors. According to Galati *et al.* (2024), the FTX contagion effect impacted other cryptocurrency markets and institutions resulting in the bankruptcies of BlockFi, Genesis Global, Celsius and Voyager Digital.

Finally, the most recent crypto-event is the ban of cryptocurrencies by China in 2025, where the Chinese government banned private ownership of digital currencies in addition to formerly issued prohibition on trading and crypto-mining in 2021 (Chen and Liu, 2022). According to Chen and Liu (2022), the Chinese ban is associated with the efforts to strengthen the digital Yuan and underscores the government's commitment to centralising financial control.

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### 1.3 Research value

The value of this paper stems from its focus on the regulatory-driven attractiveness of investing in cryptocurrencies. Thus, the study offers a novel perspective on crypto-asset evaluation through the lens of existing and forthcoming regulations. This approach remains important, because institutional investors are subject to regulatory compliance requirements and supervision.

In addition to delivering practical implications for institutional investors, integrating a forward-looking view on the regulatory landscape gives details about the anticipated trajectory of regulatory developments in the cryptocurrency market. This perspective is particularly salient given the dynamic nature of cryptocurrency regulations, which are evolving in response to the unique challenges posed by virtual assets.

Another layer of depth to this study is introduced by integrating practitioners' perspectives on investing in cryptocurrencies. This approach places the study in the context of European investors experience with its sophisticated financial ecosystem and governance framework. This European-specific viewpoint enables a nuanced understanding of how localised regulatory environments and investment cultures intersect with the globalised nature of the cryptocurrency market.

Finally, the originality of this study stems from the empirical application of an artificial intelligence (AI)-powered compliance and risk management tool to identify key regulations impacting institutional investors in Europe. There is a fast-paced growth of AI in risk management and compliance, driven by the ability of AI tools to automate complex tasks, enhance analytics and improve efficiency. This paper puts the AI-powered integrated compliance and risk management application to the test. In doing so, the paper provides a validation check verifying if the AI-powered compliance solutions remain transparent and deliver consistent output, so that they can be handled without strong governance and controls.

## 2. Study background

### 2.1 Evolution of cryptocurrencies

According to Vejačka (2014), the emergence of cryptocurrencies is dated back to 2009 and linked to the creation of Bitcoin. Hereto, Ziegeldorf *et al.* (2018) links the creation of Bitcoin to the need of having a secure and anonymous way to transfer currency from one person to another. Since the inception of Bitcoin, its value increased substantially fuelled by investors and users (Panda *et al.*, 2023). As noted by Ferreira (2021), the evolution of cryptocurrencies began with the initial forays into the realm of digital currency secured by cryptography, a field shaped by visionaries such as David Chaum, who introduced the "eCash" as an alternative payment means (Chaum, 1983). The early steps in implementing digital money such as "eCash" laid the groundwork for what would become a revolution in digital finance (Brunton, 2020). However, back then, the digital money was not an attractive asset for institutional investors. It was with the introduction of Bitcoin, created by the Satoshi Nakamoto, that the concept of a cryptocurrency attracted attention of financial markets' participants (Bradbury, 2013). With this in mind, Crosby *et al.* (2016) links the early fascination with Bitcoin to the fact that it was introduced as an innovative way of using cryptography and blockchain technology to create a decentralised currency, without the need for a central authority. Then Pele *et al.* (2021) delivered insights for the separation of cryptocurrencies from other assets and naming them "alternative assets".

The article by Chuen and Teo (2021) highlights the fact that the new monetary era quickly inspired the creation of other cryptocurrencies, known as altcoins, each seeking to improve or diversify the functionalities offered by Bitcoin (Cagli, 2019). The speculative bubble of

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2013 and the hacking of Mt. Gox in 2014 notably affected the cryptocurrency landscape. The latter event, involving the theft of 850,000 bitcoins from the leading exchange, underscored the sector's vulnerabilities and prompted a push towards improved security and regulation (Rao and Shaen, 2022).

2015 marked a turning point with the implementation of Ethereum, which expanded the possibilities of the blockchain through smart contracts (Ante, 2021), paving the way for a multitude of applications beyond simple digital currency. Ante (2021) links the Ethereum's growing popularity to the Initial Coin Offerings (ICOs) phenomenon in 2016. The ICOs became a new fundraising method that attracted a wave of innovation as well as speculation. In the following years, investors flocked to Bitcoin and Ethereum contributing to a rapid expansion phase of the cryptocurrencies market.

Going furthermore, after a period of explosive growth, the cryptocurrency market experienced a slowdown in 2018 (Tu *et al.*, 2020). However, since 2019, surviving crypto-projects have focused on developing concrete solutions to real-world problems, while touching on various sectors such as gaming or finance (Torrance *et al.*, 2023). According to Torrance *et al*. (2023), cryptocurrencies are starting to redefine the way of thinking about money, opening up prospects for financial inclusion for those who were previously excluded from the traditional banking system.

The soaring popularity of cryptocurrencies in 2021 met with a revised market conditions in spring 2022, when the valuations of crypto assets dropped. Nonetheless, as noted by Syarkani and Tristanto (2022), the investors remained bullish about the future prospects and regarded the plummeting valuations as a neutral economic cycle for markets that are yet to mature. In March 2022, the US president signed the Crypto Executive Order demanding the government to examine the risk and benefits of cryptocurrencies (Koutmos, 2023). Then, the FTX collapsed amid the indirect pressure from the Russo-Ukrainian war (Alnafisah *et al.*, 2025). As explained by Alnafisah *et al.* (2025), the onset of the military conflict in Ukraine caused the failure of LUNA and Do Kwon to keep the 1:1 peg against stablecoins. The year 2022 witnessed the European Union's finalisation of the regulations for digital assets, when the Markets in Crypto-Assets Regulation (MiCA) was introduced. The MiCA shows the difference in a regulatory approach between the US-regulations concerning cryptocurrencies and their European counterparts. Hereto, the MiCA is part of a wider regulatory package that intends to transform the European economy (Patti, 2023), while the US-regulations remain specific to certain events in cryptocurrency market.

The fallout from the FTX and Alameda Research collapse extended to 2023, with consequences resonating throughout the cryptocurrency market. As indicated by Conlon *et al.* (2023), the FTX collapse spread into the financial system. However, this event also showed that the cryptocurrency market is subject to major impact from the global financial ecosystem. Despite the turbulences caused by the FTX collapse, news appeared in 2023 about the first Bitcoin spot exchange traded fund. At the beginning, this investment undertaking was met with stark criticism from the Securities and Exchange Commission (Weber, 2019). However, in 2024, the US regulators approved outstanding applications for the Bitcoin spot ETFs from BlackRock, Greyscale and Fidelity (Krause, 2024). A year later, Blackrock launched the first bitcoin exchange-traded product in Europe, in a bid to tap growing demand for cryptocurrency exposure in new markets after attracting more than $50bn into similar products in the USA (Reuters, 2025a, 2025b).

The most recent years of 2024–2025 abounded in multi-hacks of the blockchain. A peculiar hack spanned across the cryptocurrency market in 2024 and involved the a cross-chain router protocol providing bridging services for all sorts of cryptocurrencies. As a result, Reuters (2025a, 2025b) reports that the hack caused unauthorised withdrawals

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amounting to US$125m. So far in 2025, over US$2.17bn has been stolen from the cryptocurrency market (Reuters, 2025a, 2025b). The hacking activities have intensified in 2025 with ransomware soaring to record highs and terrorist financing expanding, while the usual crypto fraud activities still remaining at a material level (Adeyemo, 2025).

### *2.2 Understanding of regulatory impact*

The current understanding of the impact of regulatory developments on cryptocurrencies is sparsely documented in the academic literature. The existing studies target specific events in the cryptocurrency market with the associated regulatory responses rather than a holistic view on the entire suite of the regulatory framework. For example, Shanaev *et al.* (2024) estimate the implications of illicit market use for the value of Bitcoin in an event studies framework by targeting regulatory impact of the US marijuana bills. Griffith and Clancey-Shang (2023) analyse the effects of the Chinese cryptocurrency ban on several aspects of the market quality, such as prices movements, volatility and liquidity. Their study is motivated by the urgency of understanding the broad implications of cryptocurrency regulations and contributes to the argumentation that the regulatory developments in China are negatively perceived by cryptocurrency investors. Indeed, the regulatory impact on the volatility of cryptocurrencies, with the example of Bitcoin, has been evidenced by Lyócsa *et al.* (2020) and Chokor and Alfieri (2021). However, these studies do not explicitly analyse market sentiment and opinions expressed by institutional investors, but the price volatility of cryptocurrencies. Hereto, Lyócsa *et al.* (2020) focuses on both the hacking events in cryptocurrency exchanges as well as scheduled macroeconomic news announcements that affect the volatility of Bitcoin, measured as realised variance and its jump component. Chokor and Alfieri (2021) proxy the understanding of the regulatory impact by analysing the relationship between the economic policy uncertainty index (EPU) and cryptocurrency volatility. These indirect approaches to gauging market sentiment result in contrasting conclusions, whereby Griffith and Clancey-Shang (2023) report a significant impact of the Chinese cryptocurrency ban and Chokor and Alfieri (2021) state that the ban on crypto-trading by the Chinese government has no significant impact.

