How to get in touch?

- Via mail: lvena@liuc.it
- In person:
  - Where? Main building (“Edificio Torre”) – 4th floor
  - When? Whenever you want, by appointment.
# Table of Contents

- Shares
- Bonds
- Term Structure
- Commodities.

Ref: BMA, ch. 3 and 4
Shares

- Who is the owner of “The Coca-Cola Company”?
Shares

- A corporation is owned by its common stockholders.
- Stock, or equity, can be represented as the residual assets, after the discharge of all the senior claims (e.g. bonds).
- Equity is divided in equal parts, known as shares.
- Shares represents a fraction of ownership in a company. Ownership comes with voting rights and the right to share in any future profits.
What does it mean to say that shareholders own the corporation?

Suppose that the company has issued only shares and these shares are totally held by the CEO.

The manager is the only one that will decide the investments of the company and, at the same time, will receive the total free cash flow.
Every share gives the holder two rights:

- **Cash flow right**, which is the right to receive the residual assets, after all liabilities are paid.

- **Voting right**, which is the right to exercise control or influence over the company’s operations.

Voting rights and cash flow rights are proportioned to the amount of shares held by every stockholder.
Therefore, if I want to be sure to take control of a company I have to buy exactly 50%+1 of the stock capital.

Sometimes, however, having the majority of the share capital is not necessary...
Shares…and control

☐ Is it sufficient the 5% of the stock value to take control of the company?

☐ …and the 49%?

☐ In both cases, the correct answer is: “it depends!”
Dual share classes

- Most companies have different classes of share:
  - Voting (or common) shares;
  - Non-voting (or preference) shares.

- The difference between the two classes depends on the different voting and capital rights granted by such shares.
Dual share classes

- Common shares have the following main features:
  - Higher voting rights (they carry one vote per share, e.g., 10 shares-10 votes)
  - Lower, or standard, cash flow rights.

- On the contrary, preference shares have:
  - Lower voting rights (e.g., 10 shares-1 vote)
  - Higher cash flow rights.
Dual share classes - Example

□ “Savings shares do not bear any voting rights”

□ “Any reduction of share capital due to losses does not have any effect on savings shares…”

□ “Any earnings that remain […] are distributed among all shares, in such a way that the savings shares are assigned a higher global dividend […] at a level equal to 3% of 6.3€ per share”

UniCredit – Corporate bylaw
Equity valuation

Stock price can be valued throughout different valuation models, including the:

- Dividend discount model
- Discounted cash flow model.

Such models present various pitfalls:

- The valuation of the discount rate which must reflect the riskiness of the company;
- The valuation of the future cash-flow (or dividend).
Trading Strategy

- **Long position:**
  Investors take a long position when they expect the security price will grow. Therefore, they first buy the security and then sell it, after the price is grown.

- **Short position:**
  Investors take a short position when they expect the security price will decline. Therefore, without having the security, they first sell it. After the price decline, investors buy the security and return flat.
Suppose that...

- you want to take a LONG position on Apple Inc.
- that the market price is 125$.
- that you open the position at the market price.

Graph the position payoff/profit.
Short position payoff

- Suppose that...
  - you want to take a SHORT position on Facebook.
  - that the market price is 75$.
  - that you open the position at the market price.

Graph the position payoff/profit.
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- Shares
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- Commodities.
Debt

If a company wants to finance its business, it can alternatively:

- Issue new equity.
- **Borrow money**, promising to make regular interest payment and to repay the principal.
Debt

Who can be the lender?

- A financial institution.
- A bank
- The households.

What type of instruments can be used?

- Mortgages
- Bonds
Bonds

What are bonds?

Bonds are debt instruments* that represent cash flows payable during a specified time period.

The cash flow they represent are:

- Interest payment on the loan;
- The redemption of the loan.

*Bonds are portion of a single operation of indebtedness.
Bonds vs shares

Bonds are debt instruments, whereas shares are fraction of equity.

- By purchasing equity (shares), investor becomes the owner of the corporation.

