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Bond Yield Workbook

Methodology

The transparent fixed-income workbench, documented.

Companion to the free Bond Yield Calculator at baratelliinstitute.com

Version 1.3 · 13 July 2026

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Quick Start · The workbook in 60 seconds

If you downloaded the workbook and want the shortest path to your yield answer, this page is it. The rest of the document is optional deeper reading.

1

Open the workbook.

The INDEX tab loads first. Six tabs total — you'll use Tab 1 for most single-bond work.

2

Go to Tab 1 (Single Bond).

Everything you need to yield-check a single bond lives here. Blue cells are inputs; gold cells are outputs — don't overwrite gold.

3

Enter the bond.

Face, coupon rate, market price, years to maturity, payments per year (usually 2). Set bond type: 1=Corp, 2=Treasury, 3=In-state muni, 4=Out-state muni. Set your federal and state marginal rates.

4

Read the four yields.

F6 Current Yield · F7 YTM · F8 YTC (if callable) · F9 YTW. For a non-callable bond, YTM is the number that matters. For a callable, YTW is what you actually earn.

5

Compare after-tax.

F12 shows the after-tax YTM at your marginal bracket. For comparing muni to Treasury to corporate on your actual tax situation, this is the number.

6

Sanity-check.

At the bottom of Tab 1: input 4.25% coupon, 10 years, price $965, semi-annual, Treasury. YTM should read 4.6925%. If not, iterative calc is disabled — see Chapter 3.

Everything else in this guide — the YTM derivation, the tax-treatment appendix, the duration and convexity chapter — is optional. Read it when the base workflow is not enough.

Table of Contents

The workbook is a computational tool. This methodology guide is the reference behind it.

Why the bond yield calculation matters

Every buyer of a bond negotiates one number: the yield. Coupon rate is fixed; the price varies; the yield closes the loop. Get the yield calculation wrong and you have miscounted the return on the trade.

Brokers quote yields on the confirmation ticket. Bloomberg reports yield-to-worst as the default number on any callable-bond screen. A fixed-income analyst comparing two bonds is comparing two yields; a family-office CFO deciding whether to shift from muni to Treasury is comparing after-tax yields; a rating agency stress-testing a portfolio is comparing yields to break-even inflation. Everything downstream of the trade starts with the yield.

This workbook computes four yields (current yield, yield-to-maturity, yield-to-call, yield-to-worst) plus their after-tax equivalents, shows the math behind each, and lets a reader replace the sample inputs with their own bonds. Nothing here is proprietary. Everything here is the same math a Bloomberg terminal runs — presented in Excel, free, and open.

What this guide does. It documents every formula in the workbook, explains why each convention was chosen, walks a reader through the tax logic that makes muni versus taxable comparisons defensible, and points out the specific real-market issues (accrued interest, day-count conventions, de minimis municipal-bond treatment) where the workbook's simplifying assumptions could matter.

What this guide does not do. It does not offer bond recommendations. It does not opine on which bonds a specific reader should buy. It does not model the credit-spread or default-probability layer of pricing. The Baratelli Institute publishes under the Lowe v. SEC publisher exception; the workbook is a computational tool, not investment advice. Every reader should consult a fixed-income specialist for trade-level decisions.

The four yields — what each means

Four numbers get called "the yield" on a bond, and using the wrong one is one of the most common mistakes retail buyers make.

Yield	What it measures	When to use it
Current Yield	Annual coupon $ divided by current market price. Simplest calculation.	Quick comparison across bonds at similar maturities. Ignores the pull-to-par.
Yield to Maturity (YTM)	The internal rate of return if you hold to maturity: the discount rate that makes present value of all future cash flows equal to today's price.	The primary yield. Every serious bond comparison uses YTM.
Yield to Call (YTC)	Same as YTM but computed to the earliest call date, using the call price as the terminal cash flow instead of face value.	Only applies to callable bonds. If the bond can be called before maturity, YTC is the yield you actually earn if it is.
Yield to Worst (YTW)	The lower of YTM and YTC. What Bloomberg quotes on a callable-bond screen.	The realistic yield: assumes the issuer will call the bond whenever it hurts the holder. Default for callable bonds.

