Forwards & Futures

Presented: Mohamed Moheyeldin
Portfolio Manager
Central Bank of Egypt
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I-Introduction to Forwards

✓ What is a forward Contract?

A Forward Contract is a contract to *deliver* an item of a particular *quality* at some time in the future, at a price *agreed upon today*. Note that the item to be delivered and the price to be paid do not change hands today, but in the future.

This item could be a commodity, currency or a **BOND**

*A quick revision what is the YTM of a bond??*
I- Introduction to Forwards

1. General:

Forward rates are break-even rates that would make you indifferent!!!

Do you understand anything???

If you want to invest an amount $P$ for 2 years, you are faced with 2 options:

– invest $P$ for two periods at the two-period spot rate $r_2$. At the end of the two periods, receive: $F_2 = P(1+r_2)^2$

– invest $P$ for one period at the one-period spot rate $r_1$ and agree now to roll over the investment at the forward rate $f_2$. This time, receive: $F_2^* = P(1+r_1)(1+f_2)$

Because we can fix the forward rate now, we must have $F_2 = F_2^*$

You should be indifferent between those 2 options

Otherwise ??!!!.
1. **General:**

   if there are to be no arbitrage opportunities. This implies that:

   \[ f_2 = \frac{(1+r_2)^2}{(1+r_1)} - 1 \]

   In general, the one-period forward rates are given by:

   \[ f_i = \frac{\left(1+r_i\right)^i}{\left(1+r_{i-1}\right)^{i-1}} - 1 = \frac{D_{i-1}}{D_i} - 1 \quad i=1,\ldots,n \]
I- Introduction to Forwards

✓ Forward rate Example:

<table>
<thead>
<tr>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Year 1</td>
<td>1</td>
</tr>
</tbody>
</table>

$1 \quad \text{10\%} \quad $1 \times (1.10)^2 = $1.21

With a two-year spot rate of 10 percent, an investor in two-year bond receives $1.21 at date 2.

This is the same return as if the investor received the spot rate of 8 percent over the first year and a 12.04 percent return over the second year.

$1 \quad 8\% \quad $1.08 \quad 12.04\% \quad $1 \times 1.08 \times 1.1204 = $1.21

Because both the one-year spot rate and the two-year spot rate are known at date 0, the forward rate over the second year can be calculated at date 0.

If the result is higher or lower compared to the market rate, then there is an arbitrage opportunity in the market.
I- Introduction to Forwards

✓ Forward rate Example: Bond Price

The no arbitrage price of a forward contract is given by:

\[ FP = S_o (1 + R_f)^T \]

Example:
Consider the 6-months forward on a zero-coupon bond that is currently selling for $600 and the risk-free rate is 3%. What is the forward price?

\[ FP = 600 \times (1.03)^{0.5} = 608.93 \]

It should be noted that any other price can result in an arbitrage opportunity.
## I-Introduction to Forwards

2. **Forwards Vs. Futures:**

<table>
<thead>
<tr>
<th></th>
<th>Forwards</th>
<th>Futures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private contract</td>
<td>Private contract between two parties</td>
<td>Traded on an Exchange</td>
</tr>
<tr>
<td></td>
<td>Not standardized (custom maturity and price)</td>
<td>standardized Contract</td>
</tr>
<tr>
<td></td>
<td>Usually one specified delivery</td>
<td>Range of Delivery dates</td>
</tr>
<tr>
<td></td>
<td>Settled at the end of the contract</td>
<td>Settled Daily</td>
</tr>
<tr>
<td></td>
<td>Delivery or cash settlement</td>
<td>Contract is closed prior to maturity</td>
</tr>
<tr>
<td></td>
<td>Counterparty Risk</td>
<td>No counterparty risk, guaranteed by the Exchange</td>
</tr>
</tbody>
</table>
II-Treasury Bond Futures

A- Features of Bond Futures:

Bond futures contracts are agreements whereby the seller must deliver to the buyer an agreed upon amount of bonds in the deliverable basket, during a specified period of time in the future, for an agreed upon price.

A long Bond Futures is a contract giving the buyer the obligation to buy a government bond in the future at a price agreed today. While the seller accepts to deliver an actual cash security at expiry.

