

Risk Analysis, Regulatory Response and Future Trends of Cryptocurrencies and their Derivatives

Rutian Wu*

School of Economics, Guangdong University of Finance and Economics, Guangdong 510320, China

Abstract. The total market capitalization of the cryptocurrency market has soared from \$100 billion in 2019 to \$3.83 trillion in 2024, and its derivatives trading volume has accounted for 74.8% of the total market volume in 2023. This study systematically analyzes the risks of high leverage, market manipulation, and lack of regulation in cryptocurrency derivatives, and discusses global regulatory response strategies. By combing the development context of derivatives such as futures, options and leveraged tokens, assessing risks based on case studies and empirical data, and comparing regulatory practices in Europe and the United States, the study finds that ultra-high leverage (up to 100 times) will exacerbate market volatility and liquidation risks, while decentralized platforms and regulatory ambiguity increase the difficulty of compliance. Cryptocurrencies are difficult to play a long-term hedge function in the crisis, and there are potential for money laundering and geopolitical abuse. The study recommends promoting regulatory coordination, adopting AI surveillance technology, and strengthening investor education to curb speculation and maintain market stability, and provide a reference for policymakers and financial institutions to find a balance between innovation and risk management.

1 Introduction

Since the birth of Bitcoin in 2009, cryptocurrencies have experienced tremendous development from being ignored to being globally contested. According to CoinGecko data, as of December 17, 2024, the total market value of global cryptocurrencies exceeded US\$3.91 trillion, of which Bitcoin and Ethereum dominated the market, accounting for 54.5% and 11.8% of the total market value respectively [1]. This market size has increased by nearly 40 times compared to the US\$100 billion level in 2019, which shows that the status of cryptocurrencies has ushered in a transformation and upgrade from marginal assets to mainstream financial instruments. The development of cryptocurrencies has not only innovated the way in which currencies may appear, but also brought new products to the futures market, namely cryptocurrency futures contracts, which have also ushered in rapid development since their launch [2]. Cryptocurrency is defined as a decentralized digital asset based on blockchain technology that is anonymous, programmable, and has a limited supply. It can be divided into three categories according to different applications: payment-type

* Corresponding author: 22250615107@student.gdufe.edu.cn

cryptocurrencies (such as Bitcoin) that serve as a medium of exchange, platform-type cryptocurrencies (such as ETH) that support smart contracts and decentralized applications, and application-type cryptocurrencies that serve certain specific scenarios. As the market value of cryptocurrencies has rapidly increased, the financial market has also seen the emergence of a trading market for cryptocurrency options and futures, namely the cryptocurrency derivatives discussed in this article [3]. Retail investors and institutions use cryptocurrency derivatives as a tool for risk hedging and speculation, and use the derivatives market to gain insight into the volatility of the spot market, so the trading volume of derivatives has far exceeded that of the spot market. According to CoinGecko's 2024 market analysis, the global cryptocurrency derivatives trading volume will reach US\$58.5 trillion [1], with perpetual contracts, futures, and options being the main forms. As more and more people participate in the cryptocurrency derivatives market, many problems in the market are reflected, such as the sensitivity caused by large price fluctuations, leveraged trading and the liquidation risks involved, and regulatory lags in emerging markets. Existing research shows that the cryptocurrency market is highly volatile, has low liquidity, and is highly speculative [3]. However, whether the risks and regulations of the cryptocurrency derivatives market are consistent with those of the cryptocurrency market still needs to be further explored. This paper aims to conduct risk analysis of the cryptocurrency derivatives market and promote regulation and response. Since the derivatives market created by the development of cryptocurrencies provides high leverage, there may be differences in price volatility, and there are a large number of forced liquidation positions under extreme market conditions, which may amplify the instability of the financial system. Therefore, the derivatives market is still different from the cryptocurrency market. Giudici further emphasized that the leverage mechanism of derivatives may transmit local risks in the derivatives market to the spot market or even to the traditional financial market through "cascade liquidation", forming risk resonance [4]. The pricing model of traditional financial derivatives (such as the Black-Scholes model) is usually based on the stability and predictability of the underlying asset price. However, the underlying assets of cryptocurrency derivatives not only lack physical support, but also have extremely high volatility. Therefore, the applicability of existing derivatives pricing theory in the cryptocurrency market is still controversial, which is the issue that this paper needs to study.