The workbook computes all four on the Single Bond tab (Tab 1) and displays them side-by-side so the buyer can see what's actually being quoted.

Why current yield is not enough. A bond trading at $965 with a $1,000 face and 4.25% coupon has a current yield of 4.40% ($42.50 / $965). But if you hold to maturity, you get the full $1,000 back — the pull-to-par of $35 is additional return over the life of the bond. YTM captures that. Current yield doesn't.

Why YTM is not enough for callable bonds. A corporate bond trading above par is a call candidate: the issuer can refinance at a lower rate by calling the old bond. If they do, the holder receives the call price (usually par) sooner than expected. YTC captures that scenario; YTW takes the lower of the two possibilities.

YTM — the math and the iterative solve

Yield to Maturity is defined as the rate **y** that solves:

```
P = Σ [ C / (1 + y/m)^t ] + F / (1 + y/m)^n
```

Where **P** is the market price, **C** is the periodic coupon (annual coupon divided by frequency **m**), **F** is the face value at maturity, **n** is the total number of periods, and **y/m** is the per-period yield. The sum is over t from 1 to n.

There is no closed-form solution. The equation must be solved iteratively — pick a candidate y, compute the right-hand side, adjust y up or down until the right-hand side equals P.

How Excel solves it. Excel's RATE(nper, pmt, pv, fv) function uses a Newton-Raphson iteration internally. The workbook passes:

```
RATE( n_years × frequency , coupon $ ÷ frequency , –price , face ) × frequency
```

The price is negative because Excel treats it as an outflow. The result is per-period yield, which the workbook multiplies by **frequency** to annualize.

Iterative calculation must be enabled. The workbook enables iterative calc in the Excel calculation properties (200 iterations, 0.0001 tolerance) so RATE converges cleanly. If you open the workbook and get #NUM! errors, check that iterative calc is on: File > Options > Formulas > Enable iterative calculation.

Worked example — period-by-period

Bond: $1,000 face, 4.25% annual coupon, 10 years to maturity, semi-annual pay, price $965. Solving RATE(20, 21.25, –965, 1000) × 2 gives YTM = 4.6925%, or a per-period yield of 2.3463%. Discount each cash flow at that per-period rate:

Period t	Cash flow $	Discount factor 1/(1.023463)^t	PV of cash flow $
1	$21.25	0.97707	$20.76
2	$21.25	0.95468	$20.29
3	$21.25	0.93279	$19.82
4	$21.25	0.91141	$19.37
5	$21.25	0.89051	$18.92
6	$21.25	0.87010	$18.49
7	$21.25	0.85015	$18.07
8	$21.25	0.83066	$17.65
9	$21.25	0.81162	$17.25
10	$21.25	0.79301	$16.85
11	$21.25	0.77483	$16.47
12	$21.25	0.75707	$16.09
13	$21.25	0.73971	$15.72
14	$21.25	0.72275	$15.36
15	$21.25	0.70618	$15.01

16	$21.25	0.68999	$14.66
17	$21.25	0.67418	$14.33
18	$21.25	0.65872	$14.00
19	$21.25	0.64362	$13.68
20	$1,021.25	0.62886	$642.23
TOTAL			**$964.99**

The 21 present values sum to the market price of $965 (rounding aside), which confirms the iterative solve. Note how the final period carries the coupon *plus* the $1,000 face — the pull-to-par that makes YTM higher than current yield.

Callable bonds — YTC, YTW, and the min-of rule

A callable bond gives the issuer the right to redeem the bond before maturity at a specified call price on or after a specified call date. From the holder's perspective, this is a written call option — the issuer will exercise when it's advantageous to them and disadvantageous to the holder.

Yield-to-call (YTC) is the yield the holder would earn if the bond is called on the first call date at the call price:

```
YTC = RATE( n_call × freq , coupon $ ÷ freq , −price , call_price ) × freq
```

Where **n_call** is the years-to-first-call and **call_price** is the price at which the issuer can redeem (usually par or a small premium).

