Cross-Exchange Arbitrage Opportunities in Illiquid Cryptocurrency Markets

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Abstract

This paper investigates arbitrage opportunities across illiquid cryptocurrency markets using order book data from 15 exchanges during May 2023. We identify 47 altcoins with daily volume under $100,000 that exhibited price discrepancies exceeding 5% for more than 30 minutes. Our analysis reveals that after accounting for transaction costs and slippage, triangular arbitrage yields an average 1.2% net return per successful trade, with execution probabilities varying from 12-28% depending on exchange pairs. The most profitable opportunities occurred in BTC trading pairs on smaller Asian exchanges during off-peak hours.

1 Introduction

Illiquid cryptocurrency markets present unique arbitrage opportunities due to fragmented liquidity and slow price discovery. Unlike efficient markets where arbitrage is quickly eliminated, crypto markets exhibit persistent price discrepancies, particularly for:

- Low-cap altcoins (market cap $< \$50$M)
- Exotic trading pairs (e.g., BTC/DOGE rather than USDT/DOGE)
- Regional exchanges with limited API access

2 Data and Methodology

2.1 Data Collection

We collected 1-minute snapshots of order books for 150 illiquid pairs from:

Table 1: Exchange Coverage

Exchange	Number of Pairs
BitMart	32
LBank	28
Hotbit	25
KuCoin	23
Gate.io	18
Others	24

2.2 Arbitrage Detection

We implemented the following arbitrage conditions:

$$\exists \quad \frac{\text{Ask}_A}{\text{Bid}_B} < 0.95 \quad \text{for} \quad A \to B \to C \to A \tag{1}$$

where spreads must persist for at least 5 minutes to account for exchange latency.

3 Empirical Results

Key findings:

- 68% of opportunities lasted 5-15 minutes
- Slippage averaged 1.8% for $500 orders
- Withdrawal delays caused 42% of failed arbitrage attempts

4 Risk Factors

4.1 Liquidation Risk

Failed arbitrage attempts led to unwanted inventory accumulation. The inventory risk metric:

$$IR = \sum_{i=1}^{n} \left(\frac{P_{\text{entry}} - P_{\text{current}}}{\times} Q_i \right) \tag{2}$$

averaged $23.50 per failed $500 arbitrage attempt.

5 Conclusion

While cross-exchange arbitrage in illiquid crypto markets shows theoretical promise, practical implementation faces significant hurdles from:

- Exchange withdrawal limits
- Network congestion
- Counterparty risk

Future work should explore automated cross-exchange settlement solutions.

References

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[2] Kroeger, A., Sarkar, A. (2022). *Arbitrage in Decentralized Exchanges.* Federal Reserve Bank of NY.