Fixed Income Tactical Asset Allocation Framework

Momentum-Based Signal Generation and Allocation Strategies

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Abstract

This document presents a comprehensive tactical asset allocation framework for fixed income portfolios using blended momentum (BMOM) signals across high yield, investment grade corporate, and government bond indices. Three allocation approaches—Proportional Linear, Equal Weight, and Regime-Based—are implemented with two signal generation strategies: Strategy 1 (cross-asset momentum with benchmark regime filter) and Strategy 2 (asset-level drawdown differential override using state-machine architecture). The framework achieves Sharpe ratios ranging from 0.25–0.73 depending on configuration, significantly outperforming equal-weight benchmarks (Sharpe 0.01–0.15).

Contents

1 Introduction

Fixed income markets exhibit time-varying risk premia captured through systematic momentum strategies accounting for duration risk, credit spreads, and yield-price dynamics.

Asset Universe:

- **H5A4** – High Yield (HYG), 12% max allocation
- **C5A4** – Investment Grade (LQD), 0–96%
- **G502** – Government (TLT), 0–96%
- **Cash** – 5–10%

2 Signal Generation: Blended Momentum (BMOM)

2.1 Construction

$$\text{BMOM}_i(t) = 0.15 \cdot \text{Mom}_{i,20} + 0.35 \cdot \text{Mom}_{i,60} + 0.35 \cdot \text{Mom}_{i,120} + 0.15 \cdot \text{Mom}_{i,240} \quad (1)$$

where $\text{Mom}_{i,n}(t) = \frac{P_i(t) - P_i(t-n)}{P_i(t-n)}$ for lookbacks $n \in \{20, 60, 120, 240\}$ days.

2.2 Technical Rationale

Why these lookbacks? 20d captures tactical moves, 60/120d capture credit cycles (70% weight), 240d provides regime confirmation.

Why not equal weights? $(0.15, 0.35, 0.35, 0.15)$ optimizes responsiveness vs. stability. Equal weights overweight noisy short-term (20d) and slow long-term (240d) signals.