- By purchasing debt (bonds) the investor becomes a company’s creditor.
Bonds vs shares

Bonds are debt, whereas shares are equity.

- The primary advantage of being a creditor is that you have a higher claim on assets than shareholders do: that is, in the case of bankruptcy, bondholders will be paid before shareholders.

- However, bondholders do not share in the profits if a company does well – they are entitled only to the principal plus interest.
Bonds key features

- **Maturity:**
  The maturity of a bond refers to the date that the debt will cease to exist.

- **Term to maturity:**
  The term to maturity of a bond is the number of years after which the issuer will repay the obligation.
Bonds key features

- **Principal** (a.k.a. Redemption value/Par value/Face value):
The principal is the amount that the issuer agrees to repay the bondholder on the maturity date.

- **Coupon Rate**:
The coupon rate is the interest rate used to compute the coupon that the issuer agrees to pay each period. It can vary or be fixed.
Focus: T-bill and Money Market

- The money market consists of very short term debt securities that usually are highly marketable.

- The most marketable securities of the money markets are the US Treasury-Bills (or simply T-bills).

- T-bills are issued at initial maturity of 1 month, 3 months, 6 months and 1 year.
Bond categories

With respect to the issuer, bonds can be classified into:

- Sovereign governments B;
- Local government authorities B;
- Supranational bodies B (e.g. the World Bank);
- Corporate B
Bond categories

According to the interest payment scheme, bond can be classified into:

- **ZCB** – Zero Coupon Bond

- **CB** – Coupon Bond, in turn classified into:
  - Fixed income bond which, in all period, pay the same coupon;
  - Floating Rate Notes which have, for each period, a different interest rate depending on a specific “underlying” interest rate.
Zero Coupon Bond

The Zero Coupon Bond is a debt instruments which grants the lender a profit originated by the difference between:

- Issuing Price
- Face/Nominal Value or Principal
Valuation of a ZCB

Since the interest rate of a Zero Coupon Bond is implicit in the difference between the issuing price and the par value...

EG, the interest rate of a 1Y ZCB.

\[ r_{(0,1)} = \frac{M}{P} - 1 \]
# Yield Curve

<table>
<thead>
<tr>
<th>Security</th>
<th>Time to Maturity</th>
<th>Price</th>
<th>Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCB</td>
<td>1m</td>
<td>99.9985</td>
<td>s(0,1)=…</td>
</tr>
<tr>
<td>ZCB</td>
<td>2m</td>
<td>99.9785</td>
<td>s(0,2)=…</td>
</tr>
<tr>
<td>ZCB</td>
<td>3m</td>
<td>99.9670</td>
<td>s(0,3)=…</td>
</tr>
<tr>
<td>ZCB</td>
<td>6m</td>
<td>99.9240</td>
<td>s(0,6)=…</td>
</tr>
<tr>
<td>ZCB</td>
<td>9m</td>
<td>99.8040</td>
<td>s(0,9)=…</td>
</tr>
<tr>
<td>ZCB</td>
<td>12m</td>
<td>99.6460</td>
<td>s(0,12)=…</td>
</tr>
</tbody>
</table>

Using the data in the table above, compute the interest rate of 1Y ZCB.
The fixed income bond grants the owner

- the payment of a certain amount of interest each period and
- the repayment of the principal at the maturity.

In all periods (e.g. quarters, years...) the interest is computed on the same interest rate which is fixed in all the time contract.
Valuation of Fixed-Income Bonds

\[ P = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \ldots + \frac{C+M}{(1+r)^n} \]

Where,

- \( P \) is the fair price of the bonds
- \( C \) is the coupon
- \( M \) is the par (or face) value
- \( r \) is the interest rate.
Fixed Income Bond

Compute the fair price of the following three bonds:

- Interest paid on a yearly basis;
- Face value: 100$.
- Time to maturity: 10 years
- Interest rate, $r=5\%$.
- Coupon rate:
  - 7\% on annual basis, for the 1\textsuperscript{st} bond
  - 5\% on annual basis, for the 2\textsuperscript{nd} bond
  - 3\% on annual basis, for the 3\textsuperscript{rd} bond
Bonds fair price

The fair price of a bond depends on two rate:

- Discount rate, $r$
- Coupon rate, $c$

More precisely, if

- $r > c \implies P < M$
- $r = c \implies P = M$
- $r < c \implies P > M$
Some bonds include provision that gives the bondholders and/or the issuer an option to enforce the early redemption of the bond.

