HMM semivariance regime allocation

> **Strategy evaluated** · **Nivel de evidencia** Histórico · Development · Sample 2014-02-05 21:00:00+00:00 to 2018-12-31 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
Annualized arithmetic return `annual_return_arithmetic`	0.933545%	4.47786%
Annualized volatility `annual_volatility`	8.3429%	13.7402%
Periods per year `annualization`	252	252
Annualized compound return (CAGR) `cagr`	0.586656%	3.59442%
Calmar `calmar`	0.03491377	0.1734758
Excess kurtosis `excess_kurtosis`	10.02718	3.564662
Alias for the share of positive periods `hit_rate`	48.9879%	53.0364%
Maximum drawdown `max_drawdown`	-16.803%	-20.72%
Periods from the previous peak to recovery `max_drawdown_recovery_periods`	N/A	444
Periods to the maximum drawdown trough `max_drawdown_underwater_periods`	767	185
Observations `n_obs`	1235	1235
Share of positive periods `positive_period_rate`	48.9879%	53.0364%
Annual risk-free rate `risk_free_annual`	2%	2%
Sharpe `sharpe`	-0.1254714	0.1817667
Skewness `skewness`	-0.665797	-0.5568905

Absolute performance · Strategy and benchmark		
Metric	**Strategy**	**Benchmark**
Sortino `sortino`	-0.1689394	0.2470617
Cumulative return `total_return`	2.90816%	18.8941%

Active performance · Strategy versus benchmark	
Field	**Value**
Annualized active return `active_return_annual`	-3.54431%
Periods per year `annualization`	252
Benchmark Sharpe ratio `benchmark_sharpe`	0.1817667
Beta `beta`	0.2050874
Correlation with the benchmark `correlation`	0.3377661
Information ratio `information_ratio`	-0.2634762
Annualized Jensen alpha `jensen_alpha_annual`	-1.55901%
Observations `n_obs`	1235
Annualized regression alpha `regression_alpha_annual`	0.0151922%
Annual risk-free rate `risk_free_annual`	2%
Strategy Sharpe ratio `strategy_sharpe`	-0.1254714
Annualized tracking error `tracking_error_annual`	13.4521%

Statistical uncertainty

Strategy · Sharpe ratio interval · block bootstrap	
Field	**Value**
Replications attempted `attempted_repetitions`	1000
Block length `block_length`	5
Lower interval bound `ci_lower`	-0.8976211
Upper interval bound `ci_upper`	0.7332358
Confidence level `confidence`	95%
Lower-tail probability `lower_probability`	2.5%
Observations `n_obs`	1235
Point estimate `point_estimate`	-0.1254714

Strategy · Sharpe ratio interval · block bootstrap	
Field	**Value**
Replications `repetitions`	1000
Seed `seed`	42
Standard error `standard_error`	0.4209043
Status `status`	evaluated
Replications with no defined estimate `undefined_repetitions`	0
Upper-tail probability `upper_probability`	97.5%
Valid replications `valid_repetitions`	1000

Strategy · Mean excess return · HAC	
Field	**Value**
Annualized estimate `annualized_estimate`	-1.0468%
Annualized standard error `annualized_standard_error`	3.38712%
Estimate per period `estimate`	-0.00415395%
Weighting kernel `kernel`	bartlett
Lags `lags`	6
Observations `n_obs`	1235
Two-sided p-value (normal) `p_value_two_sided_normal`	0.7572822
Standard error `standard_error`	0.013441%
Status `status`	evaluated
t-statistic `t_stat`	-0.3090516

Benchmark · No uncertainty estimate supplied.