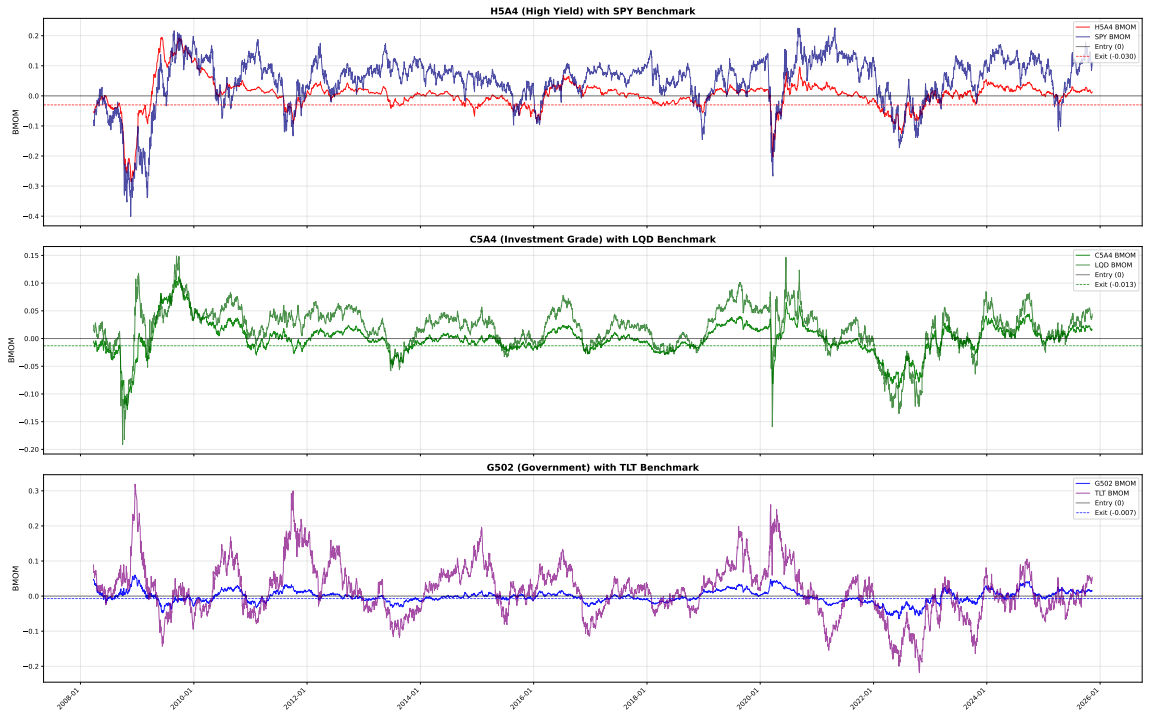

Figure 1: BMOM indicators for fixed income assets and their benchmarks over time. H5A4 uses SPY benchmark (threshold -0.030), C5A4 uses LQD benchmark (threshold -0.013), G502 uses TLT benchmark (threshold -0.010). Entry threshold is 0 for all assets.

3 Strategy 1: Cross-Asset Momentum with Benchmark Filter

3.1 Signal Logic

For each asset independently:

Exit (Signal = 0): $(C_1 \vee C_2) \wedge \text{Mom}_{240} < 0$

$$C_1 : \text{BMOM}_{\text{bench}}(t-1) > \tau \wedge \text{BMOM}_{\text{bench}}(t) < \tau \wedge \text{BMOM}_{\text{asset}}(t) < \tau \tag{2}$$

$$C_2 : \text{BMOM}_{\text{asset}}(t-1) > \tau \wedge \text{BMOM}_{\text{bench}}(t) < \tau \wedge \text{BMOM}_{\text{asset}}(t) < \tau \tag{3}$$

Entry (Signal = 1): $\text{BMOM}_{\text{asset}}(t) > 0$

Hold: Maintain previous signal otherwise.

Asset	Benchmark	Threshold τ
H5A4	SPY	-0.030
C5A4	LQD	-0.013
G502	TLT	-0.010

Table 1: Asset-specific benchmarks and thresholds.

3.2 Technical Rationale

Why cross-below? Detects momentum *deterioration*, not static weakness. Prevents whipsaw from oscillation around thresholds.

Why dual weakness? Both asset and benchmark below threshold confirms broader stress. For H5A4: only exit when both credit spreads widen (H5A4 weak) AND equity risk-off (SPY weak).

Why Mom240 filter? Prevents exits during temporary dips in long-term uptrends. Only exit when 1-year trend confirms downtrend. Significantly improves Sharpe ratio.

Why different thresholds? H5A4 (-3%): highest volatility, tolerates larger drawdowns. C5A4 (-1.3%): moderate. G502 (-1%): lowest volatility, tightest threshold.

Why SPY for H5A4? High yield sensitive to equity risk sentiment. LQD for C5A4 captures IG credit. TLT for G502 captures duration dynamics.

