



Rates Markets and Products

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Bonds

Debt instruments

Typically fixed
maturity

Typically regular
interest payments

Tradeable

Bond Characteristics

Term	Meaning
Issuer	The entity borrowing the money
Maturity date	The date at which the bond will be redeemed
Coupon	The rate of interest paid to the bondholder (per annum)
Face value	The amount repaid to the bondholder at maturity
Price	The current market price of the bond (percentage of face value)

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Bond Redemption

Fixed maturity

- Bond is redeemed at a date set at issuance

Bullet bonds

- Redemption as a one-off payment at maturity
- Usually no interim amortisation features

Variations

- Amortising bonds
- Callable bonds
- Extendable bonds

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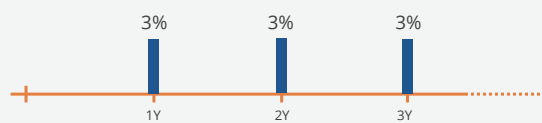
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Fixed vs. Floating

Fixed	Floating
Coupon is set at bond issuance	Coupon formula is set at bond issuance
Remains unchanged over the life of the bond	Coupons depend on future development of reference rate

Example:

- 10 year 3% fixed coupon bond, annual payments



Example:

- 10 year FRN, 6M LIBOR + 0.50%, semi-annual payments
- Current LIBOR fixing: 1.30%



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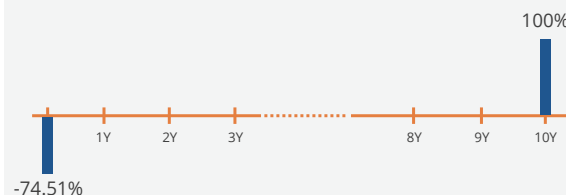
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Zero Coupon Bonds

Zero
No interest payment between issuance and maturity
Issued at a discounted price, repaid at 100%

Example:

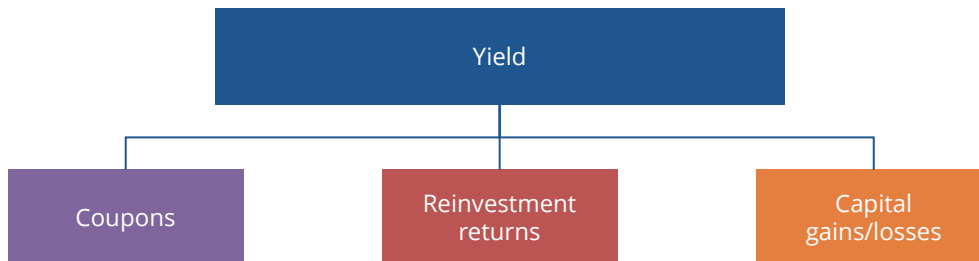
- 10 year zero bond, issued at 74.51%, repaid at 100%



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Bond Yields



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Bond Pricing Approach

The price of a bond is the sum of the present value of all outstanding coupon payments and the redemption payment



$$\text{Coupon Bond Price} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_n + FV_n}{(1+r)^n}$$

C	Coupon amount per period
FV	Face value
r	Desired rate of return, per period
n	Number of periods to maturity

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Bond Pricing Example

10 year 3% fixed coupon bond, annual payments, desired rate of return 4% per annum

$$\text{Price} = \frac{3\%}{(1 + 4\%)^1} + \frac{3\%}{(1 + 4\%)^2} + \dots + \frac{(3\% + 100\%)}{(1 + 4\%)^{10}}$$

10 year 3% fixed coupon bond, semi-annual payments, desired rate of return 4% per annum

$$\text{Price} = \frac{1.5\%}{(1 + 2\%)^1} + \frac{1.5\%}{(1 + 2\%)^2} + \dots + \frac{(1.5\% + 100\%)}{(1 + 2\%)^{20}}$$

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Bond Pricing with Excel

Excel function = -PV(rate,nper,pmt,[FV])

PV	Present Value – Price of Bond
rate	Interest rate or desired rate of return, per period
nper	Number of periods to maturity
pmt	Coupon amount per period
FV	Future Value – Face Value of Bond

