Delft University of Technology
Faculty of Technology,
Policy and Management

Lecture 3: Long-term Financing. Valuing Bonds.

MOT111A Financial Management 2023-2024

Aleksandrina Ralcheva

a.a.ralcheva@tudelft.nl

TU Delft

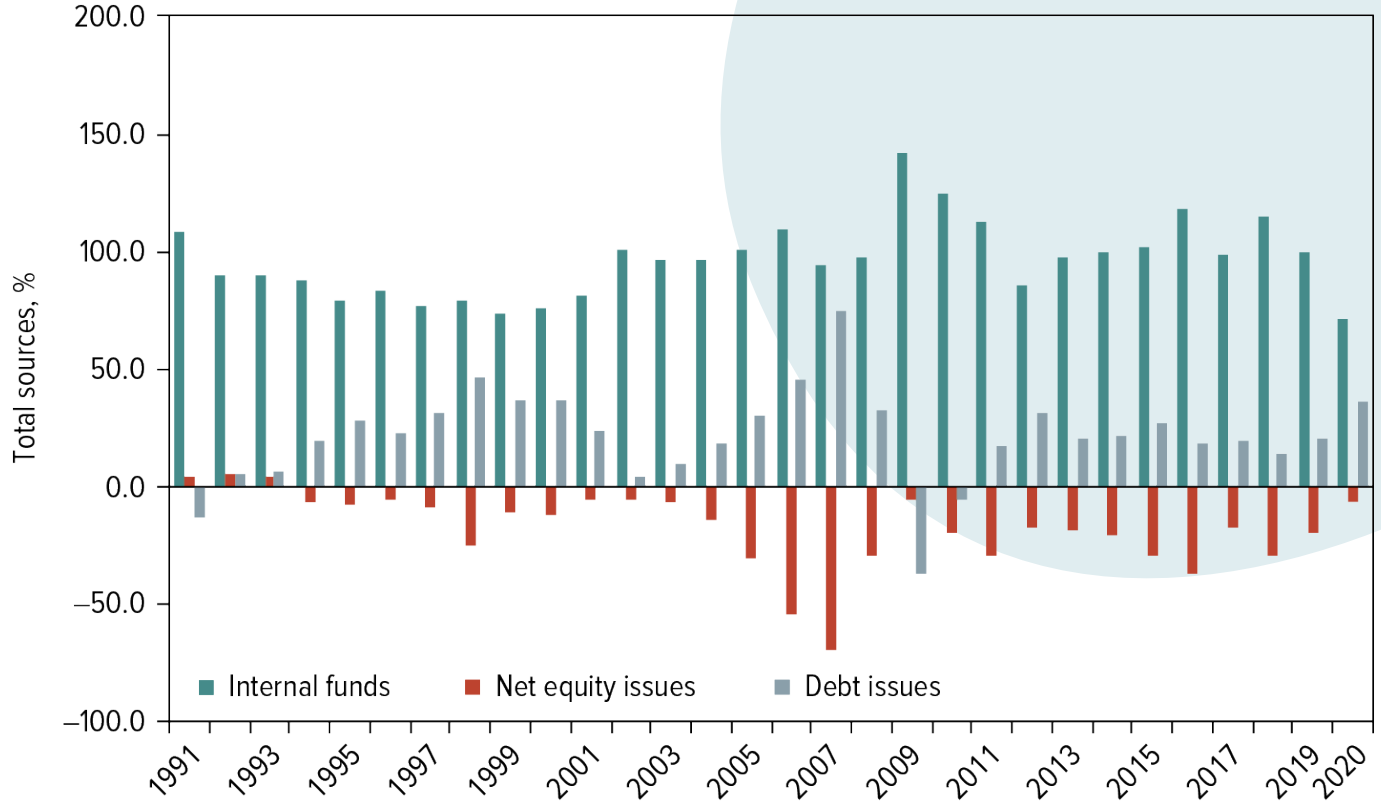
Lecture 3 Outline

- Long-term financing and financial markets (Slides + optionally Chapter 23 & 24)
  - LO1: Discuss the role of financial markets, financial intermediaries and financial instruments;
  - LO2: Discuss different sources of debt and equity financing for private and public firms.

- Valuing bonds (Chapter 6)
  - LO3: Define important bond features and types of bonds;
  - LO4: Derive the price of bonds;
  - LO5: Explain bond values and yields and why they fluctuate.

Overview of Corporate Financing

- Sources of funds for U.S. nonfinancial corporations (expressed as a fraction of the total)

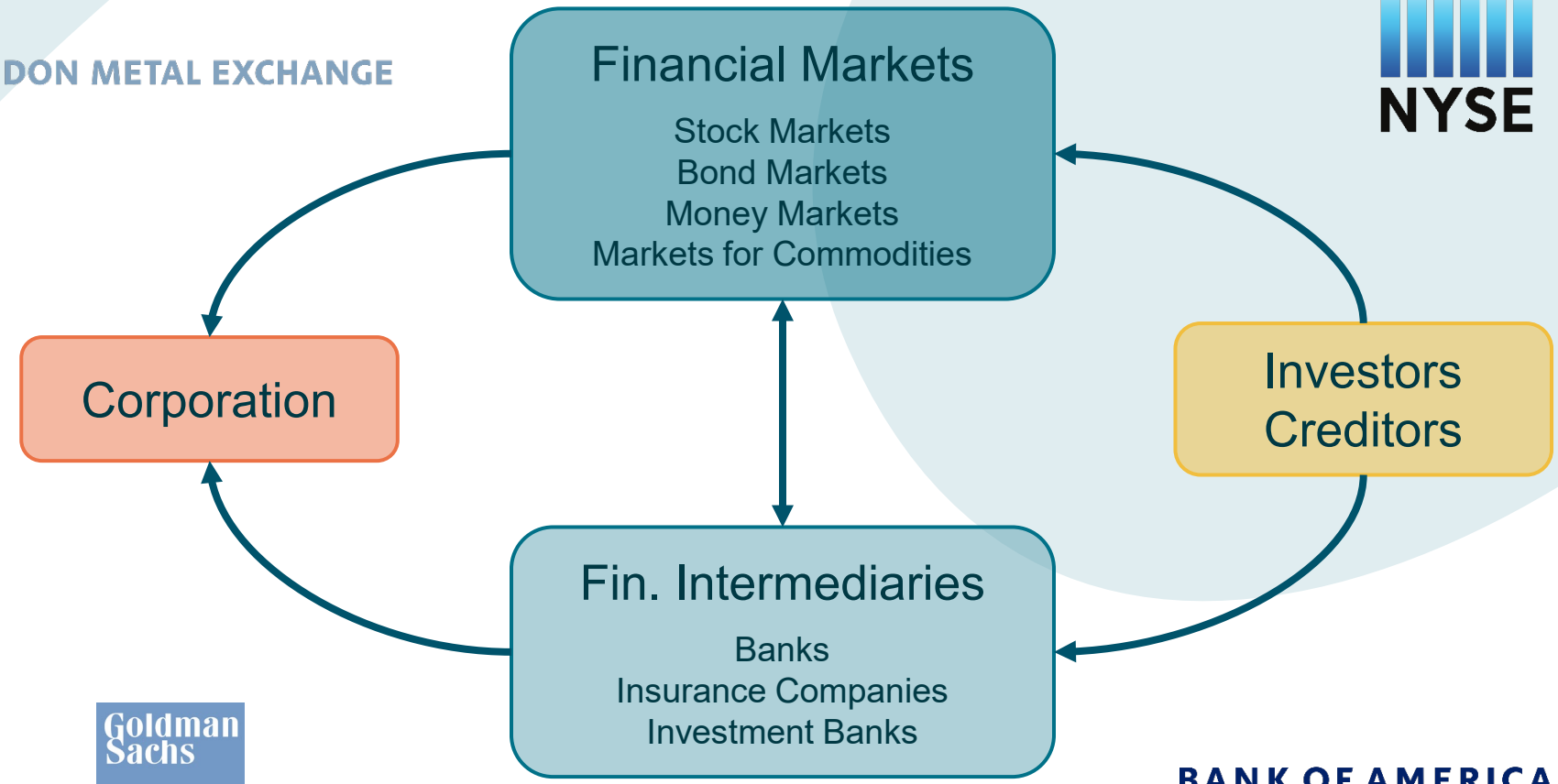


Source: Board of Governors of the Federal Reserve System, Division of Research and Statistics, Flow of Funds Accounts Table F103 at https://www.federalreserve.gov/releases/z1/default.htm.