Therefore, as noted by Feinstein and Werbach (2021), the question whether the regulatory developments push trading activities further into the less-regulated markets or provide transparency, safety and robustness to the cryptocurrency markets remains open. Feinstein and Werbach (2021) points to the desirability of either outcome of the regulatory developments. As it transpires, some investors believe that the regulatory developments would restrict investments in cryptocurrencies and cause the arbitrage of trading activities to obscure and often illegal platforms (Ayodeji *et al.*, 2023). Other investors support the current regulatory developments, because they believe that crypto regulations would stimulate activity by providing clarity to market participants (Wronka, 2024). Hereto, Feinstein and Werbach (2021) shows that these debates are conducted almost entirely without underlying data that would indicate the effects of regulation on cryptocurrency market activity. Interestingly, the negative investor sentiment towards cryptocurrency regulations is more likely to be expressed in non-European jurisdictions, while the regulatory developments in Europe are evaluated as beneficial to the cryptocurrency ecosystem. For example, Ferreira *et al.* (2021) analysed the European practices around Stablecoin regulation and concluded that the supervisory scrutiny over emerging risks and the regulatory guidance on their mitigation is justified in the case of cryptocurrencies.

A pivotal study of Benson (2024) analyses the understanding of the European cryptocurrency regulations. The study uses a survey of crypto experts from five European countries to verify if the European Union's Regulation on Markets in Crypto-Assets (MiCA)

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would have the intended effect. However the study is limited only to the MiCA, which is part of the larger anti-money laundering and financial stability framework initiative. Therefore, Benson (2024) concludes that a unified national legal framework for regulating transactions with crypto assets does not exist in European countries.

All in all, a review of the existing studies shows that the fast-paced development of Blockchain technology and the cryptocurrency growth is not met with adequate regulatory responses that failed to keep pace with this innovation in terms of its understanding, providing appropriate legal and regulatory frameworks (Kafteranis and Turksen, 2021). Consequently, investors view the regulatory developments as evolving and often blocking the cryptocurrency innovation in Europe (Financial Crime Academy, 2025). This view can be attributed to the pronounced inclination towards high-risk investments reported for the cryptocurrency investors in the Financial Lives Survey 2020 (FCA, 2020; Wang, 2024). Against this backdrop, the European Commission recognises the importance of combating the legal uncertainty and providing a clear regulatory regime in areas pertaining to blockchain-based applications. In doing so, the European Commission proposed a pilot regime for market infrastructures that would address the case of hampering cryptocurrency trading and the Distributed Ledger Technology (European Commission, 2025).

The review of the aforementioned studies also shows that the regulatory impact on attractiveness of investments in cryptocurrencies is attributed to investor sentiment (e.g. Benson, 2024) rather than a tangible measurement in terms of regulatory capital or direct compliance costs. This is also the domain, where the current paper is placed. In fact, studies that measure the regulatory impact on attractiveness of investments in terms of risk weighted assets, capital adequacy, imposed restrictions or any other form of designated economic buffer are scarce. Witzany (2020) and Miu and Ozdemir (2007) explain that regulatory capital adequacy is assessed by Pillar I and Pillar II risk models that are not applicable to the trading activities or, more specifically, to investing in specific assets.

### *2.3 Associated risks*

Analysing the attractiveness of cryptocurrencies cannot be completed without first discussing the literature on the risks and challenges associated with investing in these alternative assets. According to Rehman *et al.* (2019), the riskiness of cryptocurrencies is multifaceted, stemming from their inherent characteristics and the broader ecosystem in which they operate. As noted by Rehman *et al.* (2019), one of the most material risk boils down to the price volatility. The cryptocurrencies market is known for the existence of rapid and significant price movements. According to Mendoza-Tello *et al.* (2019), the price volatility of crypto assets is triggered by numerous factors, including speculative trading, regulatory announcements and technological disruptions. Bazán-Palomino (2020) argues that this volatility can lead to substantial gains, but also significant losses, making investment in cryptocurrencies a high-risk venture, particularly for those unfamiliar with the market's nuances.

The academic literature also highlights issues with the settlement finality, crypto-custodian insolvency and legal risks revolving around cryptocurrencies. Studies of Haentjens *et al.* (2020) and Kokorin (2023) illustrate the uncertainty regarding the legal interpretation of the crypto trading. Despite the features such as the immutable ledger, smart contracts and enhanced transparency, the review of the cases of applying the blockchain technology in clearing and settlement systems by Chamorro-Courtland (2021) reveals multiple regulatory challenges related to issues such as data privacy, security and compliance. Agarwal *et al.* (2023) add issues with integrating new blockchain-based systems with the existing legacy

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settlement processes and Bendetti and Nikbakht (2021) point to scalability problems due to the volume of financial transactions.

Security vulnerabilities present another critical risk associated with cryptocurrencies. Despite the cryptographic security of blockchain technology, the broader cryptocurrency ecosystem has been susceptible to cyberattacks (Chaganti *et al.*, 2022). As noted by Choithani *et al.* (2024), high profile hacking incidents have resulted in the loss of billions of dollars' worth of cryptocurrencies over the years, underscoring the importance of robust security measures, regulatory scrutiny and the need for constant vigilance by investors.

As observed by Azgad-Tromer (2018), regulatory risks are also looming over the cryptocurrencies market. The lack of a consistent regulatory framework, especially across different jurisdictions, creates uncertainty, which can affect market stability and investor confidence. On the other hand, as noted by Prorokowski (2011), any responsive regulatory initiatives often create unnecessary burden on institutional investors who expect smarter, but not tougher regulations to the emerging issues. Against this backdrop, Albayati *et al.* (2020) argue that regulatory actions in form of bans, restrictions or stringent compliance checks, can have immediate and profound effects on the cryptocurrencies market, affecting the accessibility, usability and value of cryptocurrencies.

Cryptocurrencies are often regarded as tools for illegal activities such as tax avoidance, money-laundering, terrorism financing and bribery (Gonzálvez-Gallego and Pérez-Cárceles, 2021). Table 1 shows common types of fraud risk associated with the cryptocurrencies market. As noted by Andryukhin (2019), fraud and scams are rampant in the cryptocurrency world, exploiting the relatively unregulated nature of the market and the anonymity of digital transactions. As further delineated by Andryukhin (2019), investors and other crypto-users are frequently targeted by schemes designed to steal their funds. These schemes include phishing attacks, fraudulent ICOs and various forms of market manipulation (see Table 1 for details). Referencing the work of Makridakis and Christodoulou (2019), the decentralised and irreversible nature of blockchain transactions means that recovering lost funds can be challenging, if not impossible.

**Table 1.** Fraud risk associated with cryptocurrencies

| Type of fraud | Description |
|---|---|
| Financial crimes | Use of cryptocurrencies as a vessel for illegal activities such as terrorism financing and money-laundering |
| Scam ICOs | Fabrication of initial coin offerings with elaborate structures (e.g. fraudulent white papers) |
| Pump and dump | Artificial boost of prices for cryptocurrencies through misleading, fraudulent and exaggerated positive statements before selling the owned stocks |
| Market manipulation | Improper interventions in the markets where cryptocurrencies or related derivative products are traded |
| Ponzi schemes | Purported investments in emerging crypto markets using fraudulent schemes |
| Broker-Dealer fraud | Violation of the broker-fiduciary duty by putting own financial gains ahead of the customers |
| Outright theft | Hacking of investors' crypto-wallets for the purpose of stealing cryptocurrencies |
| Churning | Setting up churning accounts to generate additional commissions and fees as well as to misappropriate funds |

**Source(s):** Author's own work based on: https://constantinecannon.com/ (13.08.2024)

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Finally, technology risk is also regarded as material for the case of cryptocurrencies. Hassani *et al.* (2018) point out that the technological risk cannot be overlooked when trading crypto-assets. This is due to the fact that complex and rapidly evolving technology underpins cryptocurrencies resulting in such disruptions as code vulnerabilities, scalability challenges and systemic failures of the boarder ecosystem (Radanliev, 2024).

### *2.4 Associated benefits*

Institutional investors are not only exposed to various risks associated with cryptocurrencies. There are also benefits offered by these alternative assets. The attractiveness of cryptocurrencies is the outcome of the risk-to-benefit ratio. As highlighted by Tomic *et al.* (2020), cryptocurrencies have introduced a novel dimension to the financial landscape, offering a plethora of benefits that challenge traditional banking and monetary systems. One of the foremost advantages quoted by Tomic *et al.* (2020) is the decentralisation brought by crypto-assets to financial transactions. Unlike conventional currencies controlled by national governments and central banks, cryptocurrencies operate on decentralised networks using blockchain technology (Yuan and Wang, 2018). Zetzsche *et al.* (2020) argue that the decentralisation reduces the risk of censorship, interference or manipulation by any central authority, providing a level of financial freedom and autonomy not previously possible.

Other benefits highlighted in the existing literature revolve around the ease and efficiency of crypto-transactions. Cryptocurrencies enable direct peer-to-peer transactions across the globe without the need for intermediaries such as banks or payment processors. This not only speeds up the transaction process but also significantly reduces transaction fees, making it especially beneficial for international money transfers (Hashemi *et al.*, 2020). As noted by Ghosh *et al.* (2020) cryptocurrencies also offer enhanced security features. Transactions are secured by cryptography, making them extremely difficult to counterfeit or double-spend. As described by Gabison (2016), the blockchain technology ensures that every transaction is recorded on a public ledger, providing transparency and immutability. This means that once a transaction is recorded, it cannot be altered or deleted, thereby reducing the likelihood of fraud.