Therefore, this study focuses on the trading market of cryptocurrency derivatives. First, it sorts out the operating mechanisms and market characteristics of major derivatives such as futures and options, and reviews their development from the budding of spot trading to institutionalization and Decentralized Finance (DeFi). The study focuses on analyzing five major risks: the risk of liquidation caused by high leverage (such as the liquidation of more than US\$4 billion on March 12, 2020), market manipulation (such as plug-ins, false transactions, etc.), high volatility of underlying assets (Bitcoin's daily volatility often exceeds 10%), global regulatory fragmentation (differences in regulatory frameworks between China, the United States and Europe), and bubble risks caused by a large number of speculative behaviors (such as the 75% plunge in the locked position of DeFi derivatives). In terms of regulatory response, the United States has formed a division between the Commodity Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC) and promoted the implementation of futures ETFs. Europe has passed the Markets in Crypto Assets Regulation (MiCA) to strengthen compliance. At the same time, technical means such as blockchain and AI monitoring have been gradually applied to risk prevention and control. Future trends point to product innovation (DeFi derivatives, on-chain options), institutional compliance (entry of traditional financial institutions), regulatory improvement (popularization of licensing system) and technological deepening (Layer 2, oracle optimization). Emerging market demand and global layout will become important driving factors.

2 Current development status of cryptocurrency derivatives

2.1 Major cryptocurrency derivatives

Cryptocurrency derivatives are financial contracts based on the price fluctuations of their underlying assets such as Bitcoin (BTC) and Ethereum (ETH). Their value depends on the future performance of the underlying assets [5]. Its market has formed a product system with futures, options and leveraged tokens as the core. Futures contracts are the mainstream of the market and are divided into two categories: delivery contracts and perpetual contracts. Delivery contracts set a fixed expiration date and need to be settled in kind or cash [6], while perpetual contracts are anchored to the spot price through the funding rate mechanism to avoid expiration settlement problems [7]. However, Kaur's research found that in the long run, there is a one-way causal relationship from the Bitcoin futures market to the Bitcoin spot market, which means that the Bitcoin futures market is ahead of the spot market, and traders can observe the spot market from the futures market. As the cryptocurrency market matures, cryptocurrency derivatives have become a core tool for traders and institutions to participate in risk management and speculation, and their trading volume far exceeds that of the cryptocurrency spot market. The following are several major types of cryptocurrency derivatives:

2.1.1 Futures contracts

A futures contract is a standardized agreement that requires buyers and sellers to deliver the underlying asset at an agreed price on a specific date in the future. Due to the high leverage that can be opened, risks must be controlled through a margin system and a liquidation mechanism. Cryptocurrency futures can be divided into two categories: delivery contracts and perpetual contracts. The characteristic of a delivery contract is that it has a fixed expiration date, and cash settlement or physical delivery is made at the index price when it expires. The characteristic of a perpetual contract is that it has no expiration date, and it anchors the spot price through a funding rate mechanism to avoid premium deviations. According to research by Choi et al., BitMEX perpetual contracts can reduce 99.39% of the risk of spot volatility, and thus become the dominant tool for speculators to discover prices. However, perpetual contracts also have some problems. According to the analysis of the Bank for International Settlements, the high leverage of futures contracts (usually 10-100 times) amplifies the volatility of market prices, which not only increases the risks and profits of speculators, but also increases the risk of capital outflow from exchanges [8].

2.1.2 Option contracts

Options give buyers the right, but not the obligation, to buy (call options) or sell (put options) the underlying asset at an agreed price at a specific time. The buyer pays the premium and the seller assumes the obligation to perform. Cryptocurrency options are mainly used to hedge against extreme price fluctuations. The trading volume of Bitcoin options launched by platforms such as Deribit increased by 230% year-on-year in 2023, indicating a surge in market demand for cryptocurrency option contracts [9].

2.1.3 Leveraged tokens

Leveraged tokens are crypto assets with built-in leverage. By holding a basket of futures or spot positions, they provide investors with leverage multiple returns (such as 1.5 times, 3

times) of the underlying asset. Unlike leveraged trading, leveraged tokens do not require collateral and maintenance margin, but there is a risk of liquidation and premium loss. Leveraged tokens can be automatically adjusted through smart contracts, providing users with leverage tools that do not require position-by-position operations, but high leverage ratios (such as 10x) may also lead to drastic price fluctuations [8].