Main Categories of External Funding

- Debt (loans and bonds):
  - Funding for a determined period of time;
  - Requires to pay back the lent (principal) amount and interest;
  - Risk of bankruptcy.
- Equity (stocks):
  - Investment (can be repurchased/bought back);
  - Entitles the financier to an ownership stake and a share of the revenue;
  - Risk of dilution.
- Preferences for financing (Pecking-order theory):
  - Internal funds (reinvested earnings) > New issues of debt > New issues of equity.

Overview of the Financial System



Formal Definitions (of Financial Markets and Intermediaries)

- A *financial market* is a market where financial assets (such as stocks and bonds) are issued and traded.
  - Primary market (where financial assets are issued to raise money from investors = **primary issues**);
  - Secondary market (where financial assets are purchased and sold by investors = **secondary transactions**);
  - Over-the-counter (OTC) markets (where financial assets are traded by a network of dealers, i.e., there is no organized exchange).
- A *financial intermediary* is an organization that raises money from investors and provides financing for individuals, companies and other organizations (e.g., banks, insurance companies, investment funds).

Additional Functions (of Financial Markets and Intermediaries)

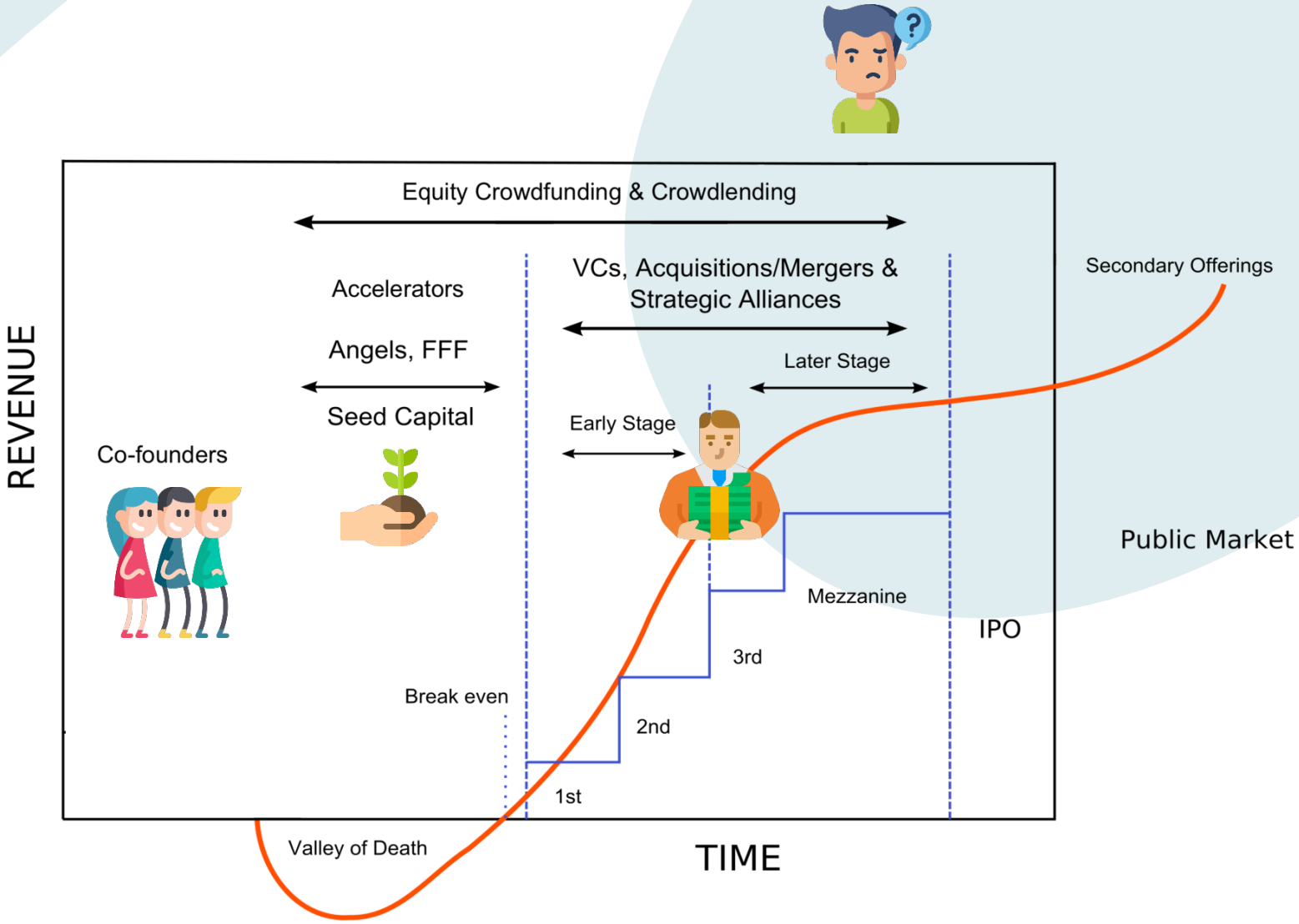
- Payment mechanism:
  - Banks, VISA, Appel Pay, Google Wallet, Venmo, etc.
- Borrowing and lending:
  - Not only to companies, but also individuals!
- Pooling risk:
  - Insurance companies (in the case of an accident).
- Information provision! (about the value of securities and commodities)
  - Essential for making financing and investment decisions.

Financial Instruments

- A *financial instrument* is a real or virtual document representing a legal agreement between an issuer and a buyer that involves a monetary value.

- Different instruments serve different purposes and satisfy different investor preferences, such as:
  - Claims on future cash flow;
  - Right to participate in company decisions;
  - Privileged, but limited right to cash flow;
  - Claims on company assets in liquidation.

Financing for Private Companies



Formal Definitions (of Early-stage Sources of Funding)

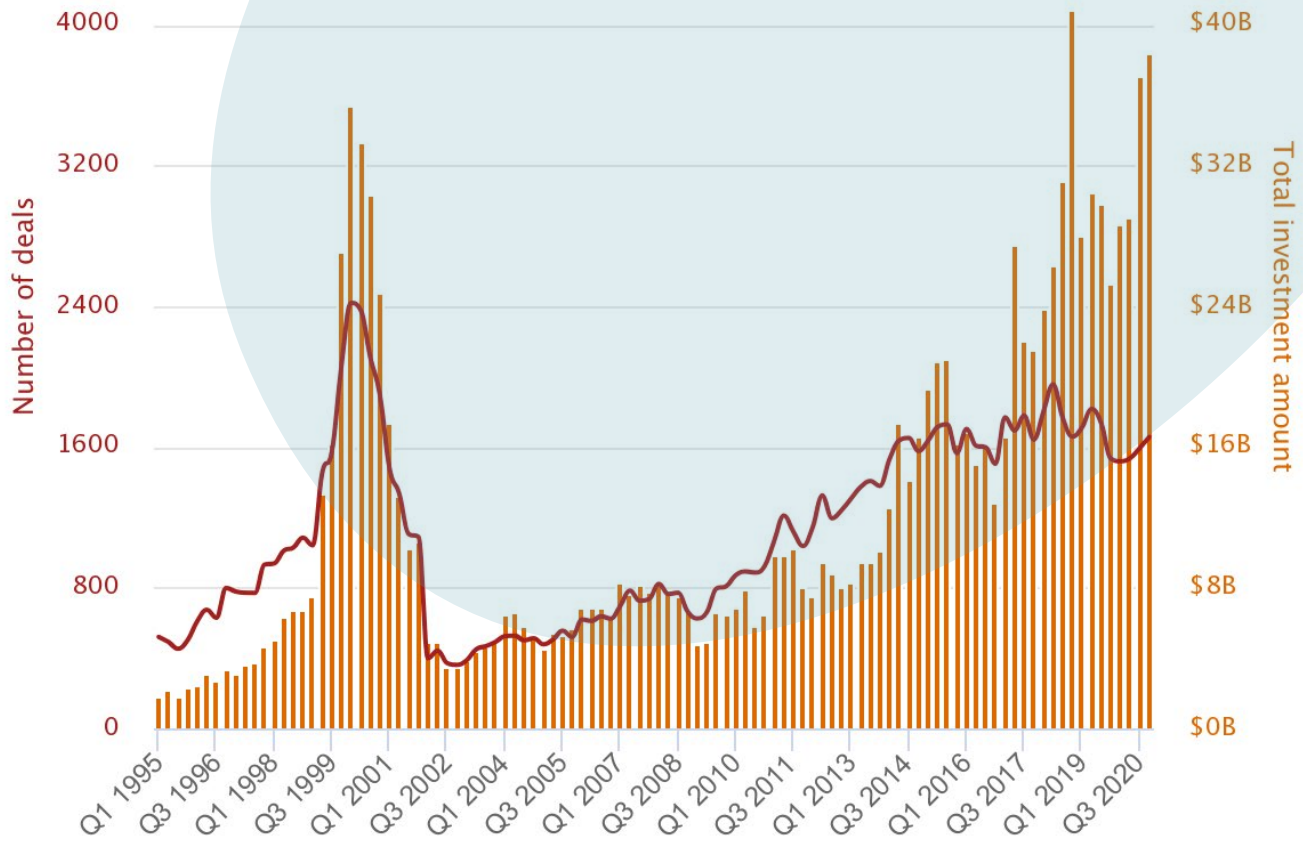
- *Accelerators* are fixed-term, cohort-based programs in support of early-stage growth-driven companies that include a mentorship, educational and financing component.

