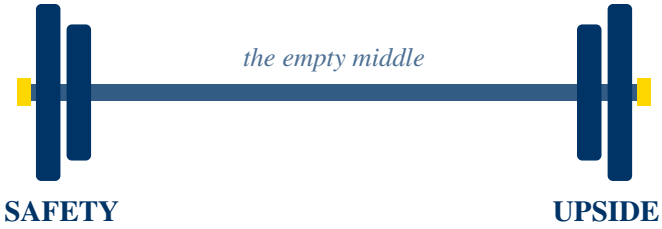
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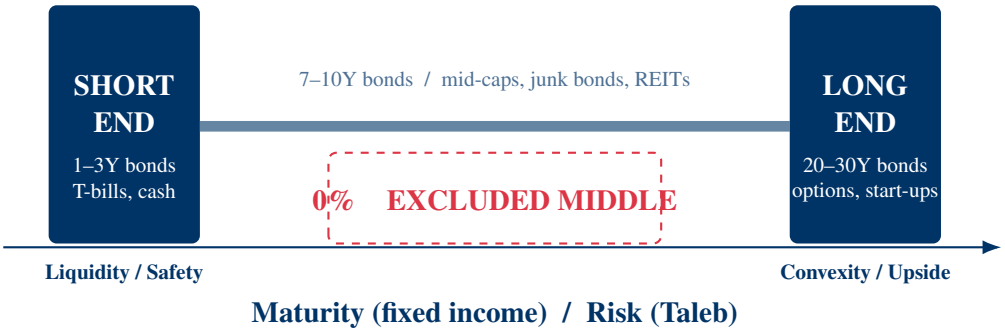
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1 Introduction: Two Ends, No Middle

Most portfolio-construction advice pulls investors towards the middle: moderate maturities, moderate risk, moderate everything. The **barbell strategy** deliberately does the opposite. It places capital at the *two extreme ends* of a spectrum and leaves the middle *completely empty*. A physical barbell carries its weight on the two plates and almost none on the thin bar between them. A barbell portfolio does the same: it puts its capital at two opposite poles to combine **safety** with **upside**.

The idea appears in two distinct but related forms:

1. **The fixed-income (maturity) barbell.** Capital goes only to short-term and long-term bonds; intermediate maturities get nothing. This is a yield-curve and convexity strategy.
2. **Nassim Nicholas Taleb's risk barbell.** Capital goes to extreme safety (T-bills, cash, gold) and extreme speculation (options, start-ups); "medium risk" gets nothing. This is a tail-risk and optionality strategy.



What You Will Master

- The bond mathematics behind barbells: Macaulay and modified duration, DV01, convexity and the Taylor expansion.
- How to build a *duration-matched* barbell and why it is always more convex than a bullet.
- A full $100 million case study under eight yield-curve scenarios, with exact repricing.
- The breakeven move, yield drag and key-rate exposures: the true cost of convexity.
- Taleb's antifragile barbell: payoff profile, the basket of bets and regime analysis.
- A practitioner's playbook, common mistakes and a self-test.

2 Key Terms and Definitions

Barbell Portfolio

A portfolio whose holdings sit at two widely separated points on a spectrum (very short and very long maturities, or very safe and very risky assets), with no holdings in between.

Bullet Portfolio

A portfolio whose cash flows are concentrated around *one* maturity, e.g. 100% in 10-year bonds. A **ladder**, by contrast, spreads holdings evenly across maturities.

Macaulay Duration

The present-value-weighted average time to receive a bond's cash flows:

$$D_{\text{Mac}} = \frac{1}{P}\sum_t t \cdot PV(CF_t).$$

For a zero-coupon bond there is only one cash flow, so $D_{\text{Mac}} = T$ (its maturity).

Modified Duration and DV01

Modified duration is the percentage price change for a unit change in yield: $D_{\text{Mod}} = -\frac{1}{P}\frac{dP}{dy} = \frac{D_{\text{Mac}}}{1+y/m}$. With continuous compounding, $D_{\text{Mod}} = D_{\text{Mac}}$. **DV01** (or PVBP) is the rupee/dollar change for a 1 basis-point move: $\text{DV01} = D_{\text{Mod}} \times P \times 0.0001$.

Convexity

The curvature of the price–yield relationship: $C = \frac{1}{P}\frac{d^2P}{dy^2}$. For a continuously compounded zero, $C = T^2$; with annual compounding, $C = \frac{T(T+1)}{(1+y)^2}$. Positive convexity means the bond gains more when yields fall than it loses when yields rise by the same amount.

Yield Drag

The yield a duration-matched barbell gives up relative to the bullet, typically on an upward-sloping curve. It is the "premium" paid for convexity.

Antifragile

Taleb's term for a system that *gains* from volatility, shocks and disorder, as opposed to one that is merely robust (unaffected) or fragile (harmed).