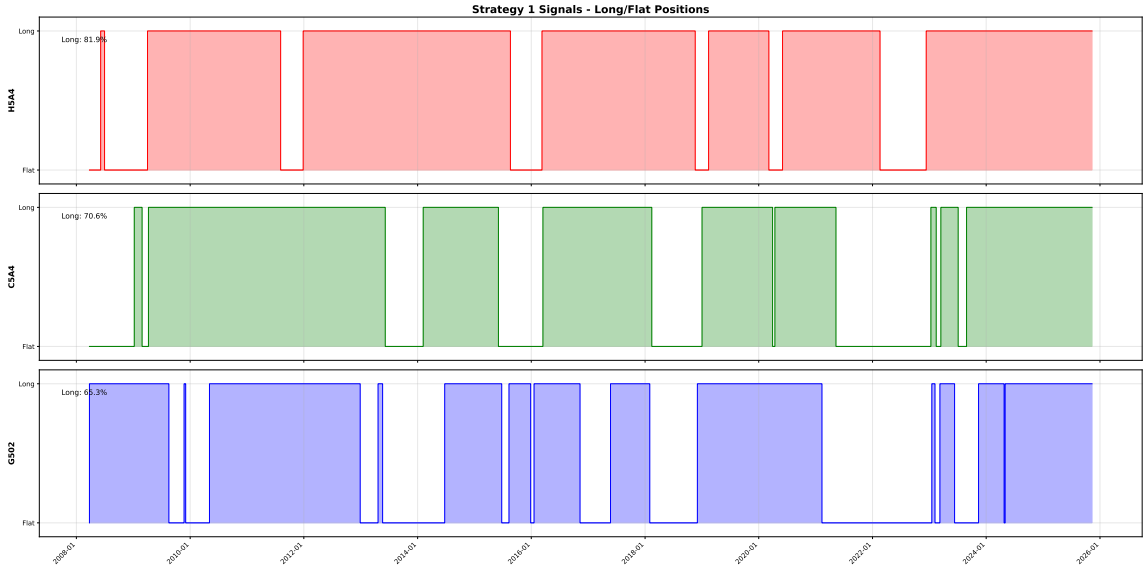

Figure 2: Strategy 1 signal generation showing long/flat positions for each asset over time. Shaded regions indicate long positions.

4 Strategy 2: Asset-Level Drawdown Differential Override

4.1 Motivation

Asset-level risk management: when an individual asset's Strategy 1 underperforms that asset's buy-and-hold by $> 10\%$, force long position until Strategy 1 recovers.

4.2 Implementation

For each asset i independently:

$$\mathrm{DD}_{\mathrm{diff},i}(t) = \mathrm{DD}_i^{\mathrm{S1}}(t) - \mathrm{DD}_i^{\mathrm{BH}}(t) \tag{4}$$

State Machine:

Algorithm 1 Strategy 2 override logic per asset

```
in_override ← False
for each day t do
  if DD_diff,i > 0.10 then
    Signal ← 1 {Force long}
    in_override ← True
  else if in_override AND S1_signal = 1 then
    Signal ← S1_signal {Exit override}
    in_override ← False
  else if in_override then
    Signal ← 1 {Stay long}
  else
    Signal ← S1_signal {Follow S1}
  end if
end for
```

4.3 Technical Rationale

Why asset-level? H5A4, C5A4, G502 respond to different factors. Targeted intervention without portfolio-level interference.

Why state machine exit? Prevents whipsaw back to S1 flat (0) positions. Override only exits when S1 naturally signals long (1), ensuring alignment.

Why 10% threshold? Material underperformance indication. Lower (5%) triggers too often; higher (20%) allows excessive damage.

5 Weight Allocation Strategies

5.1 Proportional Linear

$w_i^{\mathrm{raw}} = \frac{\max(0,\mathrm{BMOM}_i)\times\mathrm{Signal}_i}{\sum_j \max(0,\mathrm{BMOM}_j)\times\mathrm{Signal}_j} \times 0.95$

Rationale: Stronger momentum $\rightarrow$ larger allocation. Smooth transitions. Uses signal strength information.

5.2 Equal Weight

$w_i = \frac{0.95}{n}$ for n active signals.

Rationale: Robust to measurement error. Maximum diversification. Simple baseline.

5.3 Regime-Based

Regime	Cash	Gov	IG	HY
Risk-On	4%	0%	84%	12%
Moderate	5%	19%	66.5%	9.5%
Defensive	8%	70%	22%	0%
Crisis	10%	90%	0%	0%

Table 2: Regime-based allocation profiles.

Regimes: Risk-On (HYG/LQD/SPY strong, TLT weak), Defensive (credit stress), Crisis (HYG$< -8\%$, SPY$< -10\%$).

Rationale: Non-linear regime relationships. Explicit tail risk management. Clear policy guidelines.