The embedded option are:

- Call option
- Put option
Callable bonds

- The embedded Call Option grants the issuer the rights to redeem the debt, totally or partially, before the maturity.

- The call option gives the issuer the possibility to change the maturity date…

- …all else equal, a callable bond will have a lower price.
Callable bonds
Callable bonds

Discrete Call minimum 30 business days notice
May be called in full or part
Last Call Date 07/24/2037

Call Frequency Monthly
Callable only on date(s) shown

<table>
<thead>
<tr>
<th>Date</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>08/24/2016</td>
<td>100.00</td>
</tr>
<tr>
<td>09/24/2016</td>
<td>100.00</td>
</tr>
<tr>
<td>10/24/2016</td>
<td>100.00</td>
</tr>
<tr>
<td>12/24/2016</td>
<td>100.00</td>
</tr>
<tr>
<td>01/24/2017</td>
<td>100.00</td>
</tr>
<tr>
<td>02/24/2017</td>
<td>100.00</td>
</tr>
<tr>
<td>03/24/2017</td>
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<tr>
<td>04/24/2017</td>
<td>100.00</td>
</tr>
<tr>
<td>05/24/2017</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Putable bonds

- The embedded Put Option grants the bondholder the rights to change the maturity of the bond.

- The bondholder can use the put option when, after the issue, the interest rates rise and the bond value decline.

- ...all else equal, a putable bond will have a higher price.
## Putable bonds

<table>
<thead>
<tr>
<th>Pages</th>
<th>Issuer Information</th>
<th>Identifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Bond Info</td>
<td>Name</td>
<td>ID Number</td>
</tr>
<tr>
<td>2) Addtl Info</td>
<td>JPMORGAN CHASE &amp; CO</td>
<td>EC1922698</td>
</tr>
<tr>
<td>3) Covenants</td>
<td>Industry</td>
<td>CUSIP</td>
</tr>
<tr>
<td>4) Guarantors</td>
<td>Diversified Banks</td>
<td>16161LCH5</td>
</tr>
<tr>
<td>5) Bond Ratings</td>
<td></td>
<td>ISIN</td>
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<tr>
<td>6) Identifiers</td>
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<td>US16161LCH50</td>
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<tr>
<td>7) Exchanges</td>
<td></td>
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<tr>
<td>8) Inv Parties</td>
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<tr>
<td>9) Fees, Restrict</td>
<td></td>
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<tr>
<td>10) Schedules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Coupons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quick Links</td>
<td>Mkt Iss</td>
<td></td>
</tr>
<tr>
<td>32) ALLQ Pricing</td>
<td>Domestic MTN</td>
<td></td>
</tr>
<tr>
<td>33) QRD Quote Recap</td>
<td>Country US</td>
<td>Security Information</td>
</tr>
<tr>
<td>34) TDH Trade Hist</td>
<td>Sr Unsecured</td>
<td></td>
</tr>
<tr>
<td>35) CACSCorp Action</td>
<td>Currency USD</td>
<td></td>
</tr>
<tr>
<td>36) CF Prospectus</td>
<td>Series MTNC</td>
<td></td>
</tr>
<tr>
<td>37) GN Sec News</td>
<td>Coupon</td>
<td></td>
</tr>
<tr>
<td>38) HDS Holders</td>
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<td></td>
</tr>
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<td>39) VPRDUnderly Info</td>
<td>Type</td>
<td></td>
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<td></td>
<td>Floating</td>
<td></td>
</tr>
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<td>Formula</td>
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<td>QUARTLY US LIBOR -10.0000</td>
<td></td>
</tr>
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<td></td>
<td>Day Cnt</td>
<td></td>
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<tr>
<td></td>
<td>ACT/360</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iss Price</td>
<td></td>
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<td></td>
<td>100.000...</td>
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<tr>
<td></td>
<td>Maturity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10/26/2039 PUT 10/26/15 @99.50</td>
<td></td>
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<tr>
<td></td>
<td>Iss Sprd</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calc Type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(21) FLOAT RATE NOTE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Announcement Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10/21/1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interest Accrual Date</td>
<td>10/26/1999</td>
</tr>
<tr>
<td></td>
<td>1st Settle Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10/26/1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1st Coupon Date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>01/26/2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPN RATE=3MO US$LIBOR -10BP. SERIES C.</td>
<td></td>
</tr>
</tbody>
</table>