10 year 3% fixed coupon bond, semi-annual payments, desired rate of return 4% per annum

Excel function = -PV(2%,20,1.5%,100%) = 91.82%

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Yield to Maturity

In practice, the bond price is often given and investors want to know the yield they would realise



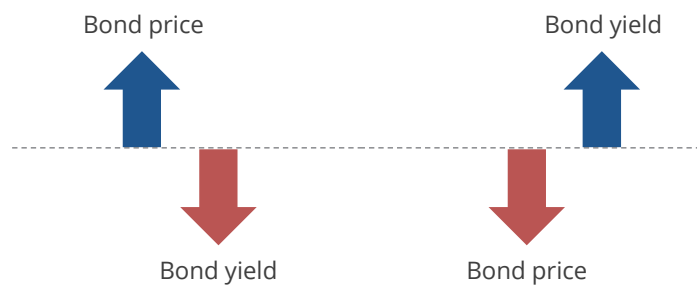
Solve for r so that: $\frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_n + FV_n}{(1+r)^n} = \text{market price of bond}$



This is referred to as the yield to maturity (YTM)

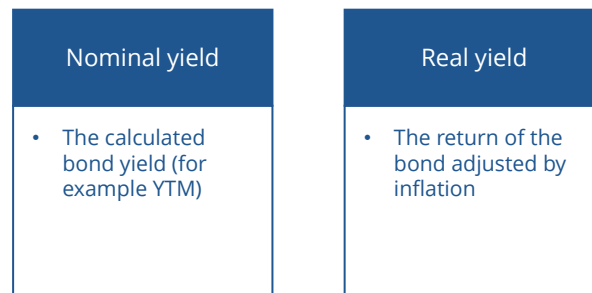
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Price/yield Relationship



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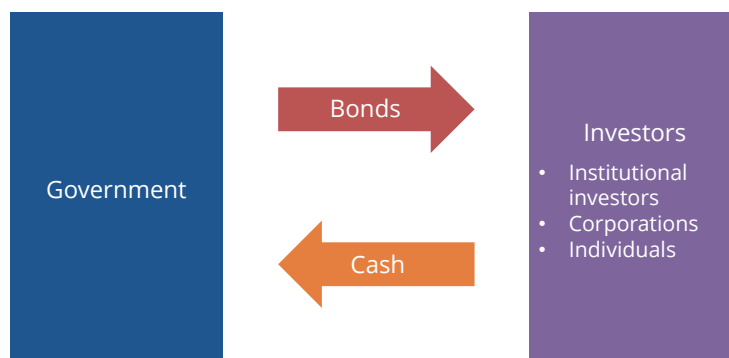
Nominal vs. Real Yield



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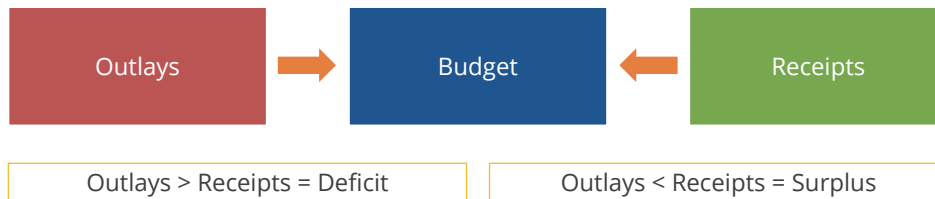
Government Bonds



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Government Budgets

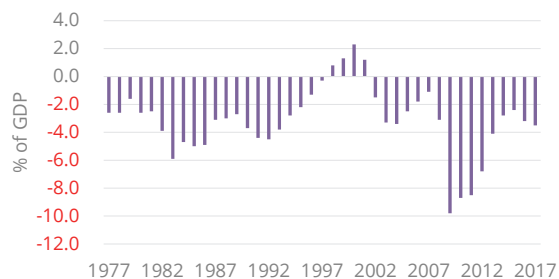


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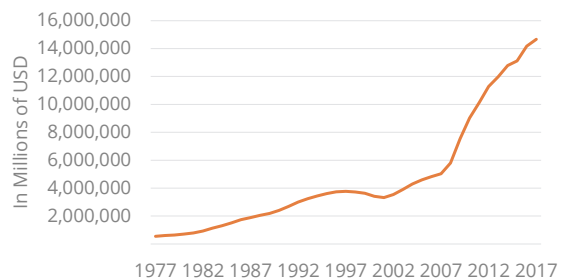
Government Deficits and Funding

