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The Structural Impact of Bitcoin Spot ETFs on Liquidity and Risk Spillovers in the Cryptocurrency Market

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Abstract:

The listing of Bitcoin spot exchange-traded funds (ETFs) is regarded as a milestone in the "institutionalization" process of the cryptocurrency market.There has yet to be a systematic review in academia as to whether this is a structural inflection point for liquidity and risk spilloversThe microstructure of the Bitcoin Market following the launch of Bitcoin spot ETFs (Jan 2024). Cryptocurrency market underwent significant changes. First, the Authorized Participant (AP) subscription and redemption mechanism introduced by the ETFs effectively compresses price spreads across exchanges and enhances weekend market liquidity depth.These customer quotes show the market price of Ethereum Futures. This also has the effect of concentrating liquidity on leading platforms, making it more difficult for small to mid-sized exchanges to survive. Second, by incorporating Bitcoin (BTC) into the traditional margin account system via ETFs, risk contagion has transformed from an "extreme tail event" into a "routine, strong feedback pattern," gradually diminishing Bitcoin's hedging properties. Lastly, the integration of futures-spot arbitrage activities with margin accounts shortens the duration of volatility spillovers. This paper constructs a review framework of "institutional shock—futures-spot interaction—market structure evolution," providing replicable and updatable literature references and empirical support for subsequent regulatory monitoring and cross-asset portfolio optimization for investors.

Keywords: Bitcoin spot ETFs; spot-futures linkage; liquidity layering; risk spillover; structural mutation.

1. Introduction

As a milestone in the 'institutionalization' process of the cryptocurrency market, the U. S. Securities and Exchange Commission (SEC) approved the listing of 11 Bitcoin spot exchange-traded funds (ETFs)

at once on January 11, 2024. By October 2025, the total Bitcoin holdings of these ETFs had reached 1. 358 million coins (accounting for 6% of the total circulation), with assets under management exceeding $169. 48 billion, representing 6. 79% of Bitcoin's total market value [1,2]. On the trading side, the leading product, BlackRock's iShares Bitcoin Trust (IBIT), has an average daily trading volume accounting for more than 50% of similar products, and its options products have an average daily notional trading value of up to $1. 7 billion. Overall, ETFs have become the main source of global Bitcoin spot trading flow. In terms of investor structure, the global number of Bitcoin holders has reached 106 million, with 28% of adults in the United States (about 65 million people) holding crypto assets; institutions account for 25. 4% of assets under management in spot Bitcoin ETFs, driving the institutional holding ratio of Bitcoin up to 33% [3,4]. As the first financial instrument to incorporate physical Bitcoin into global brokerage and retirement accounts with T+0 trading mechanisms and low investment thresholds, spot ETFs have completely reshaped the market demand curve and investor structure. This has also led the market to start questioning: Will the fragmentation of native liquidity, cross-exchange spreads, and weekend depth be systematically improved? Has the risk interaction between cryptocurrencies, U. S. stocks, and gold shifted from weak tail correlation to strong daily contagion? And how will these changes affect asset allocation and regulatory risk control? Current research can be summarized into three main directions: first, focusing on the internal liquidity anomalies in the crypto market, such as deep contractions over weekends, cross-exchange price spreads, and time zone dependencies [5,6]; second, examining risk spillovers among crypto assets, including turn of Bitcoin (BTC)'s volatility contagion to other tokens and jump amplification effects [7,8]; third, exploring the tail correlations and hedging properties between BTC and traditional assets like U. S. stocks and gold under extreme market conditions [9,10]. Existing studies mostly focus on a single dimension, either crypto market liquidity anomalies or risk spillovers, and have not yet combined spot-futures linkages. There is a lack of systematic testing on whether the introduction of Bitcoin spot ETFs triggers structural changes. Moreover, samples rarely cover the full cycle post-ETFs listing up to 2025, failing to fully reveal the investor structure shifts and the dynamic relationship between liquidity and risk contagion driven by ETFs, making it difficult to explain the new patterns as crypto assets become deeply integrated into traditional finance.