2.2 Development and evolution of the cryptocurrency derivatives market

The cryptocurrency derivatives market has entered a rapid development stage since BitMEX launched the Bitcoin perpetual contract in 2014. In the early days, the main type of contract was coin-based delivery contracts. Coin-based contracts use cryptocurrencies as margin and are extremely susceptible to price fluctuations. Users need to bear the dual risks of price fluctuations of the underlying assets and loss of margin currencies. As the market matures, U-based contracts (USDT settlement) have gradually become mainstream. U-based contracts are denominated in stablecoins, reducing settlement risks [4]. According to data from Huobi Exchange in 2022, the proportion of U-based contracts has reached 78%, and the market maturity has gradually increased. The contract types have also expanded from single futures to options, leveraged tokens, and related prediction products. The rise of the DeFi ecosystem has further enriched the form of cryptocurrency derivatives. The DeFi ecosystem has spawned innovations in synthetic assets and cross-chain protocols. For example, Synthetix issues synthetic assets Synthetix USD (sUSD) by pledging Synthetix Network Token (SNX) tokens to achieve anchoring with the US dollar [5]. DeFi products can also provide 2-5 times leverage, allowing users to participate in the market without holding spot. Cross-chain protocols (such as Polkadot) have begun to appear in the market, allowing derivatives on different chains to interconnect, which has promoted the exchange of liquidity in the cryptocurrency market [9]. In terms of trading volume, Binance Exchange's derivatives trading volume exceeded US\$1.2 trillion in Q2 2023, a year-on-year increase of 45%. This large increase is mainly driven by the large number of institutions and investors entering the market [9].

3 Risk analysis of cryptocurrency derivatives

3.1 High leverage risk

High leverage trading and forced liquidation mechanisms are the core characteristics of the cryptocurrency derivatives market. Exchanges usually provide 1-100 times leverage. BIS data shows that under leverage conditions of 10 times or more, the amplification effect of price fluctuations is particularly significant. For example, in the Bitcoin "black swan" event in May 2021, more than \$4 billion in contract positions were forced to close, triggering a waterfall-like decline. High-leverage trading triggers market stampedes through the cascading liquidation mechanism, further exacerbating market volatility [8]. In the case of high leverage (more than 50 times), slight price fluctuations may cause serious losses to the trading platform's vault, and traders may also be forced to close positions due to small price fluctuations, causing traders to blow up their positions. This exposes the systemic risks of high-leverage trading. Systemic risks are transmitted through margin calls and cascading liquidations, which may seriously cause market stampedes, that is, due to investors' panic selling of assets, market prices fall sharply, causing market chaos [10].

3.2 Market manipulation

The low liquidity and regulatory difficulties of the cryptocurrency and its derivatives market make it very easy and endless to manipulate the cryptocurrency and its derivatives market. Common methods include: using social media to attract retail investors to take over and sell for profit (such as Elon Musk's tweets affecting the price of Dogecoin); large holders concentrated buying and selling to influence prices; using robot monitoring to preemptive trading; placing large fake orders in the order book and then canceling them, creating the illusion of liquidity and causing price signal distortion [7]. There are also methods of making huge profits by manipulating low-liquidity tokens. In a low-liquidity market, \$1 million of funds can manipulate the price fluctuations of cryptocurrencies by more than 5% [11].

3.3 High volatility risk

The high volatility risk brought about by the sharp price fluctuations of cryptocurrencies and their derivatives may affect the stability of the financial system. Although high volatility means that they can be used as hedging tools, according to Bandhu S M's research, cryptocurrencies show a short-term positive reaction (price increase) to the impact of inflation, but the duration is less than 3 months, and the long-term effect is not obvious. The weak correlation between cryptocurrencies and traditional assets also makes them unable to be used as inflation hedging tools [2]. At the same time, they are less sensitive to exchange rate fluctuations and only show weak correlation in the early stages of a currency crisis, which cannot effectively hedge exchange rate risks [12]. During the Fed's interest rate hike in 2022, the correlation between Bitcoin and the S&P 500 index rose to 0.53, losing its safe-haven properties [2]. At the same time, due to the speculative trend brought about by high volatility, a large number of young people have participated in speculative behavior. This speculative behavior will be transformed into invisible gambling behavior in the high volatility environment of cryptocurrencies, causing the market to develop towards gambling. According to a Coinbase survey, 32% of users aged 18-24 regard cryptocurrencies as gambling tools [13].

