COMPUTATIONAL FINANCE & FINTECH

Valuing Bonds

Bond cash flows, prices, yield curves and government risk

Fatih Kansoy
Worcester College, University of Oxford

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LECTURE OUTLINE

Valuing bonds

Bond cash flows, prices and yields

01

CASH FLOWS

Identify coupon, face value and payment dates.

02

PRICE

Discount all future payments to today.

03

YIELD

Solve for the rate that reproduces the market price.

Keep cash-flow dates and discount-rate periods aligned.

Bond contract and payment dates

A **bond** is a contract: the investor pays the issuer today and receives promised payments on stated future dates.

Maturity date
final repayment date

Term
time remaining to maturity

Face value
principal repaid at maturity

A market quote compresses this contract into a few fields. We read one next before deriving the formulas.

Reading a U.S. Treasury quote

Coupon: 4.625%

Contractual annual coupon rate.

Price: $99\frac{3}{32}$

\$99.09375 per \$100 face value.

Maturity: 15 Aug 2036

Face value is repaid on this date.

Yield: 4.712%

YTM implied by today's price and remaining payments.

U.S. Treasury notes pay coupons semiannually. The screen plots yield, not price; its 1/32 price increase accompanies a 0.014 percentage-point fall in yield.

Coupon payments

A sterling bond has $\text{FV} = £1{,}000$, a 5.2% coupon rate, five years to maturity and semiannual coupons.

FV is the face value—the principal repaid at maturity. CPN is one coupon payment. Semiannual means two coupon payments per year.

$$\text{CPN} = \frac{\text{coupon rate} \times \text{face value}}{\text{coupon payments per year}} = \frac{0.052 \times £1{,}000}{2} = £26.$$

- The **coupon rate** is fixed in the contract and determines each £26 payment.
- The **yield to maturity** is implied by the market price and can change after issue.

The coupon belongs to the contract. Price and YTM belong to today's market valuation of that contract.

Zero-coupon bonds

A **zero-coupon bond** makes no intermediate payments. The investor pays P today and receives only face value at maturity.

P: price today; FV: face value paid at maturity; n: years to maturity; y: annual yield under annual compounding.

$$P = \frac{\mathrm{FV}}{(1+y)^n} \qquad \Longrightarrow \qquad y = \left(\frac{\mathrm{FV}}{P}\right)^{1/n} - 1 = \left(\frac{100}{92.10}\right)^{1/2} - 1 = \mathbf{4.20\%}.$$

The discount from £100 to £92.10 supplies the return. With one payment, the price directly reveals the rate for that maturity.

Yield to maturity (YTM): definition

> **Yield to maturity (YTM)** is the single discount rate that makes the present value of all remaining *promised* payments equal the bond's current cash price.

$$P = \sum_{t=1}^{N} \frac{CF_t}{(1+y)^t} \qquad \text{and, with } m \text{ coupons per year,} \qquad \mathrm{YTM}_{\mathrm{APR}} = my.$$

P is the current cash price, CF_t the promised payment in coupon period t, N the periods remaining, y the yield per coupon period, and m the coupon frequency.

- **Observed:** price and promised payments. **Solved:** the rate y.
- The coupon sets the payments; YTM changes with the market price.
- For a coupon bond, YTM compresses dated spot rates into one quotation.

YTM is a promised-payment IRR; realised return can differ after default, early sale or coupon reinvestment.

Calculating a spot rate

A zero-coupon bond has one future payment. Its price therefore identifies the market discount rate for that date.

A default-free two-year zero promises $\mathrm{FV} = £100$ and is priced today at $P_2 = £93.26$.

FV: face value at maturity; P_2: price today; r_2: annual two-year spot rate. Annual compounding is used.

$$P_2 = \frac{\mathrm{FV}}{(1+r_2)^2} \quad \Longrightarrow \quad r_2 = \left(\frac{\mathrm{FV}}{P_2}\right)^{1/2} - 1,$$

$$r_2 = \left(\frac{100}{93.26}\right)^{1/2} - 1 = \mathbf{3.55\%}.$$

- **Interpretation:** 3.55% is the annual market rate for a default-free payment received in two years.
- For a zero-coupon bond, **spot rate = YTM** because there is only one remaining payment.

Cash flows from a coupon bond

Return to the five-year sterling bond: FV = £1,000, 5.2% coupon APR, semiannual coupons and CPN = £26.

10 semiannual coupons + one face-value repayment

The timeline counts coupon periods. Period 10 is five years from today.

The final £1,026 contains the last £26 coupon and the £1,000 principal.

