Is Your Rate Hedge Actually a Curve Bet? Hedging the Long End on 32 Years of Treasury Data

Research note · Gaurav Gupta · 21 October 2026 · guptagaurav.info · Curve on 20 Oct: 2y 4.79%, 10y 5.12%, 30y 5.42%

97%
of the risk left after a duration-matched hedge is a 10s30s curve position (~$1.7M per bp per $1bn)

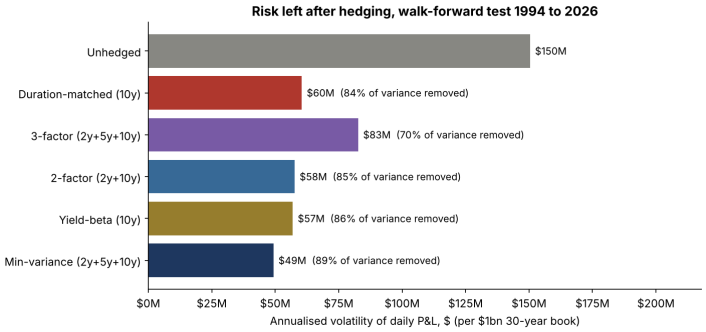
$60M → $49M
annual residual risk per $1bn: duration hedge vs minimum-variance (18% lower; CI 16-21%)

+37%
more risk left by a three-factor curve hedge than by the simple duration hedge

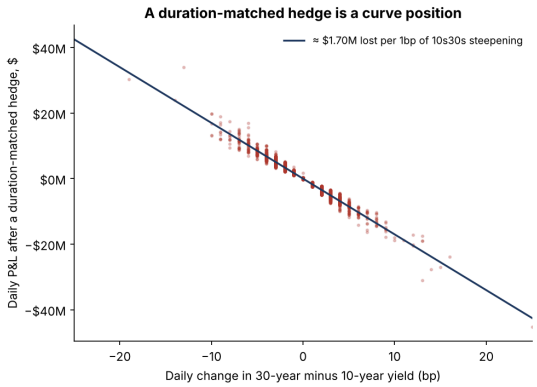
$7M vs $27M
worst hedged day in March 2023 (SVB), minimum-variance vs duration hedge

Rule (walk-forward 1994-2026)	Residual risk $/yr	Variance removed	1-day 99% VaR	Worst day	Look-ahead fit
Unhedged	$150.4M	—	$23.3M	$72.0M	—
Duration-matched 10y (baseline)	$60.4M	83.9%	$10.5M	$45.2M	83.9%
Yield-beta 10y	$56.9M	85.7%	$9.5M	$32.6M	85.5%
Two-factor (2y+10y)	$57.6M	85.3%	$9.5M	$48.3M	87.0%
Three-factor (2y+5y+10y)	$82.6M	69.8%	$13.7M	$59.9M	79.1%
Minimum-variance (2y+5y+10y)	**$49.3M**	**89.3%**	**$8.3M**	**$40.0M**	**89.0%**

Per $1bn of 30-year exposure. Residual-risk ratio to duration hedge, 95% bootstrap: min-variance 0.79-0.84; yield-beta 0.92-0.97; three-factor 1.25-1.51. Lower than the duration hedge in all 28 test years and every stress window (SVB worst day $7.2M vs $27.1M; 2022 window P&L −$12.6M vs +$68.4M).



Risk left after hedging, out of sample



After a duration hedge, P&L tracks the 10s30s move

SOURCES

- US Treasury Daily Par Yield Curve Rates, 2 Jan 1990 - 20 Oct 2026 (9,207 days)
- Mirror: huggingface.co/datasets/defeatbeta/yahoo-finance-data, revision f9120ae; sha256 13004d0b...810ef0; downloaded 21 Oct 2026
- 30-year series suspended Feb 2002 - Feb 2006; no returns computed across the gap

METHOD

- Book: $1bn constant-maturity 30-year Treasury (DV01 ≈ $1.47M/bp today)
- Hedges: 2y, 5y, 10y points; every leg financed at the 3-month bill
- Rules refit on the first trading day of each month from the prior 3 years only (asserted; unit-tested by shocking future data)
- Test: Jan 1994 - Oct 2026, 6,691 days, 322 refits; month-block bootstrap CIs