The short can deliver any bond from a number of bonds in a delivery basket (long an option). The long will be delivered against (short an option).
II-Treasury Bond Futures

A- Features of Bond Futures:

Futures and cash bonds act as substitutes to each other. Sometimes it is cheaper and quicker to use futures to extend duration of a portfolio and later substitute cash bonds for the futures contracts.

If the investor can be LONG a cash bond, and wants to hedge against possible interest rate increase. The investor can Short a number of futures contracts

At maturity of the futures contract, the investor delivers the bond against the short position
II-Treasury Bond Futures

B- US Bond Futures Market structure:

In the US market, we have 4 types of treasury bond futures

✓ 2-Years note futures
✓ 5-Years note futures
✓ 10-Years note futures
✓ Long Treasury bond futures

Each futures contract has its own Cheapest-To-Deliver (CTD) bond, and hence it stems its own duration from it.
### II-Treasury Bond Futures

<table>
<thead>
<tr>
<th>Description</th>
<th>T-Bond Futures</th>
<th>10-yrs note futures</th>
<th>5-yrs note futures</th>
<th>2-yrs note futures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract size</td>
<td>$100,000</td>
<td>$100,000</td>
<td>$100,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>Deliverable bonds eligible for delivery from the first day in the delivery month till the last day in the delivery month</td>
<td>15-yrs +</td>
<td>6.5-10 yrs</td>
<td>4.5-5 yrs</td>
<td>1.5-2 yrs</td>
</tr>
<tr>
<td>Deliverable bonds eligible for delivery from the first day in the delivery month till the last day in the delivery month</td>
<td>Bonds with at least 15 yrs remaining maturity</td>
<td>Bonds with at least 6.5 yrs remaining maturity and less than 10 yrs to maturity</td>
<td>Bonds with an original maturity not more than 5 yrs and 3 mths, &amp; remaining maturity no more than 4 yrs and 2 mths</td>
<td>Bonds with an original maturity not more than 5 yrs and 3 mths, &amp; remaining maturity no more than 2 yrs</td>
</tr>
<tr>
<td>Futures coupon</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Minimum tick</td>
<td>1/32 ($31.25)</td>
<td>1/64 ($15.625)</td>
<td>1/64 ($15.625)</td>
<td>1/128 ($15.625)</td>
</tr>
</tbody>
</table>

Minimum price movements of a treasury contract are called **Ticks**, and calculated as follows:

*Minimum tick in $ value = Face Amount * 1% * Minimum Tick in 32nd*
**II-Treasury Bond Futures**

- **10yr Futures Contract**

  - **Contract Specifications**
    - National: US 10yr 6%
    - Contract Size: 100,000 USD
    - Value of 1.0 pt: $1,000
    - Tick Size: 0.00+ (64ths)
    - Tick Value: $15.625
    - Price: 125-19+
    - Contract Value: $125,609.38
    - Last Time: 17:49:04
    - Exch Symbol: ZN
    - BBGID: BBG003QKY3S

  - **Daily Price Limits**
    - Up Limit: N.A.
    - Down Limit: N.A.

  - **Trading Hours**
    - Local: 01:00-00:00
    - Pit: 15:20-22:00

  - **First Trade**: Thu Dec 20, 2012
  - **Last Trade**: Thu Mar 20, 2014
  - **First Notice**: Fri Feb 28, 2014
  - **First Delivery**: Mon Mar 3, 2014
  - **Last Delivery**: Mon Mar 31, 2014

  - **9) Weekly COT Net Futures (COT)**

  - **Price Chart (GP)**
    - Prc Chg 1D: -0.328/-0.261%
    - Lifetime High: 132-28
    - Lifetime Low: 122-03

  - **Margin Requirements**
    - Speculator
      - Initial: 1,622.5
      - Secondary: 1,475
    - Hedger
      - Initial: 1,475
      - Secondary: 1,475

**Description**: 10-Year US Treasury Note - U.S. Treasury notes maturing at least 6 1/2 years, but not more than 10 years, from the first day of the delivery month. The invoice price equals the futures settlement price times a conversion factor plus accrued interest. The conversion factor is the ...
II-Treasury Bond Futures