This review follows three main lines—'internal liquidity—cross-coin spillover—traditional linkage'—to outline the sample periods and core indicators, focusing on research on ETFs by Vassilios Babalos, Elie Bouri, and Rangan Gupta [5], and compares them with pre-ETFs literature such as Zhang et al. [6]. At the same time, it integrates the spot-futures arbitrage framework to construct an analytical logic of 'institutional shock—spot-futures interaction—structural change. ' The study finds that spot ETFs have become critical points for liquidity and risk: the influx of institutional funds has narrowed inter-exchange price spreads and improved weekend market depth, but centralized custody has marginalized small and medium exchanges. The relationship between BTC and U. S. stocks and gold has shifted from extremely weak correlation to regularly high correlation, the risk transmission pattern has changed from one-way spillover to multiple feedback loops, its hedging properties have gradually faded, and these effects display an asymmetric distribution depending on scenario and scale.

The marginal contributions of this paper are mainly reflected in the following three dimensions: First, perspective innovation – it is the first to provide a systematic review of the impact of ETFs on the crypto market from the perspective of spot-futures linkage, breaking through the limitations of existing studies that analyze from a single dimension and clarifying the intrinsic relationship between improved liquidity and heightened risk spillovers; second, timely supplementation – it integrates the latest research and market data from 2024 to 2025, filling the gap in pre-ETFs literature regarding the explanation of new market features after institutional shocks; third, deepening practical value – it not only provides investors with a basis for cross-asset portfolio optimization, but also offers regulators targeted literature and logical support for designing cross-market risk isolation mechanisms and monitoring liquidity stratification risks.

2. Market Evolution and Mechanisms of Change

Since the approval and listing of the Bitcoin spot ETFs in early 2024, the microstructure of the cryptocurrency market has undergone significant changes. Focusing on the institutional impact brought by the ETFs, this paper systematically reviews and critically evaluates the existing literature from three dimensions: liquidity distribution, risk spillover mechanisms, and crypto-traditional asset linkages, and clearly identifies gaps in current research concerning the analysis chain of 'institutional change—market structure—risk evolution. '

2.1 Cryptocurrency Market Liquidity Research: From 'Anomalies' to 'Institutional Embedding'

Early studies generally defined the liquidity of crypto-

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currency markets as a static attribute, focusing on its differences from traditional financial markets. Zhang, Zhang & Gao were the first to systematically document the 'weekend liquidity cliff' phenomenon in crypto markets—finding that the depth of the Bitcoin market order book on weekends was on average 32% thinner than on Fridays—and pointed out that this phenomenon stems from a retail-dominated trading structure, reflecting core issues such as a homogeneous market participant structure and weak market-making mechanisms [6]. However, their study used order book snapshot data from 2021–2022, neither distinguishing the institutional characteristics of exchanges (such as whether they had fiat on-ramps or were registered as MSBs) nor accounting for the impact of cross-market arbitrage mechanisms; essentially, their research design treated liquidity as a static attribute rather than as the outcome of a dynamic equilibrium in an institutional context.

According to Vassilios Babalos, Elie Bouri, and Rangan Gupta, there is a persistence which is positive in the Cross-Exchange spreads. This study finds that liquidity concentration is not only time-varying but also time-zone dependent. Although, following the ETFs listing, cross-exchange spreads show significant convergence. However, their definition of spread is limited to the Best Bid and Offer (BBO) level, thereby excluding measures like Depth-Weighted Spread (DWSP) or Order Book Resilience. This omission overlooks nonlinear effects and the impact of large institutional orders on liquidity. At the same time, the current research has not covered the full cycle of ETFs yet. The extreme market conditions in Q4 2025 were influenced by aggravating China-US trade tensions and market volatility. The liquidity performance and market resilience in such extreme scenarios urgently need to be incorporated into future research frameworks for analysis.

However, existing research largely treats liquidity as a 'residual' of market microstructure, generally overlooking a key variable—institutional embedding. The introduction of ETFs has not only given rise to new types of traders, such as mutual funds and pension accounts, but also, through the authorized participants (APs) introduced by spot ETFs, reshaped the logic of liquidity formation as institutional arbitrageurs. The daily creation and redemption mechanism of APs maps the liquidity of the U. S. stock trading session directly to the cryptocurrency spot market, thereby breaking the traditional assumption that 'cryptocurrencies are isolated islands' and altering the dynamic equilibrium of liquidity from the perspective of market microstructure. This cross-asset liquidity transmission mechanism has not yet been sufficiently studied.

2.2 Research on Risk Spillover Mechanisms: From 'Chain Transmission' to 'Balance Sheet Linkage'

In the early stages of the cryptocurrency market, risk propagation followed a chain path of 'whale addresses → exchanges → retail investors': the trading activities of whales holding large amounts of Bitcoin could significantly impact exchange liquidity; retail investors, driven by price fluctuations and panic sentiment, would follow suit, causing risk to spread layer by layer along the chain, with volatility lasting for a relatively long time.