The min-of rule. Yield-to-worst is defined as:

```
YTW = MIN( YTM , YTC )
```

The logic: if YTC is lower than YTM, the issuer will call the bond (because the bond is trading above call price, refinancing saves them money). If YTM is lower, the issuer won't call — either because the bond is trading below call price or because refinancing is more expensive than holding. YTW picks the worse of the two for the holder.

Make-whole calls — the modern corporate convention

Most modern investment-grade US corporate bonds carry a **make-whole call** rather than a traditional fixed-price call schedule. Under a make-whole call, the issuer can redeem the bond at any time, but the redemption price is set to the greater of (a) par, or (b) the present value of all remaining scheduled cash flows discounted at a specified Treasury benchmark rate plus a small spread (typically 10-50 basis points).

The economics matter. A traditional fixed-price call at $1,050 is highly issuer-friendly — the holder gets the fixed call price regardless of where rates are. A make-whole call is holder-friendly — if rates have fallen (making the bond more valuable), the make-whole formula produces a redemption price above par because the PV of remaining cash flows at the low Treasury+spread rate exceeds par. In practice, make-whole redemptions rarely occur except in tender-offer or acquisition contexts because the make-whole premium eliminates the issuer's usual refinancing motive.

This workbook models traditional fixed-price call schedules. For a make-whole bond, YTC is not meaningful — the correct approach is to price the bond at YTM and treat the make-whole call as unlikely to be exercised until an event-driven trigger arrives. Bloomberg terminals flag make-whole bonds explicitly; check any callable-bond quote for the call type before relying on YTC.

Worked example (traditional call)

Bond: $1,000 face, 5.50% coupon, 10 years to maturity, callable in 3 years at $1,050. Current price $1,065.

```
YTM (to 10-year maturity): RATE(20, 27.50, −1065, 1000) × 2 = 4.66%
```

```
YTC (to 3-year call): RATE(6, 27.50, −1065, 1050) × 2 = 4.85%
```

YTW = min(4.66%, 4.85%) = **4.66%** (YTM binds — issuer probably won't call because interest rates are already high, so no refinancing benefit).

Compare to the same bond at price $1,120. YTM = 4.10%. YTC = 3.20%. YTW = **3.20%** (YTC binds — the bond is well above call price, so the issuer will call and refinance).

Tax treatment across four bond types

The workbook applies different effective tax rates to coupon interest based on the bond's tax classification. These are the four types coded in the workbook's Type field:

Type	Bond category	Federal tax	State tax	Effective rate
1	Fully taxable corporate	Yes (fed rate)	Yes (state rate)	Fed + State
2	US Treasury / agency	Yes (fed rate)	NO — state-exempt	Fed only
3	In-state municipal	NO — federal-exempt	NO — state-exempt	0 %
4	Out-of-state municipal	NO — federal-exempt	Yes (state rate)	State only

Statutory basis for Treasury state-exemption

The Public Salary Tax Act of 1939, codified at **31 USC §3124**, provides that interest on obligations of the United States government is exempt from state and local income tax. All 50 states honor this exemption. This is why Treasuries pay federal tax but not state tax on coupon interest.

Statutory basis for municipal bond federal-exemption

IRC §103(a) provides that interest on state and local government obligations is excluded from gross income for federal income tax purposes. This is the federal-exempt half of the muni tax break.

The state-exempt half is a matter of state law. Most states exempt interest on their own bonds (in-state munis) and tax interest on bonds issued by other states (out-of-state munis). The workbook models this as the difference between Type=3 and Type=4.

A footnote on state variation (the four exceptions)

The workbook's Type=3 (in-state muni = zero effective tax) assumes the reader's state exempts its own municipal bond interest. Four states are known exceptions where the state taxes its own in-state muni interest: **Illinois, Iowa, Oklahoma, and Wisconsin**. A reader domiciled in one of these states should treat in-state munis as Type=4 (state-taxable) for the workbook's purposes. Illinois specifically has a flat 4.95% individual income tax that applies to all municipal interest regardless of source. Consult a state-specific tax specialist before treating any muni as fully exempt.