C-Futures contracts sensitivities:

The following represents the drivers and the principals of bonds futures contract trading:

✓ Conversion factor
✓ Implied Repo Rate
✓ Cheapest To Deliver
✓ Basis
✓ Contract Option
II-Treasury Bond Futures

**Conversion Factor:**

The Futures contract is based on fictitious government bond with a fixed maturity and a fixed coupon (6% in US market)

The conversion factor system is used to adjust the price of a deliverable bond (given its specific yield and maturity) to the equivalent price of a 6% fictitious coupon bond underlying the specific futures contract (future contract price)

A specific conversion factor is assigned to each cash instrument in the deliverable basket and is constant throughout the delivery cycle. Hence, >>>>>>
II-Treasury Bond Futures

Conversion Factor:

✓ The conversion factor doesn’t change as the delivery month nears or as yields change.
✓ The calculation underlying the conversion factors reflects the price (in % terms) at which a $1 par of a security would trade if it had a 6% YTM (equal to the fictitious coupon underlying the futures contract) as of the first delivery day of the contract month.
✓ It should be noted that bond issues, in the deliverable basket, that have coupons less than the 6% fictitious bond coupon rate, will have conversion factors that are less than 1 that increases (for the same deliverable bond) with further futures contracts.
## II-Treasury Bond Futures

### Conversion Factor:

<table>
<thead>
<tr>
<th>Cash Security</th>
<th>Price</th>
<th>Source</th>
<th>Conv. Yield</th>
<th>Conv. Factor</th>
<th>Dya/Bas (32nds)</th>
<th>Implied Repo%</th>
<th>Actual Repo%</th>
<th>Net/Bas (32nds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) T 2 11/15/20</td>
<td>103-05 2/3</td>
<td>BGN</td>
<td>2.113</td>
<td>0.8205</td>
<td>4.160</td>
<td>0.635</td>
<td>0.144</td>
<td>-1.090</td>
</tr>
<tr>
<td>2) T 3 02/15/21</td>
<td>109-14</td>
<td>BGN</td>
<td>2.154</td>
<td>0.8697</td>
<td>6.676</td>
<td>0.434</td>
<td>0.144</td>
<td>-0.679</td>
</tr>
<tr>
<td>3) T 2 11/30/20</td>
<td>99-02</td>
<td>BGN</td>
<td>2.150</td>
<td>0.7873</td>
<td>5.841</td>
<td>-0.763</td>
<td>0.144</td>
<td>1.927</td>
</tr>
<tr>
<td>4) T 1 10/31/20</td>
<td>97-20 2/3</td>
<td>BGN</td>
<td>2.134</td>
<td>0.7740</td>
<td>13.544</td>
<td>-4.691</td>
<td>0.144</td>
<td>10.133</td>
</tr>
<tr>
<td>5) T 2 09/30/20</td>
<td>99-12 4/3</td>
<td>BGN</td>
<td>2.101</td>
<td>0.7873</td>
<td>16.091</td>
<td>-5.551</td>
<td>0.144</td>
<td>12.179</td>
</tr>
<tr>
<td>6) T 3 05/15/21</td>
<td>105-29</td>
<td>BGN</td>
<td>2.231</td>
<td>0.8376</td>
<td>22.686</td>
<td>-7.042</td>
<td>0.144</td>
<td>16.384</td>
</tr>
<tr>
<td>7) T 2 02/28/21</td>
<td>98-20 2/3</td>
<td>BGN</td>
<td>2.212</td>
<td>0.7806</td>
<td>19.019</td>
<td>-7.052</td>
<td>0.144</td>
<td>15.147</td>
</tr>
<tr>
<td>8) T 2 01/31/21</td>
<td>99-18 2/3</td>
<td>BGN</td>
<td>2.192</td>
<td>0.7875</td>
<td>21.288</td>
<td>-7.883</td>
<td>0.144</td>
<td>17.085</td>
</tr>
<tr>
<td>9) T 3 12/31/20</td>
<td>101-11 2/3</td>
<td>BGN</td>
<td>2.160</td>
<td>0.8012</td>
<td>23.227</td>
<td>-8.376</td>
<td>0.144</td>
<td>18.501</td>
</tr>
<tr>
<td>10) T 2 08/15/21</td>
<td>98-23</td>
<td>BGN</td>
<td>2.313</td>
<td>0.7748</td>
<td>45.079</td>
<td>-19.241</td>
<td>0.144</td>
<td>40.874</td>
</tr>
<tr>
<td>11) T 2 11/15/21</td>
<td>97-12</td>
<td>BGN</td>
<td>2.375</td>
<td>0.7612</td>
<td>56.737</td>
<td>-25.110</td>
<td>0.144</td>
<td>52.795</td>
</tr>
<tr>
<td>12) T 2 02/15/22</td>
<td>96-29 2/3</td>
<td>BGN</td>
<td>2.429</td>
<td>0.7549</td>
<td>67.307</td>
<td>-30.468</td>
<td>0.144</td>
<td>63.361</td>
</tr>
<tr>
<td>13) T 1 05/15/22</td>
<td>94-17 2/3</td>
<td>BGN</td>
<td>2.489</td>
<td>0.7331</td>
<td>79.421</td>
<td>-37.318</td>
<td>0.144</td>
<td>76.800</td>
</tr>
<tr>
<td>14) T 1 08/15/22</td>
<td>93-02</td>
<td>BGN</td>
<td>2.543</td>
<td>0.7185</td>
<td>96.348</td>
<td>-43.729</td>
<td>0.144</td>
<td>87.187</td>
</tr>
<tr>
<td>15) T 1 11/15/22</td>
<td>92-17 2/3</td>
<td>BGN</td>
<td>2.588</td>
<td>0.7120</td>
<td>99.972</td>
<td>-48.626</td>
<td>0.144</td>
<td>96.810</td>
</tr>
<tr>
<td>16) T 2 02/15/23</td>
<td>95-02 2/3</td>
<td>BGN</td>
<td>2.620</td>
<td>0.7307</td>
<td>106.067</td>
<td>-50.138</td>
<td>0.144</td>
<td>102.116</td>
</tr>
</tbody>
</table>
It doesn't imply anything and it's not even a repo rate!