3 The Bond Mathematics You Need

3.1 Pricing a zero-coupon bond

Throughout this article we use zero-coupon bonds with **continuous compounding**. This convention keeps the algebra clean and makes duration and convexity exact:

$$P(y) = 100\,e^{-yT}, \qquad D = -\frac{1}{P}\frac{dP}{dy} = T, \qquad C = \frac{1}{P}\frac{d^2P}{dy^2} = T^2.$$

3.2 The second-order Taylor expansion

For a yield change Δy, the percentage price change is approximated by

The Master Equation

$$\frac{\Delta P}{P} \approx \underbrace{-D \cdot \Delta y}_{\text{duration effect (linear)}} + \underbrace{\tfrac{1}{2} C \cdot (\Delta y)^2}_{\text{convexity effect (always } \geq 0)}$$

The convexity term is always positive because $(\Delta y)^2 \geq 0$. So *more convexity is always a cushion*: it adds to gains when yields fall and reduces losses when yields rise.

3.3 The building blocks

Bond	T (yrs)	Yield	Price / 100	Duration	Convexity	DV01 / $1M
Short end (2Y)	2	4.00%	92.312	2.00	4.00	$200
Bullet (10Y)	10	4.50%	63.763	10.00	100.00	$1,000
Long end (30Y)	30	5.00%	22.313	30.00	900.00	$3,000

Key Insight: Convexity Grows With the Square of Maturity

The 30Y bond has three times the duration of the 10Y (30 vs 10) but *nine* times the convexity (900 vs 100). This non-linearity is what makes the barbell work: a small slice of very long bonds adds a large amount of convexity.

4 The Fixed-Income Barbell

4.1 Structure and motivation

A fixed-income barbell holds bonds only at the short and long ends of the curve.

Illustration: A $10 Million Barbell

Bucket	Allocation	Instrument
Short end (50%)	$5,000,000	2-year Treasury notes
Intermediate (0%)	$0	7- or 10-year Treasury notes
Long end (50%)	$5,000,000	30-year Treasury bonds

Managers use this shape for three reasons:

- **Liquidity and reinvestment.** The short end matures quickly, providing a continuous flow of cash that can be reinvested at higher rates if interest rates rise.
- **Yield and convexity.** The long end locks in higher long-term yields and has high duration and convexity, so it rallies strongly if rates fall sharply.
- **Flexibility.** Compared with a bullet of the same duration, the barbell has superior convexity and can be re-tilted quickly, because half the book rolls off every few years.

Pitfall: A 50/50 Barbell Is Not a Fair Comparison

The 50/50 split above has a duration of $0.5 \times 2 + 0.5 \times 30 = 16$ years and a convexity of $0.5 \times 4 + 0.5 \times 900 = 452$. Comparing it with a 10Y bullet (duration 10) mixes two effects: *more convexity* and *more rate risk*. A 50/50 barbell takes 1.6 times the bullet's interest-rate risk. To isolate the convexity benefit, always compare portfolios with **equal market value and equal duration**.

4.2 Building a duration-matched barbell

Let w be the weight in the short bond (maturity T_S), $1-w$ the weight in the long bond (T_L), and D^* the target duration. Portfolio duration is a market-value-weighted average, so

$$w\,T_S + (1-w)\,T_L = D^* \quad \Longrightarrow \quad \boxed{w = \frac{T_L - D^*}{T_L - T_S}}$$

Illustration

Match a 10-year bullet using 2Y and 30Y zeros:

$$w_2 = \frac{30-10}{30-2} = \frac{20}{28} = 71.43\%, \qquad w_{30} = 28.57\%.$$

For \$100 million: **\$71.43M** in 2Y bonds and **\$28.57M** in 30Y bonds. Check: $0.7143 \times 2 + 0.2857 \times 30 = 1.429 + 8.571 = 10.0$ years.

5 Why the Barbell Is Always More Convex

Portfolio convexity, like duration, is a weighted average: $C_P = \sum_i w_i C_i = \sum_i w_i T_i^2$. Now apply a standard identity from statistics (variance = mean of squares − square of mean), treating the weights as probabilities and the maturities as outcomes:

$$\sum_i w_i T_i^2 \;=\; \Big(\sum_i w_i T_i\Big)^2 + \sum_i w_i\,(T_i - D_P)^2.$$

Since $\sum_i w_i T_i = D_P$:

The Convexity Decomposition

$$C_P \;=\; \underbrace{D_P^2}_{\text{fixed by duration}} \;+\; \underbrace{\sum_i w_i\,(T_i - D_P)^2}_{\text{dispersion of cash flows}}$$

Two portfolios with the *same duration* share the same D_P^2. The only thing that can separate their convexities is the **dispersion** of cash flows around the duration:

- A **bullet** puts all its cash flows at one date: dispersion $= 0$, so $C = D^2 = 100$.
- A **barbell** pushes the cash flows as far apart as possible: dispersion $= 0.7143(2-10)^2 + 0.2857(30-10)^2 = 45.71 + 114.29 = 160$, so $C = 100 + 160 = 260$.