Annual US budget surplus/deficit as % of GDP:



Source: Office of Management and Budget, www.whitehouse.gov/omb/historical-tables/

US Federal Debt held by the public (end of year):



Source: Office of Management and Budget, www.whitehouse.gov/omb/historical-tables/

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Benefits of Government Bond Investments

Liquidity

Credit quality

Stable income
stream

Range of
maturities

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Government Bond Yields as a Benchmark

Government bonds are usually the investment with the lowest credit risk in a country

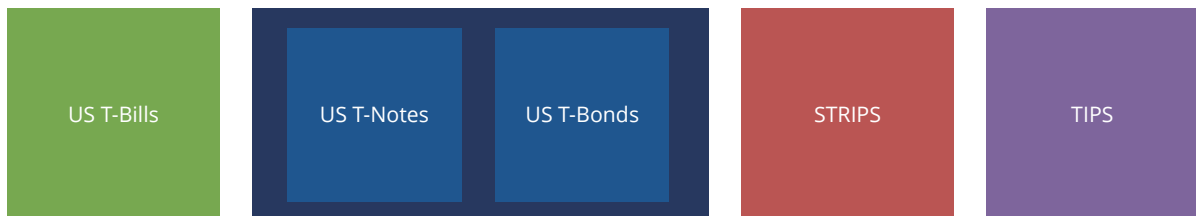


All other issuers have to pay a premium above government bond yields to compensate investors for additional credit risk (credit spread)

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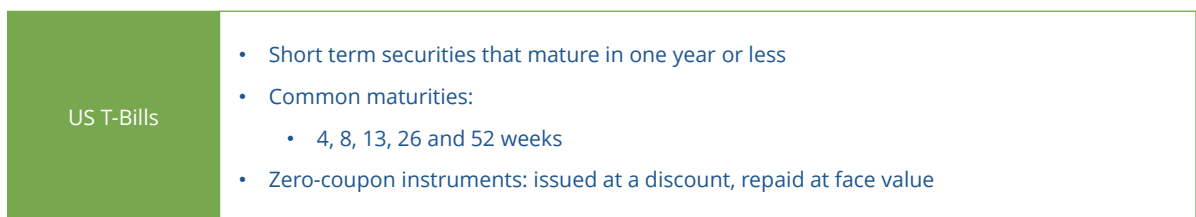
US Government Bond Products



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US T-Bills



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US T-Notes and T-Bonds

US T-Notes and T-Bonds

- Interest bearing securities with semi-annual coupon payments
- T-Notes:
 - Maturities between 1 and 10 years
- T-Bonds:
 - Maturities above 10 years

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STRIPS

STRIPS

- Created by stripping coupons from US government bonds
- Individual coupons as well as the principal are traded separately
 - For example: a 10Y T-Note can be stripped in 20 coupon payments and the redemption payment
- STRIPS zero-coupon bonds created out of coupon bonds

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Rationale for Investing in STRIPS

Interim coupon payments generate reinvestment risk

Different payment structure might be advantageous for tax-deferred investment accounts