As pointed out by Chu (2018), financial inclusion offered by the cryptocurrencies market should be regarded as a critical advantage. Cryptocurrencies can provide access to financial services for people who are unbanked or underbanked, particularly in regions with limited access to traditional banking infrastructure. By using cryptocurrencies, individuals can participate in global economic activities, access capital, and even secure loans and other financial products (Siqueira *et al.*, 2020).

Finally, as mentioned by Hassani *et al.* (2018), cryptocurrencies have spurred innovation within the financial sector and beyond. The underlying blockchain technology has found applications in various fields such as supply chain management, healthcare and digital identity verification. The rise of cryptocurrencies has prompted a re-examination of existing financial systems and is driving the development of new, more transparent and efficient systems (Weichbroth *et al.*, 2023).

### *2.5 Use of artificial intelligence in compliance*

Since the paper uses an AI-powered compliance tool to identify relevant regulations, this section discusses the academic and regulatory focus on the increased use of AI risk management tools and the governance for the AI.

As noted by EBA (2025a), the financial industry has recently undergone a digital transformation with the emergence of a broad spectrum of technologies to enhance risk management and compliance. Among those technological solutions, the use of AI tools

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prevail in reshaping the way a compliance function operates within an institution (Kothandapani, 2025). EBA (2025a) defines AI as broad range of machine-based systems designed to operate with varying levels of autonomy and which generally adapts to input data and context. According to EBA (2023a, 2023b, 2023c, 2023d, 2023e), the increased use of AI is observed across the natural person's creditworthiness and the credit scoring performed by institutions. Pattanayak (2021) adds the case of optimising internal processes to the list of AI applications and the study of Bello *et al.* (2023) discusses the use of AI in fraud detection. Pasam (2024) analyses the adoption of AI in compliance from the regulatory perspective. However, to date, none of the studies empirically tested the AI compliance tools. The academic literature focused on navigating the legal and regulatory challenges of AI in finance (Deshpande, 2024) with little insights into real-world validation of such tools. Hereto, by using the AI compliance tool, the paper serves an empirical validation of the non-deterministic automated compliance system.

The paper acknowledges the fact that the use of AI tools comes with specific risks that EBA (2025b) classifies as Information and Communication Technology Risk (ICT Risk) and advocates for sound governance arrangements against potential ICT disruptions. EBA (2025b) noted the increased innovation including digitalisation and interconnectedness that amplifies the risks from AI solutions. However, no specific governance arrangements have been proposed in this space and the EBA merely refers to the digital operational resilience framework under Directive (EU) 2022/2554 for further guidance. Against this backdrop, Pasam (2024) and Rodrigues (2020) point to the lack of algorithmic transparency to be the key challenge for Compliance Officers that use AI tools. Summing up, while AI-powered tools provide improvements to the compliance processes, their adoption introduces challenges such as the lack of transparency, management biases and imbalance between the automation and human oversight (Golzarjannat and Gustafsson, 2026). By using the AI-powered compliance tool the paper verifies the necessity to increase human oversights and develop AI-specific governance frameworks. In doing so, the paper contributes to the studies on the Regulatory Technologies solutions, commonly defined as RegTech (El Khoury *et al.*, 2025) and the human-AI interaction defined as the human-in-the-loop (Mosqueira-Rey *et al.*, 2023).

The existing academic literature on RegTech aims to explore the extent to which AI tools can be used to address compliance burden by undertaking not only complex and technical, but also time-consuming tasks. Recent studies in this vein highlight the growing role of RegTech in enhancing compliance efficiency (Firiza *et al.*, 2024), reducing regulatory risks (Singh *et al.*, 2022) and improving operations (Olaiya *et al.*, 2024). In addition to this, McCarthy (2023) argues that RegTech is more than a tool for compliance efficiency, but a new paradigm shift in regulation. However, McCarthy (2023) and Beerman *et al.* (2021) also point to practical hurdles and concerns regarding databases and data vulnerability. According to McCarthy (2023), the lack of human oversight on RegTech results in the inability of a financial institution to understand how data is collected and processed by AI tools. Therefore, from the input data perspective, the human-in-the-loop remains an important relationship to improve AI tool performance through interventional model training (Zanzotto, 2019).

## 3. Methodology

### *3.1 Research question and key assumptions*

The paper is built on the following research question: What is the impact of the relevant regulatory developments on the attractiveness of cryptocurrencies for institutional investors in Europe? This question remains significant, because it touches on the intricate relationship between evolving regulations in the cryptocurrency domain and their influence on the

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decision-making processes of institutional investors. Understanding this dynamic is crucial for identifying broader investment trends and the future trajectory of the cryptocurrencies market.

Addressing this research question entails a qualitative review of the existing and forthcoming regulations applicable to the cryptocurrencies market. At this point, the input from practitioners is gathered for the review of the regulatory background. Such defined methodological premise is built on the assumption that institutional investors care about compliance with relevant regulations. This assumption is rooted in the definition of regulatory compliance that refers to the conformance of financial services firms and institutions to laws and regulations. Thus, the paper follows up on the notion of compliance provided by Prorokowski and Prorokowski (2014), whereby financial firms despite some organisational differences share similar compliance characteristics.

The paper also assumes that the perception of the regulatory impact on the attractiveness of cryptocurrencies cannot be quantified through the means of capital adequacy. However, it can be measured by investigating investors' sentiment. This assumption comes from the analysis of the compliance organisation at financial institution by Prorokowski and Prorokowski (2014), where institutional investors are subject of monitoring and oversight from the control function. In this vein, regulatory impact can be viewed from the perspective of performing additional activities (e.g. following-up on identified risks and issues, ensuring that mitigating actions are taken according to plan, increased reporting in terms of frequency and content) and aligning to the internally defined, albeit regulatory driven, risk appetite.

### *3.2 Research methods*

For the purpose of gauging the impact of crypto-regulations, the paper develops a traffic lights approach. This decision is motivated by the fact that this method constitutes a common compliance check at financial institutions. Thus, the analysis of the regulatory background would be better understood by institutional investors.

The traffic lights approach is defined in the financial industry as the "red, amber, green" compliance check that informs a practitioner on the actual state of compliance and necessary steps that need to be taken if compliance gaps are evidenced. It is part of a qualitative assessment, because subject matter expertise is used to review specific articles, paragraphs or entire regulations to assign appropriate traffic lights. The idea to use the traffic lights approach is backed by both the academics and the regulators (Prorokowski, 2019; ECB, 2007; BCBS, 2021). According to the ECB (2007) it offers a simplified testing mechanism of any hypothesis. Prorokowski (2019) points to the popularity of the traffic lights approach in financial institutions as measures of compliance and materiality of risk. Finally, BCBS (2021) proposes the traffic lights approach for the market risk disclosures as part of the Basel Framework.

Given the nature of the research question, the following traffic lights are used:

Although the traffic lights approach stands out for its simplicity and effectiveness in project management and problem solving, the key shortcoming of this method is that it does not tell whether the impact is negative or positive. It only flags the existence of the effects that regulations have on institutional investors targeting cryptocurrencies. Thus, for the attractiveness of the crypto-assets, another layer of qualitative analysis is placed that further investigates if the discovered impact contributes in a positive or negative way to the attractiveness of cryptocurrencies. At this point, a panel of subject matter experts is consulted to assess if the impact remains favourable or detrimental to the attractiveness of investing in the cryptocurrencies market. The following practitioners are consulted in the second part of the assessment process for their feedback on the direction of the regulatory impact (Table 2):

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**Table 2.** Subject matter experts

| Subject matter expert | Function | Institution | Department | Domicile | Years of experience |
|---|---|---|---|---|---|
| Expert 1 | Senior advisor | International bank | Wealth management | Luxembourg | 15 |
| Expert 2 | Senior analyst | International bank | Institutional banking | Denmark | 8 |
| Expert 3 | Senior advisor | 3rd Party Management Company | Wealth management | Luxembourg | 20 |
| Expert 4 | Senior risk expert | International bank | Group risk | Finland | 5 |
| Expert 5 | Financial markets specialist | Universal bank | Investment products | Poland | 15 |
| Expert 6 | Compliance officer | AIF fund management | Compliance | Luxembourg | 3 |
| Expert 7 | Consultant | Consultancy firm | Risk management | Spain | 2 |
| Expert 8 | Principal consultant | Investment banking consultancy | n/a | London | 6 |
| Expert 9 | Lead quantitative analyst | International bank | Model risk management | Denmark | 10 |

**Source(s):** Author's own work

Although small, the number of practitioners is sufficient to make a meaningful rank-ordering of the regulatory initiatives into the three buckets presented in Table 3. According to Prorokowski (2016), the discriminatory power of a backtested model can be retained with the minimum of five realised observations. In this case, the qualitative discrimination would have nine realisations across the number of regulations. This is enough to implement an empirical verification of the regulatory impact on the attractiveness of cryptocurrencies. The regulatory impact can be easily gauged in a binary function of 1– legally enforceable and 0 – non-enforceable, the use of an additional qualitative layer highlights practitioners' perspective on investing in cryptocurrencies. The criteria used for selecting relevant subject matter experts include the exposure to cryptocurrencies and involvement with the compliance or risk management function. It is also important that the individual has sufficient knowledge about the relevant European legislation. Given the low number of respondents, a decision was made to include risk management consultants who have worked on the investment banking projects involving cryptocurrencies.

