SPY volatility regime strategy

Strategy evaluated · **Nivel de evidencia** Histórico · Development · Sample 2020-01-02 14:30:00+00:00 to 2024-12-31 14:30:00+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`	1258	1258
Periods per year `annualization`	252	252
Annual risk-free rate `risk_free_annual`	2%	2%
Cumulative return `total_return`	68.0549%	59.0997%
Annualized compound return (CAGR) `cagr`	10.9588%	9.74835%
Annualized arithmetic return `annual_return_arithmetic`	10.9725%	11.1748%
Annualized volatility `annual_volatility`	10.6851%	19.2599%
Sharpe `sharpe`	0.8415572	0.4773876
Sortino `sortino`	1.185145	0.638322
Maximum drawdown `max_drawdown`	-16.96%	-32.2334%
Periods to the maximum drawdown trough `max_drawdown_underwater_periods`	326	27
Periods from the previous peak to recovery `max_drawdown_recovery_periods`	420	137
Calmar `calmar`	0.6461577	0.3024297
Share of positive periods `positive_period_rate`	50.7949%	55.8824%
Alias for the share of positive periods `hit_rate`	50.7949%	55.8824%

Absolute performance · Strategy and benchmark		
Metric	**Strategy**	**Benchmark**
Skewness `skewness`	-0.4599959	-1.125332
Excess kurtosis `excess_kurtosis`	3.666225	10.17827

Active performance · Strategy versus benchmark	
Field	**Value**
Observations `n_obs`	1258
Periods per year `annualization`	252
Annual risk-free rate `risk_free_annual`	2%
Annualized active return `active_return_annual`	-0.202289%
Annualized tracking error `tracking_error_annual`	14.0647%
Information ratio `information_ratio`	-0.01438273
Correlation with the benchmark `correlation`	0.6980253
Beta `beta`	0.3872549
Annualized regression alpha `regression_alpha_annual`	6.645%
Annualized Jensen alpha `jensen_alpha_annual`	5.43155%
Strategy Sharpe ratio `strategy_sharpe`	0.8415572
Benchmark Sharpe ratio `benchmark_sharpe`	0.4773876

Statistical uncertainty

Strategy · Mean excess return · HAC	
Field	**Value**
Status `status`	evaluated
Observations `n_obs`	1258
Lags `lags`	7
Weighting kernel `kernel`	bartlett
Estimate per period `estimate`	0.0356831%
Annualized estimate `annualized_estimate`	8.99214%
Standard error `standard_error`	0.0181355%
Annualized standard error `annualized_standard_error`	4.57015%

Strategy · Mean excess return · HAC	
Field	**Value**
t-statistic `t_stat`	1.967581
Two-sided p-value (normal) `p_value_two_sided_normal`	0.04911625

Strategy · Sharpe ratio interval · block bootstrap	
Field	**Value**
Observations `n_obs`	1258
Block length `block_length`	11
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`	0.8415572
Standard error `standard_error`	0.4496161
Lower interval bound `ci_lower`	-0.02480773
Upper interval bound `ci_upper`	1.741493

Benchmark · No uncertainty estimate supplied.

Active performance · Mean active return · HAC	
Field	**Value**
Status `status`	evaluated
Observations `n_obs`	1258
Lags `lags`	7
Weighting kernel `kernel`	bartlett
Estimate per period `estimate`	-0.000802733%

Active performance · Mean active return · HAC	
Field	**Value**
Annualized estimate `annualized_estimate`	-0.202289%
Standard error `standard_error`	0.0259094%
Annualized standard error `annualized_standard_error`	6.52916%
t-statistic `t_stat`	-0.03098235
Two-sided p-value (normal) `p_value_two_sided_normal`	0.9752836

Active performance · Information ratio interval · block bootstrap	
Field	**Value**
Observations `n_obs`	1258
Block length `block_length`	11
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`	-0.01438273
Standard error `standard_error`	0.4945228
Lower interval bound `ci_lower`	-1.036252
Upper interval bound `ci_upper`	0.8387308

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`	`df5ba13c0f7c471f1519360bced8097dcfafacbe318594add1509214baee2c26`
Block length `uncertainty.blockLength`	11
Replications `uncertainty.repetitions`	1000
Seed `uncertainty.seed`	20261117

Monte Carlo

Observed path

Field	Value
Terminal wealth (multiple) `terminalWealth`	1.680549
Cumulative return `totalReturn`	68.0549%
Maximum drawdown magnitude `maximumDrawdown`	16.96%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	419
Share of periods below the peak `timeUnderWaterFraction`	79.2528%
Longest losing streak (periods) `longestLosingStreak`	6
Ruin threshold reached `ruined`	No