- *Crowdfunding* is a recently emerged alternative form of financing that connects individuals (the crowd) directly with projects that need financing via online crowdfunding platforms.

- *Business angels* are high-net-worth individuals who invest their own money, along with their time and expertise, directly in unquoted companies in which they have no familial or institutional connection, in the hope of financial gain.

Venture Capital

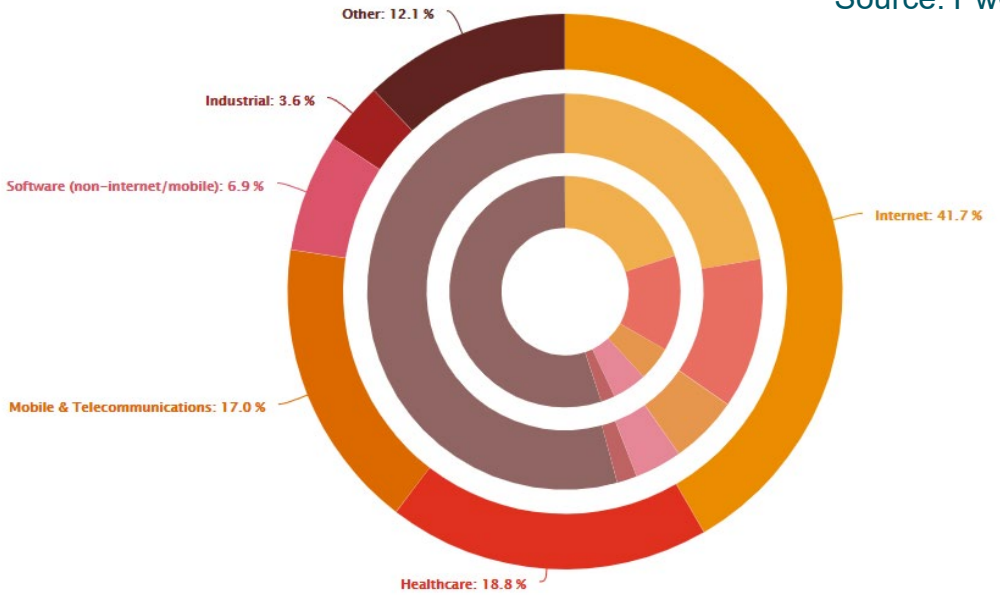
- Fund managers that invest in companies with high growth potential;
- Funds are raised from institutional investors (such as pension funds and insurance companies) and wealthy individual investors.

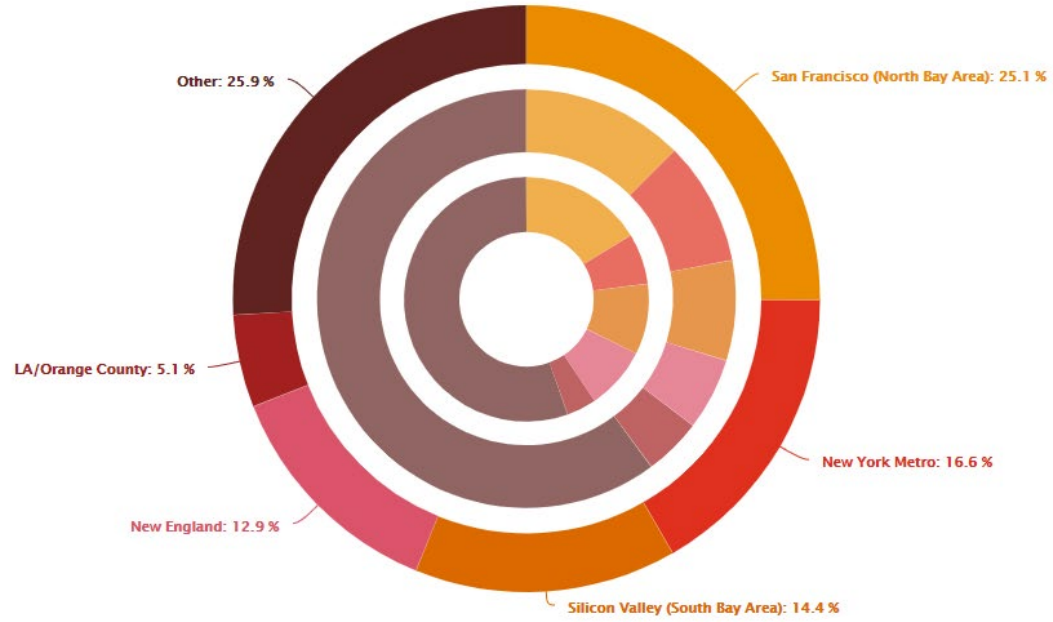


Source: PwC MoneyTree Report

Venture Capital (Cont.)