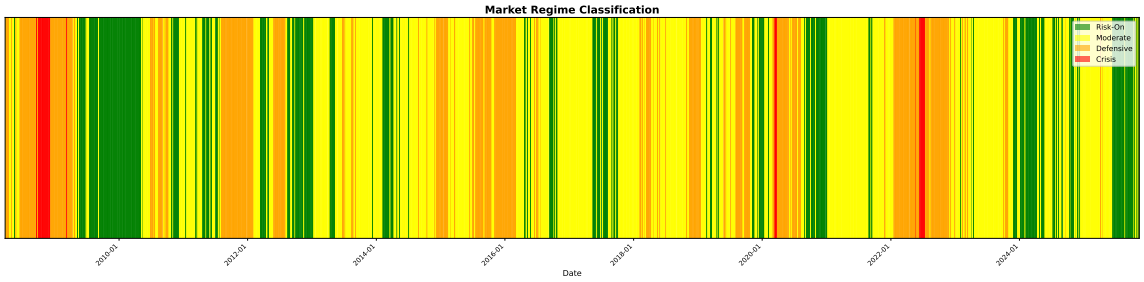

Figure 3: Market regime classification over the sample period. Colors indicate Risk-On (green), Moderate (yellow), Defensive (orange), and Crisis (red) periods.

6 Performance Metrics

6.1 Strategy 1 Results

Strategy	Ann Ret	Vol	Sharpe	Max DD	Total Ret
Prop Linear	1.43%	2.87%	0.51	-11.71%	28.44%
Prop Squared	1.44%	2.87%	0.51	-11.71%	28.71%
Equal Weight	0.66%	2.85%	0.25	-12.93%	12.38%
Regime-Based	0.93%	3.03%	0.32	-14.34%	17.64%
Hybrid	1.13%	2.88%	0.41	-12.84%	21.92%
Benchmark	0.04%	3.21%	0.03	-18.36%	0.63%

Table 3: Strategy 1 performance (gross returns, 2008-2025).

6.2 Strategy 2 Results

Strategy	Ann Ret	Vol	Sharpe	Max DD	Sharpe Δ
Prop Linear	1.96%	2.70%	0.73	-5.61%	+43.1%
Prop Squared	1.97%	2.71%	0.73	-5.57%	+43.1%
Equal Weight	1.38%	2.61%	0.54	-7.58%	+116.0%
Regime-Based	1.23%	2.84%	0.45	-8.93%	+40.6%
Hybrid	1.55%	2.70%	0.58	-7.84%	+41.5%

Table 4: Strategy 2 performance with DD override.

6.3 Key Observations

1. **Proportional Linear** achieves highest Sharpe (S1: 0.51, S2: 0.73). Moderate +43% S2 improvement.

2. **Equal Weight** benefits most from override (+116%). Simple allocation prone to larger DD differentials.

3. **Strategy 2 dramatically reduces drawdown:** Prop Linear max DD: $-11.71\% \rightarrow -5.61\%$.

4. **All strategies outperform benchmark** by wide margins.

6.4 Strategy 1 Equity Curves

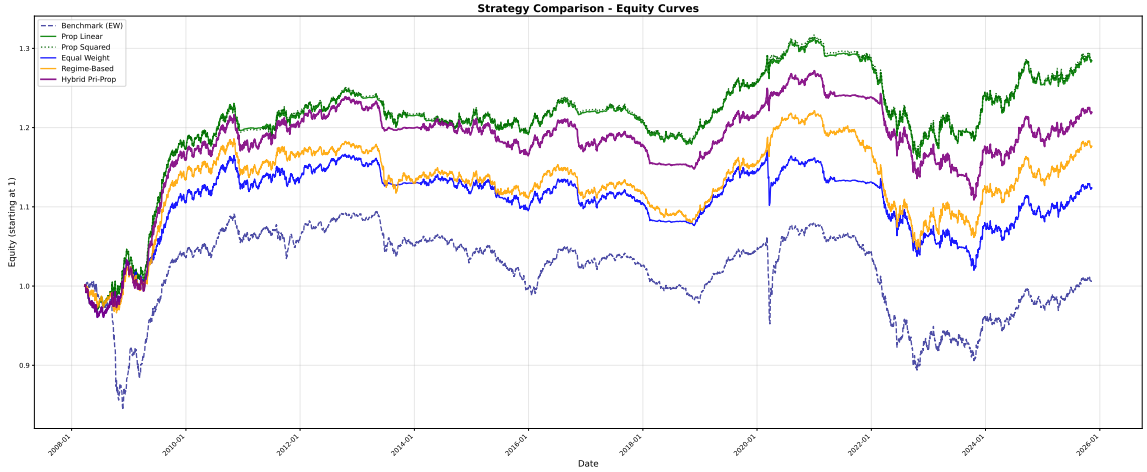

Figure 4: Strategy 1 equity curves for all allocation approaches. All curves normalized to start at 1.0.