**Table 3.** Traffic lights approach

| Traffic light | Interpretation | Required action |
|---|---|---|
| GREEN | No impact | For information only – this regulation has no measurable impact on institutional investors targeting cryptocurrencies |
| AMBER | Moderate impact | For monitoring – this regulation has some immaterial or indirect impact and should be closely monitored by relevant practitioners for any developments |
| RED | Material impact | For action – this regulation has impact on institutional investors targeting cryptocurrencies and necessitates specific steps to be taken to ensure compliance |

**Source(s):** Author's own work

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The assessment methodology consist of four steps. Firstly, the AI-powered integrated compliance and risk management application is used to select all regulations relevant for cryptocurrencies. Access to this tool has been given to the researchers by a global financial institution on a temporary basis in July 2024 and August 2025. The AI tool was implemented in 2021 at a hosting financial institution for the purpose of providing regulatory compliance checks and non-financial risk management. Since 2024, the application is powered by artificial intelligence that sources applicable regulations on a global and local level, and assigns them to predefined compliance areas. Then, stakeholders allocated to relevant compliance areas (risk managers from the three lines of defence) are notified about new regulatory developments. They are prompted by the application to assess each regulation as relevant or not for their risk function. According to the hosting institution, implementing AI streamlines and optimises the management of non-financial risks throughout the three lines of defence. At the same time, the existing risk applications will be decommissioned in the coming years. Table 4 contains basic details of the hosting institution and the AI tool.

The integrated compliance and risk management application used for sourcing relevant regulations meets the criteria defined for the AI systems in the Article 3(1) of Regulation EU (2024) 2024/1689. The AI tool is a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment (as also defined by Margetis *et al.*, 2025) and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as recommendations or decisions that can influence the compliance and risk management function.

The following coding algorithm is used to search for relevant regulations in the AI tool: (1) "Areas of Compliance" is set for "E-Money Directive"; (2) 71 Regulatory Bodies are selected to encompass only European regulators. Other data explorer options

**Table 4.** Hosting institution and AI-powered application

| Hosting institution | Presence | AI tool owner | AI tool users | AI tool usage |
|---|---|---|---|---|
| Universal Bank | Europe | Group Risk Compliance | • Group Risk Compliance<br>• Group Internal Audit<br>• IT and Cyber (ICT) Risk<br>• Change Management<br>• Model Risk Validation<br>• Risk Models Governance<br>• Operational Risk Control | • Data points for Group Internal Audit;<br>• Guidance for Group Risk Compliance's workstreams;<br>• Policy and Document life cycle management;<br>• IT asset risk assessment;<br>• IT control management;<br>• IT issue management;<br>• Reporting solution for non-financial risk management;<br>• Key Risk Indicators;<br>• Incident management (operational risk loss data management). |

**Source(s):** Author's own work

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are set to include all entries. This step helps to obtain a list of current and forthcoming (in the consultation phase) regulations. Secondly, the short-listed regulations are assessed for the materiality of their impact on cryptocurrency investments. At this point, the traffic lights approach is used. This step helps to identify most influential regulatory developments. Thirdly, the subject matter experts are consulted to provide insights into the direction of the regulations. This step indicates which regulations positively or negatively influence the attractiveness of cryptocurrencies as investment targets. The consultations take place after the documentation of the output from the AI tool in August and September 2024.

In the last step, the direction of the regulatory impact is further assessed by testing the following assumptions underpinning the research question addressed in this paper: a truly positive impact of the regulatory developments would be reflected in the case where the regulations assessed as "positive" have material impact. It remains counterfactual to conclude that "positive" regulatory initiatives with "no impact" contribute to the attractiveness of cryptocurrencies for institutional investors in Europe. Such regulations, although assessed qualitatively as "positive", would only contribute to the operational and compliance costs. Institutional investors would have to devote internal resources (e.g. develop compliance platforms similar to the one used for this study; perform manual assessments; or engage external consultancy firms) to review regulations that turn out to be non-binding. These assumptions are tested using the confusion matrix on the regulatory classification problem and the measures of sensitivity (true positive ratio) and specificity (true negative ratio), as shown in Table 5.

The true positive rate (TP) is defined as the case where 'positive' regulations have material impact on the attractiveness of cryptocurrencies market. The true negative rate (TN) is defined as the case where "negative" regulations have material impact on the attractiveness of cryptocurrencies for institutional investors. The false positive rate (FP) is defined for the regulations assessed qualitatively as "positive", but having no impact on the attractiveness of cryptocurrencies. The false negative rate (FN) follows the same logic for the regulations flagged as "negative" by the interviewed institutional investors:

$$\mathrm{TP} = \frac{a}{a+b}$$

$$\mathrm{TN} = \frac{d}{c+d}$$

**Table 5.** Confusion matrix on the regulatory classification

| | Materiality of regulatory change | |
|---|---|---|
| Qualitative assessment | Material | No impact |
| *Qualitative Assessment of Investor Sentiment* | | |
| Positive | a | b |
| Negative | c | d |

**Source(s):** Author's own work

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$$FP = \frac{b}{a+b}$$

$$FN = \frac{c}{c+d}$$

Then, the proportion of regulations correctly labelled as positive is measured by the application of Yule's Q that is a statistical measure of the association commonly used in a 2x2 confusion matrix. The following formula is used for Yule's Q given the fact that the responses are dichotomous (positive/negative):

$$Q = \frac{ad - bc}{ad + bc}$$

Yule's Q is interpreted by referencing specific thresholds presented in Table 6. Hereto, Prorokowski (2019) provides the thresholds used by the financial industry to interpret the outcome of Yule's Q. These thresholds are adopted in this paper to maximise practical implications for financial institutions.

## 4. Analysis

### *4.1 Qualitative review of regulations*

This section presents details of the qualitative review of the crypto-related regulations conducted in August and September 2024. Each regulatory initiative is briefly described for better understanding of the content and subsequently analysed for its impact on the attractiveness of the cryptocurrencies market for institutional investors. It should be noted that the qualitative assessment is constrained by the small number of the experts. Therefore, generalising their opinions should be done with caution.

*4.1.1 Markets in crypto-assets regulation: material impact.* The MiCA Regulation establishes a unified legal framework for managing crypto-assets that are not covered by existing financial regulations. This regulation applies across all EU member states and specifically targets crypto-asset service providers and issuers, aiming to create uniform standards on transparency, authorisation and supervision of transactions. The primary

**Table 6.** Yule's Q thresholds

| Yule's Q values | Interpretation |
|---|---|
| $0.8 < Q \leq 1.0$ | Very strong association between positive investor sentiment and materiality of regulatory impact |
| $0.6 < Q \leq 0.8$ | Strong association between positive investor sentiment and materiality of regulatory impact |
| $0.4 < Q \leq 0.6$ | Neutral association between positive investor sentiment and materiality of regulatory impact |
| $0.1 < Q \leq 0.4$ | Weak association between positive investor sentiment and materiality of regulatory impact |
| $Q \leq 0.1$ | No association between positive investor sentiment and materiality of regulatory impact |

**Source(s):** Author's own work based on Prorokowski (2019)

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motivation for the MiCA Regulation is to enhance consumer and investor protection and to ensure market integrity and financial stability within the EU crypto-asset markets. This regulation addresses specific risks such as fraud and market manipulation.

For institutional investors in Europe, the MiCA Regulation is assessed by the panel of subject matter experts to have a positive impact. By reducing market uncertainty and clarifying compliance requirements, it encourages more secure investments in cryptocurrencies. The regulation enhances investor confidence through increased transparency and operational resilience. Although it may pose challenges for smaller firms or new entrants due to potentially higher compliance costs, the overall impact on seasoned investors looking to diversify or solidify their portfolios with crypto-assets is expected to be beneficial.

*4.1.2 European systemic risk board crypto-assets and decentralised finance: no impact.* The European Systemic Risk Board's (ESRB) report assesses the systemic implications of cryptocurrencies and decentralised finance (DeFi) and proposes policy options for the European Union. It specifically targets potential systemic risks and vulnerabilities associated with the rapid expansion of crypto-assets and DeFi activities within the EU member states. The aim of the report is to safeguard financial stability and protect market participants from potential risks such as fraud, systemic vulnerabilities and market abuse. The report intends to guide policymakers in managing the evolving landscape of digital finance.

As assessed by the expert panel, the report provides valuable insights for institutional investors in Europe. Its emphasis on regulatory foresight and market clarity could positively influence their investment strategies by reducing market uncertainties. The recommended policies might enhance investor confidence, promoting a safer market environment. However, the call for tighter regulation could also impose compliance challenges, particularly on smaller investment firms and new entrants.

*4.1.3 Financial stability board crypto-asset activity regulation: moderate impact.* The Financial Stability Board's (FSB) regulatory framework recommendations target crypto-assets and stablecoins globally. The framework distinguishes between crypto-assets in general and global stablecoins, which could have broader implications due to their potential use as means of payment or stores of value. This document describes how the different sets of recommendations build a framework for the regulation, supervision and oversight of global stablecoins arrangements and other crypto-asset activities. Inspired by recent market upheavals, such as the collapse of major platforms and unstable stablecoins, the FSB aims to close regulatory gaps that could lead to the buildup of systemic risk.

According to the subject matter experts participating in this study, for European institutional investors, this explanatory document results in the increased clarity and safety of cryptocurrency investments. The uniform regulations may reduce the operational risks of crypto investments and potentially attract more capital into this sector by offering clearer pathways for compliance and participation in the global market.

*4.1.4 Basel paper on the crypto multiplier: no impact.* The Basel Committee's paper provides insights into how the crypto market's structure, interconnectedness and risks influence the broader financial system. This study explores the potential spillover effects of crypto-assets, where volatility or disruptions in this market can significantly affect other sectors and markets. The report aims to quantify the risks associated with the growing interconnectedness between crypto-assets and traditional financial systems.