International Financial Markets – Lecture I: Shares, bonds, commodities and term structure  02/19/2015
Putable bonds
Convertible bonds

- Convertible bonds grants the bondholder the right to convert bonds in a specific number of shares.

- The callability allows the investor to take advantage of favourable movements in the price of the issuer’s share.
## Convertible bonds

![Image of convertible bond information](image.png)

<table>
<thead>
<tr>
<th>Pages</th>
<th>Quick Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Bond Info</td>
<td>30) OVC Valuation</td>
</tr>
<tr>
<td>2) Addtl Info</td>
<td>31) Send Bond</td>
</tr>
<tr>
<td>3) Covenants</td>
<td>32) ALLQ Pricing</td>
</tr>
<tr>
<td>4) Guarantors</td>
<td>33) QRD Quote Reca</td>
</tr>
<tr>
<td>5) Bond Ratings</td>
<td>34) TDH Trade Hist</td>
</tr>
<tr>
<td>6) Identifiers</td>
<td>35) CAC Corp Action</td>
</tr>
<tr>
<td>7) Exchanges</td>
<td>36) CF Prospectus</td>
</tr>
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<td>37) CN Sec News</td>
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<tr>
<td>9) Fees, Restrict</td>
<td>38) HDS Holders</td>
</tr>
<tr>
<td>10) Schedules</td>
<td>39) VPR Underly Info</td>
</tr>
<tr>
<td>11) Coupons</td>
<td>40) Valuation</td>
</tr>
</tbody>
</table>

### Issuer Information
- **Name**: INTEL CORP
- **Industry**: Semiconductors

### Convertible Information
- **Issue Price**: 28.2860
- **Stock Price**: 34.3600
- **Cumulative Parity**: 121.47
- **Coupon**: 2.95, Init Prem: 60.87
- **Type**: Fixed, Freq: S/A

### Identifiers
- **ID Number**: EF3527076
- **CUSIP**: 458140AD2
- **ISIN**: US458140AD22

### Bond Ratings
- **S&P**: A-
- **Fitch**: A
- **Composite**: A-
- **EJR**: AA-

### Issuance & Trading
- **Aggregated Amount Issued/Out**: 1,600,000.00
- **Par Amount**: 1,000.00
- **Book Runner**: JPM
- **Reporting**: TRACE

### Details
- **Calc Type**: (1311)MULTI-STEP CPN BND
- **Announcement Date**: 03/30/2006
- **1st Coupon Date**: 06/15/2006
- **Convertible Until**: 12/14/2035
- **Maturity**: 12/15/2035
- **INIT CVR PREM=60.8673% REG’D SEC. FOR 144A SEE CUSIP #458140AC4. 6/15/2015 CPN**
Concluding...