Applying the effective rate to YTM

The workbook's after-tax YTM calculation shrinks the coupon by the effective tax rate and re-solves for yield:

```
After-tax YTM = RATE( nper , coupon × (1 − t_eff) ÷ freq , −price , face ) × freq
```

This is an approximation: it captures the tax drag on cash coupons but does not model the tax treatment of the capital gain (or ordinary income) at maturity for a discount bond. See Chapter 10 for the de minimis and OID rules that govern the terminal cash-flow treatment.

Tax-equivalent yield (TEY) and break-even rate

The classic muni-versus-Treasury decision reduces to one calculation: at your marginal tax bracket, does the tax-free muni's yield exceed the after-tax Treasury yield?

Tax-equivalent yield is the pretax yield a taxable bond would need to match the muni's after-tax return:

```
TEY = Muni yield / ( 1 – effective tax rate )
```

The effective tax rate depends on the muni type. For an in-state muni that escapes both federal and state tax, the rate is (fed + state). For an out-of-state muni escaping only federal, the rate is fed only.

Worked example

In-state muni yielding 3.50%. Investor at 32% federal + 9.3% state marginal bracket.

```
TEY = 3.50% / (1 – 0.32 – 0.093) = 3.50% / 0.587 = 5.96%
```

Compare to a Treasury yielding 4.25% (state-exempt). After-tax Treasury: 4.25% × (1 – 0.32) = **2.89%**.

The muni delivers 3.50% after-tax; the Treasury delivers 2.89% after-tax. **At this tax profile the muni produces a 61-basis-point higher after-tax return.**

Break-even federal tax rate

Another way to frame the same decision: at what federal marginal rate would the muni and Treasury deliver equal after-tax yield?

```
Break-even fed rate = 1 – ( Muni yield / Treasury yield )
```

Using the same numbers: 1 – (3.50 / 4.25) = **17.65%**. A holder with a federal marginal rate above 17.65% earns a higher after-tax return from the muni than the Treasury. Below 17.65%, the Treasury produces the higher after-tax return.

This calculation lives on Tab 3 (Muni vs Taxable) of the workbook and is the most compact way to advise a client on which bond category makes sense at their tax profile.

Duration and convexity — the risk half

Yield tells you what a bond earns. Duration tells you how much the price moves when yields change. Yield is return; duration is risk. Both matter.

Macaulay duration

Macaulay duration is the weighted-average time until you receive the bond's cash flows, weighted by the present value of each:

```
D_mac = Σ [ t × PV(cf_t) ] / Σ [ PV(cf_t) ]
```

Measured in years. A 10-year zero-coupon bond has duration = 10 (all cash flow at maturity). A **10-year 4% coupon bond at par** has Macaulay duration of approximately **8.4 years** — the weighted-average is pulled leftward by the interim coupon payments. A 10-year 6% coupon bond has duration closer to 8.0 years; higher coupons pull the weighted average further left. Long-duration bonds are those with (a) long maturity, (b) low coupon, or (c) zero coupon — the three levers that concentrate cash flows further from today.

Modified duration

Modified duration is Macaulay duration adjusted for the periodic yield:

```
D_mod = D_mac / ( 1 + y / m )
```

It's the approximate percent price change per 1% (100 basis point) change in yield. A bond with modified duration of 7 years will lose roughly 7% of its price if yields rise 1%.

For small yield changes, modified duration is a linear approximation. For large yield changes, convexity — the second-order term — matters too.

Convexity — the second-order correction

Convexity is the mathematical curvature of the bond price-yield relationship. Modified duration is the linear (first-order) approximation of price change for a yield change; convexity is the quadratic (second-order) correction that captures how duration itself changes as yields change. Formally:

```
Convexity = ( 1 / P ) × Σ [ t × ( t + 1 ) × PV(cf_t) ] / ( 1 + y / m )²
```

With duration and convexity in hand, the improved price-change estimate for a yield change Δy is: **ΔP / P ≈ –D_mod × Δy + (1/2) × Convexity × Δy²**. The convexity term is always positive for standard bonds (adds to price when yields fall, subtracts less than duration alone when yields rise) — which is why practitioners say *bonds have positive convexity*. That positive convexity is worth something to the holder; it's why yields on high-convexity bonds are slightly lower than pure-duration analysis would predict.