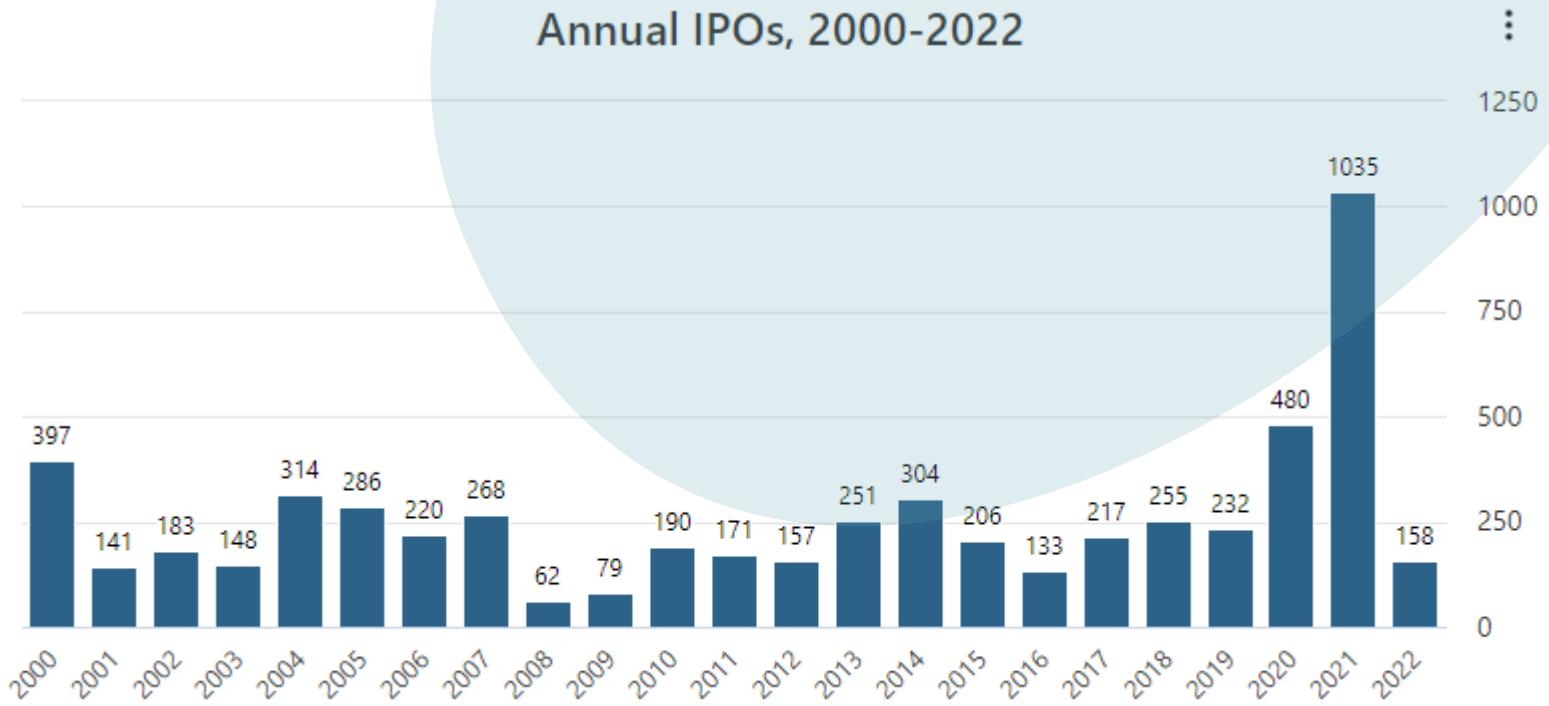
Source: PwC MoneyTree Report





Initial Public Offering

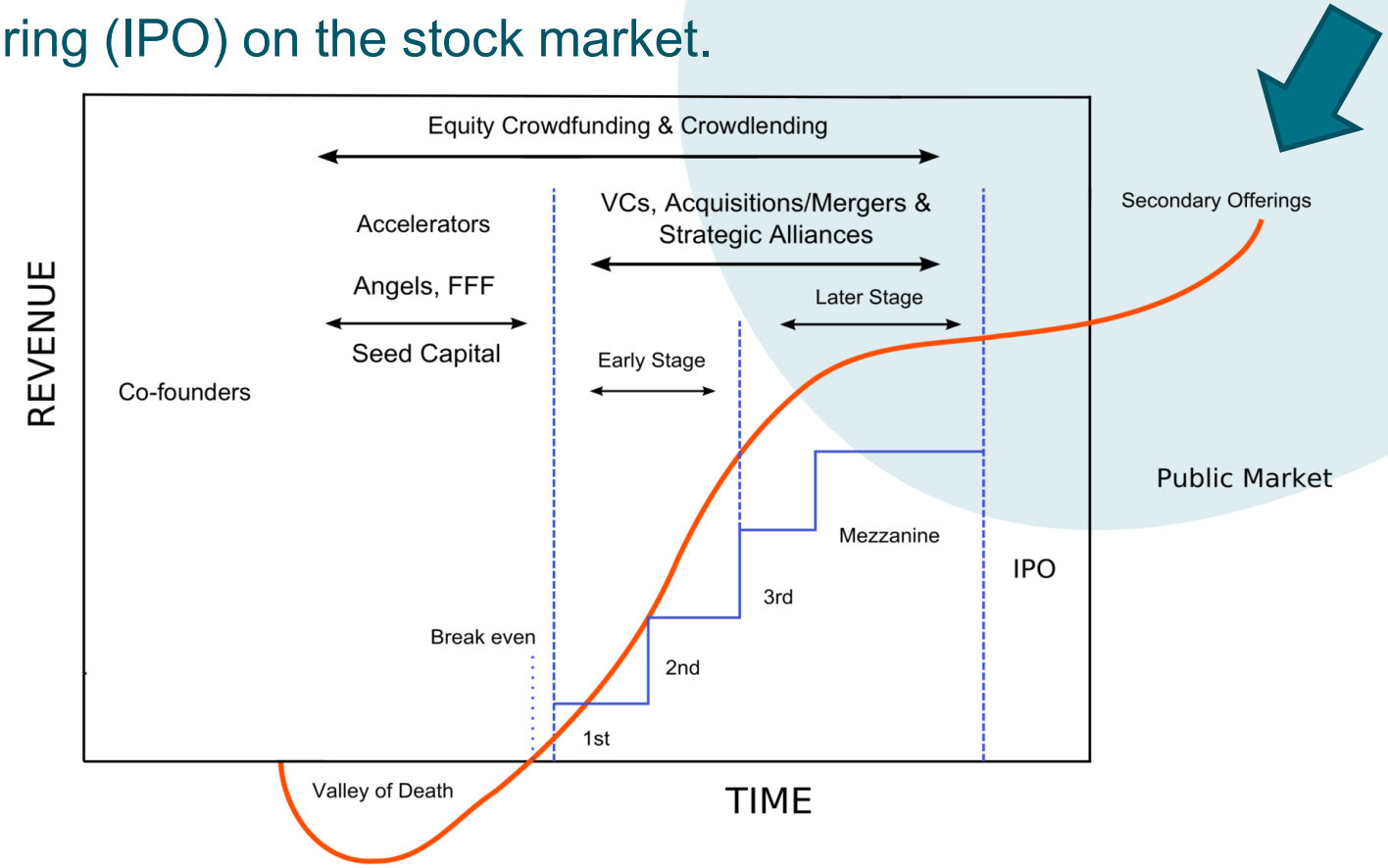
- The process through which *private* companies become *public* by selling their stock to public investors for the *first time*.
- IPOs tend to be cyclical.



Source: https://stockanalysis.com/ipos/statistics/

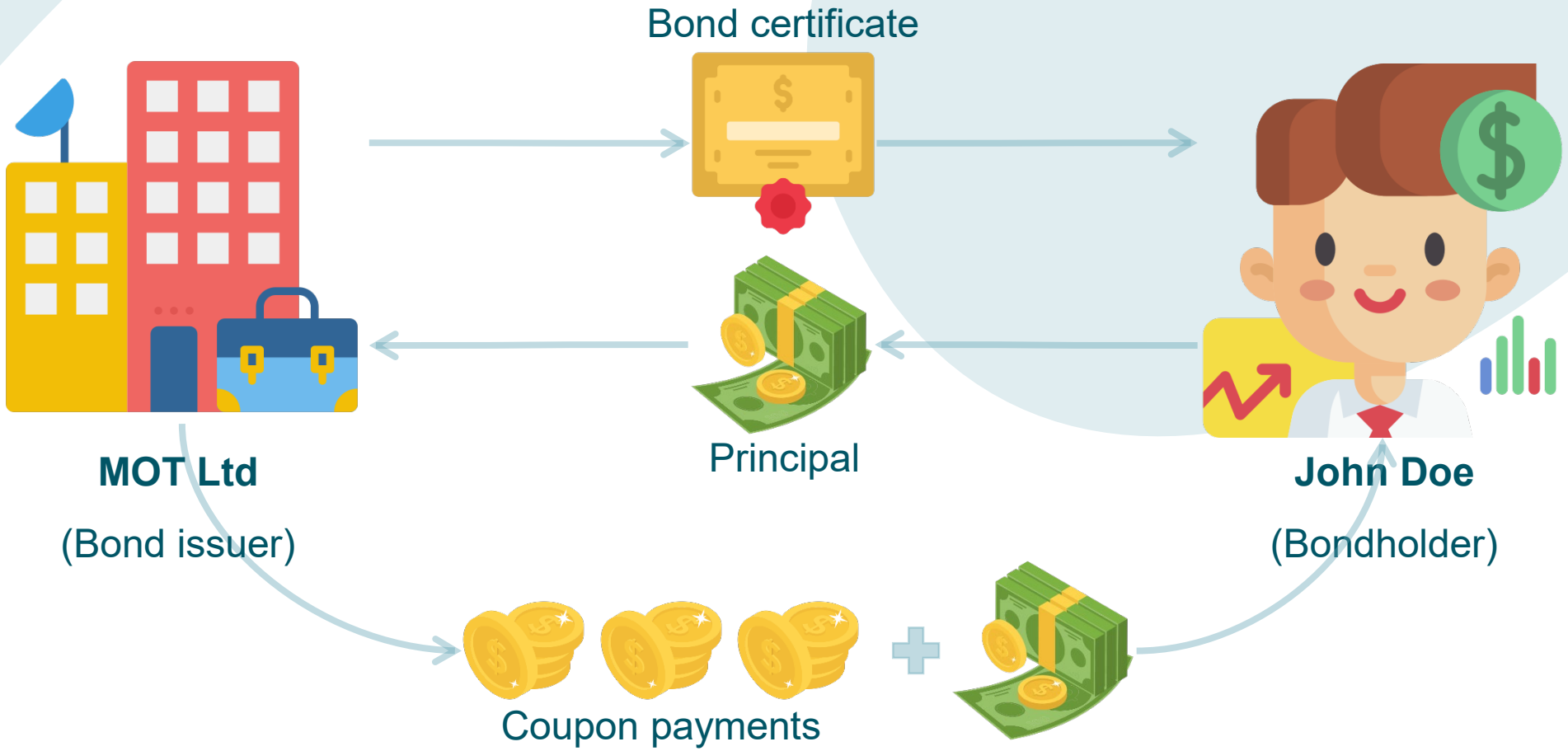
After the IPO?

