ON ONE PAGE

Macaulay vs Modified Duration

Years versus percent: how much a bond loses when rates rise.

IN ONE LINE

Macaulay duration is the weighted average time to the cash flows; modified duration is the price sensitivity. Add convexity when yields move a lot.

$$\text{Macaulay } D = \sum t \times PV(CF_t) / P$$
$$\text{Modified } D = \text{Macaulay } D / (1 + y/k)$$
$$DV01 = \text{Modified } D \times P \times 0.0001$$

t: time in years · y: yield · k: coupons a year · P: price

Five rules

1. **Years, then percent.** Macaulay is time; modified is price sensitivity.
2. **Coupons shorten it.** A zero has duration equal to maturity; a 10% coupon cuts five years to 4.25.
3. **Match the compounding.** Semi-annual bonds divide by 1 + y/2.
4. **Add convexity for big moves.** +2 points: duration says −8.66%, the bond loses 8.20%.
5. **Options change the answer.** Callable bonds need effective duration.

Five-year 5% bond at 5%

Annual coupons, price 100

Measure	Value
Macaulay duration	4.55 yrs
Modified duration	**4.33**
DV01 per 100	0.043
Convexity	23.9

Duration vs actual

+1 point: duration **−4.33%**, actual **−4.21%**. −1 point: duration +4.33%, actual **+4.45%**. Convexity closes the gap.

Before you sign it off

- [ ] Macaulay vs modified chosen for the question
- [ ] Compounding frequency matched
- [ ] DV01 stated per 100 or per position
- [ ] Convexity added for large moves
- [ ] Effective duration for callable bonds



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