3.4 Regulatory and compliance risks

The anonymity of DeFi facilitates cross-border money laundering. The Chainalysis report in 2023 showed that the amount of money laundering using cryptocurrencies reached US\$20 billion [14]. The Financial Action Task Force (FATF) framework requires Virtual Asset Service Providers (VASPs) to implement Know-your-customer rules (KYC), but DeFi protocols are also difficult to include in regulation [8]. At the same time, different policies of different countries will also lead to different specific uses of cryptocurrencies, and the market will also experience illegal fluctuations due to illegal uses of currencies. For example, the United States has a tendency to regard stablecoins as securities, while the European Union prefers to use stablecoins as payment tools (MiCA regulations). The regulatory framework of various countries for cryptocurrencies has not yet been perfected. The differences in policies and laws of various countries regarding cryptocurrencies and their derivatives have led to legal gray areas, which will lead to cross-border money laundering, illegal transactions and other issues. In addition, this has also led to the "sanction avoidance function" of cryptocurrencies in the United Nations; at the same time, the cross-chain characteristics of Defi protocols have increased the difficulty of supervision, and existing analysis tools also have lags [14].

3.5 Bubble risk

The bubble risk of the cryptocurrency derivatives market stems from its high volatility, speculative attributes and inflated prices driven by market sentiment. There have been many irrational booms in history where prices have deviated from fundamentals. The excessive value of cryptocurrencies and their derivatives today is also due to people's irrational investments in the past few years, and there may be a problem of value bubble bursting. On the one hand, leveraged trading amplifies price fluctuations and exacerbates bubble expansion [7]; on the other hand, the short-selling mechanism of derivatives may accelerate the bursting of the bubble. In addition, during the LUNA coin price crash in 2022, the liquidation mechanism of the derivatives market also exacerbated the selling of traders and institutions [15]. Regulatory response to cryptocurrency derivatives.

4 Regulatory response to cryptocurrency derivatives

4.1 Regulatory response of the United States to the cryptocurrency derivatives market

The United States' regulation of cryptocurrency derivatives presents a "multi-agency coordination + law enforcement priority" approach, with the CFTC responsible for regulating futures contracts and the SEC responsible for regulating securities derivatives. Since 2023, regulators have clarified compliance boundaries through law enforcement actions while exploring the improvement of the legislative framework. In 2023, the CFTC fined Binance \$4.3 billion and strengthened the compliance requirements for cryptocurrency derivatives trading platforms [16]. In 2025, the U.S. Office of the Comptroller of the Currency (OCC) abolished the pre-approval requirement for banks to participate in cryptocurrency business, allowing national banks to provide cryptocurrency custody and stablecoin services, aiming to reduce the compliance burden and improve regulatory consistency. However, the jurisdictional dispute between the CFTC and the SEC continues to exist. The CFTC advocates that mainstream cryptocurrencies such as Bitcoin and Ethereum be regarded as "commodities" and their derivatives markets be regulated, while the SEC believes that most tokens are securities and should be included in its regulatory scope [16].

4.2 Europe's regulatory response to the cryptocurrency derivatives market

4.2.1 Core requirements of the MiCA regulation

MiCA will take effect in December 2024, requiring crypto asset issuers and trading platforms to register in EU member states and implement strict investor protection measures. For example, stablecoin issuers must hold 100% reserves, cross-border transactions must disclose sender and receiver information, and investor protection funds must cover losses [11]. The Dutch AFM approved One Trading to become the first compliant crypto derivatives exchange in the EU, marking a breakthrough in Europe's construction of institutional trading venues.

4.2.2 Challenges of regulatory consistency

Although MiCA provides a unified framework, the 27 European Union (EU) countries have different interpretations of the regulations. In addition, countries have different policies on cryptocurrencies. For example, Germany and France actively attract crypto companies, while Estonia and other countries use flexible policies to seize the market. The regulatory affiliation

of Non-Fungible Token (NFT) and DeFi is also controversial. For example, Germany regards DeFi protocols as financial instruments, while France includes them in the regulatory scope of payment services [9,13].

4.3 Technical means and global trends

The FATF (Financial Action Task Force on Money Laundering) has included crypto assets in the existing Anti-Money Laundering (AML) and Counter-Terrorist Financing (CFT) framework, which is a key step towards the legalization of the trading ecosystem of cryptocurrencies and their derivatives, and has been widely adopted worldwide. FATF has taken the lead in the international efforts to solve the problem of crypto asset crimes, with a special focus on AML and counter-terrorism financing. This "flexible execution under unified standards" model may become the norm. In terms of technical means, blockchain analysis tools (such as Chainalysis Reactor) and AI monitoring systems will be more widely used to identify suspicious transactions and track capital flows [11].