Price of a coupon bond

$$P = \sum_{t=1}^{N} \frac{\text{CPN}}{(1+y)^t} + \frac{\text{FV}}{(1+y)^N} = \text{CPN}\,\frac{1-(1+y)^{-N}}{y} + \frac{\text{FV}}{(1+y)^N}.$$

CPN is the coupon payment, FV the face value, N the number of coupons remaining and y the YTM per coupon interval.

- The first term values the remaining coupon annuity.
- The second term values the principal repaid at maturity.

For semiannual coupons, discount with a six-month rate and count six-month periods.

Solving for a coupon bond's YTM

The five-year bond trades for £949.34. Solve for the semiannual rate y.

$$949.34 = 26\frac{1-(1+y)^{-10}}{y} + \frac{1{,}000}{(1+y)^{10}}$$

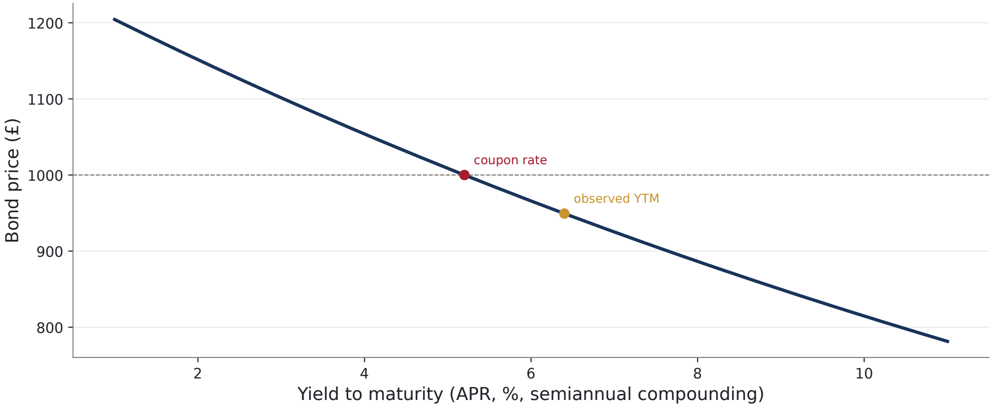
Trial y	PV of cash flows	PV − price	Direction
3.00%	£965.88	+£16.54	raise y
3.20%	**£949.34**	£0.00	root
3.40%	£933.13	−£16.21	lower y

3.20% per half-year = 6.40% APR; effective annual yield
$= (1.032)^2 - 1 = 6.50\%$

Discount semiannual cash flows at 3.20% per period, not at the 6.40% APR quotation.

A numerical root solver automates the search for the rate that sets present value equal to market price.

Price from a quoted YTM



Five-year 5.2% semiannual coupon bond

Price from a quoted YTM

Ten £26 coupons, £1,000 face value and a quoted YTM of 6.8% APR with semiannual compounding.

Match the quotation to the cash-flow interval:

$y = 6.8\%/2 = 3.4\%$ per half-year;

$N = 5 \times 2 = 10$ coupon periods.

$$P = 26\,\frac{1-(1.034)^{-10}}{0.034} + \frac{1{,}000}{(1.034)^{10}} = \textbf{£933.13}.$$

The resulting price quote is **93.313 per £100 face value**.

Holding the promised payments fixed, price falls when YTM rises.

Bond prices before maturity

01

PRICE LEVEL

Compare the coupon rate with the market YTM.

02

TIME

Follow coupon accrual and convergence to par.

03

MARKET YIELD

Reprice the same cash flows when required returns change.

Separate the effect of time from the effect of a change in market yield.

Why price can differ from face value

A one-year bond has FV $= £100$ and a 6% coupon rate. It pays a £6 coupon and £100 face value in one year.

The coupon rate is fixed by the contract. The YTM is today's market-required return. Here CPN $= £6$, FV $= £100$ and y denotes YTM.

$$P = \frac{\text{CPN} + \text{FV}}{1+y} = \frac{106}{1+y}.$$

Coupon rate versus YTM	Price calculation	Price	Classification
$6\% > 4\%$	$106/1.04$	£101.92	**premium** $P > \text{FV}$
$6\% = 6\%$	$106/1.06$	£100.00	**par** $P = \text{FV}$
$6\% < 8\%$	$106/1.08$	£98.15	**discount** $P < \text{FV}$

The promised £106 is unchanged. The purchase price adjusts so that the investor earns the market YTM.

Coupon income and price movement

Hold the same one-year bond to maturity. The investor receives a £6 coupon and the £100 face value.

