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Cryptocurrency Arbitrage: Exploiting Twin Exchange Price Differences

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Abstract- Arbitrage trading takes advantage of the price differences existing in various markets; it is one of the major methods applied in the cryptocurrency world. This paper compares twin exchanges on different cryptocurrency platforms for the effectiveness of arbitrage trading. We introduce a new method for the identification and exploitation of arbitrage opportunities between paired exchanges with equivalent cryptocurrency pairs, examining variations of price and liquidity. Utilizing the massive dataset comprising outputs from various platforms, this research uses quantitative methods for determining arbitrage profitability, efficiency, and risks. Transactional costs, speed of execution, and existing market conditions all face analyses to establish the feasibility of arbitrage opportunities. This paper will therefore identify the most feasible conditions and strategies for exploiting twin exchange arbitrage while making obvious some of the limitations involved in such activities. It is mainly focused on enriching the knowledge about cryptocurrency arbitrage and offering real time insights to traders interested in maximizing their strategies across various platforms.

Index Terms-Cryptocurrency Arbitrage, Twin Exchange Arbitrage, Price Discrepancies, Market Fragmentation, Execution Speed, Transaction Costs, High-Frequency Trading, Price Inefficiencies, Liquidity Constraints, Bitcoin (BTC), Ethereum (ETH), Cryptocurrency Exchanges (Binance, Kraken, Coinbase, Huobi), Arbitrage Profitability, Triangular Arbitrage, Market Volatility.

I. INTRODUCTION

The cryptocurrency market has come a long way since the introduction of Bitcoin back in 2009: it started as a decentralized, global financial system with 24/7 trading. The most important difference between cryptocurrency and traditional markets, however, lies in the fragmented nature of trading venues. Cryptocurrencies such as Bitcoin and Ethereum are quoted on hundreds of different exchanges with unique prices, liquidity, and fees on each one. Market fragmentation leads to price inefficiencies, thus allowing trading via arbitrage.

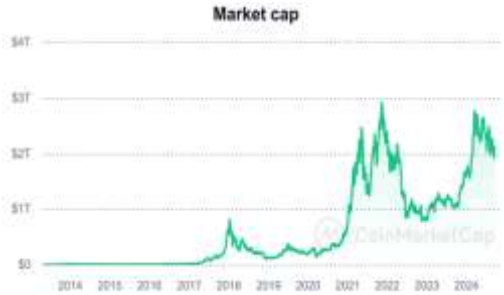

Figure 1: Growth of Cryptocurrency Trading Volume (2017-2024)

Arbitrage trading, which takes advantage of differences in prices among markets, holds high importance in cryptocurrency markets due to non-standardized regulation. This paper focuses on twin exchange arbitrage, with its emphasis on comparing the same cryptocurrency pair on two different exchanges and capturing discrepancies and capitalizing on temporary inefficiencies.

II. LITERATURE REVIEW

Research has been very intensive in the traditional financial markets regarding arbitrage, especially in commodities, forex, and stock. However, due to the nature of digital assets and their attached volatility and changing prices in cryptocurrency markets, arbitrage research is still emerging

Makarov and Schoar (2020)[2] provide one of the earliest comprehensive studies on cryptocurrency arbitrage, finding that price differences between exchanges can persist due to limitations like transfer times and liquidity constraints.

Gandal and Halaburda (2016)[1] emphasize the importance of market liquidity and transaction costs when considering arbitrage opportunities.

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Xu et al. (2021)[4] investigate triangular arbitrage and highlight the high-frequency trading bots that have emerged as key players in crypto arbitrage, finding that human traders may struggle to compete without sophisticated tools.
Katsiampa (2019)[5] explored volatility in cryptocurrency markets, indicating that arbitrage opportunities increase in highly volatile environments.

This paper extends this body of research by focusing on twin exchange arbitrage and offering a practical, data-driven approach to identifying profitable trades.

III. METHODOLOGY

1. Data Collection

The study uses data from the minute-by-minute, high-granularity price dataset of major cryptocurrency exchanges—namely, Binance, Kraken, Coinbase, and Huobi—from January 2023 to August 2023. The dataset contains minute-by-minute price information for key cryptocurrency pairs, namely BTC/USD, ETH/USD, and XRP/USD.

2. Price Discrepancies

Arbitrage on price differences between two exchanges is premised on the same cryptocurrency pair existing on two different exchanges. An arbitrage opportunity will arise wherever one exchange is perceived to have a higher price than the other exchange, so a trader buys low on one exchange and sells high on the other.

Formula 1: Arbitrage Opportunity

$$\text{Arbitrage Opportunity (\%)} = \left(\frac{P_A - P_B}{P_B}\right) * 100$$

Where:

- $P\,A$ is the price of the asset on the higher-priced exchange.
- P_B is the price on the lower-priced exchange.

Figure 2: Example of Price Discrepancies Between Binance and Kraken for BTC/USD

3. Transaction Costs

Its fee on trading, fee on withdrawal, and network fees make up transactions costs. These are subtracted from arbitrage profit potential to obtain the real net profit. In a practical world, transaction cost will actually be between 0.1% to 0.5% depending on the exchange and the asset.