KEY CALCULATIONS

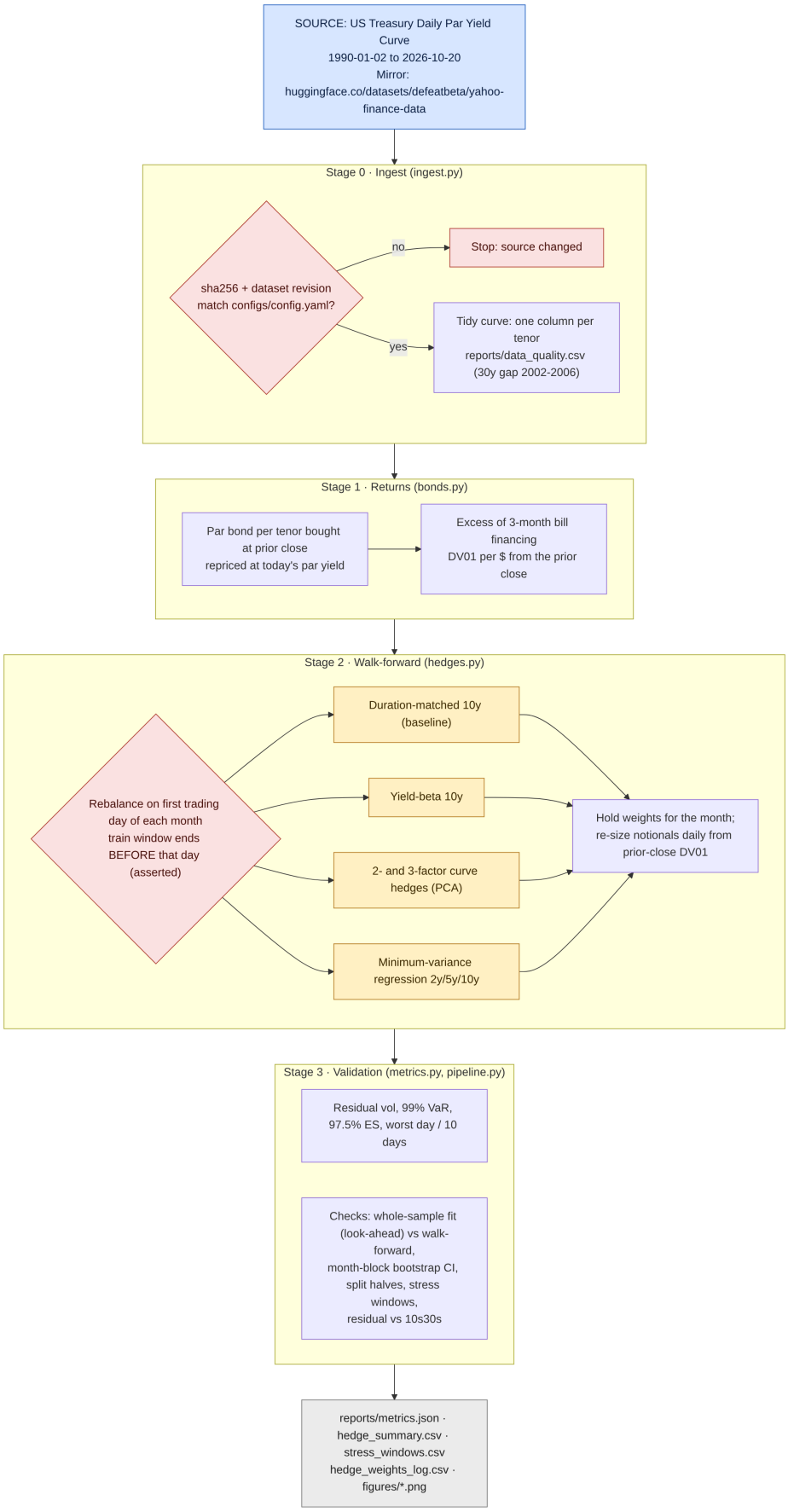
- Par-bond return: coupon = prior-close par yield, repriced at today's yield, minus bill carry
- Hedge notional = weight × book DV01(t-1) / hedge DV01(t-1)
- Min-variance: OLS of book excess return on hedge excess returns
- Capital (illustrative) = 3 × √10 × 1-day 99% VaR: $99.9M vs $79.0M; at 10% hurdle ≈ $2.1M/yr per $1bn