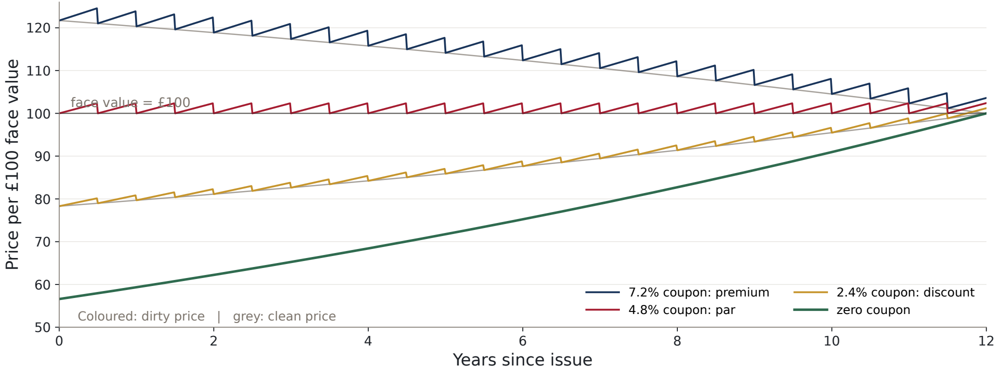
$$y = \frac{\mathrm{CPN} + (\mathrm{FV} - P)}{P} = \underbrace{\frac{\mathrm{CPN}}{P}}_{\text{coupon income}} + \underbrace{\frac{\mathrm{FV} - P}{P}}_{\text{price gain or loss}} .$$

Bond	Coupon	Move to £100	Total gain	Return
Premium: $P = £101.92$	$+£6.00$	$-£1.92$	$+£4.08$	4%
Par: $P = £100.00$	$+£6.00$	$£0.00$	$+£6.00$	6%
Discount: $P = £98.15$	$+£6.00$	$+£1.85$	$+£7.85$	8%

An above-market coupon is offset by a capital loss; a below-market coupon is supplemented by a capital gain. At par, there is no price movement.

Premium and discount mean above or below face value—not overpriced or underpriced.

Bond prices at a constant YTM



- With YTM unchanged, premium and discount prices converge to face value as maturity approaches.
- At a coupon date, dirty price falls by the coupon amount, but the investor receives that amount in cash; total wealth does not fall by the coupon.

Author calculations: 12-year bonds, £100 face value, 4.8% YTM APR and semiannual coupons.

Clean price, dirty price and accrued interest

The **dirty price** is the cash or invoice price paid at settlement. The **clean price** removes coupon interest accrued since the last coupon date.

$$\text{clean price} = \text{dirty price} - \text{accrued interest}$$

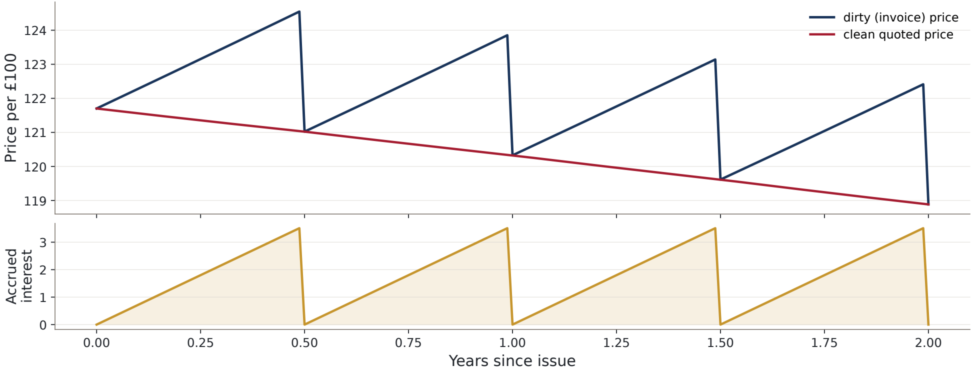
$$\text{AI} = \text{CPN} \times \frac{\text{days since the last coupon}}{\text{days in the coupon period}}.$$

AI denotes accrued interest; the day-count fraction is fixed by the bond-market convention.

Clean quote 105.187 per $\pounds 100$ face; $\pounds 1,000$ face value; $\pounds 26$ coupon; settlement 73 days into an assumed 182-day coupon period.

$$\text{dirty price} = \pounds 1{,}051.87 + \pounds 26\left(\frac{73}{182}\right) = \mathbf{\pounds 1{,}062.30}.$$

Clean and dirty price paths



- Immediately before a coupon, dirty price equals the ex-coupon dirty price plus the coupon paid.
- Accrued interest resets by the same amount, so the clean-price line does not inherit the coupon-date jump.