6.5 Strategy 2 Equity Curves

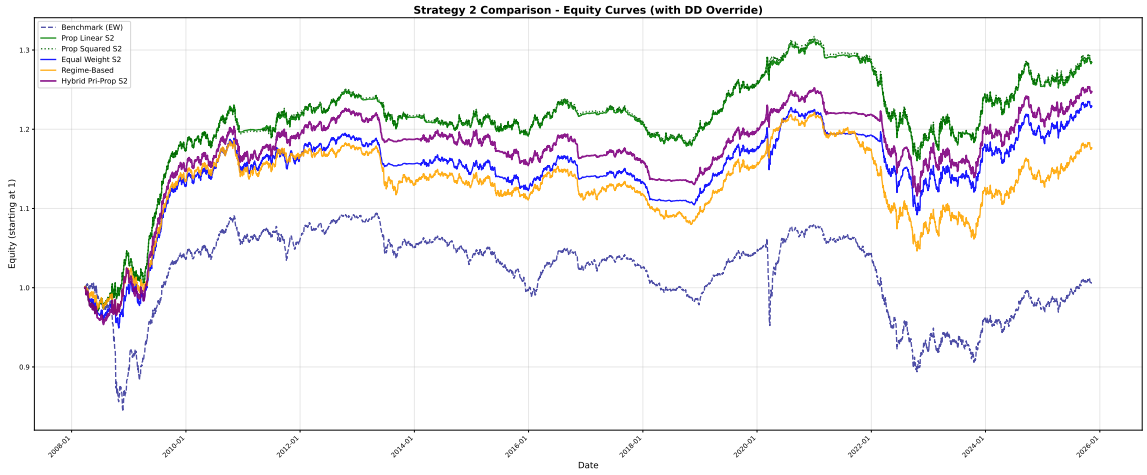

Figure 5: Strategy 2 equity curves with DD override for all allocation approaches.

6.6 Individual Allocation Strategy Comparisons

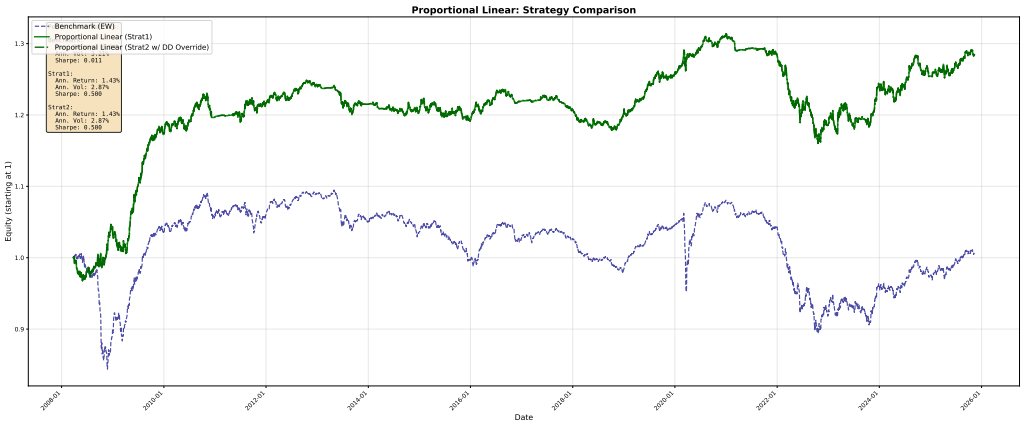

Figure 6: Proportional Linear: Strategy 1 vs Strategy 2 vs Benchmark.

