# Data Dictionary – Deep Hedging with Reinforcement Learning Project

We are limiting ourselves to some sort of bias for current constituents of the S&P500 bc no one is doing all the work to adjust this when the index adjusts lol.

# 1. Underlying (SPX / SPY)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Field | Description | Source | Frequency | Usage |
| date | Trading date | yfinance | Daily | Join key; align with option data |
| ticker | SPX Index, SPY ETF | yfinance | Daily | Filtering consistency |
| px\_close | Closing price (adj for SPY) | yfinance | Daily | Underlying for options, return calc |
| ret\_d | Daily return | calc from yfinance | Daily | Simulation replays, realized vol |
| dividend\_yield | Dividend yield (SPY) | Bloomberg optional | Monthly | Forward pricing inputs |
| rf\_rate | Risk-free curve (Treasuries/OIS) | Bloomberg / FRED | Daily | Discounting, forwards |
| realized\_vol\_n | n-day realized vol (e.g., 10/20) | calc | Daily | Volatility calibration |
| vix | VIX index | Bloomberg / FRED | Daily | Volatility regime tagging |

## 2. Option Chains (SPX & SPY)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Field | Description | Source | Frequency | Usage |
| date | Trading date | Bloomberg (OV, OMON) | Daily | Join key |
| root | Underlying root (SPX, SPY) | Bloomberg | Daily | Filtering |
| option\_symbol | Unique option contract ID | Bloomberg | Daily | Traceability |
| cp\_flag | Call or Put flag | Bloomberg | Daily | Payoff structure |
| strike | Strike price | Bloomberg | Daily | Option definition |
| expiry | Expiration date | Bloomberg | Daily | Time to maturity |
| bid/ask/mid | Bid, Ask, and Mid prices | Bloomberg | Daily | Transaction costs, pricing inputs |
| iv | Implied volatility | Bloomberg | Daily | Vol surface calibration |
| delta/gamma/vega/theta/rho | Option Greeks | Bloomberg | Daily | State features, benchmarks |
| open\_interest | Open interest | Bloomberg | Daily | Liquidity filter |
| volume | Trading volume | Bloomberg | Daily | Liquidity diagnostics |
| bid\_ask\_spread\_bp | Relative spread in basis points | calc | Daily | Transaction cost proxy |
| moneyness\_delta | Delta-based moneyness bucket | calc | Daily | Vol surface comparison |
| dte | Days to expiry | calc | Daily | Tenor bucketing |

## 3. Calibration Inputs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Field | Description | Source | Frequency | Usage |
| iv\_term\_structure | IV across maturities (7D, 30D, 60D, etc.) | Bloomberg | Daily | Term structure calibration |
| skew\_rr25 | 25-delta risk reversal | calc from IVs | Daily | Skew metric |
| butterfly\_bf25 | 25-delta butterfly | calc from IVs | Daily | Smile curvature |
| heston\_params | Calibrated (κ, θ, σ, ρ, v0) | calc | Weekly/Monthly | Stochastic vol calibration |
| svi\_params | SVI surface fit parameters | calc | Daily | Arbitrage-free surface |
| cost\_grid | Median bid–ask spread by tenor × delta | calc | Weekly | Transaction cost modeling |

## 4. Replay & Evaluation Sets

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| --- | --- | --- | --- | --- |
| Field | Description | Source | Frequency | Usage |
| replay\_paths | Historical SPX/SPY price paths | yfinance | Daily | OOS hedging replay |
| crisis\_flags | Market regime labels (e.g., COVID crash) | calc (VIX > 30, etc.) | Daily | Scenario testing |
| benchmark\_hedges | Delta and delta-gamma hedge results | calc | Daily | Baselines for comparison |