First two years of a 12-year 7.2% coupon bond

Why a higher market yield lowers an existing bond's price

Market YTM rises from 4.0% to 5.2%. The existing bond's 5.2% coupon rate and promised payments remain fixed.

01
NEW BONDS
Comparable bonds yield 5.2%

→

02
EXISTING BOND
Ten £26 coupons plus £1,000 fixed

→

03
PRICE FALLS
Until its YTM equals 5.2%

$$\text{market YTM}\uparrow \implies \text{discount factors}\downarrow \implies \text{bond price}\downarrow.$$

Repricing changes current value, not the contractual payments.

Repricing the five-year bond

Ten semiannual coupons of £26, followed by £1,000 principal. Compare YTM APRs of 4.0% and 5.2%.

Here y is the quoted YTM APR; $y/2$ is the six-month discount rate.

$$P(y) = \sum_{t=1}^{10} \frac{26}{(1+y/2)^t} + \frac{1{,}000}{(1+y/2)^{10}}.$$

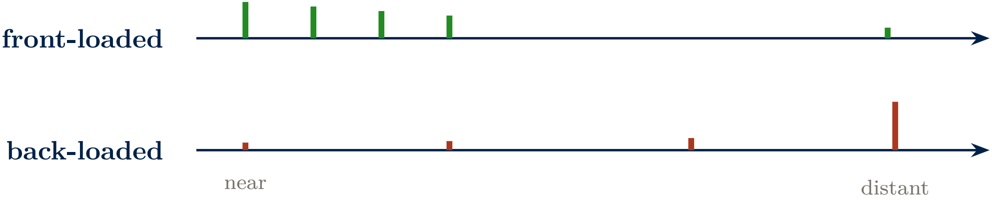
Market YTM	Six-month rate	Coupon rate versus YTM	Price
4.0%	2.0%	5.2% > 4.0%: premium	£1,053.90
5.2%	2.6%	5.2% = 5.2%: par	£1,000.00

$$\frac{1{,}000 - 1{,}053.90}{1{,}053.90} = \textbf{-5.11\%}$$

At a 5.2% YTM, the £53.90 premium disappears.

Cash-flow timing and interest-rate sensitivity

Duration summarises when the bond's present value is received and, therefore, how sensitive its price is to a change in yield.



- A distant payment is discounted through more periods, so a yield change has more leverage.
- Longer-maturity zeroes are therefore more sensitive than shorter zeroes.
- Holding maturity fixed, a higher coupon brings value forward and usually reduces sensitivity.

Maturity records the final payment date; duration reflects the timing of the entire value stream.

Maturity is not the same as duration

Prices are per £100 face value with annual compounding. Compare a 14-year zero with a 22-year bond paying a 9% annual coupon.

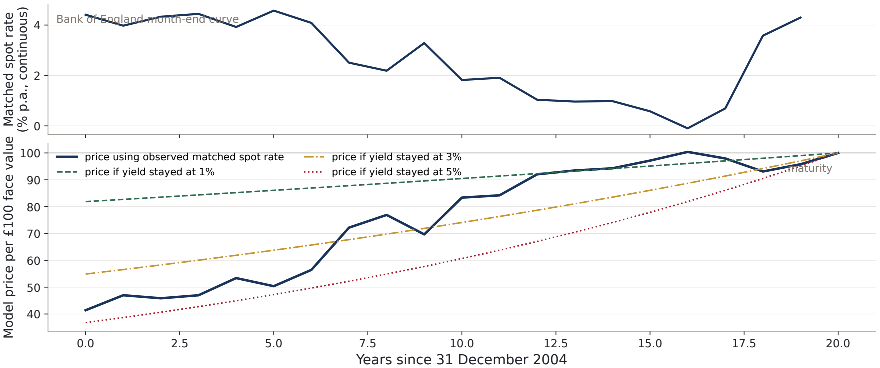
Bond	Price at 4.5%	Price at 5.5%	Percentage change
14-year zero	£54.00	£47.26	−12.48%
22-year, 9% coupon	£162.03	£144.04	−11.10%

the shorter zero is more sensitive because all of its value arrives at year 14

- The 22-year bond has a later maturity date.
- Its large coupons return substantial value before maturity.
- Cash-flow timing overturns the ranking based on maturity alone.

Author comparison with redesigned sterling amounts, maturities, coupons and yields.

Time and yield changes in observed prices



Time pulls the claim toward £100; changes in the maturity-matched spot rate move it above or below a fixed-yield path.

Bank of England month-end UK nominal government spot curves; hypothetical £100 zero maturing 31 December 2024; annual observations, 2004–2024.

