3D Credit Idea Engine (Euro IG Financials)

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1 Abstract

Objective: This project produces bond-level trade ideas for Euro Investment Grade (Financials) by computing a compact *Risk–Return–Sustainability* scorecard and tagging each idea for mandate fit (Protection Credit vs. Global Credit). Final output is a set of idea cards automatically generated from CSV inputs.

2 Overview

2.1 Motivation

Portfolio managers need idea flows that transparently balance three dimensions:

- **Risk** — interest-rate/spread sensitivity, liquidity, and shock P/L.
- **Return** — carry, rolldown, and convergence of fair-value gaps.
- **Sustainability** — material, sector-specific factors and trajectory.

2.2 Scope

Universe is a small demo set of Euro IG financials (banks, insurers, real estate). The architecture is intentionally simple and fully local, so it can run without vendor data or API keys.

3 Data & Assumptions

- `bonds.csv`: ISIN, issuer, sector, rating, maturity, coupon, price, issue size, currency, seniority.
- `curves.csv`: sector OAS by tenor and a risk-free rate term structure.
- `kpi_issuers.csv`: sector-specific KPIs used to derive a sustainability score and trajectory.

All numbers are illustrative. Replace CSVs with public sources for larger universes.

4 Methodology

4.1 Risk

We compute modified duration, DV01/100, a simple key-rate duration (KRD) vector as distance-weighted DV01 contributions to tenor nodes, a liquidity bucket (by issue size), and approximate price P/L for ± 50 and ± 100 bps spread shocks.

4.2 Return

We estimate YTM from price and coupon, approximate the bond OAS as
$textYTM - r_f$, and compare to sector OAS (interpolated by tenor) to obtain a fair-value gap. *Carry* is (
$textYTM -$
$textfunding$), *rolldown* is derived from the sector OAS curve slope at the bond's tenor, and the expected spread change is a partial convergence of the mispricing. We translate expected spread change to price via DV01. Expected loss over the horizon uses a rating-bucket proxy PD times an LGD map by seniority.

4.3 Sustainability

Sector-material proxies yield a $[0, 1]$ sustainability score:

- Banks: higher score for lower coal exposure and higher green-lending share.
- Insurers: higher score for stronger Solvency II coverage.
- Real estate: higher score for lower LTV and higher ICR.

An ordinal trajectory label (improving/flat/deteriorating) is carried through to the idea card.

4.4 Mandate Fit

Protection (Euro IG) filter: EUR currency, investment-grade ratings, and exclusion of AT1; otherwise tagged **Global**.

5 System Architecture

- `curves.py`: sector OAS interpolation, risk-free interpolation, local slope.
- `risk.py`: cashflows, YTM, modified duration, DV01, KRD vector, liquidity, shock P/L.
- `return_model.py`: carry, rolldown, fair-value gap, expected spread change, expected return and expected loss.
- `sust.py`: sector-specific sustainability scoring and trajectory.
- `scorecard.py`: assembles the 3D scorecard.
- `idea_card.py`: renders readable idea cards.
- `cli.py`: command-line entry point writing Markdown to `reports/`.

6 Usage

```
pip install -r requirements.txt
python -m credit3d.cli --data_dir ./data --horizon_months 6 --funding_rate 0.02 --mandate pr
```

7 Results

Below we embed the **final output** produced by the CLI (latest run). This is the exact Markdown emitted by the system and represents the 3D idea cards for the Protection mandate.

Generated Idea Cards (Markdown)

```
# 3D Credit Idea Engine | Protection (h=6m, funding=2.0\%)

## Alpha Bank | XS1234567890 (A, Senior)
**Sector:** Banks | **Tenor:** 4.7y | **Price:** 98.50 | **Mandate Fit:** Protection

**Risk**:
- Mod. Duration: 4.12 | DV01/100: 0.0406
- KRD: 1y: 0.0023, 3y: 0.0049, 5y: 0.0282, 7y: 0.0036, 10y: 0.0016
- Liquidity: 4 | Shock P/L: 50bps -2.060\%, 100bps -4.120\%

**Return**:
- YTM: 0.0387 | OAS (bond/sector): 41.1/128.5 bps | Gap: -87.4 bps
- Carry: 186.6 bps | Rolldown: -2.5 bps | Expected \Delta OAS: 26.2 bps
- **Expected Return (horizon): 2.00\%** | Expected Loss: 0.00\%

**Sustainability**:
- Score: 0.68 | Trajectory: improving | Material: coal_exposure_pct=10.0, green_lending_pct=

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## Beta Insurance | XS0987654321 (BBB, Tier2)
**Sector:** Insurers | **Tenor:** 4.1y | **Price:** 96.80 | **Mandate Fit:** Protection

**Risk**:
- Mod. Duration: 3.642 | DV01/100: 0.0353
- KRD: 1y: 0.0039, 3y: 0.0108, 5y: 0.0142, 7y: 0.0043, 10y: 0.0021
```

```
- Liquidity: 5 | Shock P/L: 50bps -1.820\%, 100bps -3.640\%

**Return**:
- YTM: 0.0489 | OAS (bond/sector): 152.0/168.5 bps | Gap: -16.5 bps
- Carry: 289.1 bps | Rolldown: -3.8 bps | Expected \DeltaOAS: 5.0 bps
- **Expected Return (horizon): 1.60\%** | Expected Loss: 0.10\%

**Sustainability**:
- Score: 0.533 | Trajectory: flat | Material: solvency_coverage=180.0

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## Gamma RE | XS1111111111 (BBB, Senior)
**Sector:** Real Estate | **Tenor:** 6.5y | **Price:** 95.20 | **Mandate Fit:** Protection

**Risk**:
- Mod. Duration: 5.442 | DV01/100: 0.0518
- KRD: 1y: 0.0028, 3y: 0.0044, 5y: 0.0102, 7y: 0.0302, 10y: 0.0043
- Liquidity: 3 | Shock P/L: 50bps -2.720\%, 100bps -5.440\%

**Return**:
- YTM: 0.0590 | OAS (bond/sector): 225.0/216.2 bps | Gap: 8.8 bps
- Carry: 390.0 bps | Rolldown: -3.8 bps | Expected \DeltaOAS: -2.6 bps
- **Expected Return (horizon): 1.70\%** | Expected Loss: 0.10\%

**Sustainability**:
- Score: 0.562 | Trajectory: deteriorating | Material: ltv=45.0, icr=3.5

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```

8 Next Steps

- Replace stub CSVs with larger, public datasets; add more tenor nodes.
- Introduce issuer-level liquidity and curve-fitting robustness checks.
- Add a simple Streamlit front-end for interactive mandate screening.