Convexity matters most for (a) yield changes above roughly 100-200 basis points, (b) longer-duration bonds, and (c) portfolio-level hedging where mismatched convexities create P&L; that pure duration matching would miss. For most retail and family-office use cases at typical yield-change magnitudes, modified duration is the sufficient statistic. See the Institute's standalone Bond Duration & Convexity Calculator for the full convexity computation on any bond.

Duration in the workbook

Round 1 committee fixes added Macaulay Duration (column N) and Modified Duration (column O) to the Portfolio tab. Both use Excel's DURATION() and MDURATION() functions with synthetic dates (TODAY()

and TODAY() + years × 365.25) so the year-only input matches the closed-form calculation.

Weighted-average modified duration across the portfolio (row 27) is the single most useful risk number for a bond portfolio: it tells you what the whole book does if rates move 100 basis points.

Portfolio construction and weighted-average yields

The Portfolio tab lets you enter up to ten bonds and computes weighted-average yield metrics across the entire book.

Weighted-average YTM (row 22): SUMPRODUCT of each bond's YTM times its market value, divided by total market value. This is the yield the portfolio delivers if all bonds are held to maturity. Uses market value as the weight because market value is what determines the reinvestment share of each position.

Weighted-average current yield (row 23): Same calculation on current yield rather than YTM. Useful as a quick sanity check.

Portfolio effective yield (row 24): Total annual coupon divided by total market value. A pure cash-in-cash-out yield across the book.

Weighted-average after-tax YTM (row 26, added Round 1): Same SUMPRODUCT logic but on the after-tax YTM column (M). Requires the fed and state tax rates in cells C5 and E5 to be set.

Weighted-average modified duration (row 27, added Round 1): The single most useful portfolio-level risk metric.

Interpreting weighted-average yields

If your weighted-average YTM is 4.3% and your weighted-average modified duration is 8.5, you're expecting to earn about 4.3% per year (if held to maturity) with about 8.5% price sensitivity per 1% rate change. Combine those two numbers with your view on where rates go, and you have the beginnings of a portfolio-level rate decision.

Sample data warning

The Portfolio tab ships with ten preloaded sample bonds (US Treasuries, corporate names, munis) to make the tool demonstrable out of the box. **These are illustrative, not recommendations.** Round 1 committee fixes added a prominent SAMPLE DATA banner at row 4 to make this unmistakable. Replace with your actual holdings before drawing any conclusion.

The yield curve — reading it, laddering it

Tab 4 (Yield Curve) accepts a nine-tenor Treasury yield curve as input and computes a simple ladder illustration.

Standard tenors: 3-month, 1-year, 2-year, 3-year, 5-year, 7-year, 10-year, 20-year, 30-year. Refresh from treasury.gov/resource-center/data-chart-center/interest-rates/ before use — Treasury publishes the daily yield curve at 4pm ET each business day.

Reading the curve

Upward-sloping (steep): long-term yields are higher than short-term. Normal shape; expects economic growth and rising future short rates.

Flat: long-term yields ≈ short-term yields. Late-cycle signal; market expects short rates to stay stable.

Inverted: long-term yields below short-term. Historically a recession signal — the market expects future short rates to fall.

Laddering the curve

A bond ladder is a portfolio structured so that a roughly equal notional amount matures each year across the ladder's span. As bonds mature, the cash is reinvested at the long end of the ladder, replacing maturing rungs.

The Yield Curve tab illustrates this with a nine-rung ladder. Weighted-average yield across the ladder is the number you actually earn — a blend of short (lower) and long (higher) yields in an upward-sloping curve environment.

Why ladder? A ladder averages your reinvestment rate over the cycle. If rates rise, your maturing short rungs get reinvested at the new higher rate. If rates fall, your longer rungs are still earning the old higher rate. The ladder is a rate-view-neutral portfolio.

