Predictive Power of Multi-Dimensional Composite Scores on Cryptocurrency Returns: An Exploratory Backtesting Study

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Abstract

This study examines the predictive capacity of multi-dimensional composite scores applied to cryptocurrencies over 7-day and 30-day horizons. Using a universe of 243 digital assets drawn from the top 300 by market capitalization as of February 12, 2026, we exhaustively test 20,756 score combinations (individual, pairs, triples, quadruples) and measure their correlations with observed returns. Results show that certain combinations of three or four scores achieve Pearson correlations exceeding 0.50, with return spreads between extreme quartiles surpassing 19%. While promising, these findings must be interpreted cautiously given the overfitting risk inherent to the combinatorial approach and the single observation period.

Introduction

Quantitative evaluation of cryptocurrencies remains a poorly formalized domain. Unlike equity markets, where decades of research have established well-documented risk factors (value, momentum, size), the crypto ecosystem lacks empirically validated analytical frameworks. Multi-dimensional scoring systems — integrating fundamental, technical, liquidity, security, and social traction metrics — represent an attempt at synthesis, but their effective predictive power over future returns remains understudied.

This study proposes an exploratory backtesting approach: measuring, over a 30-day period, the correlation between composite scores and realized returns, in order to identify potential predictive kernels among the available scoring dimensions.

Data and Methodology

Universe Construction

The initial sample comprises the top 300 cryptocurrencies by market capitalization as of February 12, 2026. After excluding stablecoins (price within ±10% of $1), wrapped tokens, and observations with missing data, the final universe consists of **243 assets**.

Return Variables

Two time horizons are considered:

- **R_7**: 7-day return (price on 02/19/2026 relative to price on 02/12/2026)
- **R_{30}**: 30-day return (price on 03/14/2026 relative to price on 02/12/2026)

The distribution of R_7 exhibits a median of −0.4% (46% positive returns), while R_{30} shows a median of +2.1% (60% positive returns), reflecting a modest market recovery during the second half of the period.

Combinatorial Approach

Each individual score (28 dimensions in total) is first z-score normalized. Combinations are then exhaustively tested in ascending order of complexity:

Order	Number of combinations
1 (single score)	28
2 (pairs)	324
3 (triples)	3,040
4 (quadruples)	17,364
Total	**20,756**

The composite score is defined as the sum of individual z-scores. Only combinations with at least 25 common observations are retained. For each

combination, the following are computed: Pearson correlation, Spearman correlation, and the mean return spread between the fourth and first quartiles (Q4 − Q1).

Results

Maximum Correlations by Combination Order

Order	max	ρ Pearson R_7	max	ρ Pearson R_{30}
1 (single score)	0.23	0.23		
2 (pairs)	0.27	0.36		
3 (triples)	0.52	0.53		
4 (quadruples)	0.54	0.53		

A notable jump is observed between pairs (ρ ≤ 0.36) and triples (ρ ≥ 0.52), while the transition to quadruples yields only marginal improvement, suggesting a ceiling in extractable signal.

Identified Predictive Kernels

Short-term (R_7) — Gaug_Secu + Kraken + DeFi: Pearson ρ = +0.52, Spearman ρ = +0.43, Q4−Q1 spread = +10.5% (n = 99).

Medium-term (R_{30}) — DilutMcap + GaugMom + Tw_30d + Solana: Pearson ρ = +0.53, Q4−Q1 spread = +19.4%.

Robust combination across both horizons — Kraken + DeFi + Total_OUIs: Pearson ρ R_7 = +0.39, Pearson ρ R_{30} = +0.39, R_{30} spread = +20.5%.

Returns of Short-Term Kernel Assets (Kraken ∩ DeFi)

Ticker	Name	R_7	R_{30}
MORPHO	Morpho	+28.9%	+62.3%
PYTH	Pyth Network	+19.9%	+6.4%

Ticker	Name	R₇	R₃₀
AAVE	Aave	+11.7%	+1.9%
CVX	Convex Finance	+9.7%	+8.1%
ETHFI	Ether.fi	+6.6%	+26.0%
JUP	Jupiter	+6.3%	+13.4%

All six assets jointly satisfying the Kraken and DeFi criteria posted positive 7-day returns, with a mean of +13.9%.

Returns of Medium-Term Kernel Assets (Solana ∩ Tw_30d > 0)

Ticker	Name	R₇	R₃₀
VIRTUAL	Virtuals Protocol	+8.6%	+26.4%
TRUMP	Official Trump	+4.6%	+22.5%
UNI	Uniswap	+2.1%	+18.7%
ENS	Ethereum Name Service	+15.3%	+6.2%
LINK	Chainlink	+0.8%	+5.8%

Discussion

The results suggest that combining heterogeneous scoring dimensions (security, exchange listing presence, ecosystem membership) can capture a signal correlated with future returns. However, several caveats are warranted.

The structure of the short-term kernel (security + Kraken listing + DeFi ecosystem) may reflect a quality bias: assets scoring well on these criteria are generally mature projects, more likely to benefit from recovery phases. The medium-term kernel, incorporating momentum and social traction (Twitter 30d), may capture a media attention effect whose persistence remains to be demonstrated.

The absence of significant improvement between triples and quadruples is consistent with the hypothesis of limited informational content from additional scores once the primary dimensions are captured, but could also reflect statistical saturation related to sample size.

Limitations and Future Work

The limitations of this study are substantial and must condition any interpretation:

- **Single period**: a single 30-day interval permits no generalization. Validation across multiple periods and distinct market regimes (bull, bear, sideways) is essential.
- **Overfitting risk**: testing 20,756 combinations on a sample of 243 observations creates a high risk of data snooping. Corrections for multiple testing (Bonferroni, FDR) were not applied.
- **Survivorship bias**: assets delisted or defunct prior to the observation date are absent from the sample.
- **No causal inference**: observed correlations permit no causal interpretation.
- **Transaction costs**: returns are gross, without accounting for fees, slippage, or actual liquidity.

Future work should include out-of-sample validation over independent periods, application of regularization methods, and analysis of the temporal stability of the identified kernels.

Conclusion

This exploratory study identifies multi-dimensional score combinations exhibiting non-negligible correlations with short- and medium-term cryptocurrency returns. The best-performing kernels achieve Pearson correlations exceeding 0.50 and return spreads between extreme quartiles in the range of 10–20%. These results provide a basis for further research but cannot be interpreted as validation of the predictive power of these scores absent out-of-sample testing and corrections for multiple comparisons.

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