Active performance · Information ratio interval · block bootstrap	
Field	**Value**
Replications attempted `attempted_repetitions`	1000
Block length `block_length`	5
Lower interval bound `ci_lower`	-1.089001
Upper interval bound `ci_upper`	0.5922272
Confidence level `confidence`	95%

Active performance · Information ratio interval · block bootstrap	
Field	**Value**
Lower-tail probability `lower_probability`	2.5%
Observations `n_obs`	1235
Point estimate `point_estimate`	-0.2634762
Replications `repetitions`	1000
Seed `seed`	42
Standard error `standard_error`	0.4327841
Status `status`	evaluated
Replications with no defined estimate `undefined_repetitions`	0
Upper-tail probability `upper_probability`	97.5%
Valid replications `valid_repetitions`	1000

Active performance · Mean active return · HAC	
Field	**Value**
Annualized estimate `annualized_estimate`	-3.54431%
Annualized standard error `annualized_standard_error`	5.50306%
Estimate per period `estimate`	-0.0140647%
Weighting kernel `kernel`	bartlett
Lags `lags`	6
Observations `n_obs`	1235
Two-sided p-value (normal) `p_value_two_sided_normal`	0.5195351
Standard error `standard_error`	0.0218375%
Status `status`	evaluated
t-statistic `t_stat`	-0.6440622

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**
`allowPositional`	No
Periods per year `annualization`	252
Annualization method `annualizationMethod`	declared by StrategyTrace.frequency.periodsPerYear
`calendar`	XNYS
Annual risk-free rate `riskFreeAnnual`	2%
`timezone`	UTC
Block length `uncertainty.blockLength`	5
Confidence level `uncertainty.confidence`	95%
`uncertainty.hacLagPolicy.kind`	sample-size-bartlett-v1
Replications `uncertainty.repetitions`	1000
Seed `uncertainty.seed`	42
Expected calendar hash `uncertainty.timeBasis.expectedEndsHash`	`ae96aad00d1089b5d846fc3a7ec8c047f67bf019ca2e12b52dbc69a74ed78f74`
`uncertainty.timeBasis.kind`	session-grid

Monte Carlo

Observed path

Field	Value
Longest losing streak (periods) `longestLosingStreak`	8
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	991
Maximum drawdown magnitude `maximumDrawdown`	16.803%
Ruin threshold reached `ruined`	No
Terminal wealth (multiple) `terminalWealth`	1.029082
Share of periods below the peak `timeUnderWaterFraction`	91.417%
Cumulative return `totalReturn`	2.90816%

Circular block bootstrap

Metric	Minimum	Mean	Maximum	Quantiles
Longest losing streak (periods) `longestLosingStreak`	5	8.629	18	5% = 6 · 50% = 8 · 95% = 12
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	106	722.171	1235	5% = 246.95 · 50% = 692 · 95% = 1222
Maximum drawdown magnitude `maximumDrawdown`	5.35125%	17.2188%	44.9415%	5% = 8.47645% · 50% = 15.8685% · 95% = 29.1699%
Probability of reaching the ruin threshold `ruinProbability`		0%		
Terminal wealth (multiple) `terminalWealth`	0.5682097	1.049895	1.899089	5% = 0.7889111 · 50% = 1.039883 · 95% = 1.36705
Share of periods below the peak `timeUnderWaterFraction`	85.668%	95.9979%	100%	5% = 90.1984% · 50% = 96.5992% · 95% = 99.6761%
Cumulative return `totalReturn`	-43.179%	4.98954%	89.9089%	5% = -21.1089% · 50% = 3.98833% · 95% = 36.705%

Return-order permutation

Metric	Minimum	Mean	Maximum	Quantiles
Longest losing streak (periods) `longestLosingStreak`	6	8.609	18	5% = 7 · 50% = 8 · 95% = 11
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	180	740.469	1218	5% = 375 · 50% = 720 · 95% = 1145.05
Maximum drawdown magnitude `maximumDrawdown`	8.30428%	17.424%	33.1905%	5% = 11.5773% · 50% = 16.9032% · 95% = 24.9816%
Probability of reaching the ruin threshold `ruinProbability`		0%		
Share of periods below the peak `timeUnderWaterFraction`	89.7166%	96.8483%	99.5951%	5% = 94.251% · 50% = 97.004% · 95% = 99.0283%