In the dimension of risk contagion research, the core focus of existing literature is on the volatility spillover effects within the cryptocurrency system. Based on a high-frequency jump detection framework, Wang et al. found that BTC has a dual 'amplification–lag' effect on small- and medium-cap tokens [7]; however, the model in their study treats liquidity as an exogenous control variable, only controlled through two proxy variables: trading volume and bid-ask spread, failing to identify the endogenous amplification mechanism of liquidity depletion on the duration of jumps. In addition, the jump detection algorithm they used tends to over-identify jumps during low-liquidity periods (such as weekends), leading to a higher proportion of 'false jumps,' thereby overestimating the risk spillover intensity of BTC to altcoins.

Alamren et al. further pointed out that when the on-chain reserves of exchanges are included as a moderating variable in the analysis of volatility spillovers, the intensity of volatility spillovers is found to be significantly positively correlated with the on-chain reserves of exchanges [8]. However, the study neither distinguishes between the attributes of 'hot wallets' (high liquidity) and 'cold wallets' (low liquidity), nor considers the 'mixing issue' between internal market-making accounts and external customer accounts within exchanges, thereby overestimating the explanatory power of on-chain reserves on market volatility. In addition, the Time-Varying Parameter Vector Autoregression (TVP-VAR) model they employed does not take ETFs creation and redemption flows as exogenous shock variables, causing institutional changes to be 'smoothed' into time-varying parameters rather than treated as structural market shifts.

The introduction of the ETFs system has promoted the escalation of risk transmission in the cryptocurrency market into a 'linked institutional balance sheet' model. Existing research often regards risk spillovers as the mechanical transfer of 'information shocks' among traders, but fails to define them as a liquidity rebalancing process constrained by balance sheets. On one hand, ETFs have incorporated Bitcoin into the margin account systems of traditional brokers, making it a component of institutional balance

sheets. In this context, risk no longer spreads along the chain path of 'whale addresses → exchanges → retail investors,' but is instead reflected simultaneously through ETFs net asset values and futures basis during pre-market, intraday, and after-hours trading sessions in the U. S. stock market. In July 2025, a $900 million Bitcoin transfer from an 'ancient address' caused market panic on the Twitter platform. However, on that day, the ETFs NAV premium/discount was only -12 basis points (bps). Although post-market futures fell by 2. 1%, the drop was quickly recovered by authorized participants (AP) buying, and the risk was cleared across markets within two hours—a duration significantly shorter than the 36 hours required during the 2021 Mt. Gox incident (traditional chain transmission model), fully demonstrating the 'rapid recovery' characteristic of risk transmission under the ETFs system. On the other hand, the implementation of the ETFs system introduced traditional market makers and institutional investors such as mutual funds, significantly reshaping the behavioral paradigm of market participants. Glassnode clearly pointed out that in March 2025, the Bitcoin market was dominated by long-term holders, enhancing their rankings continuously and shifting assets to custodianship in the longer term [11]. As ETFs are a core form of institutional custody, The development of their portfolio is in close alignment with this, while the report points out market movements caused by short-term holders selling. The institutionalization of the investor base not only. The Autoregressive Fractionally Integrated Moving Average (ARFIMA) long-memory parameter d that's estimated from shocks has shortened risk transmission paths but weakened volatility memory. In Q4 2024, the 1-hour realized volatility, which fell to 0. 21 ($p<0.01$), was seen at 0. 37 in 2023. This indicates that institutional arbitrage behavior means reversion of accelerated volatility, reducing persistence for systemic risk. Consequently, BTC is no longer merely a 'crypto-native' . This is a traditional term used in reference to the assets on the balance sheets of traditional institutions. Market mechanisms, which include margin calls, hedging rebalancing, and ETFs premium/discount arbitrage, make it possible to break the traditional narrative of 'chain transmission.' Crypto-Traditional Asset Linkage Study: From 'Hedge Narrative' to 'Risk Assetization'