The alternative: a barbell (short + long, no middle) captures more curve steepening upside; a bullet (concentrated at one tenor) captures more of a specific-rate view. Ladders are the default for family-office and retirement-account bond books.

Tax nuances — de minimis, OID, AMT, capital gains

The workbook's after-tax YTM captures the tax drag on cash coupons. It does not capture the tax treatment of the terminal cash flow. Four nuances matter.

De minimis rule (municipal discount)

If a muni is bought at a discount to par in the secondary market, the gain at maturity may be taxed as either capital gain OR ordinary income, depending on the size of the discount.

```
De minimis threshold: 0.25% × full years to maturity × par
```

Discount below the threshold: gain is capital gain at maturity. Discount above the threshold: gain is ordinary income at maturity.

Worked example: 10-year muni, $10,000 face. Threshold = 0.25% × 10 × $10,000 = $250. Bought at $9,800 (discount $200): capital gain treatment. Bought at $9,700 (discount $300): ordinary income treatment. The tax difference is material for high-income holders.

Original issue discount (OID) — and the §1278(b) election

If a bond is issued at a discount to par (a "deep-discount" or zero-coupon bond), the OID must be accrued as taxable interest each year on a constant-yield-to-maturity basis under **IRC §1272**. This applies whether cash is received or not.

This is why zero-coupon Treasuries and STRIPS generate an annual tax bill even though no coupon is paid. Individual holders often overlook this; the IRS does not.

Market discount (bought below par in the secondary market) is separately governed by **IRC §1276**: gain at maturity is ordinary income unless the **§1278(b) election** is made to accrue market discount currently. **The §1278(b) election is irrevocable — once made for one bond, it applies to all market-discount bonds acquired by the taxpayer during the tax year of the election and subsequent tax years.** This is a significant commitment; the election trades near-term ordinary-income tax on accrued discount against capital-gain treatment at disposition. A holder with only occasional discount-bond purchases may prefer the default §1276 treatment; a holder actively managing a discount-bond book may prefer the §1278(b) election. Consult a tax specialist before making the election.

Alternative Minimum Tax (AMT)

Municipal bonds issued to finance certain private activities — private-activity bonds, or PABs — are federal-exempt for regular tax but ARE taxable for AMT purposes.

A holder in AMT territory should check the offering statement for PAB status. General-obligation (GO) municipal bonds and revenue bonds for genuinely governmental use are typically not PABs.

Capital gains at maturity (taxable bonds)

For a taxable bond bought at a discount and held to maturity, the pull-to-par gain is a capital gain (long-term if held > 1 year, short-term otherwise). This is generally more favorable than ordinary income for a high-bracket holder.

The workbook's after-tax YTM approximation does not model this. For a bond bought at deep discount, the workbook's after-tax YTM understates the actual after-tax return. Consult a tax specialist for trade-level modeling.

Real-market conventions — accrued interest, day-count, settlement

The workbook simplifies three real-market conventions. This chapter documents what's simplified and when it matters.

Accrued interest

A bond quote is **clean price**: the price excluding accrued interest. The buyer pays the seller clean price PLUS accrued interest (the coupon interest that has accumulated since the last coupon date). This is the **dirty price**, or invoice price.

Round 2 committee fixes added an accrued-interest field to the Single Bond tab (cell C17) and to the Portfolio tab (column P). These fields are currently informational only — the RATE-input price remains clean price. A future workbook version will optionally use dirty price for the RATE solve.

Impact: on a bond bought halfway through its coupon period, accrued interest can be 1-2% of face. It does not change the YTM computation because the accrued is a return-of-principal (paid at settlement, received at the next coupon), not a return-on-principal. But it does change the cash outlay — the workbook now shows True Cash Outlay in cell F17.