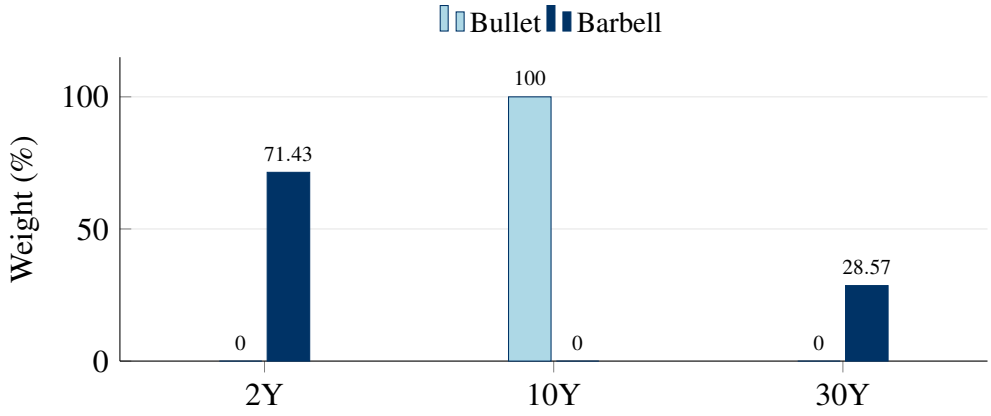
Key Insight

For a given duration, *convexity is maximised by spreading cash flows apart*. That is exactly what a barbell does, and exactly what a bullet avoids. The ladder sits in between.

6 Case Study: $100 Million Barbell vs Bullet

6.1 Market environment and portfolios

We construct two equal-dollar ($100 million each), duration-matched portfolios on the base-case spot curve $y_2 = 4.00\%$, $y_{10} = 4.50\%$, $y_{30} = 5.00\%$.



6.2 Initial metrics

Portfolio yield.

$$Y_{\text{Bullet}} = 4.500\%,$$
$$Y_{\text{Barbell}} = 0.7143(4.00\%) + 0.2857(5.00\%) = 2.857\% + 1.429\% = \mathbf{4.286}\%.$$

Portfolio convexity.

$$C_{\text{Bullet}} = 10^2 = 100, \qquad C_{\text{Barbell}} = 0.7143(2^2) + 0.2857(30^2) = 2.857 + 257.14 = \mathbf{260.0}.$$

Metric	Bullet	Barbell	Barbell − Bullet
Duration D (years)	10.00	10.00	0.00 (matched)
Portfolio yield Y	4.500%	4.286%	−21.4 bps (yield drag)
Convexity C	100.0	260.0	+160.0 (+160%)
Dispersion $C - D^2$	0.0	160.0	+160.0
DV01 ($ per bp)	$100,000	$100,000	0

Reading the Table

Both portfolios carry the same first-order risk (identical duration and DV01). The barbell has 2.6 times the convexity but gives up 21.4 bps of yield every year. The rest of this article asks one question: *when is the extra convexity worth the yield it costs?*

7 Scenario Analysis: Shocking the Yield Curve

Each portfolio is repriced bucket by bucket with the master equation: $\frac{\Delta P}{P} \approx -D\Delta y + \frac{1}{2}C(\Delta y)^2$.

7.1 Scenario A: Large parallel shift (+200 bps)

Scenario A: $\Delta y_2 = \Delta y_{10} = \Delta y_{30} = +0.02$

Bullet: $-10(0.02) + \frac{1}{2}(100)(0.02)^2 = -0.200 + 0.020 = \mathbf{-18.00\%}$ ($-$\$18.00M)
Barbell: $-10(0.02) + \frac{1}{2}(260)(0.02)^2 = -0.200 + 0.052 = \mathbf{-14.80\%}$ ($-$\$14.80M)
Outperformance: +3.20% (+\$3.20M). The duration losses are identical; the barbell's convexity cushion (5.2%) is 2.6 times the bullet's (2.0%).

7.2 Scenario B: Positive butterfly (the belly cheapens)

Scenario B: $\Delta y_2 = +25$ **bps,** $\Delta y_{10} = +100$ **bps,** $\Delta y_{30} = +25$ **bps**

Bullet (all in the 10Y belly): $-10(0.0100) + \frac{1}{2}(100)(0.0100)^2 = -0.1000 + 0.0050 = \mathbf{-9.50\%}$ ($-$\$9.50M)
Barbell, bucket by bucket:

$$\text{2Y: } -2(0.0025) + \tfrac{1}{2}(4)(0.0025)^2 = -0.0050 + 0.0000125 = -0.499\%$$
$$\text{30Y: } -30(0.0025) + \tfrac{1}{2}(900)(0.0025)^2 = -0.0750 + 0.0028125 = -7.219\%$$
$$\text{Total: } 0.7143(-0.499\%) + 0.2857(-7.219\%) = -0.356\% - 2.062\% = \mathbf{-2.42\%}$$

Outperformance: +7.08% (+\$7.08M). The barbell has *zero exposure* to the 10Y bucket where the shock is concentrated.

Common Arithmetic Slip: Squaring Small Numbers

$\frac{1}{2} \times 100 \times (0.0100)^2 = 50 \times 0.0001 = \mathbf{0.0050}$, *not* 0.0005. Getting this wrong understates the bullet's convexity cushion by a factor of ten and gives -9.95% instead of -9.50%. Always write $(\Delta y)^2$ in scientific notation first: $(10^{-2})^2 = 10^{-4}$; $(5 \times 10^{-3})^2 = 2.5 \times 10^{-5}$.