It is actually the money market return to an investor of a strategy of (a) buying bonds today and selling futures to hedge, then (b) waiting until the delivery date, then (c) delivering those bonds to fulfill the futures contract obligation even if they are not the cheapest to deliver bond.

The cash flows involved in the above transaction are to *pay cash today to buy bonds and receive cash on delivery*. This calculation takes into account all the cash flows associated with the security.
II-Treasury Bond Futures

Implied Repo Rate:

✓ Implied repo is what you receive in relation to what you pay; *highest economic return on capital*

✓ The implied repo rate, can also be thought of as the theoretical return the investor would earn through a cash-and-carry deal (buying the cash bond and shorting the futures contract where the cash bond will be delivered at the futures contract maturity, and so the investor will be earning the repo rate of the investment)

\[
\text{Long Money Market} = \text{Long Cash Bond} + \text{Short Futures Contract}
\]
## II. Treasury Bond Futures

### Implied Repo Rate:

<table>
<thead>
<tr>
<th>Cash Security</th>
<th>Price</th>
<th>Source</th>
<th>Conv. Yield</th>
<th>Conv. Factor</th>
<th>Govt/Bas (32nds)</th>
<th>Implied Repo (%)</th>
<th>Actual Repo (%)</th>
<th>Net/Bas (32nds)</th>
</tr>
</thead>
<tbody>
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<td>103-05³⁄₄</td>
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II-Treasury Bond Futures

**Cheapest-To-Deliver:**

The bond that yields the lowest price for the future is called the CTD and the associated future price (forward price of the bond divided by its conversion factor) would be the fair value of the future in the absence of any delivery option value.

The CTD bond is the one that maximises the return to the arbitrageur engaging in Cash n Carry arbitrage, that is, buying the bond and simultaneously selling the future, holding the bond to expiry and then delivering it into the futures contract.

Ie Bond with the highest implied Repo rate
II-Treasury Bond Futures

Cheapest to Deliver

What Determines the CTD from the deliverable basket?

Yields Bias :

Bonds with higher yields tend to become more likely to be the CTD.