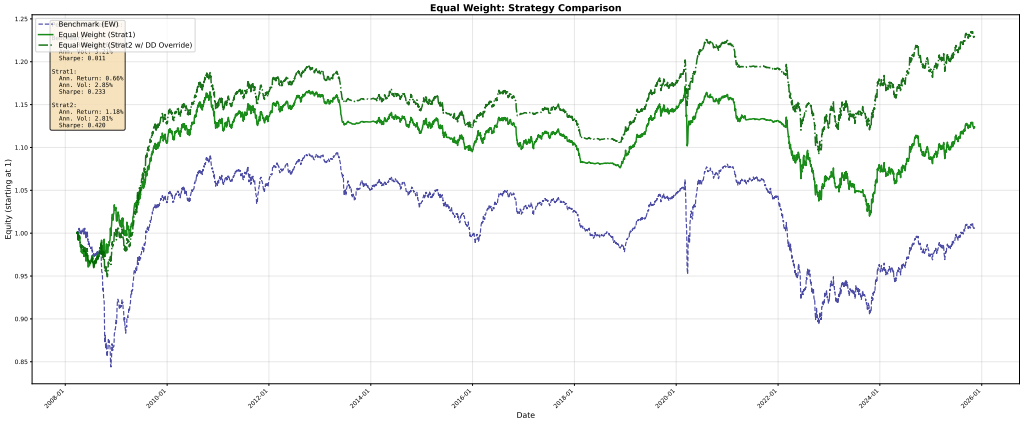

Figure 7: Equal Weight: Strategy 1 vs Strategy 2 vs Benchmark.

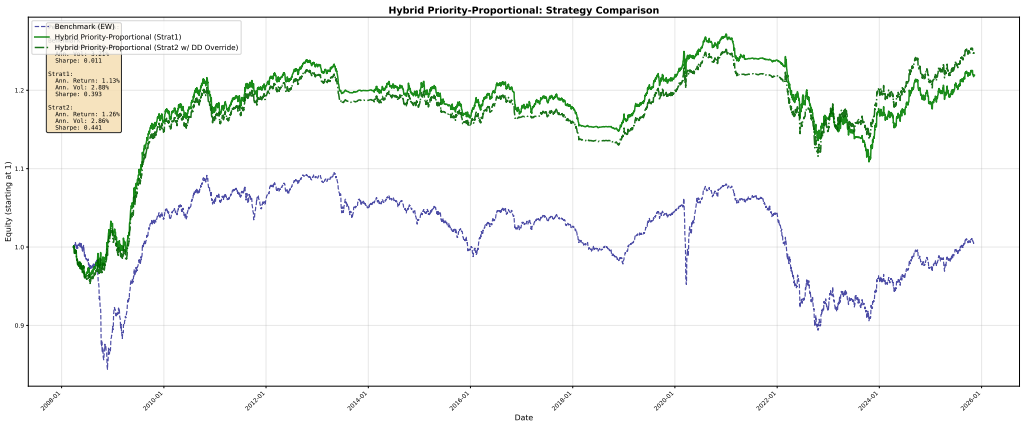

Figure 8: Hybrid Priority-Proportional: Strategy 1 vs Strategy 2 vs Benchmark.

