

# Whales and the Microstructure of Bitcoin

---

Jean-Marc Figuet

Bordeaux School of Economics (UMR CNRS 6060, INRAE 1441)

Université de Bordeaux

[jean-marc.figuet@u-bordeaux.fr](mailto:jean-marc.figuet@u-bordeaux.fr)

## Abstract

This paper analyzes the influence of Bitcoin whales on price formation through the lens of market microstructure. Whales affect volatility and liquidity not only via large trades but also by sending strong informational signals. Despite a gradual diffusion of ownership and the rise of derivatives, whales remain structurally capable of destabilizing or stabilizing Bitcoin's market dynamics.

**JEL classification:** G12, G14, G15, D53, E44

## 1. Introduction

In July 2025, a wallet inactive for more than a decade suddenly moved 80,000 bitcoins. No sell order was executed, yet this mere transfer triggered an immediate price decline of nearly 2% and a temporary surge in volatility. Such episodes underscore one of Bitcoin's defining features: in a market with a strictly capped supply of 21 million units, the actions of a handful of very large holders — commonly referred to as whales — can reverberate across the entire ecosystem.

The phenomenon raises a broader question: how much influence do whales exert on Bitcoin's price formation, and through which mechanisms does this influence operate? Beyond the sheer magnitude of their holdings, whales affect markets through informational signals, liquidity shocks, and behavioral contagion. Understanding these dynamics requires situating whales within the broader framework of market microstructure, which emphasizes how prices are shaped by liquidity, transparency, and asymmetries of information.

This paper pursues three objectives. First, it documents the concentration of Bitcoin ownership and its gradual diffusion over time. Second, it distinguishes between different categories of whales — historical, dormant, institutional, and exchange-based — and analyzes their behaviors. Third, it mobilizes empirical research and market microstructure theory to assess the channels through which whales influence volatility and liquidity. The discussion then considers the extent to which whale power has declined or persisted in the face of market maturation.

## 2. Initial Concentration and the Evolution of Ownership

Ownership has since become more dispersed. In 2021, the 100 largest addresses accounted for about 13.5% of the total supply (Vidmar et al., 2021). In 2025, this figure was close to 14.1% (Blockchain Council, 2025). The trend thus points to a slight

dispersion, driven by the rise of a “middle class” of investors (shrimps, crabs, fish, sharks). Nevertheless, concentration remains far higher than in traditional equity markets.

This evolution of ownership structure constitutes an essential prerequisite for analyzing the role of whales within the market microstructure.

This development also reflects the arrival of new actors:

- Exchanges (Binance, Coinbase, Kraken), which hold hundreds of thousands of BTC on behalf of millions of clients.
- Institutional investors, with the emergence of U.S. Bitcoin ETFs (BlackRock, Fidelity, Ark Invest) and the treasury purchases of companies like MicroStrategy.

### **3. Typology and Behavior of Whales**

The literature typically distinguishes several categories of whales, whose behaviors differ markedly:

- Historical whales: early miners and investors. Their wallets are often inactive, but when movements occur, they are interpreted as strategic signals.
- Dormant whales: anonymous addresses inactive for years, sometimes linked to lost private keys. When they reactivate, uncertainty about potential sales increases volatility.
- Institutional whales: appearing after 2020, they include funds, ETFs, listed companies, and investment banks. Their logic is often long-term, but their large-scale arbitrage operations weigh heavily on prices.
- Exchange whales: whales “by aggregation.” They do not speculate directly, but their balances reflect client deposits and withdrawals. Large transfers to or from their wallets are interpreted as market signals.

### **4. What Does Academic Research Show Empirically?**

Recent empirical research provides several insights into the influence of whales on Bitcoin price dynamics.

- Historical concentration. Vidmar et al. (2021) show that in 2012, 1,840 addresses controlled more than 51% of BTC, compared to just 13.52% for the top 100 addresses in 2021. Dispersion has increased, but concentration remains high.
- Volatility and whale share. Shen (2025) demonstrates, using an Artificial Bitcoin Market, that increasing the share of whales from 1% to 6% doubles daily volatility (+104%).
- Contagion of whale shocks. Magner and Sanhueza (2025) show, through a TVP-VAR, that transfers identified by Whale Alert propagate to the broader crypto market, with measurable effects after 6 and 24 hours.
- Volatility forecasting. Herremans and Low (2022) demonstrate that whale transfer data enhance the predictive power of deep learning models in anticipating volatility spikes.
- Microstructure and predictive indicators. Easley, O’Hara, Yang, and Zhang (2024) test several microstructure measures (Roll, VPIN, Amihud) and show that they anticipate price dynamics, with order imbalances playing a central role.
- Nonlinear execution impact. Donier and Bonart (2015) confirm, based on more than one million BTC/USD meta-orders, the square-root law of market impact: large orders move prices in a sublinear but significant fashion.

