MST-HRP portfolio allocation

> **Strategy evaluated** · **Nivel de evidencia** Histórico · Development · Sample 2021-01-04 21:00:00+00:00 to 2024-12-31 21:00:00+00:00

N/A marks an undefined or missing value. Return and risk fractions are shown as percentages. The JSON evidence preserves the original precision of the results.

Assessment limits

Survivorship bias. Not assessed. Historical universe membership is missing (SURVIVORSHIP_BIAS_NOT_CONTROLLED).

Look-ahead bias. Not assessed. The report does not verify when signals became available.

Multiple testing. DSR and PBO cannot be assessed from the evidence supplied.

Costs and execution. Gross and net returns were reconciled with recorded costs. Cost sensitivity and actual execution were not assessed.

Use of AI. The evidence does not say whether Strateva used AI in the review.

Advice. This report does not constitute investment advice.

Performance and risk

Absolute performance · Strategy and benchmark

Metric	Strategy	Benchmark
Observations `n_obs`	1005	1005
Periods per year `annualization`	252	252
Annual risk-free rate `risk_free_annual`	2%	2%
Cumulative return `total_return`	2.00543%	38.1946%
Annualized compound return (CAGR) `cagr`	0.499119%	8.4495%
Annualized arithmetic return `annual_return_arithmetic`	0.879685%	9.37819%
Annualized volatility `annual_volatility`	8.73971%	15.9102%
Sharpe `sharpe`	-0.1259373	0.4649763
Sortino `sortino`	-0.1727407	0.6579216
Maximum drawdown `max_drawdown`	-16.7269%	-26.9036%
Periods to the maximum drawdown trough `max_drawdown_underwater_periods`	123	233
Periods from the previous peak to recovery `max_drawdown_recovery_periods`	605	561
Calmar `calmar`	0.0298392	0.3140656
Share of positive periods `positive_period_rate`	52.5373%	53.2338%
Alias for the share of positive periods `hit_rate`	52.5373%	53.2338%

Absolute performance · Strategy and benchmark

Metric	Strategy	Benchmark
Skewness `skewness`	-0.1835745	-0.1443375
Excess kurtosis `excess_kurtosis`	2.327383	1.959894

Active performance · Strategy versus benchmark

Field	Value
Observations `n_obs`	1005
Periods per year `annualization`	252
Annual risk-free rate `risk_free_annual`	2%
Annualized active return `active_return_annual`	-8.4985%
Annualized tracking error `tracking_error_annual`	11.3864%
Information ratio `information_ratio`	-0.7463704
Correlation with the benchmark `correlation`	0.7186784
Beta `beta`	0.3947815
Annualized regression alpha `regression_alpha_annual`	-2.82265%
Annualized Jensen alpha `jensen_alpha_annual`	-4.02119%
Strategy Sharpe ratio `strategy_sharpe`	-0.1259373
Benchmark Sharpe ratio `benchmark_sharpe`	0.4649763

Statistical uncertainty

Strategy · Mean excess return · HAC

Field	Value
Status `status`	evaluated
Observations `n_obs`	1005
Lags `lags`	6
Weighting kernel `kernel`	bartlett
Estimate per period `estimate`	-0.00436768%
Annualized estimate `annualized_estimate`	-1.10066%
Standard error `standard_error`	0.0170986%
Annualized standard error `annualized_standard_error`	4.30885%

Strategy · Mean excess return · HAC	
Field	**Value**
t-statistic `t_stat`	-0.2554404
Two-sided p-value (normal) `p_value_two_sided_normal`	0.798383

Strategy · Sharpe ratio interval · block bootstrap	
Field	**Value**
Observations `n_obs`	1005
Block length `block_length`	10
Replications `repetitions`	1000
Seed `seed`	20261117
Confidence level `confidence`	95%
Lower-tail probability `lower_probability`	2.5%
Upper-tail probability `upper_probability`	97.5%
Replications attempted `attempted_repetitions`	1000
Valid replications `valid_repetitions`	1000
Replications with no defined estimate `undefined_repetitions`	0
Status `status`	evaluated
Point estimate `point_estimate`	-0.1259373
Standard error `standard_error`	0.5106627
Lower interval bound `ci_lower`	-1.165137
Upper interval bound `ci_upper`	0.8409793

Benchmark · No uncertainty estimate supplied.

