

# Crypto Momentum: Complete Trial Lineage and Failed Sleeve-Admission Evidence

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Research simulation and, where explicitly identified, Alpaca paper evidence. No funded performance, peer review, independent replication, external acceptance, or future return is claimed.

**Short title:** AlphaForge crypto momentum: complete trial lineage  
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## Abstract

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AlphaForge tested cross-sectional and time-series momentum in perpetual-futures prices. This paper reconciles all 18 charged crypto-momentum hypothesis identities recorded from 2026-06-20 through 2026-06-25. The best persisted result, a 21-day time-series momentum signal rebalanced weekly, had annualized Sharpe 0.4863, total return 26.83%, and maximum drawdown 17.02% from 2022-02-08 through 2026-06-01. Its artifact-era Deflated Sharpe Ratio was only 0.0684. The worst result, a seven-day cross-sectional signal rebalanced daily, had Sharpe -1.1690, total return -42.39%, and maximum drawdown 50.64%. All 18 artifacts failed their recorded DSR gate.

A separate 2021–2026 diagnostic combined three momentum signals and measured Sharpe 0.0780. Its full-sample correlation with a carry diagnostic was +0.0444 and stress correlation was negative, but the combined Sharpe was only 0.0556 and even the reported decorrelated ceiling was 0.1206.

Diversification without standalone edge does not earn a sleeve slot. No persisted momentum capacity sweep exists. This family is research-only: it is not validated, admitted, live, or part of an Alpaca paper account.

## Claim boundary

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This paper establishes only that:

1. the economic hypotheses and implemented formulas can be stated precisely;
2. all 18 charged identities are joined to immutable ledger rows and persisted artifacts;
3. positive, negative, selection-adjusted, and diversification evidence is published together;
4. every persisted artifact failed its original DSR gate; and
5. overlap with existing price-trend families is explicitly resolved.

It does **not** establish a forward Sharpe, expected maximum drawdown, useful capacity, independent alpha source, future return, live execution record, or investable product. Artifact-era DSR values use the selection context stored when each run was produced; this paper does not mislabel them as restatements against the current 228-identity union.

# Economic hypotheses

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The cross-sectional hypothesis is that assets with stronger recent returns than peers continue to outperform those with weaker returns over the next holding interval. The time-series hypothesis is that an asset's own normalized trailing return predicts the sign and relative strength of its next return. Possible mechanisms include slow information diffusion, investor attention, behavioral underreaction, trend-chasing flows, and compensation for crash or liquidity risk. None makes momentum a law; rapid reversals, crowded exits, trading costs, and changing market structure are direct falsifiers.

The primary literature supplies a prior and an overlap map, not validation of ALPHAC:

- Moskowitz, Ooi, and Pedersen document time-series momentum across conventional futures and forwards ([Journal of Financial Economics](#)).
- Liu and Tsyvinski identify crypto-specific momentum and investor-attention effects while showing that standard asset-pricing factors do not fully explain crypto returns ([Review of Financial Studies](#)).
- Liu, Tsyvinski, and Wu construct crypto market, size, and momentum factors ([Journal of Finance](#)).
- Grobys and Sapkota test momentum in cryptocurrency markets ([Economics Letters](#)).
- Chi and coauthors study cross-sectional risk factors in cryptocurrency futures and emphasize that signal frequency matters ([Journal of Futures Markets](#)).

These studies do not validate AlphaForge's universe history, feature timestamps, transaction-cost model, trial search, or implementation.

## Exact ALPHAC implementation

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Let  $c(i, t)$  be the point-in-time close for instrument  $i$  at hourly decision bar  $t$ . Missing history remains missing rather than being backfilled from the future.

For long horizon  $L$  and short skip  $S$ , cross-sectional momentum is:



The charged variants use  $L=168$  with  $S=24$ ;  $L=504$  with  $S=48$ ; and  $L=2160$  with  $S=168$ . They correspond approximately to seven-day/one-day-skip, 21-day/two-day-skip, and 90-day/seven-day-skip signals on hourly bars. The values are ranked across the complete point-in-time universe at each decision.