Interest-rate risk before maturity

Interest-rate risk is the risk that a change in market yields changes the value of the bond's remaining cash flows before maturity.

$$P_t(y) = \sum_{j=t+1}^{T} \frac{CF_j}{(1+y)^{j-t}} \qquad \Longrightarrow \qquad y\uparrow \Rightarrow \ P_t\downarrow$$

P_t is the bond price at date t, CF_j a remaining cash flow at date j, T maturity and y the market yield per period.

Decision	What a later yield change affects	Investor consequence
Hold to maturity	Its interim market price, but not the promised maturity payment	No resale loss is realised; the bond still pays face value at maturity
Sell before maturity	The price at which the remaining cash flows can be sold	The realised holding-period return can differ from the original YTM

Default-free is not price-stable: a rise in market yields lowers the resale price.

Pricing with the zero-coupon curve

01

REPLICATE

Match every payment amount and date with zero claims.

02

VALUE

Apply the market discount factor for each date.

03

QUOTE

Calculate one YTM after the bond price is known.

The spot curve determines value; YTM summarises the resulting price.

The Law of One Price

The **Law of One Price** says that two tradable portfolios with identical cash flows at every date must have the same price today.

$$CF_A(t) = CF_B(t) \text{ for every } t \quad \Longrightarrow \quad \boxed{P_A = P_B}$$

- Match the payment amount, date and currency in every state of the world.
- A coupon bond can be compared with a portfolio of dated zero-coupon payments.
- If their prices differed, buying the cheaper package and selling the dearer one would create an arbitrage.

The argument requires the same currency, payment dates and default-free cash flows; trading frictions or short-sale limits can obstruct an actual arbitrage.

Replicating a coupon bond with zero-coupon bonds

A three-year default-free bond has $£1,000$ face value, a 6% annual coupon and one payment each year.

Cash-flow package	Year 1	Year 2	Year 3
Coupon bond	£60	£60	£1,060
One-year zero claim	£60	—	—
Two-year zero claim	—	£60	—
Three-year zero claim	—	—	£1,060
Replicating portfolio	£60	£60	£1,060

match the amount *and* the date of every promised payment

A zero claim here means a tradable default-free payment at one specified date; its face value is chosen to reproduce the bond's cash flow on that date.

Discount factors from the spot curve

A **discount factor** d_t is the price today of £1 delivered at date t by a default-free claim.

The Bank of England reports continuously compounded spot rates r_t^{cc}. Here $s_t = e^{r_t^{cc}} - 1$ is annual-effective and $d_t = e^{-r_t^{cc} t} = 1/(1+s_t)^t$.

Maturity	BoE r_t^{cc}	Annual-effective s_t	Discount factor d_t	Zero price per £100
1 year	0.7084%	0.7109%	0.992941	£99.29
2 years	1.4418%	1.4523%	0.971576	£97.16
3 years	2.0688%	2.0904%	0.939822	£93.98

$$\pounds 1 \text{ due at } t \quad \longleftrightarrow \quad \boxed{\pounds d_t \text{ today}}$$

Bank of England UK nominal government spot curve, 31 December 2009; annual-effective conversion and zero prices are author calculations.

Rates must be converted to the same compounding convention before they are used together.

The no-arbitrage price

Buy enough of each zero claim to deliver the bond's £60, £60 and £1,060 payments.

Payment date	Face value required	Price per £100	Units bought	Cost today
Year 1	£60	£99.2941	0.6	£59.58
Year 2	£60	£97.1576	0.6	£58.29
Year 3	£1,060	£93.9822	10.6	£996.21
			Cost of the replicating portfolio	**£1,114.08**

$$P_{\text{bond}} = 60d_1 + 60d_2 + 1{,}060d_3 = \textbf{£1,114.08}.$$

The coupon bond and the zero portfolio deliver identical payments, so £1,114.08 is the no-arbitrage price.

Arbitrage when the quoted price differs

Suppose the bond is quoted at $\pounds 1,130$, while the matching zero portfolio costs $\pounds 1,114.08$.

Cash flow today

short bond	(+£1,130.00)
buy zero portfolio	(-£1,114.08)
locked cash today	$+\pounds 15.92$

Cash flows after today

	Year 1	Year 2	Year 3
zero receipts	(+60)	(+60)	(+1,060)
short-bond payments	(-60)	(-60)	(-1,060)
net	**0**	**0**	**0**

if the quoted bond were cheaper than £1,114.08, reverse both trades

The calculation diagnoses a theoretical arbitrage. Bid–ask spreads, funding, taxes and short-sale constraints determine whether it can be executed in practice.

Spot-rate valuation

Value each promised payment with the market discount factor for its own date, then add the present values.

