Swap Valuation and Curve Sensitivities

Reusable rates analytics module: curve bootstrapping, swap pricing, and DV01/BP01 risk reporting.

Problem

- Need a clean, testable rates analytics toolkit for scenario analysis and swap valuation without vendor lock-in.
- Produce decision-ready risk measures (DV01/BP01) across maturities and shocks.

Approach

- Curve layer: discount and forward curve objects; bootstrapping from a minimal instrument set (configurable).
- Pricing: par swap rate, PV, and cashflow schedules; supports scenario curve shifts (parallel/steepener/flattener).
- Risk: DV01/BP01 computed via bump-and-reprice; outputs aggregated by tenor buckets.
- Quality: unit-testable pricing and sensitivity routines; sanity checks for monotonicity and curve consistency.

Outputs

- Curve and par-rate tables across maturities; PV and sensitivity tables per swap or portfolio.
- Scenario matrix showing PV and DV01 changes under predefined shocks.
- Plots for curve shapes and sensitivity distribution across tenors.

Tech Stack

Python, numerical routines for curve construction, test suite for core analytics.

Next Improvements

- Add OIS discounting + multiple-curve framework and simple convexity adjustments.
- Support swaption vol inputs for option-consistent scenario impacts (where data is available).
- Packaging as a small library with CLI and notebook examples.