For institutional investors in Europe, this working paper is assessed by the expert panel as valuable in highlighting the indirect and direct risks associated with the spillover effects. Understanding the interconnectedness and contagion channels can help investors better navigate the crypto market and adopt more strategic risk management practices. The paper is likely to prompt a cautious, albeit informed, approach to cryptocurrency investments by

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providing guidelines that help investors recognise areas of vulnerability. However, highlighting the existence of spillover effects could also increase investor hesitancy, thereby reducing participation in the cryptocurrencies market.

*4.1.5 Basel crypto assets policy measures: crypto, tokens and decentralised finance: navigating the regulatory landscape: no impact.* This document addresses the nature, growth and regulatory challenges posed by crypto tokens and DeFi. It covers their technological and economic structure, primarily focusing on the European Union. The report explores how different types of crypto tokens, such as utility tokens, security tokens and stablecoins are structured and function within the DeFi ecosystem. The primary purpose of this document is to highlight how crypto tokens and DeFi platforms challenge traditional financial systems.

According to the expert panel, for European institutional investors, the report serves as a valuable tool in understanding the evolving landscape of crypto tokens and DeFi. The comprehensive analysis helps identify investment opportunities, while also underscores the risks and regulatory requirements. By offering deeper insights into DeFi's complexities, it enables investors to strategise risk management and compliance practices.

*4.1.6 European Securities and Markets Authority (ESMA) distributed ledger technology crypto-asset services: moderate impact.* The Distributed Ledger Technology Pilot Regime applies uniformly across all EU member states, targeting various stakeholders including crypto-asset issuers and service providers, as well as financial entities that deal with these assets. The primary purpose of this regulation is to provide clear criteria for the classification of crypto-assets, distinguishing those that should be treated as financial instruments under existing financial regulations.

For institutional investors in Europe, this regulation is assessed to present both opportunities and challenges. By clarifying the classification of crypto-assets, it provides a more predictable and secure investment environment, potentially encouraging more institutional involvement in the cryptocurrencies market. However, the stringent criteria and regulatory oversight might also deter some investors due to the perceived compliance costs. Overall, while the regulation aims to enhance safety and transparency, its impact on investment attractiveness depends on individual risk tolerance levels.

*4.1.7 European Commission new crypto tax transparency rules: material impact.* The European Commission proposed crypto tax transparency rules as part of a comprehensive digital finance package aimed at enhancing the innovation and competitiveness of digital financial assets. This regulation is expected to be applicable across all EU member states, promoting a unified approach to taxation and reporting requirements for digital financial assets, including cryptocurrencies. The primary purpose of the proposed regulation is to create a framework that increases the transparency of cryptocurrency transactions. This will be achieved through standardised reporting requirements, allowing EU tax authorities to track transactions across borders. The rules aim to combat tax evasion and improve the reliability of tax data by providing better insight into taxpayers' cryptocurrency holdings and activities.

The interviewed subject matter experts express mixed opinions regarding the proposed crypto tax transparency rules. On one hand, they establish clear regulations and reduce tax uncertainty, offering a safer investment environment that boosts investor confidence. On the other hand, the stricter reporting obligations may be perceived as burdensome, potentially discouraging some investors and leading to a perception of reduced attractiveness of cryptocurrencies due to the increased scrutiny.

*4.1.8 Regulation (European Commission) 2023/1113: material impact.* Regulation (EU) (2023b) 2023/1113 of the European Parliament and of the Council of 31 May 2023 on

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information accompanying transfers of funds and certain crypto-assets and amending Directive (EU) 2015/849 aims at improving the transparency of cryptocurrency transfers. This regulation ensures that information accompanying such transfers aligns with anti-money laundering and counter-terrorist financing directives, ultimately increasing the accountability and security of these transactions. The regulation requires that each transfer is accompanied by information about both the payer and the recipient, enhancing the traceability of transactions. The motivation behind this legislation is to mitigate risks associated with the misuse of crypto-assets for illicit activities. It further aligns crypto-asset transfers with existing frameworks for traditional funds, ensuring consistent monitoring.

According to the expert panel, this regulation presents a mix of opportunities and challenges. On one hand, improved traceability increases transaction security and deters fraudulent activities. On the other hand, these measures are regarded to raise compliance costs for service providers, which might be passed on to institutional investors. Furthermore, strict requirements can add administrative burdens, potentially reducing the attractiveness of investing in cryptocurrencies.

*4.1.9 Financial stability board Asia group discuss vulnerabilities (5/17/2023): no impact.* This regulatory initiative constitutes a part of the Financial Stability Board's (FSB) global framework, which aims to create a unified global standard for regulating cryptocurrencies. It specifically addresses the role of non-bank financial intermediation in the financial ecosystem. Although discussed by the FSB's Asia Group, this framework applies to Europe, affecting a range of stakeholders, from banks to crypto-asset service providers. The primary purpose of this initiative is to mitigate risks associated with non-bank entities and their interaction with crypto-assets.

For European institutional investors, this regulatory discussion points towards clearer and more secure oversight of cryptocurrencies, potentially encouraging investment by reducing financial risk. The subject matter experts highlight the fact that this initiative is only a non-binding regulatory discussion.

*4.1.10 European banking authority/CP/2023/20: no impact.* The European Banking Authority (EBA) has launched the consultation on joint EBA and ESMA guidelines on suitability assessments of the management body and holders of qualifying holdings. The scope of this regulatory proposal is extensive, affecting crypto-asset service providers, issuers of asset-referenced tokens and other related entities across all EU member states. The regulation seeks to standardise requirements for these entities, ensuring that the same rules apply irrespective of the specific country of domicile.

As far as the subject matter experts are concerned, for institutional investors in Europe, this regulatory proposal encourages investors to engage more with crypto-assets, presenting them as safer and more stable investment options. The envisaged oversight and transparency requirements provide a greater safety margin, appealing to risk-averse institutional investors. However, the increased regulatory burden could discourage others due to the higher compliance costs and the decreased flexibility in their operational strategies.

*4.1.11 ESMA general principles: reporting of derivatives on crypto-assets: no impact.* This regulatory enhancement falls under the ESMA guidelines for reporting, whereby the principles are designed to streamline reporting requirements and enhance the transparency of the derivatives market across the European Union. The main purpose of these principles is to refine the process of derivatives reporting to increase data quality and reduce reporting costs across the chain – from counterparties to trade repositories and regulatory bodies. The motivation behind this enhancement is to ensure more efficient oversight of the derivatives market, which is crucial for maintaining financial stability. By simplifying and clarifying reporting obligations, the principles seek to mitigate the administrative burden on entities

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involved in derivatives trading and ensure that regulatory bodies can more effectively monitor market risk.

According to the expert panel, for institutional investors in Europe, the ESMA guidelines are seen as a positive development. The streamlined reporting requirements can reduce operational costs and complexity, making it easier for these investors to comply with regulatory standards. Furthermore, the subject matter experts point out that the ESMA guidelines provide a margin of safety that reassures investors about the stability of the derivatives market. This could potentially encourage more investment in derivatives by reducing perceived risks.

*4.1.12 European banking authority money laundering and terrorist financing money laundering/terrorist financing (ML/TF) risk factors guidelines: no impact.* This is an amended regulation with the enhanced mechanisms for assessing money laundering and terrorist financing risks within financial institutions across the EU. In this context, funds obtained through crowdfunding or in the form of cryptocurrencies are flagged to carry specific risks, in particular in relation to the risks arising from the borderless situation and anonymity that the crypto assets allow.

The subject matter experts negatively respond to this regulatory initiative by pointing to the lack of clarification as to why customers involved in cryptocurrencies would have different risk profiles to other customers receiving funds from similar sources. The expert panel argues against the concept of flagging specific market participants as risky if their funding methods involve cash donations, crypto assets or crowdfunding.

*4.1.13 European banking authority supervisory colleges under markets in crypto-assets regulation: no impact.* The EBA consultation paper is focused on developing draft regulatory technical standards for supervisory colleges under MiCA Regulation. These standards aim to establish the framework, structure, and protocols for supervisory colleges, facilitating efficient collaboration among competent authorities overseeing crypto-assets. The purpose of the consultation paper is to ensure consistent and coordinated oversight of the rapidly evolving crypto-asset market. The standards aim to promote effective supervision of issuers and service providers in the crypto-asset industry by fostering information exchange and collaboration among relevant authorities.

The subject matter experts agree with the criteria proposed in the consultation for assessing which are the most relevant credit institutions or investment firms involved in cryptocurrencies. For institutional investors in Europe, these standards could positively influence investment practices. The establishment of supervisory colleges ensures a unified regulatory approach, reducing compliance uncertainties. This encourages institutional investors to consider crypto-asset investments with increased confidence in a consistent regulatory environment.

*4.1.14 European banking authority consultation on implementation of sanctions: no impact.* The EBA has launched consultations on two sets of guidelines on internal policies, procedures and controls to ensure the implementation of Union and national restrictive measures. The consulted regulation on restrictive measures aims to establish a framework for crypto-asset service providers across the EU. The aim of this regulatory initiative is to create a common understanding of the steps needed for compliance with restrictive measures when performing transfers of funds and crypto-assets. The motivation behind the consultation is to consider advantages and disadvantages, as well as potential costs and benefits from the qualitative perspective of the proposed policy options.