Active performance · Mean active return · HAC	
Field	**Value**
Status `status`	evaluated
Observations `n_obs`	1005
Lags `lags`	6
Weighting kernel `kernel`	bartlett
Estimate per period `estimate`	-0.0337242%

Active performance · Mean active return · HAC	
Field	**Value**
Annualized estimate `annualized_estimate`	-8.4985%
Standard error `standard_error`	0.0211749%
Annualized standard error `annualized_standard_error`	5.33607%
t-statistic `t_stat`	-1.592652
Two-sided p-value (normal) `p_value_two_sided_normal`	0.1112382

Active performance · Information ratio interval · block bootstrap	
Field	**Value**
Observations `n_obs`	1005
Block length `block_length`	10
Replications `repetitions`	1000
Seed `seed`	20261117
Confidence level `confidence`	95%
Lower-tail probability `lower_probability`	2.5%
Upper-tail probability `upper_probability`	97.5%
Replications attempted `attempted_repetitions`	1000
Valid replications `valid_repetitions`	1000
Replications with no defined estimate `undefined_repetitions`	0
Status `status`	evaluated
Point estimate `point_estimate`	-0.7463704
Standard error `standard_error`	0.4693196
Lower interval bound `ci_lower`	-1.648381
Upper interval bound `ci_upper`	0.1573222

Subperiods and robustness

Additional metrics · No evidence supplied.

Verification and configuration

Engine checks	
Field	**Value**
Schemas valid `schema_valid`	Yes
Evidence hash valid `hash_valid`	Yes
Signature verified `signature_verified`	No
Confirmatory provenance verified `confirmatory_provenance_verified`	No
`reconciliation.tolerance`	1e-09
Status `reconciliation.status`	reconciled
Metric paths checked `reconciliation.checkedPathCount`	96
Hash bindings valid `hash_bindings_valid`	Yes
Metrics reconciled `metrics_reconciled`	Yes
Simulations reproduced `simulations_reproduced`	Yes
`kernelVersion`	1.1.0

Decision thresholds · No evidence supplied.

Engine configuration	
Field	**Value**
Periods per year `annualization`	252
Annualization method `annualizationMethod`	declared by StrategyTrace.frequency.periodsPerYear
Annual risk-free rate `riskFreeAnnual`	2%
`allowPositional`	No
`timezone`	UTC
`calendar`	XNYS
Confidence level `uncertainty.confidence`	95%
`uncertainty.hacLagPolicy.kind`	sample-size-bartlett-v1
`uncertainty.timeBasis.kind`	session-grid
Expected calendar hash `uncertainty.timeBasis.expectedEndsHash`	`8e1fe64e981335d7a376af88b2f10b3166ba81d4a3a81e8f5aed948cd115e7e3`
Block length `uncertainty.blockLength`	10
Replications `uncertainty.repetitions`	1000
Seed `uncertainty.seed`	20261117

Monte Carlo

Observed path

Field	Value
Terminal wealth (multiple) `terminalWealth`	1.020054
Cumulative return `totalReturn`	2.00543%
Maximum drawdown magnitude `maximumDrawdown`	16.7269%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	604
Share of periods below the peak `timeUnderWaterFraction`	95.8209%
Longest losing streak (periods) `longestLosingStreak`	9
Ruin threshold reached `ruined`	No

Circular block bootstrap

Metric	Minimum	Mean	Maximum	Quantiles
Terminal wealth (multiple) `terminalWealth`	0.6145966	1.0343	1.803867	5% = 0.7663271 · 50% = 1.018266 · 95% = 1.369681
Cumulative return `totalReturn`	-38.5403%	3.42998%	80.3867%	5% = -23.3673% · 50% = 1.82659% · 95% = 36.9681%
Maximum drawdown magnitude `maximumDrawdown`	5.28055%	18.19%	43.0633%	5% = 9.04985% · 50% = 17.1389% · 95% = 31.6834%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	82	610.075	1005	5% = 206.95 · 50% = 602.5 · 95% = 997
Share of periods below the peak `timeUnderWaterFraction`	82.8856%	95.8688%	100%	5% = 89.9453% · 50% = 96.4179% · 95% = 99.7015%
Longest losing streak (periods) `longestLosingStreak`	5	8.491	17	5% = 6 · 50% = 8 · 95% = 11
Probability of reaching the ruin threshold `ruinProbability`		0%		

Return-order permutation

Metric	Minimum	Mean	Maximum	Quantiles
Maximum drawdown magnitude `maximumDrawdown`	8.66425%	17.0423%	31.9308%	5% = 11.5704% · 50% = 16.6344% · 95% = 24.2025%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	180	613.072	999	5% = 311 · 50% = 600.5 · 95% = 955
Share of periods below the peak `timeUnderWaterFraction`	91.0448%	96.8199%	99.801%	5% = 93.8259% · 50% = 97.0149% · 95% = 98.9104%
Longest losing streak (periods) `longestLosingStreak`	6	8.702	18	5% = 7 · 50% = 8 · 95% = 12
Probability of reaching the ruin threshold `ruinProbability`		0%		