Factor Bias :

When deliverable yields are above the notional coupon (6%), longer duration tend to become CTD

When Deliverable yields are below the notional coupon (6%), shorter duration tend to become CTD
II-Treasury Bond Futures

**Cheapest to Deliver**

The importance of the CTD:

The future Price will be equal to the forward price of the CTD divided by its conversion factor and the duration will be equal to the CTD duration divided by the conversion Factor.
**II-Treasury Bond Futures**

**Cheapest To Deliver:**

<table>
<thead>
<tr>
<th>Cash Security</th>
<th>Price</th>
<th>Source</th>
<th>Conv. Yield</th>
<th>Conv. Factor</th>
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</tr>
<tr>
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<td>99-12 2a</td>
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</table>
II-Treasury Bond Futures

*Basis:*

The “Gross Basis” measures the difference between the cash price of the deliverable security and the forward price.

- Basis = Spot - Forward
- Net Basis = Gross basis - Net carry

Net interest carry is the largest component of the basis. It is a measure of the coupon rate on the cash bond net of the repo financing cost.

- Net Carry = Coupon rate – Repo Financing

The seller of the future has the option to deliver any of a number of deliverable securities, and this option has a value.
II. Treasury Bond Futures

_Basis:_
The basis can be traded in a strategy form as follows:

- Buying the basis is exactly the same as buying the CTD bond and simultaneously selling futures contracts at a pre-agreed price difference.

- The sources of returns can be divided into:
  - Coupon received on the bond;
  - Convergence (any price appreciation or depreciation of futures relative to the bond);
  - Capital gains/losses on the bond which, if duration matched, are exactly offset by losses/gains due to changes in the futures price.
II. Treasury Bond Futures

Basis:

The CTD basis will tend to converge to zero on the delivery date, as the price effect of carry diminishes.
II. Treasury Bond Futures

*Basis:*

In a positive carry environment, the futures contract price should equal the converted CTD price less the positive carry. Hence, the carry benefits exceeds the carrying charges (financing costs). As a result, futures contract price should price below the cash bond market price.

In contrast, the negative carry case implies that the futures contract price should equal the converted cash bond price *plus* the negative carry, in which the carry benefits are less than the carrying charges of the position (financing costs). As a result, futures contract prices should price above the cash bond price.
**II-Treasury Bond Futures**

**Basis:**

**Positive carry**

\[ \text{Futures price} = \left( \frac{B}{CF} \right) - \text{Positive carry} \]

This means that the futures contract price will keep increasing in value relative to the CTD the more deferred its expiration (+ve Basis diminishing as the contract approaches maturity)

**Negative carry**

\[ \text{Futures price} = \left( \frac{B}{CF} \right) - \text{Negative carry} \]

This means that the futures contract price will keep decreasing in value relative to the CTD the more deferred its expiration (-ve Basis diminishing as the contract approaches maturity)
II-Treasury Bond Futures

Contract Option:

The seller of a futures contract possesses a valuable option, where the buyer must be compensated for.

The difference between the forward price of the CTD bond divided by its conversion factor (Theoretical Futures Price), and the market price of the futures contract is the market's valuation of the delivery option.

Futures contracts often trade at a discount relative to the forward price of the CTD bond, divided by its factor only when the option is valuable.

The effect of the delivery option is as follows >>>
II-Treasury Bond Futures

**Contract Option:**

- Delivery Option
  - Seller can choose which bond to deliver (cheapest to deliver)

- Timing Option
  - Within some guidelines set by the CBOT, seller decides when during the delivery month delivery will take place.

Generally speaking, an upward sloping yield curve and positive carry will make it economical to deliver on the last business day while an inverted yield curve and negative carry usually lead to early delivery.
II-Treasury Bond Futures

Contract Option:

✓ Wildcard Option
  ➢ Seller can give notice of intent to deliver for several hours after the exchange has closed and the futures settlement price has been fixed.

In a falling market, the seller can use the wildcard option to profit from the fixed delivery price.