7.3 Scenario C: Bear flattening (short rates rise sharply)

Scenario C: $\Delta y_2 = +150$ **bps,** $\Delta y_{10} = +50$ **bps,** $\Delta y_{30} = 0$

Bullet: $-10(0.0050) + \frac{1}{2}(100)(0.0050)^2 = -0.0500 + 0.00125 = \mathbf{-4.875\%}$ ($-$\$4.875M)
Barbell: 2Y: $-2(0.0150) + \frac{1}{2}(4)(0.0150)^2 = -0.0300 + 0.00045 = -2.955\%$; 30Y: 0.00%.
Total: $0.7143(-2.955\%) + 0.2857(0\%) = \mathbf{-2.11\%}$ ($-$\$2.11M)
Outperformance: +2.76% (+\$2.76M). The short bond has low duration, and 28.57% of the capital sits in the unchanged 30Y.

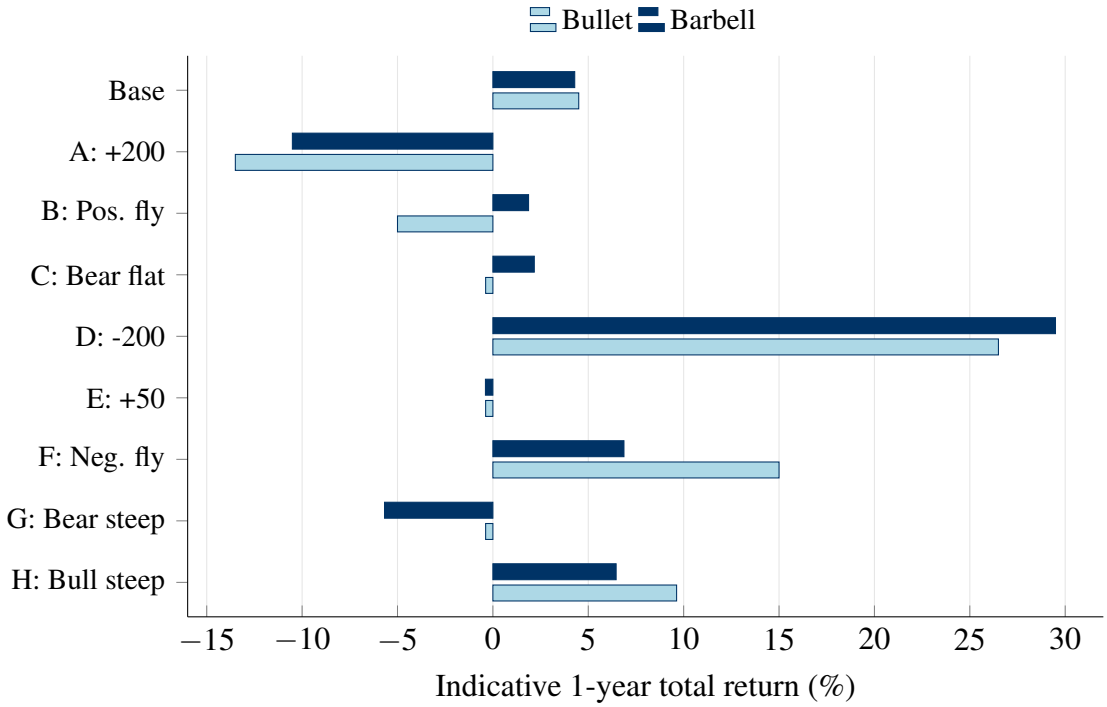
7.4 The full scenario matrix

The three textbook cases all favour the barbell. A fair test must also include the scenarios where it *loses*. Table 1 adds five more shocks and an indicative one-year total return (yield carry plus the instantaneous price change).

Table 1: **Price and indicative 1-year total returns (Taylor approximation)**

	Δy (bps)			Price return			
Scenario	**2Y**	**10Y**	**30Y**	**Bullet**	**Barbell**	**Total diff.**	**Winner**
Base case (unchanged)	0	0	0	0.00%	0.00%	−0.21%	**Bullet**
A: +200 parallel	200	200	200	−18.00%	−14.80%	+2.99%	**Barbell**
B: Positive butterfly	25	100	25	−9.50%	−2.42%	+6.87%	**Barbell**
C: Bear flattening	150	50	0	−4.88%	−2.11%	+2.55%	**Barbell**
D: −200 parallel	−200	−200	−200	+22.00%	+25.20%	+2.99%	**Barbell**
E: +50 parallel	50	50	50	−4.88%	−4.68%	−0.01%	**Bullet**
F: Negative butterfly	−25	−100	−25	+10.50%	+2.58%	−8.13%	**Bullet**
G: Bear steepening	0	50	150	−4.88%	−9.96%	−5.30%	**Bullet**
H: Bull steepening	−150	−50	0	+5.13%	+2.17%	−3.16%	**Bullet**

Total diff. = (Barbell yield + price return) − (Bullet yield + price return). Indicative only: it ignores roll-down and reinvestment.