This regulation receives mixed responses from the expert panel regarding its impact on institutional investors in Europe. While it encourages a safer investment environment by reducing market uncertainty, it also imposes stricter compliance requirements that could

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discourage some investors. A restrictive exposure assessment helps institutional investors to identify and assess areas where they are exposed to risks of non-compliance with restrictive measures and risks of circumvention of restrictive measures, based on their activities and customer base. However, it comes at significant cost of obtaining the right data for identification purposes.

*4.1.15 Financial stability board letter to G20 finance ministers: no impact.* In its letter to G20 Finance Ministers and Central Bank Governors dated on the 11 July 2023, the FSB provides recommendations to the stability of global financial systems. The letter touches upon several areas, including non-bank financial intermediation, operational resilience, climate-related risks and crypto-asset markets and activities. These recommendations emphasise global standards that are applicable across G20 countries and beyond, aiming for consistent international regulatory and supervisory approaches. The purpose of this letter is to prompt the development of a global regulatory framework to address the vulnerabilities in cryptocurrencies market and activities. In particular, the FSB recommends to implement a consistent global framework that ensures crypto-assets are subject to robust regulation commensurate with their risks. Lessons from the collapse of the FTX motivate the FSB's stance on cryptocurrencies in this letter.

As noted by the subject matter experts, for institutional investors in Europe, the refined focus on crypto-asset oversight could encourage investment by creating a safer, globally consistent framework and prevent a similar collapse of cryptocurrency exchanges in the future.

*4.1.16 Basel Central bank digital currency: no impact.* The Basel Committee's paper presents the results of a survey of 86 central banks conducted in late 2022 about their involvement in digital currency work, as well as their motivations and intentions of potentially issuing one. The survey also asked about central banks' assessment of the use of stablecoins and other crypto-assets in their jurisdictions. The paper shows that, although central banks have stepped up their work on central bank digital currencies in response to the cryptocurrencies, stablecoins and other crypto-assets are rarely used for payments outside the crypto ecosystem.

According to the expert panel, for institutional investors in Europe, the insights provided by the Basel Committee's paper are beneficial, because of the indication of the preparedness and attitudes of central banks worldwide towards digital currencies and crypto-assets. The subject matter experts point to the fact that the paper considers the influence of recent turmoil in the cryptocurrencies market on the development and deployment of central bank digital currencies.

*4.1.17 ESMA risks from unregulated products: no impact.* This statement by the ESMA concerns the risks associated with investment firms providing unregulated products and services alongside regulated investment offerings. It highlights that many investment products such as crypto-assets, real estate or raw materials fall outside financial regulations. Where investment firms engage in providing both regulated and unregulated products and services, there is a risk that investors may not be aware that the protections afforded by investment services regulation do not apply to the unregulated products.

For institutional investors, the ESMA's statement on risks from unregulated products is regarded by the expert panel as beneficial, because it serves to eliminate ambiguous market practices. In the case where an investor engages with an investment firm, the latter cannot use its reputation to provide potentially misguided reassurance in relation to the unregulated products and/or services offered by that investment firm. This initiative is particularly welcomed by the subject matter experts. Clearer distinctions between

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regulated and unregulated services may further encourage responsible investing and attract more participants to the cryptocurrencies market.

*4.1.18 European banking authority guidelines on preventing the abuse of funds and certain crypto-assets transfers: no impact.* EBA has published another consultation paper on the proposed guidelines on preventing the abuse of funds and certain crypto-assets transfers for money laundering and terrorist financing purposes. The main objective of these Guidelines is to ensure that relevant authorities can fully trace the crypto transfers where this is necessary to prevent, detect or investigate money laundering and terrorist financing. To achieve this, the EBA proposes the development of procedures to detect and manage the transfer of funds and crypto-assets lacking the required information on the payer/originator and the payee/beneficiary.

The expert panel criticises the proposed regulatory initiatives pointing to the fact that they remain in contrast to the existing rules on real-time monitoring of transactions. This misalignment with other regulations threatens to undermine the beneficial innovation in risk management services around the digital asset ecosystem. The subject matter experts express doubts regarding the required compliance levels within the proposed scope of the regulation.

*4.1.19 Financial stability board global regulatory framework for crypto-asset activities peer review: no impact.* This regulatory initiative is an umbrella public note accompanying the final framework on crypto-assets activities. The note outlines the oversight of crypto-asset activities and markets. It includes high-level recommendations for regulating, supervising and overseeing both crypto-assets and global stablecoins. The FSB framework is intended to promote international consistency and comprehensiveness in regulatory approaches to crypto-assets, addressing financial stability risks without stifling innovation. The focus is on ensuring that crypto-assets, especially those used widely as means of payment or stores of value, are subject to consistent and comprehensive regulation.

Because many crypto-asset activities are still operating without being subject to comprehensive regulation, or being undertaken in non-compliance with applicable jurisdictional regulations, the expert panel regards the FSB's high-level recommendations as beneficial for institutional investors in Europe. According to the subject matter experts, the proposed standards remain relevant and consistent. By addressing regulatory disparities and enforcing a globally coordinated regulatory approach, the framework may reduce the risk of market manipulation and fraud, encouraging more secure and stable investment in crypto-assets.

*4.1.20 Crypto-assets: green light to new rules for tracing transfers in the European Union: material impact.* The European Parliament (EP) has endorsed the first EU rules aimed at tracing crypto-asset transfers to prevent money laundering. This legislation mandates that information on the source and recipient of crypto-assets travel with each transaction, mirroring the travel rule used in traditional finance. The purpose of introducing the new rules on required information serve to enhance transparency, security, and regulatory compliance in the crypto-asset market. The legislation aims to combat financial crimes such as money laundering and market manipulation by ensuring that all crypto transfers can be traced and suspicious activities can be blocked. The EP also gives green light to imposing strict disclosure requirements related to the environmental impact of crypto services.

According to the expert panel, for institutional investors in Europe, the endorsement of the MiCA Regulation by the EP with enhanced rules on disclosure encourages a safer and more transparent environment for investing in cryptocurrencies. The traceability of crypto transactions is particularly welcomed by the subject matter experts, because it increases the confidence in the cryptocurrencies market, making the crypto-assets more attractive for

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conservative investors. The compliance costs are outweighed by the benefit of eliminating suspicious firms that seek minimal regulatory interference.

### *4.2 Assessment of regulatory impact*

The below table provides a summary of the qualitative impact of the current and forthcoming regulations encompassing the cryptocurrencies market. The table indicates the materiality assessment of the impact with the investor sentiment towards the reviewed regulations.

Reviewing Table 7, one should note that the majority of the regulatory initiatives are assessed as "positive" in their contribution to the attractiveness of investing in cryptocurrencies. Hereto, 75% of cases are positively assessed by the subject matter experts. However, only four out of 20 (20%) regulations are found to have material impact on institutional investors in Europe. The majority of the regulatory initiatives are assessed as immaterial. This is due to the fact that these regulatory initiatives are often in the form of consultations or recommendations for future regulation, and hence remain non-binding for institutional investors.

The qualitative findings highlight key drivers of the regulatory impact by pointing to the introduction of uniform standards across the EU; reduction of market uncertainty and clarifications of compliance needs for investment firms. Among additional positive factors, the subject matter experts also mention the enhanced investor protection and transparency with specific measures introduced to increase transparency and boost investor confidence. Overall, the assessed regulations are expected to encourage more cryptocurrencies market participation.

The most impactful regulations are: (1) MiCA Regulation (2023/1114); (2) EC New Crypto Tax Transparency Rules; (3) Regulation (EU) (2023b) 2023/1113 and (4) the endorsement by the EP of the rules aimed at tracing crypto-asset transfers. At this point, only (3) is assessed as 'negative' by the interviewees. Although, the subject matter experts highlight the additional compliance costs and challenges with the remaining impactful regulatory initiatives, the benefits of promoting market integrity and financial stability outweigh the additional compliance costs.

Summing up, the qualitative query reveals that the regulatory changes generally enhance the cryptocurrencies market's attractiveness by fostering a more secure and stable investment environment for institutional investors. While some regulations increase compliance and operational burdens, the positive impact on transparency, security and investor confidence prevails.

Although qualitatively assessed as "positive", the evolving regulatory landscape is further tested to check if the cryptocurrency regulations are truly positive in increasing the attractiveness of the cryptocurrencies market for institutional inverts in Europe. For this purpose, Table 8 shows the confusion matrix classifying the regulatory initiatives across their impact and investor sentiment.

A visual inspection of the confusion matrix reveals that "false positive" cases prevail among the regulatory changes regarding the cryptocurrencies market. Furthermore, the number of concordant and discordant pairs is the same. Applying the Yule's Q formula to the above matrix results in the $Q = 0$, meaning that there is no association between the "positive" assessment of regulations and their impact materiality. The empirical findings suggest that the "positive" qualitative assessment of the regulations results from chance and not from a systemic relationship between the regulatory impact and the investment sentiment. Indeed, the results confirm that the majority of regulatory initiatives, although assessed as boosters for the attractiveness of investing in cryptocurrencies, do not have necessary force to be the true drivers of investments.

