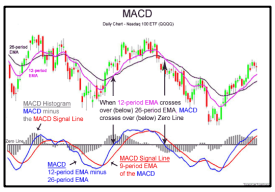
DFIC Quant Group
McMaster University

Tvesha Shah
January 12th 2024

DFIC Quant Team – Crypto Momentum Strategy

Overview: The **CryptoMomentum** strategy is a momentum-based crypto trading algorithm designed to take advantage of trends in the cryptocurrency market. By utilizing technical indicators like RSI, EMA, and MACD, the algorithm identifies top-performing cryptocurrencies and dynamically allocates capital to them. Below are key components and explanations for presenting the algorithm:

1. **Initialization and Universe Setup**
   a. **Initial Capital**: $100,000.
   b. **Top 25 Cryptocurrencies**: The algorithm focuses on the top 25 cryptocurrencies based on trade volume to ensure liquidity. The universe is updated daily with this filter applied to obtain the top 25 most traded coins.
2. **Technical Indicators**
   a. **RSI (Relative Strength Index)**: The RSI is used to determine momentum. An RSI above 60 but below 75 signals strong momentum but avoids overbought conditions. This helps identify cryptocurrencies that are trending upwards without being overextended.
   b. **EMA (Exponential Moving Average)**: The short-term (12-period) and long-term (26-period) EMAs are used to track trend direction. A bullish signal occurs when the short-term EMA crosses above the long-term EMA, indicating upward momentum. A bearish crossover (short-term EMA crossing below the long-term EMA) suggests the opposite.
   c. **MACD (Moving Average Convergence Divergence)**: This indicator tracks the relationship between two EMAs (12 and 26 periods). A positive histogram and MACD line above the signal line indicate bullish momentum, while a negative histogram signals a reversal or weakening momentum.



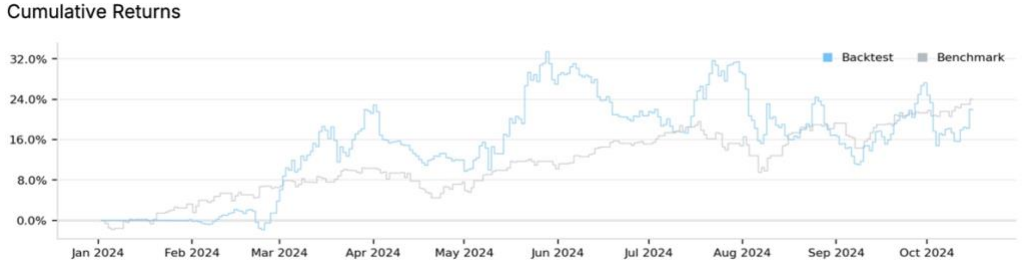
3. **Entry Conditions** - The algorithm will when ALL bullish signals are displayed.
   a. Short-term EMA > long-term EMA (bullish crossover)
   b. RSI between 60 and 75 (indicating strong momentum)
   c. MACD line above the signal line with a positive histogram
4. **Exit Conditions** - The algorithm sells the entire position when one of the following occur:
   a. Short-term EMA crosses below long-term EMA (bearish crossover)
   b. MACD line falls below the signal line with a negative histogram
5. **Diversification**: The strategy ensures no single cryptocurrency holds more than 15% of the portfolio to avoid concentration risk.