RECOMMENDATIONS

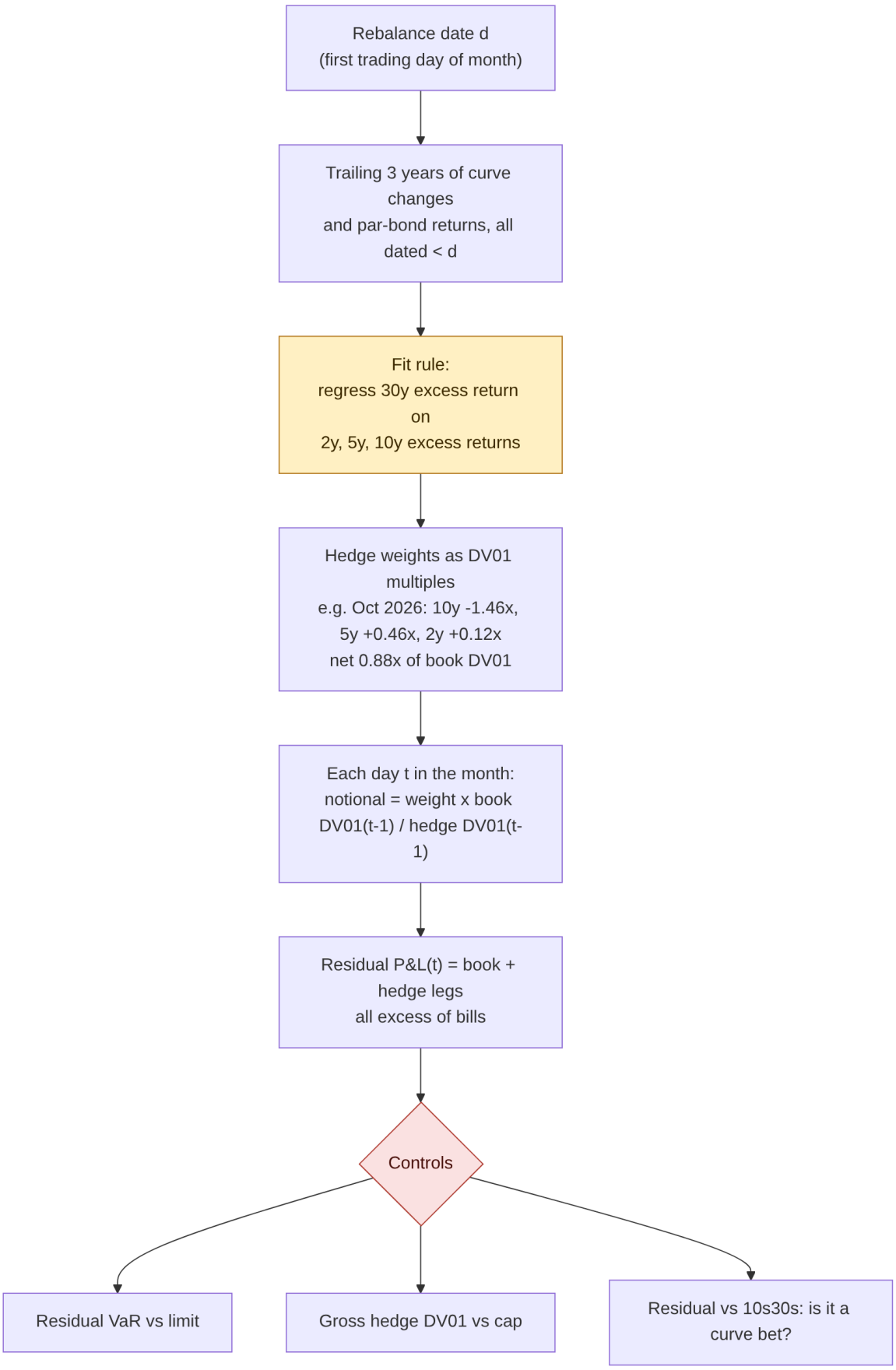
- Set hedge ratios by monthly regression refit; Oct 2026 refit: short 10y 1.46×, long 5y 0.46×, long 2y 0.12× book DV01 (net 0.88×).
- Keep the duration hedge as reference; revert automatically if the regression hedge loses two consecutive quarters on realised residual risk.
- Report and limit residual 10s30s exposure alongside DV01; cap gross hedge DV01 at 2× the book.
- Approve hedge methodology changes on walk-forward evidence only: the three-factor rule gained 9 points of variance reduction from look-ahead.
- Re-test before applying to corporate, mortgage or liability books (spread and convexity risk not covered).

Independent research on public data; not deployed; not investment advice. Capital, cost-of-capital (10%) and rebalancing-cost (0.25bp per $ DV01 traded) figures are illustrative assumptions. Code: github.com/guptagaurav-info/treasury-curve-hedging

Pipeline: from the Treasury curve to validated hedge rules



One monthly hedge decision and its controls



Proposed production design (not implemented)