Day-count conventions

Different bond markets use different day-count conventions for accrued-interest and yield calculations:

Convention	Used for	Description
30/360	US corporate bonds; municipal bonds	360-day year; each month treated as 30 days
Actual/Actual	US Treasuries	Actual day counts; actual days in year (365 or 366)
Actual/360	Money-market instruments; some CDs	Actual days; 360-day year
Actual/365	UK Gilts and some sovereigns	Actual days; 365-day year regardless of leap year

Round 2 added a day-count selector on the Single Bond tab (cell C18). For most retail bonds this selector is informational — the RATE function computes yield on a smooth semi-annual compounding basis that closely approximates both 30/360 and Actual/Actual conventions.

Settlement conventions

Treasuries: T+1 — settle one business day after trade. **Corporates and municipals: T+2** — settle two business days after trade. These conventions matter for accrued-interest calculation (accrued is computed to settlement date, not trade date) but not for the yield math the workbook computes.

How to use the workbook, step by step

Step 1: Open and orient

The workbook opens on the INDEX tab. Six tabs total: INDEX, Single Bond, Portfolio, Muni vs Taxable, Yield Curve, Reference, Disclosures. Iterative calculation is pre-enabled (needed for the YTM solve to converge). If you see #NUM! errors on any yield cell, check File > Options > Formulas > Enable iterative calculation.

Step 2: Single Bond analysis

Tab 1 (Single Bond). Enter your bond in the blue input cells: face, coupon, price, years to maturity, payments per year, callable Y/N (with call price and years to call if yes), fed and state tax rates, and bond type (1=Corporate, 2=Treasury, 3=In-state muni, 4=Out-state muni). Yields calculate to the right in the gold output cells.

YTM is the primary number for a non-callable bond. YTW is the primary number for a callable bond. After-tax YTM is the number you actually keep — use this for cross-comparisons across bond types.

Step 3: Portfolio analysis

Tab 2 (Portfolio). Replace the sample bonds with your actual holdings. Set the federal and state tax rates in row 5. Weighted-average YTM, current yield, after-tax YTM, and modified duration compute at the bottom.

The Type field (column H) has data validation: only 1, 2, 3, or 4 are accepted. Any other value is rejected with an error dialog.

Step 4: Muni-vs-Taxable comparison

Tab 3 (Muni vs Taxable). Enter the muni yield, muni type (in-state or out-of-state), comparable Treasury yield, comparable corporate yield, and your fed and state marginal rates. The tab shows TEY, after-tax Treasury yield, after-tax corporate yield, per-bond verdict cells, and break-even federal rate.

A holder with a federal marginal rate above the break-even earns a higher after-tax return from the muni. Below, the taxable comparable produces the higher after-tax return. This is the most compact way to inform a family-office allocation decision at a specific tax profile.

Step 5: Yield curve check

Tab 4 (Yield Curve). Refresh the nine-tenor Treasury yields from treasury.gov before use (published daily at 4pm ET). Ladder illustration shows weighted-average yield across a nine-rung structure.

Step 6: Reference and disclosures

Tab 5 (Reference) defines every yield and tax term used in the workbook, with cross-references to the tab where each term is computed. The Appendix section on Tab 5 covers de minimis, OID, AMT, and 31 USC 3124.

Tab 6 (Disclosures) is the full-length educational-only disclaimer. The Institute publishes under the Lowe v. SEC publisher exception. This is not investment advice.

A note on test verification

At the bottom of Tab 1 (rows 30-31) is a known-good check: input 4.25% coupon, 10 years, price $965, semi-annual, Treasury, and YTM should read 4.6925%. If it does not, iterative calculation is disabled or the sheet has been modified. This is the ten-second confidence check before you trust the workbook for a real trade.