CF_t is the cash flow at date t; s_t is the annual-effective spot rate and $d_t = 1/(1+s_t)^t$ the corresponding discount factor.

$$\boxed{P = \sum_{t=1}^{T} CF_t d_t = \sum_{t=1}^{T} \frac{CF_t}{(1+s_t)^t}}$$

$$P = \frac{60}{1.007109} + \frac{60}{(1.014523)^2} + \frac{1{,}060}{(1.020904)^3} = \mathbf{£1{,}114.08}.$$

one payment date $\longrightarrow$ one market discount factor

Using the three-year spot yield for all three payments would ignore the prices of one- and two-year claims; using the bond's YTM would use a summary rate before the price has been established.

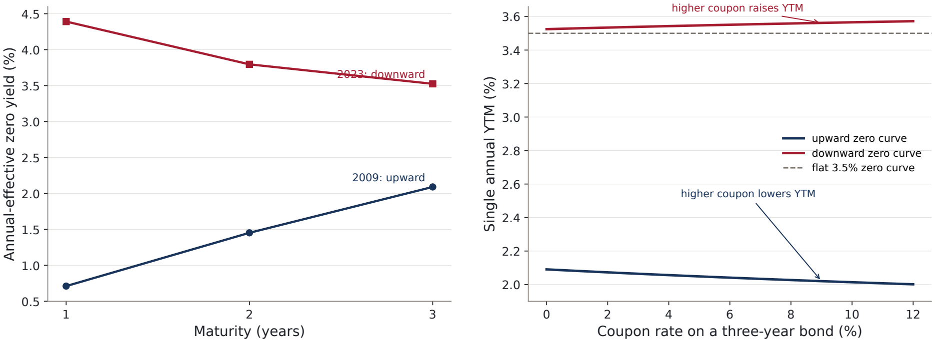
YTM after the bond has been priced

The curve implies $P = £1,114.08$. Now solve for the single annually compounded rate y that reproduces that price.

$$1{,}114.08 = \frac{60}{1+y} + \frac{60}{(1+y)^2} + \frac{1{,}060}{(1+y)^3} \quad \Longrightarrow \quad \mathbf{y{=}2.0410\%}.$$

1. The spot curve values the three dated payments and gives $P = £1,114.08$.
2. The displayed equation then solves for one rate, $y = 2.0410\%$, that reproduces that price.
3. This YTM is a quotation for the whole bond; it is not the discount rate used for every payment when the spot curve is not flat.

Yield-curve slope and coupon-bond YTM



On an upward curve, higher coupons place more weight on lower early spot rates and therefore produce a lower YTM. A downward curve reverses this relation; on a flat curve, all coupon patterns have the same YTM.

Bank of England UK nominal government spot curves, 31 December 2009 and 31 December 2023. Source rates converted from continuous to annual-effective compounding; hypothetical three-year default-free bonds are author calculations.

Spot rates and YTM serve different purposes

	Spot or zero curve	Coupon-bond YTM
Market information	Prices of default-free instruments supply one rate for each payment date	The bond's price and promised payments determine one rate for the whole bond
Main use	Discount each dated cash flow and determine price	Report that price as a single comparable yield
Coupon pattern	The date-specific rates do not depend on this bond's coupon	YTM generally changes with the coupon pattern when the curve is not flat

dated cash flows + spot curve $\longrightarrow$ price $\longrightarrow$ YTM quotation

Bank of England nominal government spot curves are estimated from gilt and repo-market prices.

Sovereign bond risk

01

CONTRACT

Identify the promised amount, date and settlement currency.

→

02

CAPACITY

Determine how the government can obtain the payment money.

→

03

EVIDENCE

Use matched yields and restructuring evidence.

Assess nominal payment, timing and purchasing power separately.

Three separate risks in a sovereign bond

A sovereign bond is a national-government contract specifying the promised amount, payment date and settlement currency.

Risk	Question	Possible outcome
Payment risk	Will the promised cash arrive in full and on time?	Payment is missed, delayed or restructured.
Real value	What will the nominal payment buy?	Inflation or depreciation lowers purchasing power.
Market price	What if the bond is sold before maturity?	A change in required yield moves the resale price.

Payment, purchasing power and resale value are different questions.

How a government can address a funding shortfall

A government owes £1,000 tomorrow but taxes and available refinancing provide only £920.

$$\text{funding gap} = £1{,}000 - £920 = \mathbf{£80}.$$

Route	Immediate action	Where the burden moves
Fiscal or refinancing	Raise revenue, cut other spending, borrow or seek official support	Taxpayers, service users, new lenders or supporting institutions
Monetary, where available	Issue or obtain settlement money; make the nominal payment	Holders of money and fixed claims through inflation or depreciation
Restructure or default	Reduce the amount, extend the date or miss the payment	Existing creditors through delay or loss

The gap does not disappear: policy changes which balance sheet absorbs it and in what form.