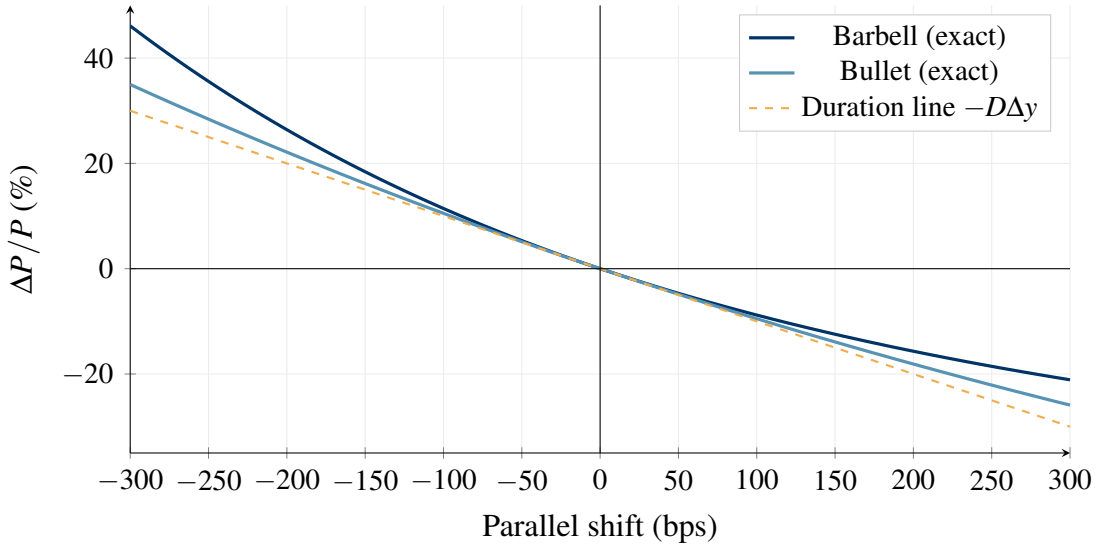
Key Insight: The Barbell Is a View, Not a Free Lunch

The barbell wins on *large parallel moves* in either direction, and when the *belly underperforms the wings*. It loses when rates are *calm*, when the move is *small* (Scenario E), when the *belly rallies* (F), and when the *long end sells off* (G). Duration matching protects only against parallel shifts; it says nothing about curve shape.

8 The Price–Yield Curve and the Breakeven Move

8.1 Exact repricing

With continuous compounding the exact return of a zero for a parallel shift Δy is $e^{-T\Delta y} - 1$. Plotting both portfolios against the straight duration line shows the convexity "smile".



Both curves lie *above* the duration line (positive convexity), and the barbell lies above the bullet everywhere. On price alone, the barbell never loses for a parallel move. Its only cost is the yield drag.

Shift	Bullet (Taylor)	Bullet (exact)	Barbell (Taylor)	Barbell (exact)
+200 bps	−18.00%	−18.13%	−14.80%	−15.69%
−200 bps	+22.00%	+22.14%	+25.20%	+26.40%

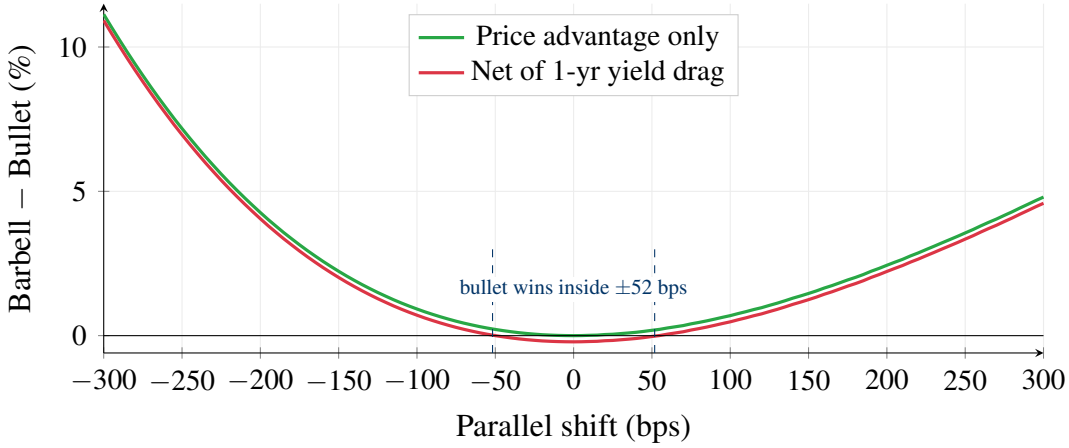
The Taylor approximation stops at the second order. For the 30Y bond at ± 200 bps, the omitted third-order term $-\frac{1}{6}T^3(\Delta y)^3$ becomes material, so the exact barbell numbers differ by about 1 percentage point. For risk reports on long bonds, use full repricing.

8.2 The breakeven parallel move

Over a one-year horizon the barbell gains $\frac{1}{2}\Delta C\,(\Delta y)^2$ from extra convexity and loses the yield drag. Setting them equal:

Breakeven Formula

$$\tfrac{1}{2}\,\Delta C\,(\Delta y^*)^2 = \text{Yield drag} \quad\Longrightarrow\quad |\Delta y^*| = \sqrt{\frac{2\times \text{Yield drag}}{\Delta C}}$$
$$= \sqrt{\frac{2\times 0.002143}{160}} = 0.00518 \approx \textbf{52 bps}.$$



Key Insight: Convexity Is Long Volatility

Buying a barbell against a bullet is economically similar to buying an option on rates: you pay a steady premium (yield drag) and are rewarded only if realised moves are large. If you expect yields to move by more than about 52 bps over the year, the barbell is cheap; if not, it is expensive. This is why the market rarely offers convexity for free. When volatility is expected to be high, the belly tends to yield more than a duration-matched barbell, so the yield drag widens.