- A *Seasoned Equity Offering (SEO)* is any issuance of shares that follows a company's Initial Public Offering (IPO) on the stock market.



What are bonds?

- Fixed-income securities issued by corporations and governments to raise capital.



Types of bonds

- Depending on the coupon:
  - Zero-coupon bonds (or pure discount bonds, e.g., US Treasury bills);
  - Fixed-interest coupon bonds (e.g., US Treasury notes & US Treasury bonds);
  - Floating-rate bonds (or floaters have variable interest rate that is tied to a benchmark rate, e.g., to the Treasury bill rate).

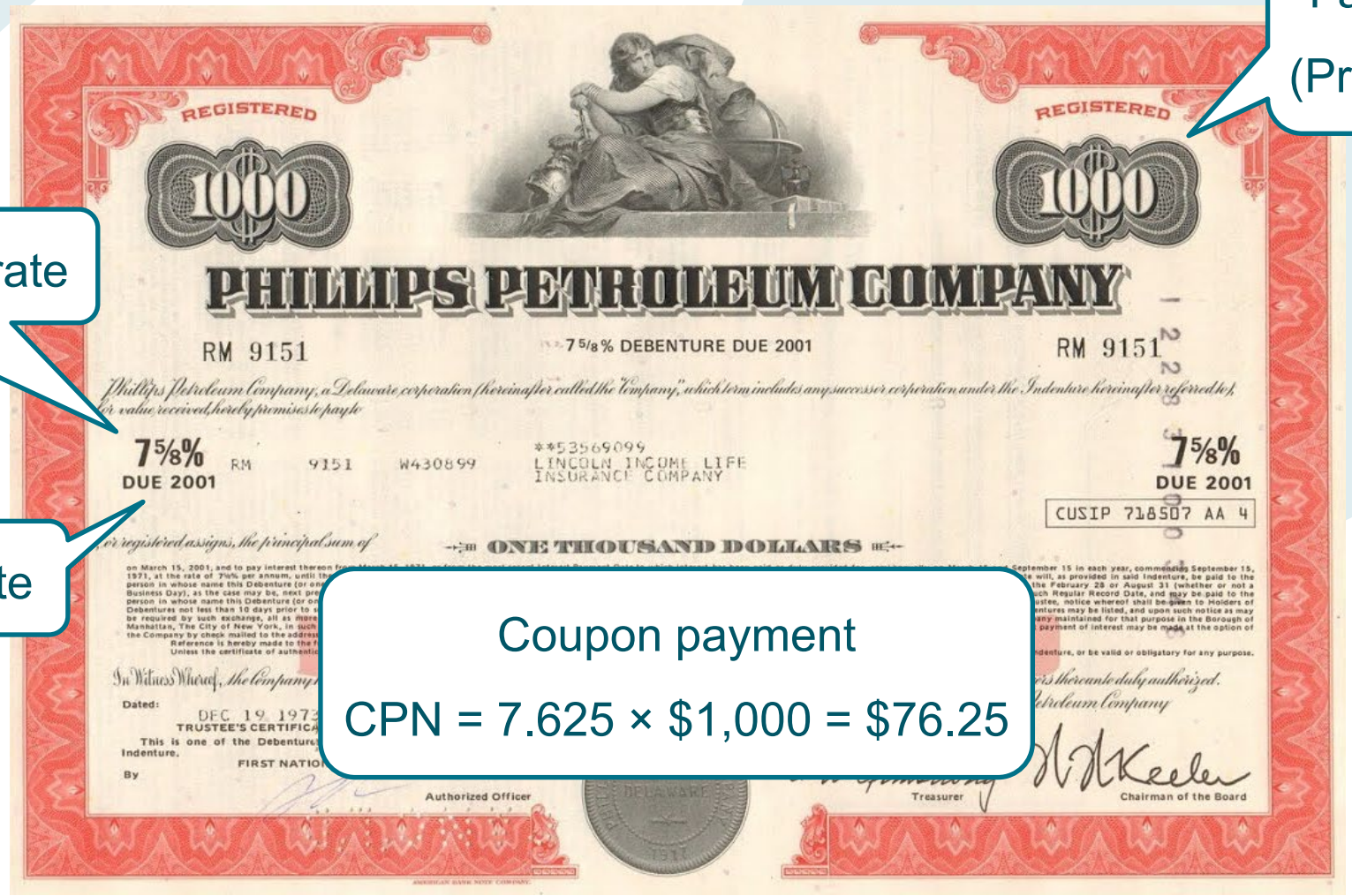
- Depending on the issuer:
  - Corporate bonds;
  - Municipal bonds (or munis);
  - Sovereign (government) bonds (e.g., issued by “Uncle Sam”, the biggest borrower in the world).

Exotic Bonds

- Catastrophe (or CAT) bonds
  - raise money for companies in the insurance industry in the event of a natural disaster (e.g., earthquake or tornado);
  - allow the issuer to receive funding by deferring or completely forgiving the obligation to pay interest and repay the principal if a disaster occurs (given specific conditions);
  - primary investors are hedge funds, pension funds, and other institutional investors;
  - Global pandemic bond by the World Bank triggered by COVID-19.

- Sustainable development bonds
  - Wildlife Conservation Bond (WCB, or “Rhino bonds”).

The Terms of a Bond



Face (par) value

(Principal amount)

Coupon (Interest) rate

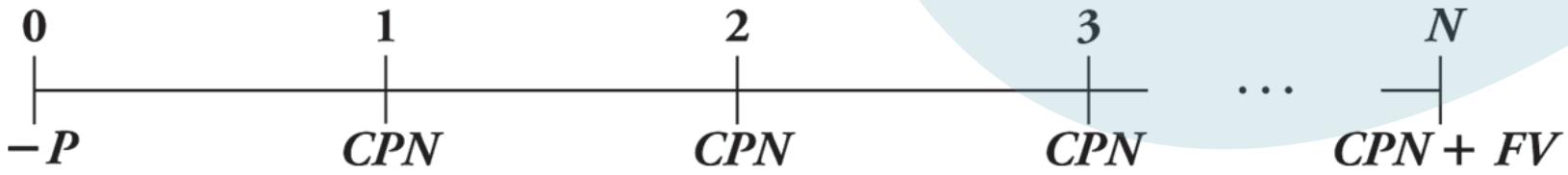
Maturity date

Coupon payment

CPN = 7.625 × $1,000 = $76.25

The Value of a Bond

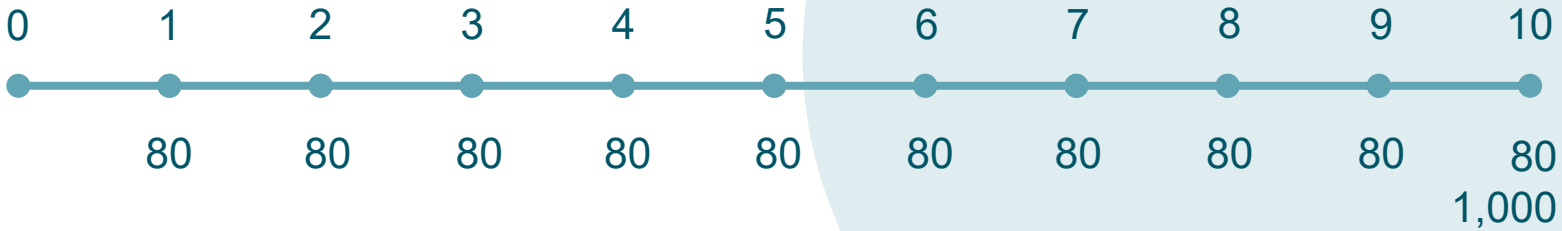
- What do we need to know to determine the (present) value or price of a bond (*P*)*?*
  - The number of periods remaining until maturity (*N*)*;*
  - The face (par) value (*FV*);
  - The coupon payment (*CPN*);
  - The market interest rate for bonds with similar features (or the bond's yield to maturity, *YTM*).