Full repayment can still lose purchasing power

The government pays £1,000 in one year. The price level rises unexpectedly by 8% before payment.

$$\underbrace{\pounds 1{,}000}_{\text{payment in one year}} \div \underbrace{1.08}_{\text{price-level adjustment}} = \underbrace{\pounds\mathbf{925.93}}_{\text{value in today's pounds}}.$$

Nominal outcome	Real outcome
£1,000 paid in full	Worth £925.93 in today's pounds
No contractual shortfall	£74.07 purchasing-power loss (7.41%)

Full payment in pounds does not guarantee full purchasing power.

Expected inflation is normally reflected in yields; the unanticipated loss comes from unexpected inflation.

Debt currency and repayment options

The **settlement currency** is the money in which the contract requires principal and coupons to be paid. It changes the issuer's available payment routes.

	Own-currency debt	Foreign- or shared-currency debt
Source of payment money	Tax revenue, refinancing and, where institutions permit, central-bank money	Taxes, exports, reserves, refinancing or external official support
Main constraint	Political and institutional access to monetary financing; inflation and depreciation may result	The government cannot create the settlement money unilaterally
If funding is insufficient	Nominal payment may still be made, but real value can fall; default remains possible	A liquidity shortfall can lead more directly to delayed payment or restructuring

Debt currency changes the available payment routes; it does not by itself determine whether the bond is safe.

Interpreting a sovereign yield spread

A **sovereign yield spread** is the difference between a government bond's yield and the yield on a chosen benchmark bond.

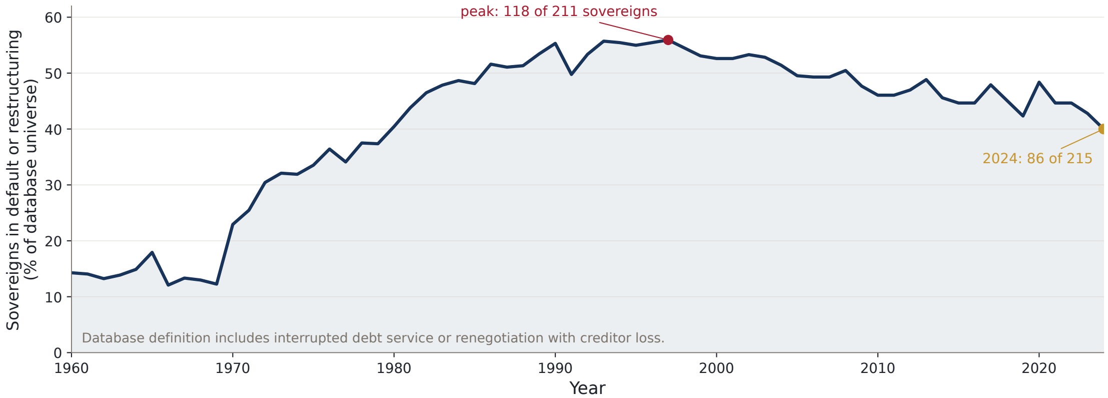
$$\text{spread}_{i,T} = y_{i,T} - r^*_{c,T},$$

$y_{i,T}$ is issuer i's yield at maturity T; $r^*_{c,T}$ is a benchmark yield matched by currency c and maturity.

- A wider spread may reflect expected default or restructuring losses.
- It may also reflect liquidity, legal terms, market structure and institutional support.
- If currency or maturity is not matched, inflation, exchange-rate and term effects contaminate the comparison.

A yield spread is evidence about relative pricing; it is not itself a default probability.

Sovereign defaults and restructurings



Bank of Canada–Bank of England Sovereign Default Database 2025, 1960–2024; 2024 observations are preliminary. Retrieved 18 August 2026.

The database uses a broad distress definition: interrupted debt service or a renegotiation that reduces creditor present value, across bonds and loans.