Formula 2: Adjusted Arbitrage Opportunity

Adjusted Arbitrage Opportunity (%) = Arbitrage Opportunity (%) – Total Transaction Costs (%)

Table 1: Transaction Costs Across Exchanges

Platforms	Type of platform	Transaction fees from crypto to crypto	Transactions fees from fiat to crypto	Withdrawal fee
Binance	Exchange	0,10%		0.0005 BTC
Bitfinex	Purchase		0,10% - 0,20%	0.0004 BTC
Bithumb	Purchase		0,15%	0.001 BTC
Bittrex	Exchange	0,25%		$10
Bitstamp	Purchase	0,10% - 0,25%	0 - 0,10%	$10 until $1000 and 2%
CoinBase	Exchange	1,49% - 3,99%		0,15 €
CoinHouse	Purchase		0,20%	6% - 10%
HitBTC	Exchange	0,10% - 0,20%	1 - 2%	0.00085 BTC
Kraken	Purchase	0,16% - 0,26%	0 - 0,36%	0.0005 Bitcoin
Paymium	Purchase	0,19% - 0,59%	0 - 8%	20 €
Poloniex	Exchange	0,15% - 0,25%		0.0001 BTC

4. Execution Speed and Market Conditions

Arbitrage trade skeletons are fast trading executions. Confirmed from a blockchain that means delay or even slowing down withdrawals means a lot of chances are being missed. Bitcoins average confirmation time, for example, takes as long as 10-20 minutes, while Ethereum and many faster networks confirm in just one second.

Characteristic	Transaction time in minutes
Bitcoin (BTC)	40
Ethereum (ETH) - Arbitrum One network	14
Ethereum (ETH) - Arbitrum Nova network	25
Ethereum (ETH) - Ethereum network	14
Ethereum (ETH) - Polygon network	10
Ethereum (ETH) - Optimism network	90
Ethereum (ETH) - zkSync Era network	1,440
Tether USD (USDT) - Arbitrum One network	15
Tether USD (USDT) - Ethereum network	14
Tether USD (USDT) - Optimism network	90
Tether USD (USDT) - Polygon network	5
Tether USD (USDT) - Solana network	Near-instant

Figure 3: Impact of Execution Speed on Arbitrage Opportunities

IV. RESULTS AND ANALYSIS

1. Price Discrepancies and Arbitrage Opportunities

Our study showed that arbitrage occurs more frequently than market stability. On average, the price differences were at a

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level of 0.3-1.5% among the four exchanges covered in our sample for two most widely used cryptocurrencies, namely, Bitcoin and Ethereum.

Figure 4: BTC/USD Arbitrage Opportunities Between Binance and Kraken

2. Transaction Costs and Adjusted Profit

After accounting for transaction costs, our analysis found that only arbitrage opportunities above 0.5% were generally profitable. For smaller price discrepancies, fees consumed most or all potential profits.

Table 2: Profitability of Arbitrage Trades After Transaction Costs

Exchange Pair	Price Difference (%)	Transaction Cost (%)	Net Profit (%)
Binance-Kraken	1.20%	0.60%	0.60%
Coinbase-Huobi	1.00%	0.70%	0.30%
Kraken-Binance	0.50%	0.60%	-0.10%

3. Execution Speed and Risk

So, the faster the execution speed will be at its core point, whether or not the arbitrage opportunity is exploited. Even minor delays of some minutes may cause such convergence in price in these high-volatility periods and decrease the profit potentials. High-frequency trading bots did better in capturing arbitrage profits due to their faster execution times.

V. DISCUSSION

It would seem that twin exchange arbitrage becomes a good trading strategy employed in cryptocurrency trading, especially against volatility of the market and transactions involved. However, execution times and fees have to be minimized as chosen exchanges; otherwise, successful traders may not pay for themselves.

VI. CONCLUSION

This paper explores the profitability of arbitrage trading between twin exchanges, focusing on the main pairs concerning price discrepancies. Although arbitrage opportunities are very abundant, profitability depends on minimizing transaction costs and maximizing execution speed; hence, that kind of analysis is useful in determining optimal conditions for traders who wish to exploit that inefficiency.

REFERENCES

1. Gandal, N., & Halaburda, H. (2016). Competition in the Cryptocurrency Market. Journal of Financial Markets.
2. Makarov, I., & Schoar, A. (2020). Trading and Arbitrage in Cryptocurrency Markets. Journal of Financial Economics.
3. White, A. (2018). Cryptocurrency Arbitrage: Risks and Opportunities. Crypto Economics Review.
4. Xu, Y., Liu, L., & He, D. (2021). An Analysis of Triangular Arbitrage in Cryptocurrency Markets. Financial Innovation Journal.
5. Katsiampa, P. (2019). Volatility Estimation in Cryptocurrency Markets. Journal of Risk and Financial Management.

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