9 Beyond Parallel Shifts: Key-Rate Exposures

A single duration number hides *where* on the curve the risk sits. **Key-rate durations** (KRDs) split the total duration across maturity buckets:

Portfolio	KRD 2Y	KRD 10Y	KRD 30Y	Total
Bullet	0.00	10.00	0.00	10.00
Barbell	1.43	0.00	8.57	10.00

- The bullet is a pure bet on the **10Y point**.
- The barbell is overwhelmingly a bet on the **30Y point**: 86% of its duration comes from the long bond, even though that bond is only 28.57% of the capital.
- A **barbell-minus-bullet** position (long barbell, short bullet, duration-neutral) is therefore a *flattener with a butterfly*: it profits when the 10Y cheapens relative to the wings and when the 2s30s curve flattens.

Pitfall: Ignoring the Long-End Concentration

Scenario G (a 150 bps bear steepener at the long end) costs the barbell about 10% while the bullet loses under 5%. A "safe-looking" barbell that is 71% in 2-year paper still carries most of its rate risk in 30-year bonds. Always report KRDs alongside duration.

10 Nassim Taleb's Risk Barbell

10.1 The philosophy

In *The Black Swan* and *Antifragile*, Nassim Nicholas Taleb applies the barbell idea to risk itself. His argument is that "medium-risk" investments such as mid-cap stocks, junk bonds and REITs are not moderate at all. Their tail risks are *hidden*: in a crash, correlations rise, losses become large and open-ended, while the upside was always capped. The investor does not actually know the worst case. Taleb's alternative is to **remove the middle entirely**.

The Taleb Barbell

85–90% in extreme conservatism: short-term government T-bills, cash, gold.
0% in medium risk: no mid-caps, junk bonds or REITs.
10–15% in extreme speculation: out-of-the-money options, early-stage start-ups, high-beta growth bets, crypto assets.

10.2 Payoff profile of a $100,000 portfolio

Assume $90,000 in T-bills earning 5% for one year and $10,000 in speculative bets that return k times their capital.

Outcome	Multiple k	Portfolio value	Return	Capital kept
Worst case: all bets go to zero	0.0×	$94,500	−5.5%	94.5%
Heavy losses	0.5×	$99,500	−0.5%	99.5%
Break-even bets	1.0×	$104,500	+4.5%	100%
Good year	5.0×	$144,500	+44.5%	100%
One big winner	10.0×	$194,500	+94.5%	100%
Best case	20.0×	$294,500	+194.5%	100%
Extreme best case	50.0×	$594,500	+494.5%	100%

Key Insight: Bounded Downside, Open Upside

The maximum loss is known in advance (about 5.5% after T-bill interest), whatever happens in the market. The upside is open-ended. The portfolio breaks even if the speculative bucket returns just 0.55× its capital, because the T-bill interest pays for part of the speculative losses.

10.3 Why many small bets?

Asymmetric bets are lottery-like: most fail, a few succeed spectacularly. Splitting the speculative \$10,000 into ten \$1,000 bets increases the chance of catching the rare winner without increasing the maximum loss.

Illustration: A Basket of 10 Bets

Outcomes: six bets go to zero, one returns $0.5\times$, one $1\times$, one $3\times$ and one $25\times$.

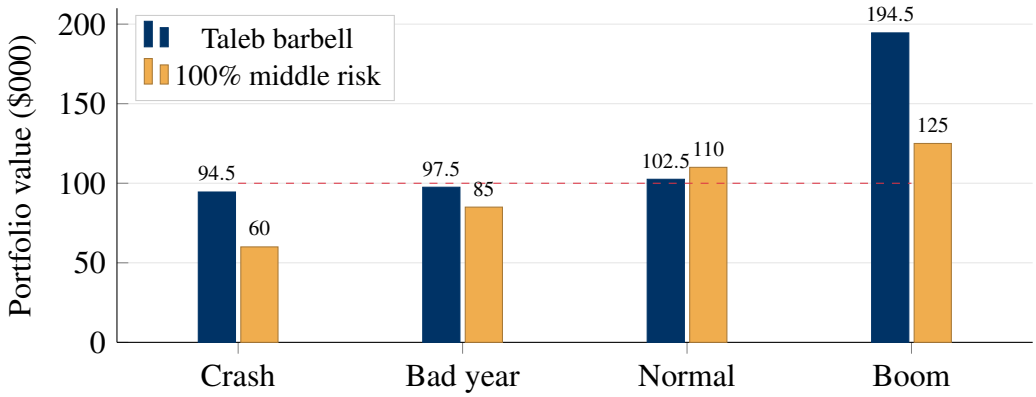
$$\text{Basket payoff} = 0.5(1{,}000) + 1(1{,}000) + 3(1{,}000) + 25(1{,}000) = \$29{,}500.$$

Portfolio value $= \$94{,}500 + \$29{,}500 = \$\mathbf{124{,}000}$, a return of **+24.0%** even though **7 of the 10 bets lost money**.

