# CIRE Fixed Income Yields

Bond pricing, duration, convexity, day-count, yield curves. The fixed-income outcomes in CIRE Element 7 (Securities, managed products and mutual funds), plus deeper background.

## Pricing + yield

### Bond price

`P = Σ C/(1+y)^t + F/(1+y)^n`

*Discount each cash flow at YTM*

### Current yield

`annual coupon / current price`

*Ignores capital gain/loss to maturity*

### YTM rule of thumb

`(C + (F - P)/n) / ((F + P)/2)`

*Approximation; breaks down for long n*

### YTC (yield to call)

`Same as YTM but using call date + call price`

*Use YTW = min(YTM, YTC) when callable*

## Duration + convexity

### Modified duration

`ΔP/P ≈ -ModDur × Δy`

*First-order; misses convexity for big Δy*

### Macaulay duration

`Weighted average time to cash flow`

*Used in immunization*

### Convexity adjustment

`ΔP/P ≈ -ModDur × Δy + 0.5 × Conv × (Δy)²`

*Add for large yield shifts*

## Day-count + settlement

- T+1 settlement since May 27, 2024 for equities and most bonds
- In Canada, settlement accrued interest uses actual/365 for government and corporate bonds
- US Treasuries: actual/actual; US corporates: 30/360

## Yield curve shapes

- Normal: long rates above short rates (typical)
- Flat: long rates ≈ short rates (transition signal)
- Inverted: short rates above long rates (recession indicator)
- Humped: medium-term rates highest

## Spreads

- G-spread: yield over interpolated government curve
- Z-spread: spread over zero-coupon government curve
- OAS: option-adjusted spread, removes embedded option value

## Duration worked example

A 10-year bond with modified duration 7.5 and yield 4.0%. If the yield rises 25 basis points to 4.25%, the approximate price change is -7.5 x 0.25% = -1.875%. For a bond priced at $1,000 this is a $18.75 drop. Convexity adds a small positive correction on top.

## Common YTM and duration mistakes

- Confusing modified duration with Macaulay duration. ModDur = Macaulay / (1 + y/m).
- Using the YTM rule-of-thumb formula for very long maturities. The approximation gets less accurate as maturity lengthens.
- Treating callable-bond yield as YTM. Callable bonds use yield-to-call when the call price is below the current market price.
- Forgetting that bond prices and yields move inversely. Rising yields means falling prices, always.
- Settlement: T+1 since May 27, 2024 for equities and most bonds. Pre-2024 references to T+2 are out of date.

## Callable bond worked example

5-year corporate bond, $1,000 face, 6% coupon, callable at $1,020 after year 2. Current price: $1,050. Yield to maturity: 4.8%. Yield to call: 4.3%. Investor's effective yield depends on whether the bond gets called.

- When market yields fall below the coupon, the issuer is likely to call. Pricing the bond at yield-to-call protects against this scenario.
- Yield-to-worst is the LOWER of YTM and YTC. For callable bonds trading above par, yield-to-worst is typically yield-to-call.
- Rule of thumb: if a bond trades above its call price, default to YTC. If it trades below face value, default to YTM.

## Bond ladder strategy

A bond (maturity) ladder spreads bond maturities across a range of years to manage reinvestment risk. As each rung matures, proceeds buy a new long-end rung at current yields. Smooths interest-rate fluctuations over the cycle.

- Best for: income-oriented investors who do not want to time the yield curve.
- Worst for: investors with conviction on rate direction. A bullet portfolio (concentrated at one maturity) outperforms in strong directional moves.
- Note: a ladder does not remove reinvestment risk. It spreads it across the maturity dates.

## Yield curve shapes and what they signal

- Normal (upward-sloping): long yields > short yields. Expansion expected.
- Inverted: short yields > long yields. Historically a leading recession indicator.
- Flat: nearly identical yields across maturities. Transition phase, often before inversion.
- Steep: very wide gap between short and long. Strong growth + inflation expectations.

### Read the live cheat sheet

Worked examples, callable bonds, credit ratings.

**https://registrantprep.ca/cheat-sheets/cire-fixed-income-yields**