Appendix A · Formula reference

Yield	Formula (Excel)	Notes
Current Yield	`= (Face × Coupon%) / Price`	Annual coupon $ divided by market price
Yield to Maturity	`= RATE(n×freq, C×face÷freq, −price, face) × freq`	Solves the DCF equation iteratively
Yield to Call	`= RATE(n_call×freq, C×face÷freq, −price, call_price) × freq`	YTM computed to call date and call price
Yield to Worst	`= MIN(YTM, YTC)`	Lower of the two
After-tax YTM	`= RATE(n×freq, C×face×(1−t_eff)÷freq, −price, face) × freq`	Coupon shrunk by effective tax rate
Effective tax rate	`= IF(type=1, fed+state, IF(type=2, fed, IF(type=3, 0, IF(type=4, state, 0))))`	Depends on bond type code (1-4)
Tax-Equivalent Yield	`= muni_yield / (1 − t_effective_muni)`	In-state: fed+state; Out: fed only
Break-even Fed Rate	`= 1 − (muni_yield / treasury_yield)`	Above this rate, muni produces higher after-tax return
Macaulay Duration	`= DURATION(TODAY(), TODAY()+n×365.25, coupon, YTM, freq)`	Weighted-avg time to cash flows (years)
Modified Duration	`= MDURATION(TODAY(), TODAY()+n×365.25, coupon, YTM, freq)`	Approx % price change per 1% yield
Convexity (informal)	`= (1/P) × Σ [t × (t+1) × PV(cf_t)] / (1 + y/m)²`	Second-order price-sensitivity correction
Weighted-avg portfolio YTM	`= SUMPRODUCT(YTMs, MVs) / SUM(MVs)`	Market-value-weighted yield

Appendix B · Sources and further reading

Primary tax and statutory sources

• Internal Revenue Code (IRC) §103(a) — federal-tax exclusion for state and local government interest

• IRC §1272 — accrual of original issue discount on debt instruments

• IRC §1276 — treatment of market discount on debt instruments

• IRC §1278(b) — irrevocable election to include market discount currently in income

• 31 USC §3124 — Public Salary Tax Act of 1939, state-tax exemption for US government obligations

• De minimis rule for municipal bond discount: applicable under §1276 and §1273

• Alternative Minimum Tax on private-activity bonds: IRC §55-59

• State-specific muni interest taxation (four exceptions: Illinois, Iowa, Oklahoma, Wisconsin — see Chapter 5 footnote)

Market data sources (recommended)

• US Treasury Daily Yield Curve: treasury.gov/resource-center/data-chart-center/interest-rates

• Corporate bond pricing: TRACE (FINRA), Bloomberg, ICE Data Services, MarketAxess

• Municipal bond pricing: MSRB EMMA (emma.msrb.org) — free public access

• Investment-grade credit spreads: Bloomberg Barclays / ICE BofA indices

Baratelli Institute companion resources

• Bond Duration & Convexity Calculator: baratelliinstitute.com/tool-bond-duration-convexity.html — the risk-side companion to this yield tool, including full convexity computation

• Bond Ladder Builder: baratelliinstitute.com/tool-bond-ladder-builder.html — full ladder construction beyond the 9-tenor illustration on Tab 4

• Municipal Bond Yield Calculator: baratelliinstitute.com/tool-municipal-bond-yield.html — dedicated muni TEY tool

• Financial Modeling Toolkit ($99): the Wall Street standard Excel templates — DCF, LBO, Trading Comps, WACC. baratelliinstitute.com/financial-modeling-toolkit.html

• CFO & Controller's Guide ($449): flagship practitioner reference including the WACC and capital-allocation methodology behind institutional bond decisions. baratelliinstitute.com/guide-cfo.html

• Family Office Reference Guide ($449): the reference book behind family-office fixed-income allocation. baratelliinstitute.com/guide-fo.html

Textbook references

• Fabozzi, Frank J., *The Handbook of Fixed Income Securities*, McGraw-Hill (latest edition). The standard practitioner reference.

• Tuckman & Serrat, *Fixed Income Securities: Tools for Today's Markets*, Wiley. Rigorous mathematical treatment with worked examples.

• CFA Institute, *Fixed Income* curriculum modules. Free reference material for practitioners and candidates.

Version 1.3. Compiled 13 July 2026. Committee-driven refresh: added make-whole call discussion, convexity definition, four-state muni footnote, §1278(b) irrevocability note, one-page quick-start card, period-by-period YTM cash-flow table, 10-year 4% coupon duration parallel example, dropped "Chapter N" prefixes, replaced "wins" with clinical after-tax-return language. Distributed freely under the Institute's Lowe v. SEC publisher exception. Educational only — not investment, tax, or legal advice.