Simulation settings and bindings

Field	Value
`simulationSchemaVersion`	strateva-simulation-evidence/v2

Simulation settings and bindings	
Field	**Value**
`engineVersion`	0.9.0
`kernelVersion`	1.1.0
`observationCount`	1005
`strategyTraceHash`	`ee74df1a8681ecc20253e937881fbafd7cd98fced883944c93cfc496d2fbc328`
`contentHash`	`f3741205ac26175f9aa32dd05eb560d8483f668f83b7e1bb0e40271fe890de36`
Replications `configuration.repetitions`	1000
Seed `configuration.seed`	20261117
Block length `configuration.blockLength`	10
Initial wealth `configuration.initialWealth`	1
Ruin threshold (share of initial wealth) `configuration.ruinWealthFraction`	50%
`configuration.quantiles`	5% · 50% · 95%
`classic.method`	CIRCULAR_MOVING_BLOCK_BOOTSTRAP
`classic.sampling`	WITH_REPLACEMENT
`permuted.method`	FISHER_YATES_RETURN_ORDER_PERMUTATION
`permuted.sampling`	WITHOUT_REPLACEMENT
Terminal wealth invariant `permuted.terminalWealthInvariant`	Yes
Terminal wealth (multiple) `permuted.terminalWealth`	1.020054

Provenance and traceability

Evidence and input hashes	
Field	**Value**
`bundleSchemaVersion`	strateva-evidence-bundle/v3
`artifactId`	`urn:strateva:strategy-trace:ee74df1a8681ecc20253e937881fbafd7cd98fced883944c93cfc496d2fbc328`
`engineVersion`	0.9.0
`kernelVersion`	1.1.0
`generatedAt`	2026-11-17T18:08:09Z
`contentHash`	`39646ea81f13c7e1a9792c099c21782d7480788ac0f4ff9b4cc68dfa202a7887`
Strategy return series hash `inputHashes.strategyReturns`	9970d7264119c279f6a0133e7bdf3a7687a2bac0b85fc877637438a3c21964be
Benchmark return series hash `inputHashes.benchmarkReturns`	ba99e5a780ddada37d64f41a50e643150fd4a9113a76757514e56c6d52a1341d

Evidence and input hashes	
Field	**Value**
`lineage`	strategyTrace:ee74df1a8681ecc20253e937881fbafd7cd98fced883944c93cfc496d2fbc328 · scope:8b7af6c9b2f1be8a179e771b1a41734da3fa8814a5fb2407e73fcb049ac4bd38 · artifact:b21e0248f03a1c2143a5a9eba57d9292a886311616f22567d1cce36a123ed67d · data:fa1c22f9b95955ece97683486438e0baac1bf5d11b364d6c8e040320d030dd52

Provenance statement	
Field	**Value**
`claim`	development
`runId`	N/A
`freezeHash`	N/A
`engineCommit`	N/A
`containerImageDigest`	N/A

Evidence signature · No evidence supplied.

StrategyTrace · Identity, frequency, conventions and benchmark	
Field	**Value**
`traceSchemaVersion`	strateva-strategy-trace/v1
`engagementId`	eng-b21e0248
`runId`	mst-hrp-allocation-development
`generatedAt`	2026-11-17T18:08:09Z
`scopeContentHash`	`8b7af6c9b2f1be8a179e771b1a41734da3fa8814a5fb2407e73fcb049ac4bd38`
`artifactContentHash`	`b21e0248f03a1c2143a5a9eba57d9292a886311616f22567d1cce36a123ed67d`
`dataContentHash`	`fa1c22f9b95955ece97683486438e0baac1bf5d11b364d6c8e040320d030dd52`
`frequency.barInterval`	1d
Periods per year `frequency.periodsPerYear`	252
`frequency.calendar`	XNYS
`frequency.sourceTimezone`	America/New_York
`conventions.returnType`	SIMPLE
`conventions.returnUnit`	FRACTION
`conventions.timestampMeaning`	UTC_PERIOD_END
`conventions.turnover`	SUM_ABSOLUTE_POSITION_CHANGES
`conventions.exposure`	FRACTION_OF_EQUITY
`conventions.costs`	RETURN_FRACTION
`benchmark.kind`	SERIES
`benchmark.symbol`	URTH
`contentHash`	`ee74df1a8681ecc20253e937881fbafd7cd98fced883944c93cfc496d2fbc328`

Notes included in the evidence	
Field	**Value**
`disclosures`	The engine recomputed the metrics from verified StrategyTrace net returns. · Monte Carlo has its own hash. It affects criteria only if preregistered for that purpose.