5 Future trends of cryptocurrency derivatives

5.1 Monetization development

Existing results show that not only Bitcoin, but other leading cryptocurrencies can be used as effective diversification and hedging tools [12]. Although cryptocurrencies and their derivatives can be used as diversification tools, they need to control positions and risks and observe market sentiment [17]. As can be seen in Bandhu's analysis, BTC can be used as a diversification tool in a normal market, but in an extreme bear market, the correlation coefficient with SP500 rises to 0.68, indicating that risk assets have lost their safe-haven properties. At the same time, due to its complete reliance on code rules and market consensus and its high volatility, cryptocurrencies are not like gold, which has natural scarcity and physical support and is accepted by central banks as foreign exchange reserves. Therefore, they cannot replace gold as a long-term safe-haven asset. In the future, cryptocurrencies and their derivatives will not only develop into national legal currencies, such as the Federal Reserve has launched a digital dollar pilot [2], but may also become digital gold, which can be used to hedge risks in other markets. At the same time, regulatory efforts will become stricter, and relevant AI will appear to capture transactions on the blockchain to prevent illegal transactions such as money laundering from occurring in the cryptocurrency market as much as possible.

5.2 Product innovation

In the future, DeFi derivatives and on-chain financial derivatives will dominate the cryptocurrency derivatives market due to the characteristics of automatic execution of smart contracts to reduce custody risks and fund misappropriation risks. DeFi also has the characteristics of globalization, low transaction costs and high transaction efficiency [18]. At the same time, other structured products may appear in the market, such as customized products such as BTC volatility index futures and AI tokens.

5.3 Global coordinated supervision

With the development of DeFi derivatives, this globally available technology will drive countries to move towards a unified regulatory direction. Transnational crimes committed in

the cryptocurrency derivatives market can be tracked and punished by all countries. At the same time, countries will also launch for cryptocurrencies. The systems of various countries will also be gradually improved and gradually integrated with the FATF's AML/CFT standards.

6 Conclusion

This study focuses on the risk characteristics and regulatory responses of the cryptocurrency derivatives market, aiming to discuss the risk differences and regulatory gaps between the derivatives market and the spot market. The research motivation stems from the high leverage of cryptocurrency derivatives, the high volatility of the underlying assets and the fragmentation of global supervision. The risk transmission mechanism implied by its characteristics may amplify the instability of the global financial system, and the applicability of traditional derivatives theory is limited. This study systematically combed the development history and product types of cryptocurrency derivatives, described the five core risks of high leverage risk, market manipulation, high volatility, regulatory compliance and bubble risk, and combined with the US CFTC and SEC division pattern, Europe's MiCA Act and other regulatory practices, explored the application of technical monitoring methods. At the same time, it pointed out the future trend towards monetization, the innovation of DeFi products and the trend of global collaborative supervision.

After experiencing rapid growth in market value, the high leverage and low liquidity characteristics of the cryptocurrency derivatives market have significantly exacerbated market risks. Although the United States and Europe have promoted compliance through the separate regulatory framework and MiCA regulations, global regulatory fragmentation and DeFi anonymity still provide a breeding ground for criminal activities such as money laundering. Although the application of technical means (such as blockchain analysis tools) has improved risk monitoring capabilities, current monitoring tools still lag behind. In the future, the cryptocurrency derivatives market will present three major trends: first, technology-driven product innovation, such as DeFi derivatives that reduce transaction costs through smart contracts, and structured products such as on-chain volatility indices will appear in the market; second, the global coordination of regulatory frameworks, FATF's AML/CFT standards will be integrated with the systems of various countries; third, with the maturity of monetization and risk aversion, cryptocurrencies may gradually evolve into "digital gold", but their speculation needs to be balanced through position control and risk hedging mechanisms. Based on a systematic review of the risk characteristics, regulatory practices and future trends of the cryptocurrency derivatives market, this study further proposes the differences between its risk transmission mechanism (such as "cascade liquidation") and traditional theory in view of the high leverage, non-physical subject matter and decentralized characteristics of cryptocurrency derivatives, providing a new framework for pricing and risk management of digital native asset derivatives, and revealing the risk resonance effect between the cryptocurrency derivatives market and the spot market and traditional financial market, filling the gap in the study of cross-market systemic risks in the digital economy era, and providing a multi-dimensional perspective for the academic community to deepen digital financial research and improve the policy framework at the regulatory level and optimize risk management for market entities. In terms of application value, it provides a basis for investors to avoid leverage risks, exchanges to strengthen risk control, and regulators to fill the gaps in cross-border supervision. At the same time, it promotes the transformation of cryptocurrency derivatives from "speculative tools" to "compliant financial products", and helps their sustainable development in the digital economy era.

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