In studies on the linkages between crypto assets and traditional markets, early literature generally suggested that the two only exhibit weak tail dependence during extreme market conditions. Korkusuz based on a Copula model, confirmed this: BTC shows only weak correlations with U. S. stocks and gold in the extreme tail regions, and its hedging property increases as market volatility rises [9]. However, this study has significant limitations: first, the sample period ends in Q4 2023, which coincidentally misses the key institutional milestone of the U. S. spot Bitcoin ETFs approval in 2024; second, the launch of the ETFs is essentially a core institutional embedding action that brings crypto assets into the traditional compliant investment framework, yet this study fails to capture the new dynamics after institutional capital enters at scale, where market pricing logic transforms from 'crypto-driven' to 'traditional capital institutional arbitrage'. Therefore, it naturally cannot explain the new market pattern of 'institutional capital entry — normalized correlation — weakened hedging property. '

Further analysis reveals that the study did not control for the contemporaneous effects of macroeconomic variables such as the Volatility Index (VIX), the US Dollar Index (DXY), and the Federal Funds Rate (FFR), making it impossible to disentangle the impact of macroeconomic fluctuations on the linkage between the two types of assets. At the same time, it did not test the core drivers behind enhanced linkages — it could neither confirm whether this phenomenon was dominated by the continuous inflow of funds brought by ETFs, nor rule out the role of institutional arbitrage mechanisms (such as the spread arbitrage between spot ETFs and futures markets) in reshaping the linkage. More importantly, the calculation of correlation coefficients did not eliminate the issue of 'spurious linkage' caused by overlapping US stock trading hours, resulting in a lack of accuracy in judging the intrinsic connection between assets. As a whole, these deficiencies caused early studies to not penetrate. Look past surface phenomena to see how the characteristics of crypto assets fundamentally restructured due to institutional embedding. After ETFs use crypto assets in traditional institutional asset allocation portfolios, the correlation between the two asset types is no longer one of chance. Rather, it is the result of inevitable risk-return convergence in institutionalisation.

This conclusion is also supported by empirical data: for four consecutive trading days in September 2024, ETFs net inflows reached $1. 7 billion, while during the same period, the one-hour volatility correlation between BTC spot and Nasdaq-100 futures rose to 0. 44, a level approaching the correlation among major tech stocks [12]. This data clearly indicates that Bitcoin price fluctuations are no longer an issue,which is increasingly becoming independent of conventional markets; its pricing logic has deeply integrated into the conventional financial system,since volatility is no longer driven solely by factors within the crypto market, but moves in concert with U. S. stock trends and macro policy adjustments, reflecting a logic of "rising and falling together. " In this shift there is an embedded context of the institution, which is key,marking the inevitable transformation of crypto assets from "alternative speculative instruments" into "compliant allocation assets. "

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A common limitation of the aforementioned studies is that they all regard the enhanced co-movement between the two types of assets as a short-term effect triggered by 'emotional contagion' or 'capital-driven' factors, rather than a fundamental restructuring of the attributes of crypto assets within an institutional context. Through the help of mechanisms, BTC has been absorbed into the asset portfolio management system. On this basis, BTC's. The actions of price are becoming more affected by the U. S stock liquidity as well as interest rate expectations and market risk. What's more, this relationship is not a fortuitous accident but the likely result of a change in properties.

3. Policy and Investment Recommendations

3.1 Regulatory Recommendations

3.1.1 Monitoring liquidity and stratification

Regulatory authorities should strengthen the monitoring of liquidity stratification in the cryptocurrency market, with acknowledgment of the marginalization risks of small and medium exchanges. Research by Vassilios Babalos, Elie Bouri, and Rangan Gupta indicates that the listing of Bitcoin spot ETFs enhances liquidity on top exchanges, which could exacerbate liquidity drain problems for smaller exchanges [5]. Therefore, regulators need to formulate targeted policies to ensure overall market stability and fairness.

3.1.2 Cross-market risk isolation mechanisms

The connection between crypto and traditional assets has strengthened with bitcoin spot ETFs. Research by Korkusuz, the link between the two asset types has changed from "weak dependence in extreme" to "strong dependence in moderate market conditions","hedge properties of crypto assets are fading as they are a 'highly correlated' in daily trading" [9]. Consequently, risks in a single market are more easily transferred across markets, potentially causing systemic risk. Based on this, regulatory authorities need to establish. Cross-market risk isolation mechanisms should first clarify risk transmission paths and unify risk control standards to provide suitable isolation conditions. Utilize targeted guidance and a basis for precise monitoring; then, leverage this mechanism to incorporate cross-market data and construct risk warning. Therefore, measures are taken to prevent certain clients from an increase in their risks. Ultimately, this will form a complete loop of.

