CRY04: Bitcoin Mining Economics Study

Technical Analysis Report | February 01, 2026

1. Data Overview

Subject: Marathon Digital (MARA)
Analysis Period: 2021-02-01 to 2026-01-30 (~5.0 years)
Total Observations: 11,366 rows across 4 datasets
Stock Data: 1,256 daily OHLCV observations
Data Sources: Yahoo Finance API, CoinGecko, exchange APIs (synthetic operational data)

2. Methodology

2.1 Metrics Computed

- Network hashrate tracking
- Difficulty adjustment analysis
- Mining profitability (cost/BTC)
- Energy efficiency (J/TH)
- Miner revenue breakdown
- Renewable energy adoption
- ASIC efficiency trends

2.2 Risk Analytics (CFA Standards)

- **Sharpe Ratio:** (Return - Rf) / Volatility (Rf = 0)
- **Sortino Ratio:** Return / Downside Deviation
- **Value at Risk (VaR):** Historical 95% and 99% confidence
- **Maximum Drawdown:** Peak-to-trough decline

2.3 Crypto-Specific Indicators

- **Volume Analysis:** On-chain vs exchange volume
- **Volatility:** Rolling 30-day realized volatility
- **Correlation:** BTC/ETH correlation, equity beta

3. Risk Metrics Summary

Ticker	Total Return	Ann. Return	Volatility	Sharpe	Max DD
MARA	-54.2%	-14.5%	112.2%	-0.13	-95.9%

4. Detailed Risk Profile

Return Distribution

Metric	Value
Positive Days	46.6%
Best Day	42.41%
Worst Day	-27.03%
Sortino Ratio	-0.24

Value at Risk

Confidence	Daily VaR
95%	-10.48%
99%	-14.95%

5. Data Quality Assessment

Completeness: All trading days covered for analysis period
Stock Data: Yahoo Finance adjusted prices (splits, dividends)
Market Data: Synthetic/illustrative for portfolio demonstration

6. Key Observations

- Crypto equities exhibit extreme volatility compared to traditional assets

- High correlation with Bitcoin price movements

- Regulatory developments significantly impact valuations

- Trading volume and liquidity vary significantly across exchanges

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Data Source: Yahoo Finance (stock), Synthetic (market) | Report Code: CRY04
Portfolio Sample - Demonstrates data engineering methodology
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