The value effect of restructuring

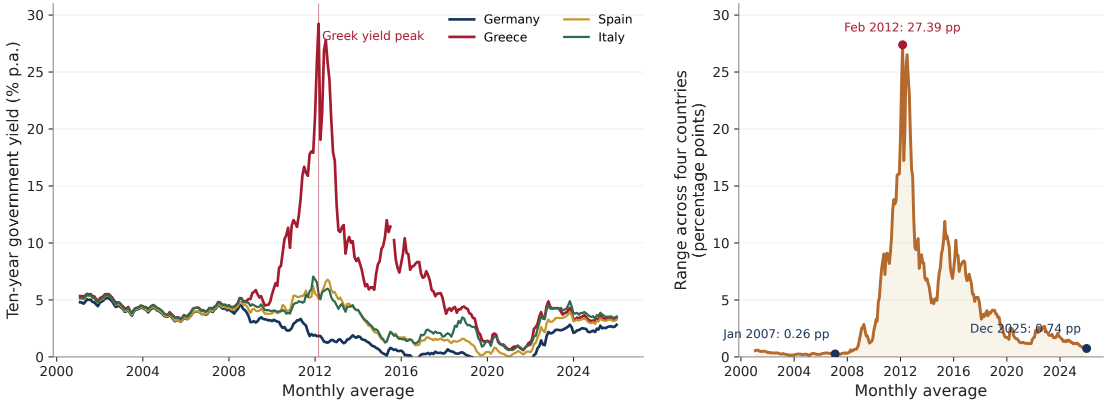
A bond promises £1,000 in one year. Creditors instead accept £850 in three years. Hold the discount rate at 5% to isolate the cash-flow change.

$$\mathrm{PV}_{\text{promise}} = \frac{\pounds 1{,}000}{1.05} = \pounds 952.38, \qquad \mathrm{PV}_{\text{restructured}} = \frac{\pounds 850}{1.05^3} = \pounds 734.26.$$

$$\text{creditor PV loss} = \pounds 218.12 = \mathbf{22.90\%} \text{ of promised PV.}$$

A haircut can come from lower principal, lower coupons or a later date; in an actual crisis the required discount rate may move as well.

Government bond yields in the euro area



A shared currency removes national exchange-rate differences within the comparison, but yields can still diverge because fiscal position, expected loss, liquidity and official support differ across issuers.

Eurostat: monthly average yields on approximately ten-year central-government bonds in Germany, Greece, Spain and Italy, January 2001–December 2025.

RECAP

Four questions to carry forward

01

READ A QUOTE

What do coupon, price, maturity and YTM mean?

02

VALUE IT

Which cash flow and discount factor belong to each date?

03

TRACK PRICE

What changes because of time, coupons and market yields?

04

ASSESS RISK

Will a government pay in full, on time and in money of expected value?

Contract first; market valuation second; risk interpretation third.

Recap: read a bond quote

Separate what the contract fixes from what today's market determines.

Field	Treasury quote	Meaning
Coupon	4.625%	Contractual annual rate used to calculate coupon payments
Maturity	15 August 2036	Date of the final coupon and face-value repayment
Price	$99\frac{3}{32} = 99.09375$	Market price per \$100 face value
YTM	4.712%	One discount rate that reproduces price from all remaining promised payments

$$\textbf{coupon}\ 4.625\% < \textbf{YTM}\ 4.712\% \quad\Longrightarrow\quad P < \mathrm{FV}\ \ \textbf{(a discount bond)}$$

A quoted price per 100 of face value must be scaled to the investor's actual face value.

Recap: value the promised payments

01

Write the cash flows

List every remaining coupon and principal payment with its date.

Use periods that match the cash-flow interval.

02

Determine the price

Discount each payment with the market factor for its date.

$$P^* = \sum_t CF_t d_t$$

03

Report the YTM

If a single quotation is needed, solve for the rate that reproduces price.

$$P^* = \sum_t \frac{CF_t}{(1+y)^t}$$

The spot curve determines the no-arbitrage price. YTM is the single-rate quotation calculated from that price.

Recap: explain a price change before maturity

Start by identifying which of three mechanisms has changed.

Mechanism	If market yield is unchanged	What to check
Passage of time	Premium and discount prices move toward face value	Remaining dates and cash flows
Coupon settlement	Dirty price falls when the coupon is detached; the investor receives the coupon in cash	$P_{\text{dirty}} = P_{\text{clean}} + \text{AI}$
Market yield change	Not held fixed: every remaining payment is revalued	$y \uparrow \Rightarrow P \downarrow$; later cash flows are more sensitive

Do not interpret the coupon-date fall in dirty price as an investor loss, or a yield-driven fall as default.

Recap: assess a government bond

Check	Evidence needed
Contract	Payment amount, date, currency and governing law
Payment capacity	Taxes, reserves, refinancing, monetary access and available official support
Loss channels	Missed or delayed payment, restructuring, inflation, currency depreciation or lower real purchasing power
Yield comparison	Compare bonds only after matching currency, maturity, liquidity and contractual terms

First value the contractual cash flows; then assess whether they will arrive in full, on time and with the expected purchasing power.