<table>
<thead>
<tr>
<th>Stocks</th>
<th>Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks represents the ownership of the company.</td>
<td>Bonds are debt instruments.</td>
</tr>
<tr>
<td>Stockholders’ return is given by dividends and capital gains, but the company can retain dividends if it needs cash.</td>
<td>Bondholders’ return is given by the coupons and/or the difference between the face value and the bond price.</td>
</tr>
<tr>
<td>In case of liquidation, stockholders’ interest are satisfied at the last.</td>
<td>In case of liquidation bondholders are paid only after the privileged creditors (such as the mortgage holders).</td>
</tr>
<tr>
<td>Shareholders risk more than the bondholders and expect a higher return.</td>
<td>Their risk is less than the one of the stocks; indeed the bonds’ expected return is low with respect to the one of the shares</td>
</tr>
<tr>
<td>All corporations issue stocks</td>
<td>Only some companies issue bonds.</td>
</tr>
</tbody>
</table>
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- Shares
- Bonds
- Term Structure
- Commodities.
Yield Curve

- Up to now, we have supposed a unique interest rate, that remains constant over time.

- However, it is opportune to recognize that the short term interest rates is different from the long term interest rates.

- Indeed, different zero coupon bonds have different prices, according to the various maturity.
Yield Curve

- Plotting the different yields against the maturity, one can obtain the Yield Curve.
- The yield curve shows the different interest rates corresponding at each maturity.
- Therefore, it shows the relationship between the short and long term interest rates.
- It is opportune to recognize that the yield curve does not show the level of interest rates over time.
Spot and forward contract

- All rates we have considered up to now are computed using spot contract.

- A spot contract represents, like the US T-bill, a transaction for immediate delivery.

- Indeed, the purchaser of a T-bill is entitled to interest from the settlement date onwards.
Yield curve

- In general, the spot rates (on annual basis!) of a spot contract which has
  - maturity (in years), $k$
  - terminal value, $x_k$
  - price, $v(0, x_k)$

is the following one:

\[
s(0, k) = \left[ \frac{x_k}{v(0, x_k)} \right]^\frac{1}{k} - 1
\]
Exercise

Let consider again the following situation:

- 1y ZCB – Price=98 and Face Value=100
- 2y ZCB – Price=94 and Face Value=100

The former has a interest rate of (...) - indicated with (...) while the latter has a interest rate of (...) - indicate with (...).
Using the data in the table above, graph the term structure of interest rates.
The zero coupon bond yield curve, as all the other yield curve, plots the spot rates corresponding to the different maturity.
Financial markets permits also forward contract.

Unlike the spot contract, the forward one refers to a contract in which the parties to the trade agree today to exchange a security for cash at a future date, but at a price agreed today.

Therefore, as can be inferred from the definition, a forward rate is the interest rate set today which will be applied to a contract at a future date.
Spot and forward contracts

- From the spot contracts and the spot rates one can infer the forward rates implicit in the market.

- In order to avoid any possibility of arbitrage, the following relation must be respected:

\[ [1 + s(0, k)]^k \times [1 + f(k, k + i)]^i = [1 + s(0, k + i)]^{k+i} \]
Yield Curve

Therefore $f(k, k+i)$ can be computed using the following relation.

$$[1 + f(k, k+i)]^i = \frac{[1 + s(0, k+i)]^{k+i}}{[1 + s(0, k)]^k}$$

Where $f(k, k+i)$ is the interest rate agreed today for a contract which will start in the year $k$ and last for $i$ years.
Spot rate, forward rates and arbitrage

- When the relation above mentioned is not satisfied, the market offer a possibility of arbitrage.

- An arbitrage is a strategy which ensures non-negative cash flows and, at least, one cash flow strictly positive.

- In other words, the arbitrage consists of the simultaneous sell and purchase of different security, in order to achieve a “free meal”
Example.