STRIPS offer advantages for some investors/situations

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TIPS

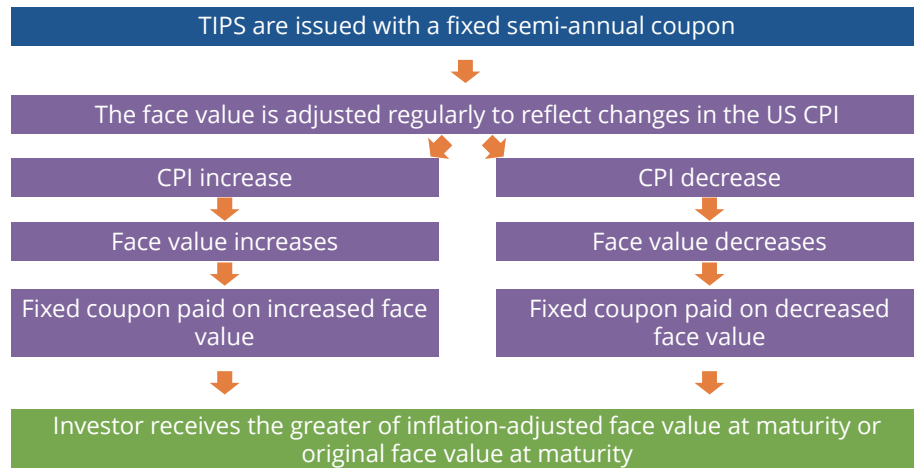
TIPS

- Treasury Inflation-Protected Securities (TIPS)
- Initial maturities:
 - 5, 10, 30 years
- Protect investors against inflation by adjusting the face value by changes in the consumer price index (CPI)

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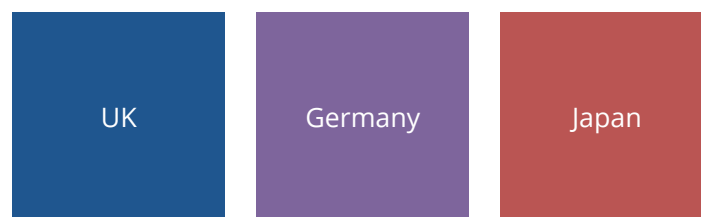
TIPS Mechanics



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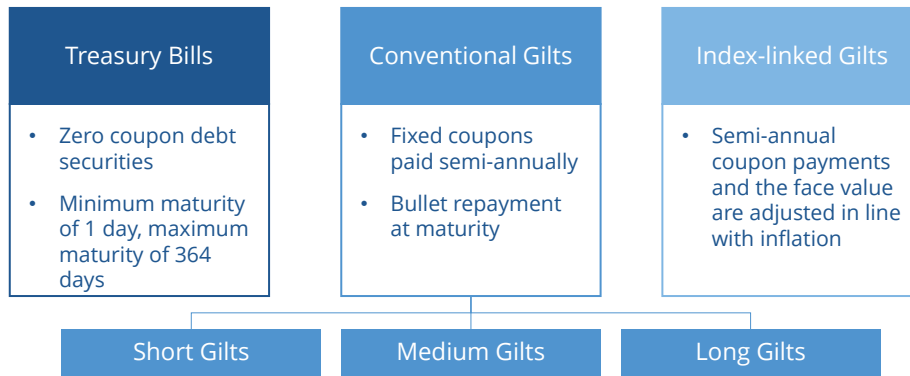
Non-US Government Bond Market Examples



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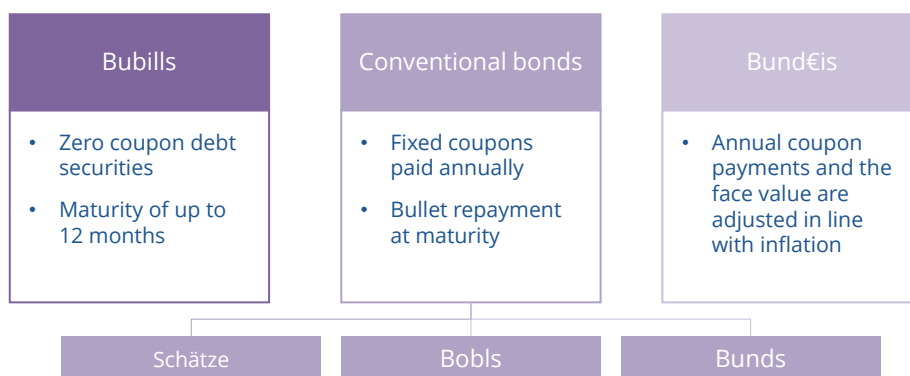
UK Government Bond Markets