$$P = CPN \times \frac{1}{y}\left(1 - \frac{1}{(1+y)^N}\right) + \frac{FV}{(1+y)^N}$$

The Value of a Bond: Example

- Cash flows of MOT bond:



- Assume similar bonds have YTM of 8%.
- Bond value = Present value of the coupons + Present value of the principal amount

$537 + $463 =

$1,000

(trades at par)

$80 × 1/0.08 × (1 - $1/1.08^{10}$) =

$80 × 6.710 =

$537

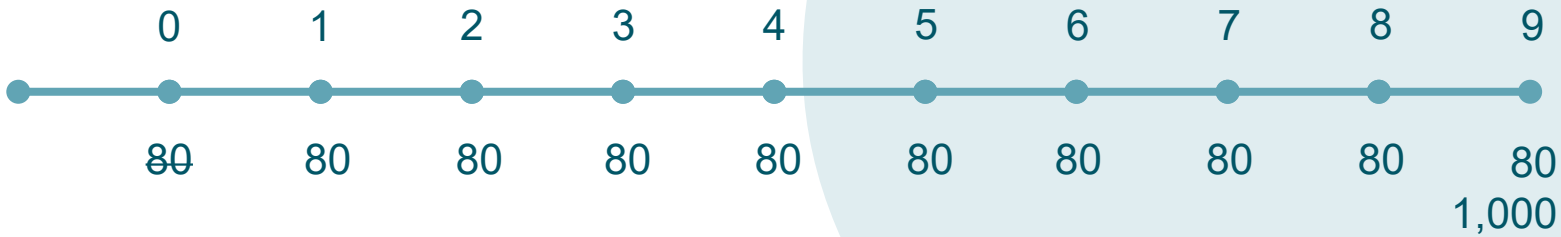
$1,000 × $1/1.08^{10}$ =

$1,000 × 0.463 =

$463

What happens when interest rates rise?

- Cash flows of MOT bond:



- The YTM has risen to 10%.
- Bond value = Present value of the coupons + Present value of the principal amount

$461 + $424 = $885

(trades at a discount)

$80 × 1/0.10 × (1 - 1/1.10^9) =

$80 × 5.759 =

$461

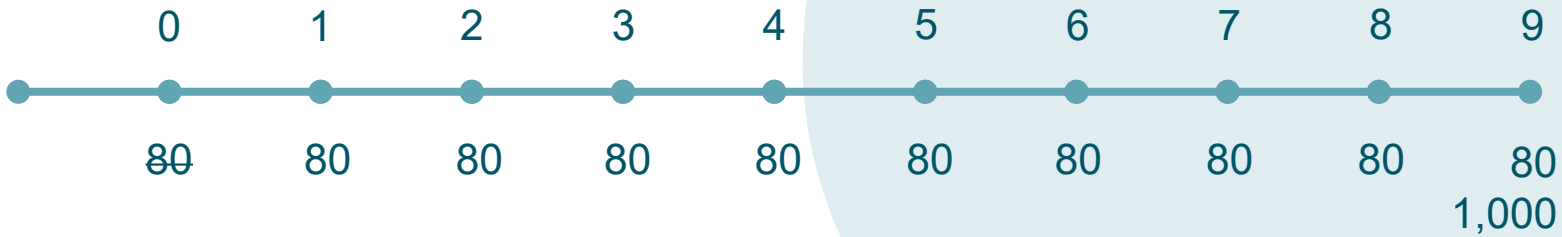
$1,000 × 1/1.10^9 =

$1,000 × 0.424 =

$424

The Value of the Discount

- Cash flows of MOT bond:



- The YTM has risen to 10%.
- Bond value = Present value of the coupons + Present value of the principal amount

$461 + $424 = $885

(trades at a discount)

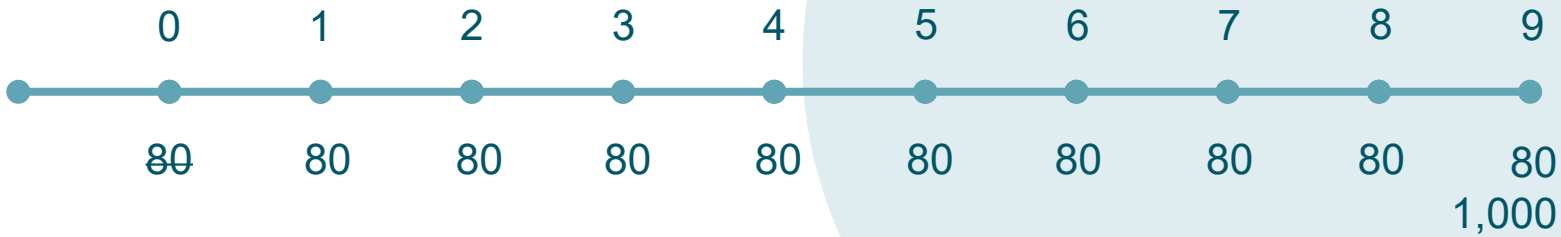
$20 × 1/0.10 × (1 - 1/1.10^{9}) =

$20 × 5.759 =

$115

What happens when interest rates drop?

- Cash flows of MOT bond:



- The YTM has dropped to 6%.
- Bond value = Present value of the coupons + Present value of the principal amount

$544 + $592 = $1,136

(trades at a premium)

$80 × 1/0.06 × (1 - $1/1.06^9$) =

$80 × 6.802 =

$544

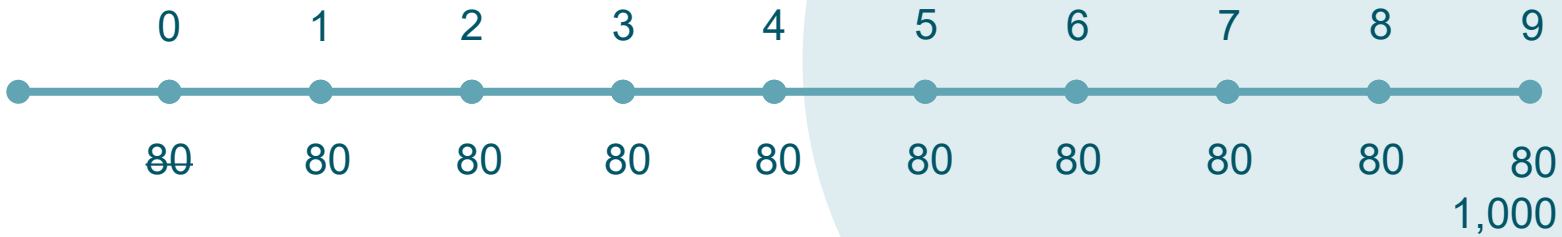
$1,000 × $1/1.06^9$ =

$1,000 × 0.592 =

$592

The Value of the Premium

- Cash flows of MOT bond:



- The YTM has dropped to 6%.
- Bond value = Present value of the coupons + Present value of the principal amount

$544 + $592 = $1,136

(trades at a premium)

$20 × 1/0.06 × (1 - 1/1.06^{9}) =

$20 × 6.802 =

$136

Zero-Coupon Bond

- Cash flows of a US Treasury bill with maturity of 1 year:

- YTM = $10,000 / $9,500 – 1 = 5%
- Always trade at a discount (pure discount bonds).
- A default-free zero-coupon bond provides a risk-free return = risk-free interest rate.
- The yields of default-free zero-coupon bonds at different maturities (the yield curve) provide sufficient information to determine the price and yield of any other default-free bond.