There is an important advantage to the short future on this day: at 14:00 hours that day the exchange settlement price and hence the invoice amount to be received by the short are fixed. However, the short does not have to announce an intent to deliver until 20:00 hours on that day. During the six hours after the settlement price, if interest rates rise and the bond price falls, the short will earn the difference between the actual price received for the bond, which is the EDSP set at 14:00, and the price that they will have to pay to acquire the bond.
II-Treasury Bond Futures

Contract Option:
The market, values the delivery option by discounting the futures price relative to the forward price of the cheapest to deliver bond. hence,

✓ The seller of the futures contract "pays" this discount and benefits from being long the delivery option.

✓ The buyer of the futures contract receives this discount and is "short" the delivery option.

✓ If no change in the CTD bond occurs between now and the futures delivery date, a long bonds / short futures hedge will underperform an equivalent-term money market return. This is because the delivery option purchased will have expired worthless and the hedge will have underperformed by the original option value.
II. Treasury Bond Futures

**Contract Option:**

Value of the delivery option depends on likelihood of shifts in the CTD, which is going to be reflected in the “Net Basis” that is the market assessment of the theoretical delivery option value.

Factors affecting the delivery option value are (for high option values):

- The closer together the maturities in the basket
- The longer the time to expiry
- The higher the market volatility
- The closer market yields are to 6%
II. Treasury Bond Futures

3-Relationships & Conclusions:

✓ A market rally to yield levels below the notional coupon of the future (from which the factor is derived) tends to push the cheapest-to-deliver bond toward short-maturity, short-duration issues.

✓ A steepening of the yield curve tends to richen short-maturity issues relative to long-maturity issues, pushing the cheapest-to-deliver bond toward long-maturity, long-duration issues.
II. Treasury Bond Futures

3-Relationships & Conclusions:

✓ Without delivery options, the futures price would closely track the forward price of the cheapest-to-deliver bond, divided by its factor.

✓ The futures duration would therefore approximate the dollar duration of the cheapest-to-deliver bond, divided by its factor.

✓ Delivery options affect the futures duration by introducing the influence of other bonds that are close to becoming cheapest-to-deliver.
II. Treasury Bond Futures

3-Relationships & Conclusions

Hence, we can say that futures sometimes can be better than cash bonds because of:

- Lower transaction costs
- More liquid
- Less disruptive
- Facilitates net short or long positioning
- Less capital intensive
II. Treasury Bond Futures

4-Pricing Forwards Vs. Futures:

A simplified way to approximate the fair market price of a futures contract is to treat it as if it were a forward contract.

First, the fair forward price of each cash deliverable bond is divided by its conversion factor to come up with their converted forward prices, and the lowest of the converted forward prices gives an approximate price for the futures contract.

\[
\text{Converted Fwd Price} = \frac{\text{Fair Fwd Price}}{\text{Conv. Factor}}
\]

\[
\text{Fair Forward Price} = \text{Futures Price} \times \text{Conv. Factor}
\]
II. Treasury Bond Futures

4-Pricing Forwards Vs. Futures:

If the market price of the contract were higher than the minimum converted forward price of a cash bond, then the futures contract is considered to be rich and should be sold against the purchase of the CTD cash bond, with the intention of later delivering with a guaranteed riskless profit; this is known as a Cash-n-Carry Trade. So,

If Futures Price > Minimum Converted Fwd Price
✓ The futures contract is rich
   ➢ Perform a cash-n-carry trade
II. Treasury Bond Futures

4-Pricing Forwards Vs. Futures:

It should be noted that the fair forward price of any cash bond is the cash market price plus financing charges to some horizon minus the coupon income earned on the bond, which is then divided by its conversion factor to come up with the “Converted Forward Price” that is expected to equal the futures contract price.

Look at the following formulae >>>
II-Treasury Bond Futures

4-Pricing Forwards Vs. Futures:

\[ \text{Fair Fwd price} = \text{Cash price} + (\text{Financing cost} - \text{Current income}) \]

\[ \text{Fair Fwd price} = \text{Cash price} + \text{Net carry} \]

\[ \text{Net carry} = \text{Horizon financing} - \text{Current income} \]

\[ \text{Current income} = \text{Coupon} \div \text{Bond dirty price} \]
III-Trading Strategies

Trading Strategies:

- Outright duration directional trades
- Yield curve positioning trades
- Hedging trades
- Basis trades

The golden rule is:

\[
\text{No. of contracts} = \frac{(D_{new} - D_{old}) \times \text{Portfolio Value} \times \text{Con. Factor}}{\text{CTD Dur}}
\]
Outright directional trade example:

You need to add 3 years of duration to a $100 million portfolio having a current duration of 3.5 years, using the 5-years treasury bonds june-10 futures, where the CTD conversion factor is 0.8681 and its duration is 3.968 years.