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**Table 7.** Summary of qualitative findings

| Regulation | Impact | Nature of impact | Opinion |
|---|---|---|---|
| Markets in Crypto-Assets Regulation (MiCA) | Material | Positive | Promotes market integrity and investor protection |
| ESRB Crypto-assets and Decentralised Finance | No Impact | Positive | Increases awareness and prepares markets for regulatory changes |
| FSB Crypto-Asset Activity Regulation | Moderate | Positive | Enhances global regulatory coordination and financial stability |
| Basel Paper on the Crypto Multiplier | No Impact | Negative | Raises concerns over market volatility and systemic risks |
| Basel Crypto Assets Policy Measures | No Impact | Positive | Helps navigating the regulatory landscape effectively |
| ESMA Distributed Ledger Technology Crypto-Asset Services | Moderate | Positive | Provides clarity and standardisation across EU markets |
| EC New Crypto Tax Transparency Rules | Material | Positive | Increases transparency and adds compliance leyers |
| Regulation (EU) (2023b) 2023/1113 | Material | Negative | Transfers compliance costs to institutional investors |
| FSB Asia Group Discuss Vulnerabilities (5/17/2023) | No Impact | Positive | Encourages proactive management of crypto-related risks |
| EBA/CP/2023/20 | No Impact | Positive | Presents stable investment options |
| ESMA General Principles: Reporting of derivatives on crypto-assets | No Impact | Positive | Enhances transparency in derivatives markets |
| EBA Money Laundering and Terrorist Financing (ML/TF) Risk Factors Guidelines | No Impact | Negative | Flags cryptocurrency investors as risky |
| EBA Supervisory Colleges under MiCA Regulation | No Impact | Positive | Ensures consistent supervisory practices across the EU |
| EBA Consultation on Implementation of Sanctions | No Impact | Negative | Adds compliance costs |
| FSB Letter to G20 Finance Ministers | No Impact | Positive | Prevents collapse of cryptocurrency exchanges |
| Basel Central Bank Digital Currency | No Impact | Positive | Shows central banks' progress in adopting digital currencies |
| ESMA Risks from Unregulated Products | Moderate | Positive | Eliminates ambiguous market practices and reduces risks from unregulated products |
| EBA Guidelines on preventing the abuse of funds and certain crypto-assets transfers | Moderate | Negative | Remains in contrast to the existing regulations |
| FSB Global Regulatory Framework for Crypto-Asset Activities | No Impact | Positive | Reduces risk of market manipulation and fraud |
| Crypto-assets: green light to new rules for tracing transfers in the EU | Material | Positive | Makes crypto-assets more attractive for risk-averse investors |

**Source(s):** Author's own work

According to Prorokowski (2016), the application of the Yule's Q remains an adequate choice for a statistical validation of the qualitative results. However, it should be noted that the discrimination between the positive and negative impact, as well as the differentiation of the regulatory impact is based on the limited number of expert opinions. With more input

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**Table 8.** Classification matrix for crypto-regulations

| Qualitative assessment | Materiality of regulatory change: Material | Materiality of regulatory change: No. impact |
|---|---|---|
| *Qualitative Assessment of Investor Sentiment* | | |
| Positive | 3 | 9 |
| Negative | 1 | 3 |

**Source(s):** Author's own work

data points (both in terms of expert assessments and the number of regulatory initiatives), the confusion matrix can be expanded to a 3x3 matrix including a neutral sentiment category and a moderate impact classification. Then, for improved statistical precision, the non-parametric Goodman and Kruskal's gamma coefficient can be introduced. In fact, the Yule's Q has the same formula as the gamma coefficient for a 2x2 matrix. The difference is that the gamma coefficient is equipped with a z-statistic for significance testing, and hence uses less conservative thresholds for its interpretation. Therefore, with the Yule's Q being a simplistic gamma without the test of significance applied to a small number of qualitatively driven data points, the statistical validation results should be treated with caution.

Before focusing on the implications of the prevailing "false positive" cases, the paper focuses on the possible root cause for this outcome. According to the study of Prorokowski (2025) on model risk of advanced and machine learning constructs, the quantitative results would indicate issues with the used solution. Therefore, the prevailing number of "false positive" cases can be attributed to the used AI-powered platform that indiscriminately flagged both biding and non-binding regulatory initiatives as relevant for the risk management of the cryptocurrencies. At this point, the AI output included reports and discussion papers from various institutions such as the European Systemic Risk Board or the Financial Stability Board. These papers are not legally binding for EU institutional investors and only present the regulatory outlook on recent events in the cryptocurrency market. As a consequence, relevant stakeholders to the AI tool become overburdened with quasi-regulatory publications that need to be further processed. It consumes time and resources without bringing additional value. This concept exist in the academic literature as the paralysis by analysis, whereby stakeholders are increasingly confused from the volume of information that needs to be processed (Lenz and Lyles, 1985). In reality, every case flagged by AI is assessed by risk managers allocated to the cryptocurrency domain. These subject matter experts are required to conclude on the relevancy of the cases for the institutional investors. In doing so, they issue a memo detailing the relevancy, impact and a brief summary of each case. This memo is then distributed as a circular to institutional investors. The prevailing number of "false positive" cases means that the cases are assessed as not relevant for institutional investors. In the fast-paced investment world, the time allocated to reviewing discussion papers could be better spent on a more detailed review of the most relevant and material regulations that constitute the compliance framework for institutional investors.

The empirical results indicating the prevalence of "false positive" regulatory initiatives contribute to the academic discussion by Feinstein and Werbach (2021) on whether the recent regulatory developments provide incentives or barriers to investing in the cryptocurrency markets. To this end, the results confirmed by the Yule's Q show that there is no true impact in either direction. Contrary to the arguments delivered by Ayodeji *et al.* (2023), the assessed

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regulatory initiatives are unlikely to cause arbitrage of trading activities to less regulated markets. However, considering the paralysis by analysis concept, there is limited improvement in the transparency of the cryptocurrency markets.

*4.3 Assessment of the artificial intelligence-powered compliance tool*

This section provides feedback on the use of the AI-powered tool that has been used for the purpose of obtaining a list of regulatory developments. It should be noted that the researchers were required to apply for a permission to access this tool at the host institution. Given the security measures, the external access using private laptops was not possible and the use of the tool required physical presence at the host institution with access to the internal network.

Firstly, the tool did not deliver consistent output for the same query. On three separate occasions and following the same steps, the output was materially different. The paper uses the output from 2024, because the most recent query failed to deliver any results and the interim query made in August 2025 resulted only in the following regulations:

- Guidelines on complaints-handling for the securities (ESMA) and banking (EBA) sectors.
- Guidelines on remuneration policies and practices related to the sale and provision of retail banking products and services.
- Guidelines on the information to be provided for the authorisation of payment institutions and e-money institutions and for the registration of account information service providers under Article 5(5) of Directive (EU) 2015/2366.
- Directive 2009/110/EC.

The above list was followed by a small number of local regulations for Sweden in the native language issued by the Swedish supervisory authority Finansinspektionen.

Secondly, as seen in the above bullet points, the taxonomy used by the AI-tool to label the regulations remains inconsistent and altered for the majority of cases. The paper uses the labels as delivered by the AI tool. However, at this point, one can see that the taxonomy should be presented in a unified and consistent manner. The below Table 9 highlights the differences in the regulatory taxonomy between the AI tool and the original titles found on the regulatory publications.

Thirdly, the AI tool failed to highlight other significant regulatory developments that impact cryptocurrencies. It focused only on the regulations that have a direct link to the E-Money Directive ignoring the Basel Committee's cryptoasset standard amendments published in July 2024 and the prudential treatment of cryptoasset exposures published in December 2022, where the Basel Committee discusses the calculation of the adjusted notional for cryptocurrencies. Moreover, the tool did not deliver any regulatory developments on the taxation of cryptocurrencies that are especially important for institutional investors involved in lending and hedging transactions with cryptocurrencies. Finally, the output of the AI-powered tool consists mostly of soft regulatory publications that are non-binding for institutional investors and not enforceable in Europe.

Finally, both binding and non-binding regulatory initiatives are brought under the compliance umbrella. One would normally expect more compliance effort towards the regulations that have direct and material impact on institutional investors. The inclusion of soft regulatory developments in the form of non-binding statements and reports might create unnecessary compliance costs. The AI tool does not differentiate between the hard and soft regulations. This task is left for the end users assessing the output for relevancy.

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**Table 9.** AI Tool misleading taxonomy