Replicating a Coupon Bond: Example

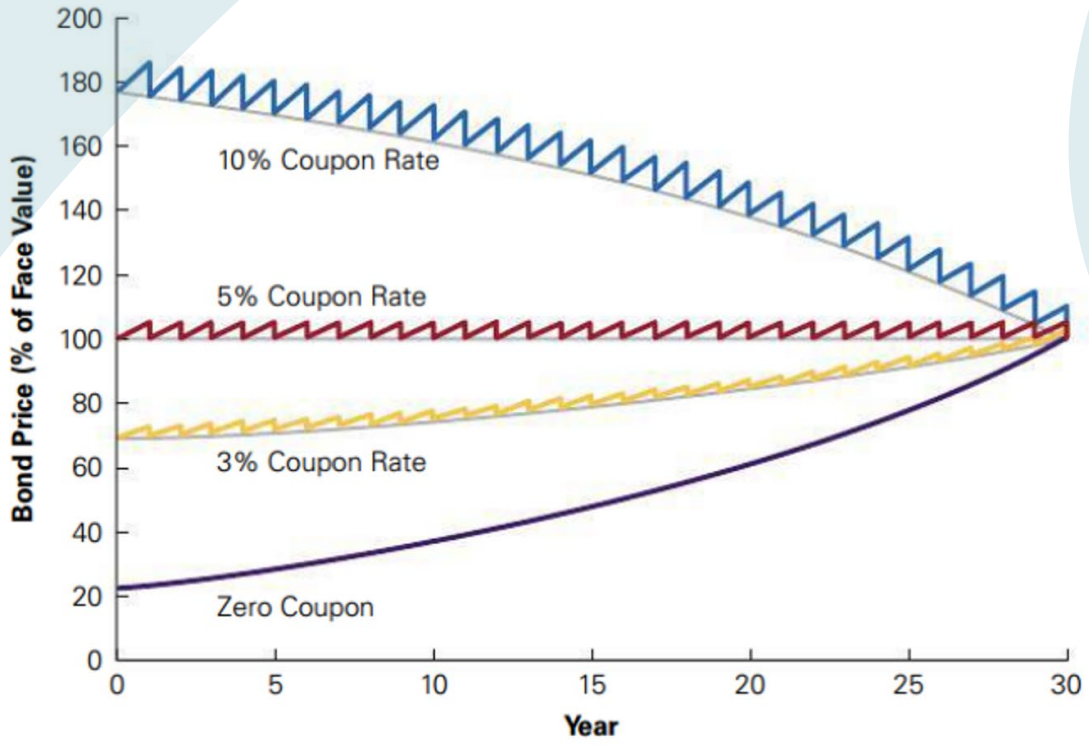
- Cash flows of a 3-year coupon bond:

- Zero-coupon bonds with maturity of 1, 2 and 3 years:

Maturity	1 year	2 years	3 years
YTM	3.50%	4.00%	4.50%
Price	$96.62	$92.45	$87.63

- $P = 100 / 1.035 + 100 / 1.04^2 + (100 + 1000) / 1.045^3 = \$1,153$

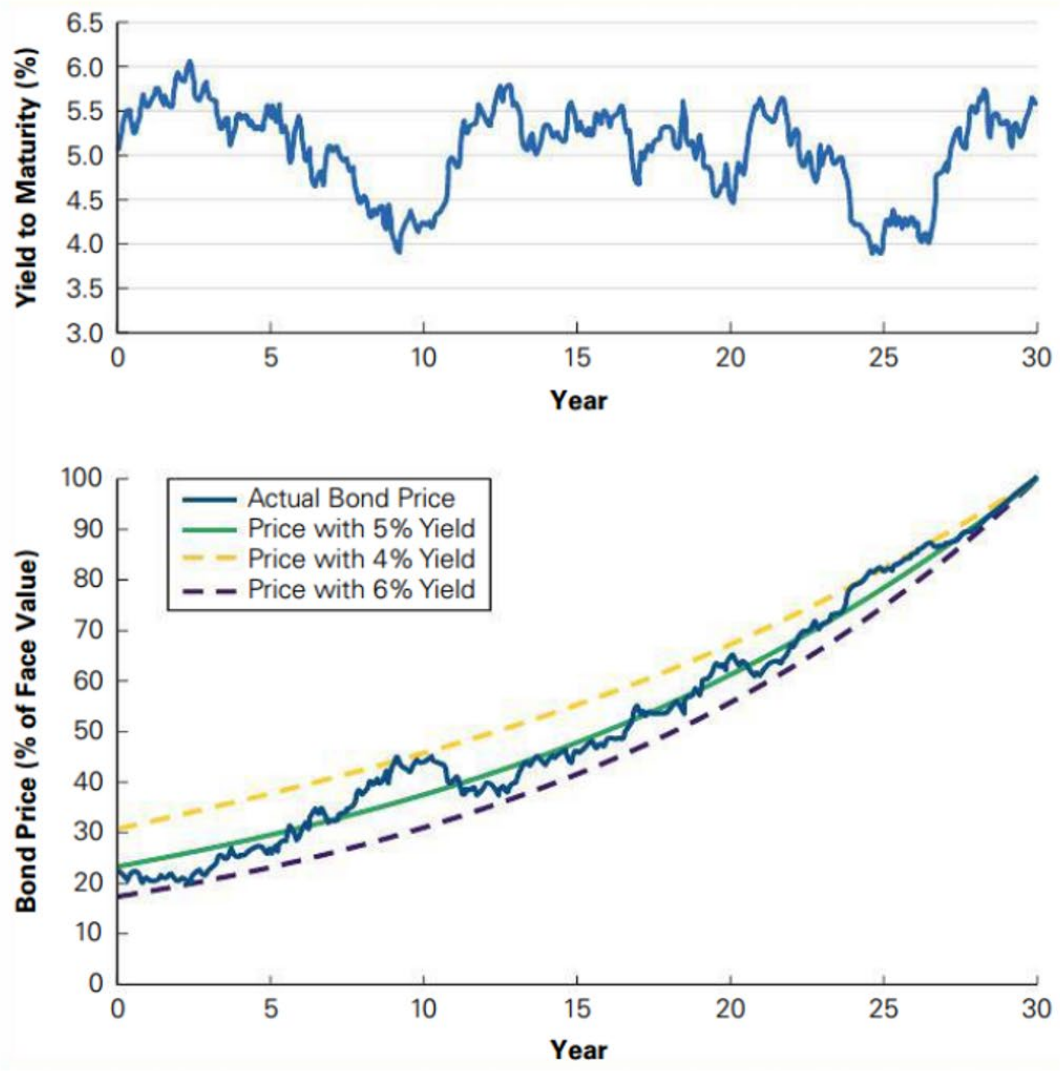
Time and the Value of a Bond



- Assuming the yield to maturity remains constant (at 5%):
  - Bond prices move towards the bond's face value over time;
  - The price of a zero-coupon bond rises smoothly;
  - The price of a coupon bond rises between coupon payments, but drops on the coupon date, reflecting the amount of the coupon payment.