No. of contracts = \((6.5-3.5) \times 100,000,000 \times 0.8681 / (3.968 \times 100,000)\) = +656 contracts (approx.)

Now, your portfolio sensitivity has increased as if you purchased the 5-years cash bonds, but the trade was implemented using futures contract. However, there are a number of assumption:
Outright directional trade example:

- You are up to taking the roll-over risk of the futures contract
- The CTD underlying the futures contract is not going to change, otherwise it will affect the futures contract pricing that might end up not having the exact exposure initiated
- Being long the futures contract involves selling the embedded delivery option to the seller. So, this might end-up receiving any of the bonds in the delivery basket; probably, however, the CTD!

What is meant by a roll over of the future contract?
III-Trading Strategies

Hedging trade example:

You need to fully hedge $100 million portfolio having 3.5 years of duration using the 5-years treasury bonds june-10 futures, where the CTD conversion factor is 0.8681 and its duration is 3.968 years.

No. of contracts = \[(0-3.5) \times 100,000,000 \times 0.8681 \div (3.968 \times 100,000)\] = - 766 contracts (approx.)

What might go wrong in this Hedging Scenario?
What are the risks that I am not hedged against?
III-Trading Strategies

_Hedging trade example:_

Although we are fully hedged in this example, however there are a number of assumption:

- Yield curve will change in a parallel shift manner
- The behavior of the CTD is going to represent the behavior of the portfolio
- The CTD underlying the futures contract will not change causing disruptions in the hedge
- You are up to taking the roll-over risk of the futures contract
- Otherwise, we will be subject to basis risk, which is the inability of the hedge to offset any gains or loss in the cash investment (portfolio)
III- Trading Strategies

Basis trade example:

Before going into the example, we need to re-enforce some concepts:

✓ To “buy the basis” or to “go long the basis” is to buy the cash bonds and sell a number of futures contracts equal to the conversion factor for every $100,000 par value of the cash bond

✓ To “sell the basis” or to “go short the basis” is to sell the cash bonds and buy a number of futures contracts equal to the conversion factor for every $100,000 par value of the cash bond
### Basis trade example:

If, Actual Net Basis > Theoretical Net Basis
- ✓ Basis is rich
- ✓ Futures price is cheap relative to cash price
- ✓ Sell the basis (reverse cash and carry trade)

If, Actual Net Basis < Theoretical Net Basis
- ✓ Basis is cheap
- ✓ Futures price is rich relative to cash price
- ✓ Buy the basis (cash and carry trade)
III-Trading Strategies

*Basis trade example:*

Reasons to long the basis

- Short end of the yield curve is expected to decline (lower financing cost)
- Expected high volatility in rates resulting in possible change in the CTD
- Spreads between deliverables are expected to change triggering a change in the CTD
- The futures contract price is rich with high implied repo rate
III-Trading Strategies

*Basis trade example:*

If the basis is rich, then this reflects a high delivery option value, which cannot be the case during the futures contract delivery price. This is because an arbitrage profit can be exploited through a cash-n-carry trade, and delivering the cash bond.

However, the basis can be positive or negative before the start of the delivery month reflecting a value in the delivery option and that the CTD is not yet possible.
Basis trade example:

- Treasury bond 5-years 2.375% Aug-14
- Cash market price = 102.09+
- June 5-years futures delivery = 117.24
- Conversion factor = 0.8681
- Delivery = 0.8681 * 117-24 = 102.218775
- Gross Basis = 102.30-102.22 = 2.5/32

So, the futures price should be equal to the cash delivery price divided by the factor, which is equal to 117.75 that is equal to the futures contract price.

This makes sense here as we are in the delivery month already, which reflects no room for a basis trade here!