| AI tool taxonomy | Original title (e.g. EUR-Lex) |
|---|---|
| Markets in Crypto-Assets Regulation (MiCA) | Regulation (EU) (2023a) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937 |
| ESRB Crypto-assets and Decentralised Finance | Crypto-assets and decentralised finance: Systemic implications and policy options, May 2023, ESRB Task Force on Crypto-Assets and Decentralised Finance |
| FSB Crypto-Asset Activity Regulation | FSB Global Regulatory Framework for Crypto-Asset Activities |
| Basel Paper on the Crypto Multiplier | BIS Working Papers No 1104: The Crypto Multiplier |
| Basel Crypto Assets Policy Measures: Crypto, tokens and DeFi: navigating the regulatory landscape | FSI Insights on policy implementation No 49: Crypto, tokens and DeFi: navigating the regulatory landscape |
| ESMA Distributed Ledger Technology Crypto-Asset Services | Letter to EU institutions on DLT Pilot Regime Implementation (03/04/2024) |
| EC New Crypto Tax Transparency Rules | Tax transparency rules for cryptoasset transactions (DAC8) |
| Regulation (EU) (2023b) 2023/1113 | Regulation (EU) (2023b) 2023/1113 of the European Parliament and of the Council of 31 May 2023 on information accompanying transfers of funds and certain crypto-assets and amending Directive (EU) 2015/849 |
| EBA/CP/2023/20 | Consultation Paper on Joint EBA and ESMA Guidelines on suitability assessments of the management body and holders of qualifying holdings under MiCAR |
| ESMA General Principles: Reporting of derivatives on crypto-assets | ESMA Final Report: Guidelines on the conditions and criteria for the qualification of cryptoassets as financial instruments |
| EBA Money Laundering and Terrorist Financing (ML/TF) Risk Factors Guidelines | Guidelines amending Guidelines EBA/2021/02 on customer due diligence and the factors credit and financial institutions should consider when assessing the money laundering and terrorist financing risk associated with individual business relationships and occasional transactions ("The ML/TF Risk Factors Guidelines") under Articles 17 and 18(4) of Directive (EU) 2015/849 |
| EBA Supervisory Colleges under MiCA Regulation | Draft Regulatory Technical Standards on supervisory colleges under Article 119(8) of Regulation (EU) No 2023/1114 (MiCAR) |
| EBA Consultation on Implementation of Sanctions | Consultation Paper: Two sets of Guidelines on internal policies, procedures and controls to ensure the implementation of Union and national restrictive measures |
| Basel Central Bank Digital Currency | BIS Papers No 136: Making headway – Results of the 2022 BIS survey on central bank digital currencies and crypto |
| ESMA Risks from Unregulated Products | Statement: Avoiding Misperceptions: Guidance for Crypto-Asset Service Providers Offering Unregulated Services |
| EBA Guidelines on preventing the abuse of funds and certain crypto-assets transfers | EBA Consultation Paper: Guidelines on preventing the abuse of funds and certain crypto-assets transfers for money laundering and terrorist financing purposes under Regulation (EU) (2023b) 2023/1113 |

**Source(s):** Author's own work

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The above findings contribute to the academic discussion on RegTech advancements in compliance and risk management, whereby the studies of El Khoury *et al.* (2025), Firiza *et al.* (2024) and Freij (2020) highlight the benefits of enhancing efficiency and fostering innovation within the financial sector by using complicated applications. However, the paper provides empirical evidence of AI tool instability in a real operational workflow and reinforces the conclusions made by McCarthy (2023) and Beerman *et al.* (2021) that the human supervision and strong governance framework is pivotal to ensure that any AI solution remains fit for purpose.

The above findings also highlight the weaknesses in the governance arrangements for AI tools and the consequences of such deficiencies. Against this backdrop, Barraza de la Paz *et al.* (2023) reviewed the emerging risk management frameworks, mandatory laws and standards including the Regulation EU (2024) 2024/1689 to deliver insights into AI risk management and advising on risk controls. Batool *et al.* (2025) delivered further analysis of the existing AI governance solutions that could assist practitioners in developing comprehensive AI risk management frameworks and organization-level governance. Although the aspects of AI governance at financial institutions are already discussed by Adari (2021), there is still a growing need for a study that would provide further guidance for financial services firms on implementing robust AI risk management with recommendations for the AI tool testing framework, AI model lifecycle management and AI model risk measurement. The case study presented in this paper strongly advocates for more guidance in terms of instructions for AI risk management at financial institutions.

## 5. Conclusions

This paper has analysed the most recent set of regulatory initiatives relevant for the European institutional investors who target cryptocurrencies. Relying on the industry-used traffic light system, the paper measures the impact and relevance of each regulation classifying them as having no impact (green), medium impact (amber) and material impact (red). Only the red flags require specific actions from institutional investors and necessitate specific steps to be taken towards compliance. The green flags remain for information purposes only with no measurable impact on the attractiveness of cryptocurrencies market. The amber flags have been assigned for the regulatory initiatives that require monitoring (e.g. consultation papers).

The primary research question is about the impact of relevant regulatory developments on the attractiveness of cryptocurrencies for institutional investors in Europe. The qualitative findings indicate that the recent regulatory initiatives generally enhance the attractiveness of cryptocurrencies for institutional investors. The key developments such as the MiCA Regulation and the New Crypto Tax Transparency Rules are regarded by subject matter experts to significantly improve market integrity, investor protection, and transparency. According to the interviewees, these regulatory measures reduce uncertainties and financial risks, thereby making cryptocurrencies a more viable and appealing investment option for institutional investors in Europe. However, generalisation of these findings should be done with caution due to a small number of the interviewed experts. Therefore, the paper introduced empirical assessment of the regulatory impact using statistical tools that are adequate for the small number of observations.

Bounding the above claims to the available data shows that the number of interviewees is sufficient to draw statistically significant conclusions on the impact of regulations on the attractiveness of cryptocurrencies for institutional investors in Europe. A closer look into the rank-ordering matrix presented in the paper reveals that the regulatory noise remains a significant hindrance to the institutional investors and compliance analysts. There is an evident prevalence of regulations that have no impact, but had to be reviewed and processed

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by relevant practitioners. However, one should be aware that these conclusions are bounded by the empirical limits of the study caused by the failure of the AI tool that introduced this noise.

However, a deeper analysis of the materiality of the regulatory impact reveals that the majority of the assessed regulations have no impact on the cryptocurrencies market. This is due to the fact that these initiatives merely serve as public recommendations for future regulations, non-binding guidelines and statements, or draft regulatory concepts in a consultation phase. Therefore, the paper concludes that there is no relationship between the initial positive assessment of the regulations and their true impact on the attractiveness of cryptocurrencies market for institutional investors. These findings confirm the industry opinion that soft-regulations do not stimulate institutional investments and generate operational burdens. Hereto, the paper does not propose a new conceptual framework for regulating institutional investors, but only gives recent evidence of the impact of the impact of the regulatory noise on practitioners.

The paper does not undermine the importance of the assessed regulations. However, each new development (even the non-binding regulation) is usually assessed by dedicated compliance teams for the potential actions. This process generates operational costs and consumes resources. For institutional investors, it would be better to deal with a more consolidated regulatory view on the cryptocurrencies than a number of non-material statements that remain for information purposes only. Therefore, policymakers and regulators are advised to strengthen the collaboration in issuing more consolidated and unified statements concerning the cryptocurrencies market.

Although the primary research question is related to the attractiveness of investing in cryptocurrencies under the most recent regulatory development, the true value of the paper is the empirical test of the AI compliance tool. The paper constitutes a rare case study of using AI-driven compliance showing that the conclusions regarding the impact of the crypto-regulations might be affected by the output of the used AI tool and its deficiencies in delivering consistent and relevant notifications on regulatory developments in this space. Therefore, the study recommends that financial services firms develop robust governance frameworks around the adopted AI solutions taking into account the materiality and complexity of the performed tasks, as well as risks arising from the use of AI. There should also be risk assurance regarding the continuity of the activities in case of system failures. With this in mind, institutional investors should always consider a compliance function as a critical process that requires additional governance around both in-house and outsourced AI applications.

The used AI tool for the purpose of this study proved inefficient in a consistent identification, monitoring and managing of compliance needs. As a result, the AI tool failed to enable institutional investors to make well-informed decisions on risk taking in cryptocurrency investments. Therefore, the study concludes that institutional investors assign a clear responsibility for the management and oversight of any AI solution in the critical functions such as compliance. Sufficient resources should be allocated to ensure compliance with all legal and regulatory requirements beyond the unvalidated reliance on the AI output. Ideally, a senior compliance officer should be delegated to perform the control function of the AI tool with the ability to conduct periodic reviews and use-tests of the AI platform. In doing so, the senior compliance officers should be able to implement feedback related to the AI solutions from the end-users and other critical functions.

Despite the flagged deficiencies of the AI tool, the detailed analysis of each regulation offers valuable insights into compliance requirements and investment strategies. Practitioners can use this study to better understand which regulatory developments are

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considered material and how these may influence the attractiveness of investing in cryptocurrencies. The study paints the picture of the evolving regulatory landscape for crypto-assets, which remains important for institutional investors. Further studies should focus on the long-term effects of recent regulatory changes and include jurisdiction-specific regulations for a comparative analysis of heterogeneity/homogeneity in regulatory and supervisory approaches to the cryptocurrencies. In addition, the paper recommends further studies advising on AI-outsourcing arrangements within the critical functions such as compliance.

The paper addresses an important and timely topic by offering practical perspectives and an empirical validation of an AI compliance tool. However, the study is not free of limitations. Firstly, the attractiveness of investing in cryptocurrencies is measured qualitatively based on the investor sentiment rather than tangible data regarding compliance and operational costs, or the impact on regulatory capital. Moreover, the number of respondents remains small, albeit sufficient for the utilisation of the rank-ordering statistical tools. A future study is recommended in this space to quantify these compliance costs and provide more precise analytics. In doing so, the existing formalisation of the market sentiment presented in this paper can be enriched with insights into new compliance frameworks. Secondly, the paper does not adequately engage with the existing literature on institutional finance, payments infrastructure, or the practical validation of RegTech tools. However, to date, no study has proposed practical approaches to validate AI compliance tool. Finally, the paper generalises over financial institutions and institutional investors assuming uniformity and consistency in decision making and compliance arrangements. However, in practice, financial services firms vary from credit institutions and investment fund managers to FinTech companies and shadow banking entities. The absence of segmentation of the institutional investors can be regarded as oversimplification in the methodological assumptions. Therefore, the conclusions should be treated with caution and a future study is recommended to focus on a specific type of institutional investors.

Finally, as far as the uncovered deficiencies in the AI tool are concerned, the paper advocates for a study that would guide the financial industry in developing robust AI model governance frameworks with insights into the testing setups for the AI tools and necessary risk controls including the AI model risk quantification and mitigation. The proposed study would complement the existing literature on AI governance arrangements at financial institutions.

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