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`	1235
`strategyTraceHash`	`b9648544d89aa5879e43a3a394a85b61225414f850751ff85fd605f3e341eeaf`
`contentHash`	`5647ee22127f5ded37cdb716fde1342dda00cf4711f3b93b888045007626121a`
Block length `configuration.blockLength`	5
Initial wealth `configuration.initialWealth`	1
`configuration.quantiles`	5% · 50% · 95%
Replications `configuration.repetitions`	1000
Ruin threshold (share of initial wealth) `configuration.ruinWealthFraction`	50%
Seed `configuration.seed`	42
`classic.method`	CIRCULAR_MOVING_BLOCK_BOOTSTRAP
`classic.sampling`	WITH_REPLACEMENT
`permuted.method`	FISHER_YATES_RETURN_ORDER_PERMUTATION
`permuted.sampling`	WITHOUT_REPLACEMENT
Terminal wealth (multiple) `permuted.terminalWealth`	1.029082
Terminal wealth invariant `permuted.terminalWealthInvariant`	Yes

Provenance and traceability

Evidence and input hashes	
Field	**Value**
`bundleSchemaVersion`	strateva-evidence-bundle/v3
`artifactId`	`urn:strateva:strategy-trace:b9648544d89aa5879e43a3a394a85b61225414f850751ff85fd605f3e341eeaf`
`engineVersion`	0.9.0
`kernelVersion`	1.1.0
`generatedAt`	2026-11-17T17:17:50Z
`contentHash`	`976bc25a192631de4ce543200573dd60becfe06df3fa9e9ba740decc07fa38bb`
Benchmark return series hash `inputHashes.benchmarkReturns`	e613326f7612e95c214177ec25f8ce11acc54352716f3cb302ed574c63a200df
Strategy return series hash `inputHashes.strategyReturns`	632fa69fe28562c17b1b7d0eb5e2ff72e43ac310568790e0f458b330692c3c06

Evidence and input hashes	
Field	**Value**
`lineage`	strategyTrace:b9648544d89aa5879e43a3a394a85b61225414f850751ff85fd605f3e341eeaf · scope:478f4ecfdf3362079e6c5537272d10df097037e46bc59c22e8c4401492cb715d · artifact:6e59209ab69b96cc78802063bca5931ba61b4141242a1c43c3333f522b97cdda · data:73db4bff1acb2d6de3bfd9ee0c50ce2c9d3a37097b5b079be6a7533b989c9065

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

Evidence signature · No evidence supplied.

StrategyTrace · Identity, frequency, conventions and benchmark	
Field	**Value**
`artifactContentHash`	`6e59209ab69b96cc78802063bca5931ba61b4141242a1c43c3333f522b97cdda`
`benchmark.kind`	SERIES
`benchmark.symbol`	URTH
`contentHash`	`b9648544d89aa5879e43a3a394a85b61225414f850751ff85fd605f3e341eeaf`
`conventions.costs`	RETURN_FRACTION
`conventions.exposure`	FRACTION_OF_EQUITY
`conventions.returnType`	SIMPLE
`conventions.returnUnit`	FRACTION
`conventions.timestampMeaning`	UTC_PERIOD_END
`conventions.turnover`	SUM_ABSOLUTE_POSITION_CHANGES
`dataContentHash`	`73db4bff1acb2d6de3bfd9ee0c50ce2c9d3a37097b5b079be6a7533b989c9065`
`engagementId`	eng-46a42cd3
`frequency.barInterval`	1d
`frequency.calendar`	XNYS
Periods per year `frequency.periodsPerYear`	252
`frequency.sourceTimezone`	America/New_York
`generatedAt`	2026-11-17T17:17:50Z
`runId`	frozen-source-replay-hmm-semivariance-allocation
`scopeContentHash`	`478f4ecfdf3362079e6c5537272d10df097037e46bc59c22e8c4401492cb715d`
`traceSchemaVersion`	strateva-strategy-trace/v1

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.