For horizon  $L$ , time-series momentum is:



The charged horizons are 168, 504, and 2160 hourly bars. The denominator scales trailing returns by a 168-hour exponentially weighted volatility estimate. Positive values imply long direction and negative values short direction before portfolio construction. Normalization does not eliminate gap risk or make signals comparable when data quality differs across instruments.

Most artifacts use rank allocation over 58 Binance perpetual contracts, with 25 walk-forward legs, 6,048 training bars, 1,512 test bars, 72 purge bars, and 168 embargo bars. Charged variants change signal horizon, blend, allocator, rebalance cadence, or half-universe split. Such changes remain distinct hypotheses even when they share one economic mechanism.

## Complete trial lineage

The public family packet binds 18 immutable identities to `crypto_momentum`:

| Machine-label group                                       | Charged identities | Question tested                                                                               |
|-----------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------|
| <code>mom_ts_504</code>                                   | 9                  | 21-day trend across daily, 3-day, weekly, 2-week, long-only-rank, and split-universe variants |
| <code>mom_xs_504_48</code>                                | 2                  | 21-day cross-sectional momentum at daily and weekly cadence                                   |
| <code>mom_ts_2160</code>                                  | 2                  | 90-day time-series trend under daily and weekly cadence                                       |
| <code>mom_xs_2160_168</code>                              | 1                  | 90-day cross-sectional momentum with a seven-day skip                                         |
| <code>mom_xs_168_24</code>                                | 1                  | Seven-day cross-sectional momentum with a one-day skip                                        |
| <code>mom_ts_168 + mom_ts_504 + mom_ts_2160</code>        | 1                  | Multi-horizon time-series blend                                                               |
| <code>mom_ts_504 + mom_xs_504_48</code>                   | 1                  | Weekly time-series/cross-sectional blend                                                      |
| <code>mom_xs_504_48 + mom_xs_2160_168 + mom_ts_504</code> | 1                  | Recovered legacy diversification diagnostic                                                   |
| <b>Total</b>                                              | <b>18</b>          | Every identity remains charged to the global search burden                                    |

Seventeen identities came from the original `var*` research profiles. The eighteenth was recovered from `artifacts/exp1/20260625T075446Z/experiments.jsonl` when canonical discovery was corrected to include durable artifact ledgers. This correction ran no experiment. The recovered artifact names 3,358 configured instruments across both `BINANCE` and `XUSE` namespaces, unlike the cleaner 58-contract crypto panels. It is retained as a diagnostic, not treated as a direct replication.

The machine-readable source is `/glassbox/crypto_momentum_family.json`. It includes every hypothesis key, immutable ledger source, source hash, compact configuration, persisted result, and artifact-era validation verdict. The global identity join remains available at `/glassbox/trial_packet_manifest.json`.

## Results

### Best persisted specification

The strongest artifact is weekly `mom_ts_504` with rank allocation:

| Measure                          | Persisted value          |
|----------------------------------|--------------------------|
| Initial / final simulated equity | \$100,000 / \$126,825.13 |
| Total return / CAGR              | 26.83% / 5.67%           |
| Annualized Sharpe / volatility   | 0.4863 / 12.38%          |
| Maximum drawdown                 | 17.02%                   |
| Annual turnover                  | 30.32x                   |
| Fees paid                        | \$7,274.25               |
| Net funding cashflow             | +\$975.14                |
| Artifact-era DSR / gate          | 0.0684 / failed          |

This is the maximum Sharpe among the 18 persisted identities, not an independently chosen confirmatory result. It fails the governing DSR threshold and its drawdown exceeds the program's 11% expected-maximum-drawdown objective.

## Worst persisted specification

Daily `mom_xs_168_24` is the clearest falsification:

| Measure                          | Persisted value         |
|----------------------------------|-------------------------|
| Initial / final simulated equity | \$100,000 / \$57,605.73 |
| Total return / CAGR              | -42.39% / -12.01%       |
| Annualized Sharpe / volatility   | -1.1690 / 10.47%        |
| Maximum drawdown                 | 50.64%                  |
| Annual turnover                  | 129.02x                 |
| Fees paid                        | \$22,178.23             |
| Artifact-era DSR / gate          | 0.0000001665 / failed   |

The difference between the best and worst identities is specification sensitivity, not evidence that the best setting has isolated a stable law. Across the complete family, annualized Sharpe ranges from -1.1690 to +0.4863 and maximum drawdown ranges from 15.15% to 50.64%. Zero of 18 persisted validations clears its artifact-era DSR gate.