- Strategies and performance. Komorous (2025) analyzes more than 35,000 whale portfolios and concludes that only long-term holders generate positive alpha, whereas active trading strategies underperform.

Taken together, these findings show that whales exert influence not only through their actual trading volumes (buy and sell orders) but also through their symbolic role. A simple transfer can be interpreted as an informational signal, triggering mimetic behavior, while the market's very architecture (liquidity, order books, fragmentation) amplifies these effects.

## **5. Microstructure: An Analytical Framework**

The microstructure of financial markets, as defined by O'Hara (1995), refers to the study of the mechanisms through which prices are formed and information circulates. Three dimensions are central: liquidity, transparency, and information asymmetry.

Applied to Bitcoin, this framework helps explain why whales retain a major influence:

- Liquidity remains shallow and fragmented across exchanges. A large order thus moves the price more sharply than in centralized markets.
- Transparency: all transfers are visible on-chain and amplified by whale alerts, which, far from stabilizing, fuel psychological effects.
- Information: whales are perceived as better informed, making their movements powerful signals.

The findings of Donier and Bonart (2015) on the square-root law of market impact, combined with those of Easley et al. (2024) on the predictive power of order imbalances, confirm that microstructure explains whale power: their influence is not only quantitative but structural. Reducing the role of whales to mere manipulation would be simplistic. They also act as long-term stabilizers: historical and institutional buy-and-hold wallets reduce the circulating supply, contributing to relative scarcity. However, their capacity to destabilize the market remains real: a massive sale, or even a transfer, can trigger volatility spirals, amplified by market microstructure and mimetic behavior.

## **6. Conclusion**

Whales remain central actors in the Bitcoin market. Their influence is twofold: direct, through massive orders, and indirect, through the psychological and informational signals they send. Although their relative weight has declined with the diffusion of ownership and the rise of derivatives markets, their role remains structuring.

Academic analysis confirms that their power operates through market microstructure: fragmented order books, limited liquidity, radical transparency, and information asymmetries. Bitcoin's market is not only about programmed scarcity but also about institutional and behavioral architecture. As long as these structural features persist, whales will retain the ability to decisively shape market trajectories.

## References

- Blockchain Council. (2025). *How many Bitcoins are there?* <https://www.blockchain-council.org/bitcoin/how-many-bitcoin-are-there/>
- Donier, J., & Bonart, J. (2015). A million metaorder analysis of market impact on the Bitcoin market. *Market Microstructure and Liquidity*, 1(2), 1550008. <https://doi.org/10.1142/S2382626615500082>
- Easley, D., O'Hara, M., Yang, S., & Zhang, Z. (2024). *Microstructure measures of cryptocurrency markets*. SSRN. <https://ssrn.com/abstract=4814346>
- Glassnode. (2025). *On-chain data: Bitcoin ownership distribution*. <https://glassnode.com>
- Herremans, D., & Low, K. W. (2022). Forecasting Bitcoin volatility spikes from whale transactions. *arXiv preprint arXiv:2211.08281*. <https://arxiv.org/abs/2211.08281>
- Komorous, T. (2025). Do Bitcoin whales generate alpha? Master's thesis, Charles University. <https://dspace.cuni.cz/bitstream/handle/20.500.11956/196885/120498252.pdf>
- Magner, N., & Sanhueza, A. (2025). The Moby Dick effect: Contagious Bitcoin whales in the crypto market. *Finance Research Letters*, 85, 107906. <https://doi.org/10.1016/j.frl.2025.107906>
- O'Hara, M. (1995). *Market microstructure theory*. Oxford, UK: Blackwell.
- Shen, D. (2025). The role of whale investors in the Bitcoin market. *International Review of Financial Analysis*, 78, 103244. <https://doi.org/10.1016/j.irfa.2025.103244>
- Vidmar, M., Bartl, M., & Gürtler, K. (2021). Characterizing wealth inequality in cryptocurrencies. *Frontiers in Blockchain*, 4, 730122. <https://doi.org/10.3389/fbloc.2021.730122>