10.4 Regime analysis: barbell vs a "middle-risk" portfolio

Compare the Taleb barbell with \$100,000 invested entirely in moderate-risk assets across four market regimes (illustrative assumptions).

Regime	Middle return	Spec. multiple	Barbell	Middle	Difference
Black-swan crash	−40%	0.0×	\$94,500	\$60,000	+\$34,500
Bad year	−15%	0.3×	\$97,500	\$85,000	+\$12,500
Normal year	+10%	0.8×	\$102,500	\$110,000	−\$7,500
Boom / positive swan	+25%	10.0×	\$194,500	\$125,000	+\$69,500
Max drawdown			**−5.5%**	**−40.0%**	



10.5 Caveats

- **The bleed.** In most years the speculative bucket loses value. The barbell trails the middle-risk portfolio in normal markets, so investors need discipline to stay with it.
- **"Safe" must really be safe.** Inflation, currency and sovereign risk still apply to cash and T-bills. In an emerging market, the safe bucket must be chosen with care.

- **Position sizing is the strategy.** If the speculative share creeps up after a run of wins, the bounded-downside property is lost. Rebalance back to 90/10.
- **Asymmetry must be real.** The speculative bets must have *limited* downside (you cannot lose more than you put in) and *convex* upside. Leveraged or short-option positions are the opposite of what Taleb intends.

11 Comparing the Strategies

Feature	Fixed-income barbell	Taleb risk barbell	Bullet (reference)
Short pole	Short-term bonds (1–3 years)	Safe havens (cash, T-bills, gold)	—
Long pole	Long-term bonds (20–30 years)	Asymmetric bets (options, start-ups)	—
Excluded area	Intermediate bonds (7–10 years)	Moderate-risk equities / corporate debt	All but one maturity
Primary goal	Yield-curve positioning & convexity capture	Tail-risk protection & upside optionality	Target a specific horizon
Key metrics	Duration, convexity, DV01, KRDs, yield drag	Max drawdown, payoff asymmetry	Duration, DV01, yield
Payoff shape	Convex in yields	Convex in outcomes	Less convex
Cost	Yield drag; curve-twist risk	Steady bleed in calm years	Gives up convexity
Works best	High rate volatility; flattening; rich belly	Crises and regime shifts	Stable rates; belly carry
Fails when	Calm markets; bear steepening; belly rally	Long calm periods	Large or belly-specific moves
Typical users	Bond PMs, insurers, pension funds, bank treasuries	Tail-risk funds, VCs, individuals	Liability matchers

The Common Thread

Both barbells **buy convexity**. Each gives up some carry or expected return in calm conditions in exchange for a payoff that improves sharply in extreme outcomes. One works in yield space, the other in outcome space; the economics are the same.

12 A Practitioner's Playbook

12.1 When to prefer a barbell over a bullet

1. **You expect high rate volatility.** If the expected move exceeds the breakeven, convexity pays.

2. **You expect the curve to flatten**, or the belly looks rich (low yield) relative to the wings.
3. **You have liability or liquidity needs at both ends**: near-term cash requirements and long-dated obligations, as for insurers and pension funds.
4. **You want reinvestment flexibility** in a rising-rate cycle: the short end rolls into higher yields quickly.

12.2 When to prefer a bullet

1. Rates are expected to stay range-bound, so carry dominates.
2. The curve is steep around the belly, offering attractive roll-down.
3. A single known liability date must be immunised.
4. You expect long-end supply pressure, i.e. a bear-steepening risk.

12.3 Implementation checklist

Before You Put on a Barbell

- ☐ Match **market value and duration** (or DV01) with the benchmark bullet.
- ☐ Compute the **yield drag** and the **breakeven move**; compare it with implied and historical rate volatility.
- ☐ Report **key-rate durations**, not just total duration.
- ☐ Stress-test **non-parallel** scenarios: butterflies, steepeners and flatteners.
- ☐ Use **full repricing** for long bonds and large shocks.
- ☐ Plan for **rebalancing**: the short bucket matures and duration drifts as time passes and rates move.
- ☐ Check **liquidity** of the long end: very long bonds can be thin in stress.

12.4 An Indian fixed-income perspective

The same mechanics apply to the Indian government securities market. A manager can barbell **91/182/364-day T-bills or short-dated G-secs** against **30- to 40-year G-secs** (natural holdings for insurers and pension funds), and compare the result with a 10-year benchmark bullet. Two local features matter. First, liquidity in India is concentrated in the 10-year benchmark, which can make the belly trade rich, a natural case for a barbell. Second, the long end is driven by demand from insurers and provident funds and by government borrowing calendars, which creates long-end supply risk (Scenario G). Run both the scenario matrix and the key-rate analysis before committing.