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German Government Bond Markets



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Japanese Government Bond Markets

Treasury discount bills

- Zero coupon debt securities
- Maturity of up to 12 months

JGBs

- Fixed coupons paid semi-annually
- Bullet repayment at maturity

JGBis

- Semi-annual coupon payments and the face value are adjusted in line with inflation

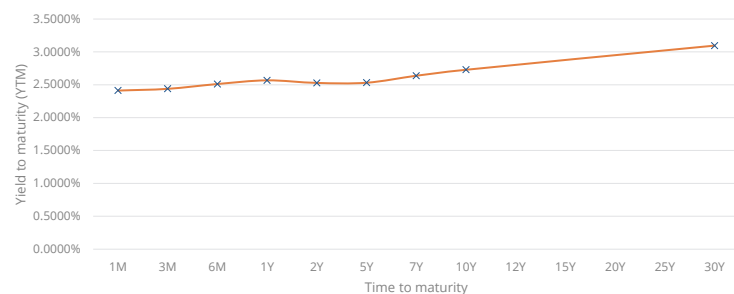
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What is a Yield Curve?

Yield curve

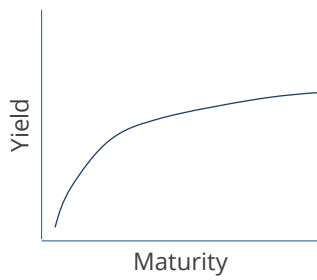
- Plot of bond yields against maturities
- All bonds used must have same issuer and credit quality



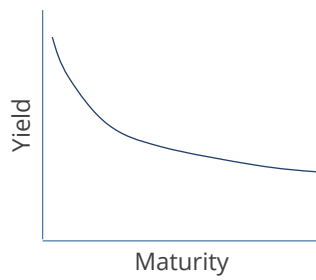
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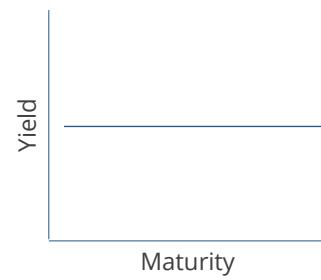
Yield Curve Shapes



Normal yield curve



Inverted yield curve

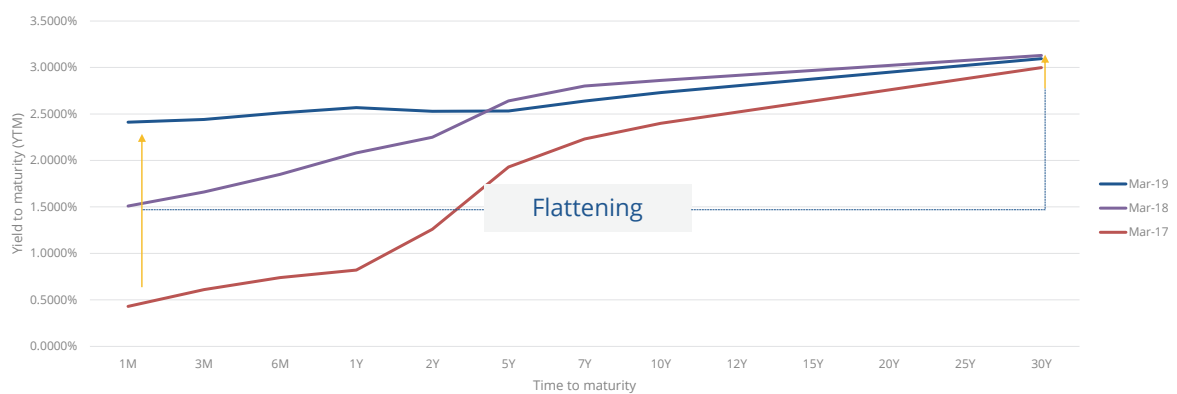


Flat yield curve

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Yield Curve Volatility



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What Drives Yield Curves?

Expectations

Supply

Demand

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