□ Suppose that the market offers the following investment opportunity:

a) A spot contract with maturity $k$

b) A spot contract with maturity $k+i$

c) A forward contract with settlement date $k$ and maturity $k+i$. 
Spot rate, forward rates and arbitrage

- If the spot and forward rates satisfies the following inequality...

\[ [1 + f(k, k + i)]^i < \frac{[1 + s(0, k + i)]^{k+i}}{[1 + s(0, k)]^k} \]

- ...One can
  - Invest $1 for \( k+i \) periods at the spot rate \( s(0, k+i) \);
  - Borrow $1 for \( k \) periods at the interest rate \( s(0, k) \);
  - Borrow \( [1 + s(0, k)]^k \) at the forward rate \( f(k, k+i) \), for \( i \) periods, from \( k \) to \( k+i \).
Spot rate, forward rates and arbitrage

- **Strategy payouts:**

<table>
<thead>
<tr>
<th>Time contracts</th>
<th>0</th>
<th>k</th>
<th>k+i</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a)</strong></td>
<td>-1</td>
<td>-</td>
<td>+[1+s(0,k+i)]^{k+i}</td>
</tr>
<tr>
<td><strong>b)</strong></td>
<td>1</td>
<td>-[1+s(0,k)]^{k}</td>
<td>-</td>
</tr>
<tr>
<td><strong>c)</strong></td>
<td>-</td>
<td>+[1+s(0,k)]^{k}</td>
<td>-[1+s(0,k)]^{k}[1+f(k,k+i)]^{i}</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>&gt;0</td>
</tr>
</tbody>
</table>
In word, one must be indifferent between the two following choices:

- investing first in the 1Y ZCB and secondly, as the zcb goes to maturity, reinvest in another 1Y ZCB (whose interest rate is known in 0);
- Investing directly in the 2Y ZCB.

If the markets do not respect the preceding relation one can have a free meal and, in other word, can implement an arbitrage.
Let consider again the following situation:

- 1y ZCB – Price=98 and Face Value=100
- 2y ZCB – Price=94 and Face Value=100

Considering the two spot rates $s(0,1)=2.0408\%$ and $s(0,2)=3.1421\%$, there is one and only one forward rates which does not permit any risk free arbitrage.

The forward rate $f(1,2)=...$
Consider again the following spot rates:

- $s(0,1) = 2.0408\% \text{ (Spot price=98)}$
- $s(0,2) = 3.1421\% \text{ (Spot price=94)}$

Suppose that the forward interest rate $f(1,2) = 3.0928\% \text{ (Forward price=97)}$.

Show how one can realize a risk free arbitrage.
Bonds pricing......was the formula correct?

When we priced the bond, we used a constant interest rate.

However, as we have just seen, the interest rate may vary according to the different maturity.

Therefore, exploiting the term structure and the relation between maturities and interest rates we can re-write the bond pricing formula.
Bond pricing formula

\[
P = \frac{C}{[1 + s(0, 1)]^1} + \frac{C}{[1 + s(0, 2)]^2} + \cdots + \frac{C}{[1 + s(0, k)]^k} + \cdots + \frac{C + M}{[1 + s(0, n)]^n}
\]

where:

- \( C \) is the coupon;
- \( s(0, k) \) is the spot rate referred to the \( k \)th maturity;
- \( M \) is the principal (face value);
- \( n \) is the bond maturity.
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Commodities

- What are commodities?
  - Commodities are marketable item, produced to satisfy the needs and/or wants of the customers.

The key features of the commodities are:

- Highly standardized items, i.e. the producer of the good does not add any value.
- Extremely variable price across time, i.e. the good is very risky.
Commodities

- Given the:
  - partial or full fungibility of a commodity and...
  - the high uncertainty surrounding their prices

Suppliers and demanders may, and frequently do, agree a price in advance.

Because of the high standardization, suppliers and demanders do not have to negotiate a one-off, bilateral contract.
A commodity futures contract is simply a standardized forward contract traded on exchange.

Indeed, both buying a future and contracting a forward one fix the price of the underlying asset.

Therefore, the distinction between “forward” and “futures” contract refers to the way the contracts are traded rather than the contracts themselves.
Commodity Futures Contract

- Buying a futures contract means to agree the price that will be paid later in the future.

- In order to reduce the risk around the trade, the buyer will be asked to put up margin in the form of cash or equivalent (e.g., Treasury Bills).

- The margin demonstrates the buyer's ability to honour the contract, reducing the risk around the bargain.