Circular block bootstrap

Metric	Minimum	Mean	Maximum	Quantiles
Terminal wealth (multiple) `terminalWealth`	0.8011665	1.750715	3.512496	5% = 1.180806 · 50% = 1.70033 · 95% = 2.469443
Cumulative return `totalReturn`	-19.8834%	75.0715%	251.25%	5% = 18.0806% · 50% = 70.033% · 95% = 146.944%
Maximum drawdown magnitude `maximumDrawdown`	5.17976%	14.3097%	33.7587%	5% = 8.48488% · 50% = 13.4307% · 95% = 22.8143%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	66	337.109	1258	5% = 123.95 · 50% = 280 · 95% = 759.05
Share of periods below the peak `timeUnderWaterFraction`	74.8013%	87.8905%	100%	5% = 80.2862% · 50% = 88.0763% · 95% = 94.9921%
Longest losing streak (periods) `longestLosingStreak`	5	7.173	12	5% = 6 · 50% = 7 · 95% = 9
Probability of reaching the ruin threshold `ruinProbability`		0%		

Return-order permutation

Metric	Minimum	Mean	Maximum	Quantiles
Maximum drawdown magnitude `maximumDrawdown`	7.22699%	14.1974%	28.3731%	5% = 9.59772% · 50% = 13.7698% · 95% = 20.1953%
Longest stretch below the peak (periods) `longestUnderwaterStreakPeriods`	95	323.139	811	5% = 162 · 50% = 298 · 95% = 558.15
Share of periods below the peak `timeUnderWaterFraction`	85.7711%	89.7409%	93.0048%	5% = 87.8378% · 50% = 89.8251% · 95% = 91.3355%
Longest losing streak (periods) `longestLosingStreak`	5	7.626	15	5% = 6 · 50% = 7 · 95% = 10
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`	1258
`strategyTraceHash`	`161a067349b84bb7eb1a0e5afe114bd723c8bbe56e362bbd3ccb4d8a699c5f09`
`contentHash`	`db42925480c5becb9231e2dbaf2209be0ca38e5feded724a751fbe00cc17f067`
Replications `configuration.repetitions`	1000
Seed `configuration.seed`	20261117
Block length `configuration.blockLength`	11
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`	1.680549

Provenance and traceability

Evidence and input hashes	
Field	**Value**
`bundleSchemaVersion`	strateva-evidence-bundle/v3
`artifactId`	`urn:strateva:strategy-trace:161a067349b84bb7eb1a0e5afe114bd723c8bbe56e362bbd3ccb4d8a699c5f09`
`engineVersion`	0.9.0
`kernelVersion`	1.1.0
`generatedAt`	2026-11-17T17:39:00Z
`contentHash`	`7ee52f77a8389884b412055c7fbb10848bcc6a128e6fcc0916bf45f5a02a2cec`
Strategy return series hash `inputHashes.strategyReturns`	5b07c2ecaac9a6eee1e7ee6745270aa0041f21d29453d6d8183726780d7d4ee2
Benchmark return series hash `inputHashes.benchmarkReturns`	7c9efc25c31c103d244dae0717bbaf2af1c86c7f20f299367ae96791b959a63f

Evidence and input hashes	
Field	**Value**
`lineage`	strategyTrace:161a067349b84bb7eb1a0e5afe114bd723c8bbe56e362bbd3ccb4d8a699c5f09 · scope:5c6112a41e9febe148db308b052a850fec6aef1b075a7ab032fd07d6ed507ed6 · artifact:d4089eeab4d33edaf587e5f745a95e3a3a1b47d501333f9ee59375e37c0f4418 · data:4353b087f128840fa8f5048d8c312072af01da947bb1e14811dd6b3abf29ef4a

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-d4089eea
`runId`	rule-based-market-regimes-development
`generatedAt`	2026-11-17T17:39:00Z
`scopeContentHash`	`5c6112a41e9febe148db308b052a850fec6aef1b075a7ab032fd07d6ed507ed6`
`artifactContentHash`	`d4089eeab4d33edaf587e5f745a95e3a3a1b47d501333f9ee59375e37c0f4418`
`dataContentHash`	`4353b087f128840fa8f5048d8c312072af01da947bb1e14811dd6b3abf29ef4a`
`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`	`161a067349b84bb7eb1a0e5afe114bd723c8bbe56e362bbd3ccb4d8a699c5f09`

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.