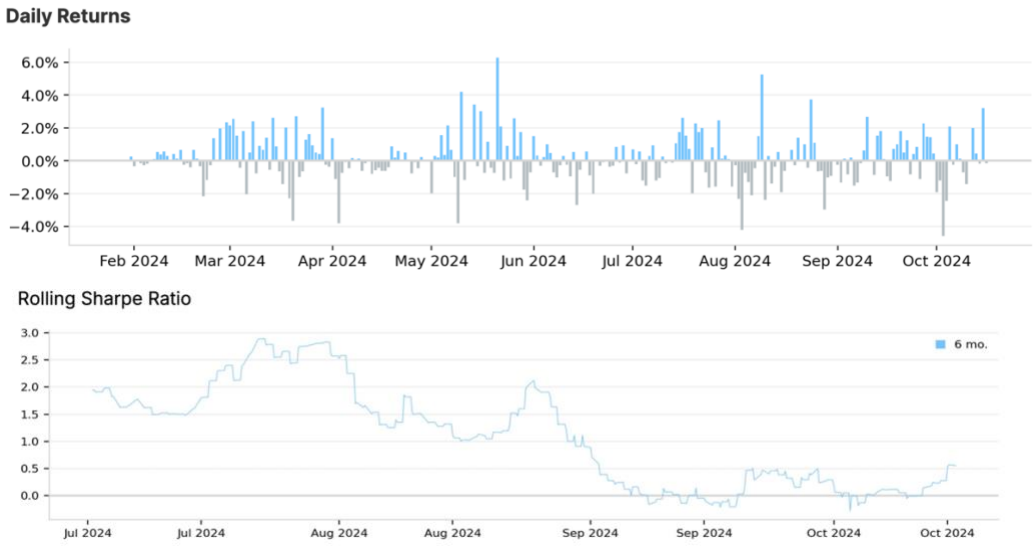
Key statistics

Time Frame	1.1.2024 to 1.1.2025	1.1.2020 to 1.1.2021	1.1.2020 to 1.1.2025
Net Profit	$23,058.56	$50,341.95	$243,639.18
Return	21.80	167.39 %	375.78 %
Sharpe Ratio	1.044	3.58	1.073
PSR	53.034%	80.590%	39.641%
Win Rate	41%	55%	44%
Average Win	1.19%	2.09%	1.70%
Average Loss	-0.07%	-0.70%	-0.42%
Total Orders	183	302	1544

Please note that the end of 2024 – where bitcoin reached its max – was not included in the backtest

Performance metrics





Findings

The CryptoMomentum strategy showed significantly better performance in 2020-2021 compared to 2024-2025, with staggering difference in returns. The **Sharpe ratio** was much higher in 2020-2021 (3.58 vs. 1.044), reflecting stronger risk-adjusted returns during a volatile market. Additionally, the **win rate** and **average win** were notably higher in 2020-2021 (55% and 2.09%) compared to 41% and 1.19% in 2024-2025, highlighting the strategy's diminished effectiveness in a less volatile environment.

The key difference between the two periods is the market conditions. In 2020-2021, the crypto market was highly volatile and speculative, with strong price swings and clear trends, which suited the momentum strategy. This volatility made it easier to capture profitable opportunities. An exemplary example of this is Bitcoin's price, which surged by over 650% from 2020 to 2022, followed by a 75% decline and then a 500% rebound (The Australian). However, by 2024-2025, the market matured, with reduced volatility and more institutional involvement, resulting in slower price movements and fewer clear trends. For instance, Bitcoin's price fluctuations in 2024 were mostly under 80%, compared to over 100% in 2020-2021, indicating a more stable market environment (The Australian). This shift in market behavior made it harder for the strategy to profit from momentum-based signals.

To improve the strategy for 2024-2025, several key adjustments could be made to enhance its adaptability in a more stable market. First, incorporating a **stop-loss mechanism** or **trailing stop** would help to manage risk, particularly in periods of lower volatility when price movements tend to be less predictable. Additionally, **adjusting the RSI thresholds** (e.g., widening the range or modifying the overbought/oversold levels) and increasing the **periods for EMA** and **MACD** would smooth out signals, reducing false positives and making the strategy more robust to market noise. Additionally, incorporating a **momentum oscillator**, such as the **Stochastic RSI**, could help fine-tune entry and exit points, particularly when combined with overbought/oversold levels to improve timing.

Another improvement could be the introduction of **Bollinger Bands** to identify price volatility and potential reversal points. **The Average Directional Index (ADX)** could also be added to assess the strength of trends, helping to filter out weak or sideways trends, which can cause false signals in a low-volatility environment. To further enhance the strategy, implementing **time-based filters** (e.g., adjusting indicator thresholds based on specific market hours or events) could help adapt to varying liquidity and volatility levels throughout the day or week. Another potential modification is **multi-timeframe analysis**, where the algorithm uses longer timeframes for trend direction and shorter ones for execution, which would increase the strategy's robustness and help avoid reacting to short-term market noise. These modifications would allow the algorithm to adjust more effectively to changing market conditions and refine its performance in an evolving, more institutional-driven market.