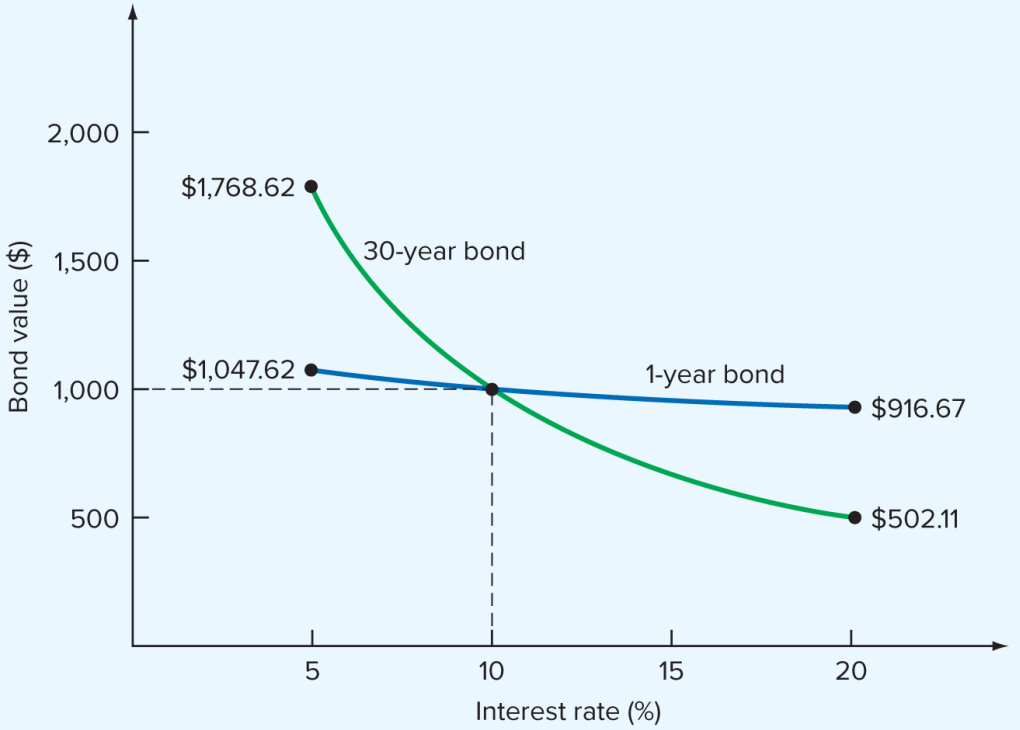
The Value of a Bond: Recap

- There is an inverse relationship between interest rates and bond prices.
- Bond prices converge to the bond's face value as the bond approaches its maturity date.
- Simultaneously, bond prices move up and down due to unpredictable changes in bond yields.



Bond Price Sensitivity

- How sensitive the bond's price is to interest rate changes depends on:
  - Duration – the longer the time to maturity, the greater the interest rate risk (all else equal).
  - Coupon rate – the lower the coupon rate, the greater the interest rate risk (all else equal).
- The higher the sensitivity the higher the interest rate risk!

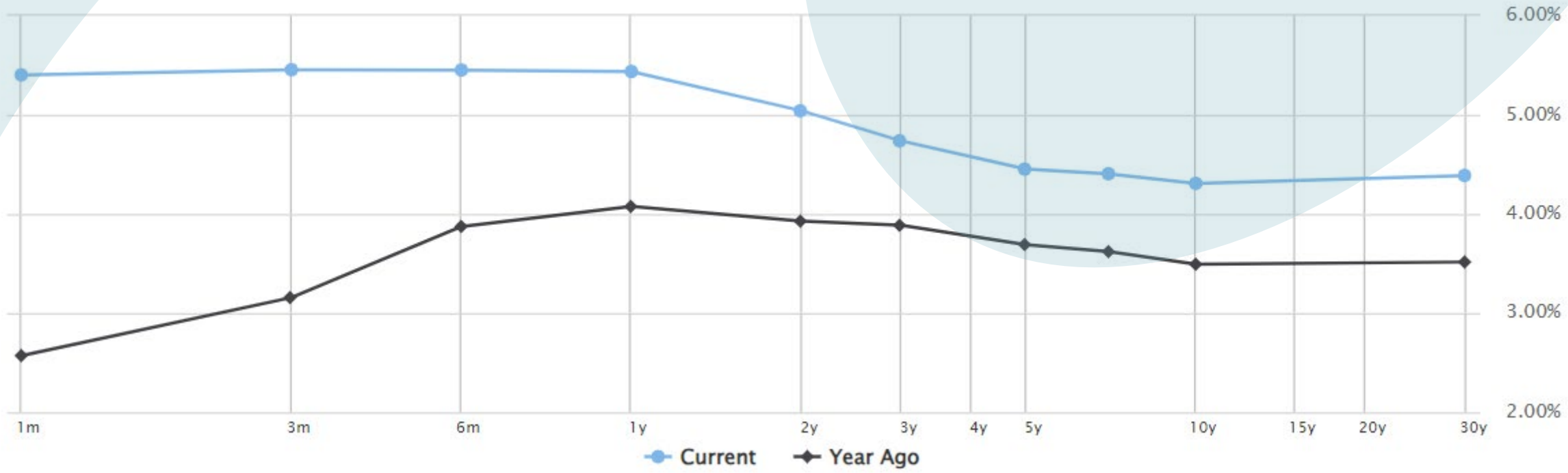


Value of a Bond with a 10 Percent Coupon Rate for Different Interest Rates and Maturities

	Time to Maturity	
Interest Rate	1 Year	30 Years
5%	$1,047.62	$1,768.62
10	1,000.00	1,000.00
15	956.52	671.70
20	916.67	502.11

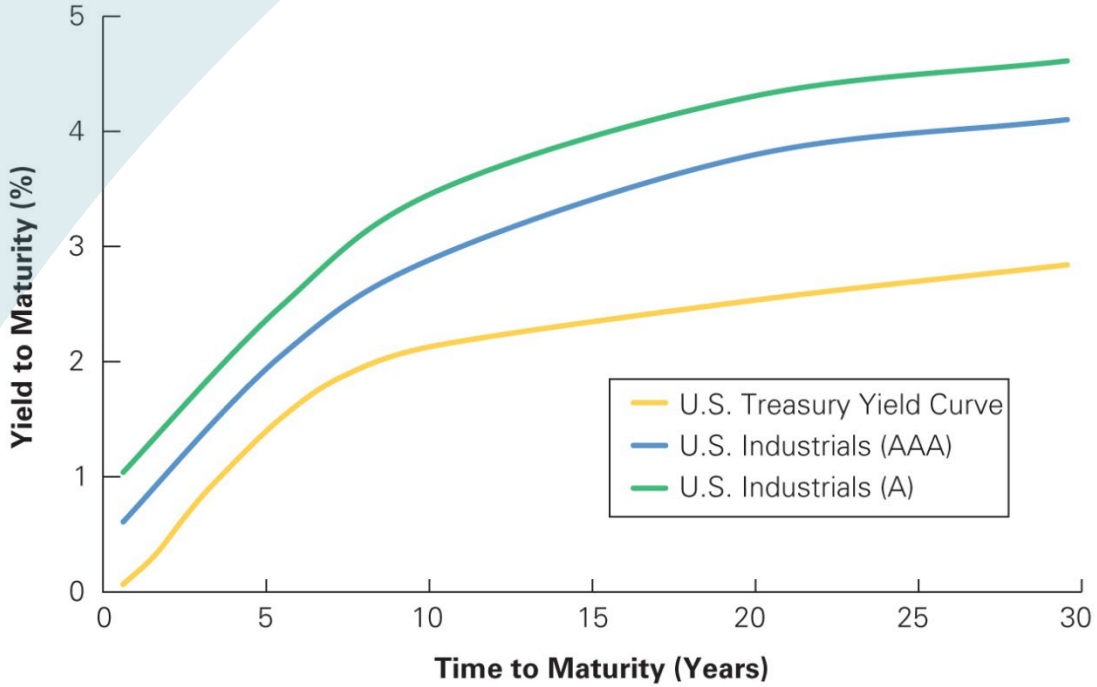
The Bond Yield Curve

- US Treasury Quotes;
- Plot of US Treasury yields relative to maturity (types of yield curves).



Source: www.wsj.com, September 19, 2023

Corporate Yield Curves



- Not default free!
- Investors demand higher yield as extra compensation for the risk => lower price.

Bond Rating			
Moody's	Standard & Poor's	Grade	Risk
Aaa	AAA	Investment	Lowest Risk
Aa	AA	Investment	Low Risk
A	A	Investment	Low Risk
Baa	BBB	Investment	Medium Risk
Ba, B	BB, B	Junk	High Risk
Caa/Ca/C	CCC/CC/C	Junk	Highest Risk
C	D	Junk	In Default

- Lower-rated bonds have higher yields.