13 Common Mistakes to Avoid

Mistake	Correction
Comparing a 50/50 barbell with a 10Y bullet	Match duration (and market value) first; otherwise you are comparing rate risk, not convexity.
Treating duration matching as full hedging	It neutralises only small parallel moves; curve shape still matters.
Ignoring yield drag	Convexity costs carry; compute the breakeven move.
Arithmetic slips in $(\Delta y)^2$	$(0.01)^2 = 0.0001$; $(0.005)^2 = 0.000025$. Write powers of ten explicitly.
Using Taylor for big shocks on long bonds	Third-order terms matter at ± 200 bps for 30Y; reprice exactly.
Calling 71% short paper "low risk"	86% of the barbell's duration sits in the 30Y.
Letting the Taleb speculative bucket grow	Rebalance to the target split, or the downside is no longer bounded.
Using leveraged or short-option "bets"	These are concave, not convex; they defeat the purpose.

14 Self-Test: Questions and Answers

Q1. Weights for a duration-matched barbell

Q: Using 3Y and 25Y zeros, find the weights that match a 7Y bullet.
A: $w_3 = (25-7)/(25-3) = 18/22 = 81.82\%$, $w_{25} = 18.18\%$.

Q2. Convexity of that barbell

Q: What are its convexity and its convexity pick-up over the 7Y bullet?
A: $C = 0.8182(9) + 0.1818(625) = 7.36 + 113.64 = 121.0$. Bullet $C = 49$. Pick-up $= 72$, which equals the dispersion $0.8182(3-7)^2 + 0.1818(25-7)^2 = 13.09 + 58.91 = 72$.

Q3. Parallel shock

Q: For our \$100M case, what is each portfolio's price return if yields fall 100 bps in parallel?
A: Bullet: $+0.10 + \frac{1}{2}(100)(0.0001) = +10.50\%$. Barbell: $+0.10 + \frac{1}{2}(260)(0.0001) = +11.30\%$. The barbell gains 0.80% more (\$0.80M).

Q4. Breakeven

Q: If the yield drag were 30 bps instead of 21.4 bps, what would the breakeven move be?
A: $\sqrt{2(0.0030)/160} = \sqrt{0.0000375} = 0.00612$, about 61 bps.

Q5. Curve view

Q: You expect the 10Y to rally 75 bps while the 2Y and 30Y stay unchanged. Barbell or bullet?
A: Bullet. This is a negative butterfly: the bullet owns all of the rally ($+7.5\% + 0.28\%$), and the barbell owns none of it.

Q6. Taleb worst case

Q: With 85% in T-bills at 6% and 15% in speculative bets, what is the worst-case one-year return?
A: $0.85 \times 1.06 = 0.901$, so the return is -9.9%. The downside is known and bounded.

Q7. Concept check

Q: Why can two portfolios with the same duration have different convexities?
A: Because $C_P = D_P^2 + \text{dispersion}$. Equal duration fixes D_P^2; convexity then depends only on how widely the cash flows are spread around D_P.

15 Summary

Ten Things to Remember

1. A barbell holds the two extremes and leaves the middle empty; a bullet holds only the middle.
2. Compare portfolios with **equal market value and duration**: $w_S = (T_L - D^*)/(T_L - T_S)$.
3. $\Delta P/P \approx -D\Delta y + \frac{1}{2}C(\Delta y)^2$, and the convexity term is always positive.
4. $C_P = D_P^2 + \text{dispersion}$: spreading cash flows apart maximises convexity.
5. In the case study, the barbell has convexity 260 vs 100 but yields 21.4 bps less.
6. The barbell wins on large parallel moves and when the belly cheapens; it loses in calm markets and when the belly rallies or the long end sells off.
7. Breakeven $|\Delta y^*| = \sqrt{2 \times \text{drag}/\Delta C} \approx 52$ bps here.
8. Check key-rate durations: 86% of the barbell's duration is in the 30Y.
9. Taleb's barbell bounds the downside (about -5.5%) and keeps the upside open.
10. Both barbells are ways of **buying convexity**: a premium in calm times for protection and upside in extreme ones.

Companion Workbook

All the numbers in this article are reproduced in the companion Excel workbook *Barbell_Strategy_Duration_Convexity.xlsx*, with live inputs, eight yield-curve scenarios, exact repricing, the price–yield curve, the Taleb payoff model and a 25-question Q&A tab.

16 Abbreviations and Acronyms

Financial Terms & Metrics

Abbreviation	Full Form & Meaning
bps	Basis points (1 bp = 0.01%)
D_{Mac}	Macaulay duration
D_{Mod}	Modified duration
DV01	Dollar value of a 1 bp move (also PVBP)
PVBP	Price value of a basis point
KRD	Key-rate duration
C	Convexity
YTM	Yield to maturity
2s30s	Yield spread between 30Y and 2Y
G-sec	Government of India dated security
T-bill	Treasury bill

Strategy & Market Terms

Term	Meaning
Barbell	Holdings at two extremes, none in the middle
Bullet	Holdings concentrated at one maturity
Ladder	Holdings spread evenly across maturities
Positive butterfly	Belly yields rise relative to the wings
Negative butterfly	Belly yields fall relative to the wings
Bear flattener	Short yields rise more than long yields
Bear steepener	Long yields rise more than short yields
ALM	Asset–liability management
OTM	Out of the money (options)
REIT	Real estate investment trust

17 About the Author

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