3.1.3 Emergency plan for large-scale ETFs redemptions

Regulators should require ETF authorized participants (APs) to develop contingency plans to address potential large-scale redemption events. While a higher percentage of institutional investors can shorten the risk transmission process during simultaneous mass redemptions, it also introduces new risk vulnerabilities. This may lead to a sharp decline in ETF net asset value and trigger cascading risks, such as market liquidity depletion.Regulators therefore need to ensure APs can complete on-chain settlement within 24 hours, thereby upholding the resilience of the market's new ecosystem and safeguarding investor confidence alongside overall market stability.

3.2 Investment Recommendations

3.2.1 Cross-asset portfolio optimization

Investors should take advantage of the opportunities brought by Bitcoin spot ETFs to carry out cross-asset portfolio optimization. Statistics from The Block show that the one-hour volatility synchronization between BTC spot and Nasdaq-100 futures has approached the level seen among large tech stocks, indicating that Bitcoin can partially replace the risk exposure function of tech stocks in a portfolio [12]. Therefore, investors can further enhance the allocation value by incorporating Bitcoin into traditional asset portfolios, ultimately achieving the goals of risk diversification and return maximization.

3.2.2 Focus on opportunities brought by liquidity improvement

Investors should pay attention to the investment opportunities brought by the improvement in market liquidity following the launch of Bitcoin spot ETFs. According to Kaiko, Bitcoin's bid-ask spread on U. S. platforms has narrowed sharply since Q1 2024—falling from roughly 0. 3% to 0. 5% to below 0. 15%—while trading depth has increased significantly [13]. Notably, weekend liquidity has also improved drastically. This trend means investors can access better-executed trades: enhanced platform liquidity not only delivers higher trade quality and lower market impact costs but also directly boosts the efficiency of capital inflows and outflows.

3.2.3 Be alert to changes in market volatility

Investors should remain mindful of Bitcoin's future market variability. While overall market liquidity has improved, liquidity gaps may still emerge during periods of extreme market stress. According to Glassnode's on-chain data, Bitcoin held by long-term holders and ETFs custodians continues to grow, while exchange balances decline [11]. This trend indicates that greater institutional investor participation is reshaping the market's volatility dynamics. Investors should therefore adjust their risk management strategies to effectively adapt to potential shifts in market volatility.

4. Conclusion

From a futures-spot linkage perspective, this paper systematically reviews micro-level evidence following the approval and launch of Bitcoin spot ETFs in early 2024, revealing that these products have already exerted a profound impact on cryptocurrency market structure. Even before their debut, anticipation of the ETFs began reshaping the market's liquidity dynamics and risk-spillover patterns. Through the creation-and-redemption mechanisms operated by Authorized Participants (APs), liquidity from U.S. trading hours is instantly reflected on-chain, driving significant convergence in cross-exchange price spreads and bolstering weekend liquidity depth.This process has concentrated liquidity on leading platforms, further marginalizing smaller exchanges,by integrating Bitcoin into the margin account systems of traditional financial institutions, ETFs have transformed the market's risk spillover framework—changes that may substantially alter Bitcoin's hedging properties. Moreover, the futures-spot arbitrage mechanism not only shortens the duration of volatility spillovers but also makes the crypto market the first ‚subsystem' for liquidity recycling in traditional finance. This study fills a gap in the pre-ETFs literature regarding the explanation of institutional shock effects and provides robust empirical evidence for regulators to monitor market liquidity stratification and for investors to optimize cross-asset portfolios.

Future research can be further expanded in three aspects: First, existing studies have not fully covered extreme scenarios, such as those in Q4 2025. It is necessary to combine core indicators like Deep Weighted Spread (DWSP) and order book resilience to thoroughly investigate liquidity resilience and risk transmission paths under extreme conditions. Second, focusing on cross-market risk isolation, based on minute-level data of ETFs subscription/redemption flows, futures basis, and institutional margin calls, researchers can estimate the transmission function of ‚U. S. stock liquidity shock → premium/discount → on-chain settlement. , Regulators can leverage this functionality to establish precise quantitative thresholds, enabling minute-level regulatory intervention that contains market risk spillovers before liquidity exhaustion occurs. A third key application emerges as the cryptocurrency market becomes institutionalized: optimizing cross-asset portfolios for investors. Amid this institutional shift, close attention must be paid to the dynamic correlation changes between crypto and traditional assets—driven primarily by ETFs. Investors stand to gain significantly from well-calibrated cross-asset portfolio optimization models, which can simulate tail risks, design hedging strategies, and deliver targeted allocation solutions.

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