## Diversification diagnostic: low correlation is insufficient

The recovered `exp1` momentum blend measured annualized Sharpe 0.0780, maximum drawdown 20.94%, and artifact-era DSR 0.5607. Against its carry diagnostic, full-sample correlation was +0.0444; correlation was -0.5768 on the combined book's worst 2.5% of days and -0.6290 when either sleeve was in its worst 2.5%. Those correlations appear attractive in isolation.

But the equal combination produced Sharpe only 0.0556 and maximum drawdown 12.82%. Even the artifact's decorrelated Sharpe ceiling was only 0.1206. Negative stress correlation cannot rescue two weak expected-return processes. The test therefore supports a null: momentum does not earn a separate sleeve slot merely because it sometimes offsets carry.

## Capacity and execution boundary

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No persisted crypto-momentum capacity sweep changes capital while holding the momentum return hypothesis fixed. Capacity is therefore **unmeasured**, not zero and not positive. Turnover as high as 129.02x, fees, venue concentration, order-book depth, funding, and crowding make extrapolation especially unsafe.

There is also no continuous broker-reconciled forward record for this crypto-momentum family. AlphaForge's incumbent paper experiment is funding carry; AlphaMax and AlphaTrend already express related price-trend mechanisms in equities and managed futures. Crypto momentum is not an Alpaca paper sleeve, not an AlphaVintage result, and not included in published live returns.

## Overlap and sleeve decision

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Crypto momentum, AlphaMax equity momentum, and AlphaTrend managed-futures trend differ in market, formation horizon, and portfolio construction, but all monetize persistence in prices. They are not automatically three independent economic mechanisms. Under the research taxonomy, the 18 crypto variants form one family and at most one sleeve candidate.

An independent sleeve claim would require a preregistered forward specification, a clean crypto-only point-in-time universe, net positive standalone evidence after current union deflation, measured capacity, and contemporaneous return correlations against the actual live books, including stress windows. None is presently established.

## Reproduction map

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- `src/alphaforge/features/library/momentum.py`: signal formulas and point-in-time feature code.
- `docs/design/alphaDesign.md`: original momentum specification and research contract.
- `var*/experiments.jsonl` and `artifacts/exp1/20260625T075446Z/experiments.jsonl`: immutable charged identities.
- `artifacts/cpanel/*/walkforward.json` and `artifacts/walkforward/crypto_mom_base/walkforward.json`: original persisted simulations.
- `artifacts/exp1/20260625T075446Z/momentum/walkforward.json` and `exp1_metrics.json`: recovered momentum/diversification diagnostic.
- `scripts/audit_crypto_momentum_family.py`: deterministic ledger-to-artifact audit.
- `artifacts/research/crypto_momentum_family.json`: generated family evidence packet.
- [/glassbox/crypto\\_momentum\\_family.json](#): stable public machine-readable packet.

Reproduction requires the pinned project environment and underlying market-data lake. The public packet proves the claims made here and hashes their source artifacts; it does not imply that every venue or vendor dataset may be redistributed.

## Packet completeness

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This family paper verifies shared identity, authorship, mechanism, literature, family accounting, and stable-publication sections for 18 identities. It does not retroactively manufacture exact identity-level preregistrations, full return bundles, environment snapshots, or capacity studies. All 18 trial packets therefore remain incomplete until every required section is proved. A family paper is meaningful coverage, not a completed identity packet.

## Decision

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**Research decision:** reject sleeve admission. Preserve all 18 identities, including the severe negative result and the recovered mixed-universe diagnostic. Do not search additional momentum variants without a new mechanism and explicit family budget.

**Live decision:** do not add crypto momentum to the paper book. It has no broker-reconciled forward record, no measured capacity, and no independently validated edge.

**Publication decision:** publish the complete family null under Arhan Canli's authorship. The credible accomplishment is not the 0.4863 selected Sharpe; it is a record that makes the selected result, failed deflation, 50.64% adverse drawdown, overlap, and non-admission equally inspectable.

## References

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