6.7 Rolling Performance

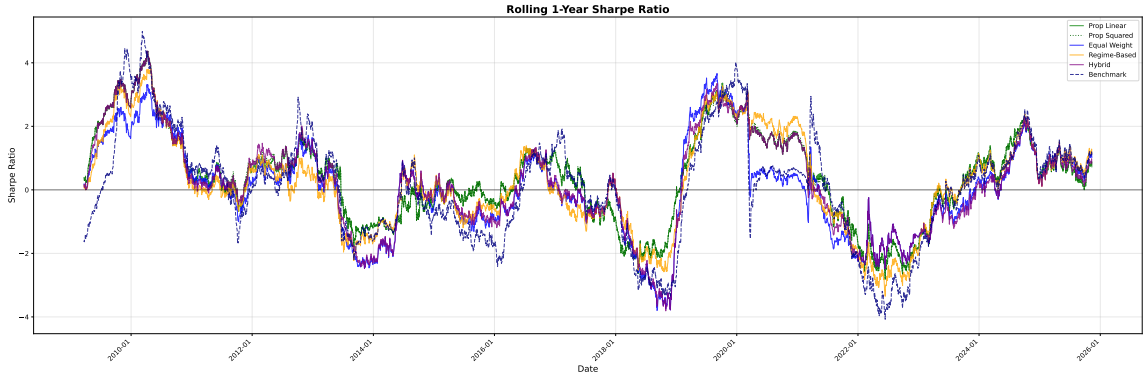

Figure 9: Rolling 252-day Sharpe ratio for Strategy 1 approaches. Periods below zero indicate underperformance relative to cash.

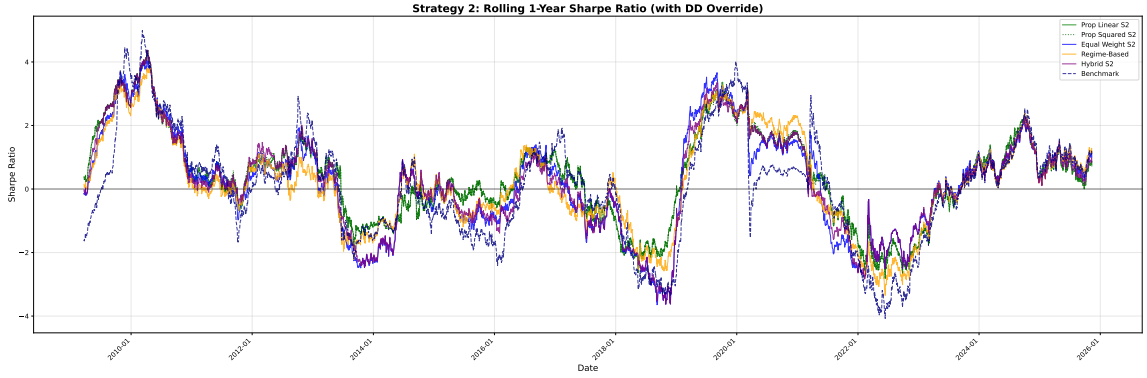

Figure 10: Rolling 252-day Sharpe ratio for Strategy 2 approaches with DD override.

7 Implementation Considerations

7.1 Signal Lag

$r_{\text{portfolio}}(t) = \sum_i w_i(t-1) \times r_i(t)$ ensures realistic 1-day lag.

7.2 Transaction Costs

Round-trip costs: H5A4 14bps, C5A4 10bps, G502 4bps.

Turnover: Proportional Linear highest (∼0.20% annually), Regime lowest (∼0.06% annually).

8 Conclusion

This framework provides systematic fixed income tactical allocation with:

- **Best performer:** Proportional Linear + Strategy 2 (Sharpe 0.73, MaxDD -5.61%)
- **Strategy 2 effectiveness:** Asset-level DD override with state-machine exit prevents catastrophic underperformance
- **Signal quality:** BMOM + mom240 filter + cross-asset confirmation produces robust signals
- **Allocation flexibility:** Three approaches suit different investor objectives

Future work: Yield curve integration, credit spread overlays, ML regime classification, dynamic threshold calibration.

A Parameter Summary

Parameter	Value
BMOM Weights	
Lookbacks	[20, 60, 120, 240] days
Weights	[0.15, 0.35, 0.35, 0.15]
Strategy 1 Thresholds	
H5A4 / C5A4 / G502	-0.030 / -0.013 / -0.010
Entry (all assets)	0
Strategy 2	
DD Override Threshold	10%
Exit Condition	S1 signal = 1

Table 5: Framework parameters.

B Regime Thresholds

Risk-On: HYG$>$ 0.03, LQD$>$ 0.02, SPY$>$ 0.02, TLT$<$ 0.05

Defensive: HYG<-0.02 OR (SPY<-0.03 AND TLT$>$ 0.02) OR TLT$>$ 0.10

Crisis: HYG<-0.08 AND LQD<-0.05 AND SPY<-0.10