Bond Future Definition and Valuation
Summary

- Bond Future Introduction
- The Use of Bond Futures
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- Practical Guide
- A Real World Example
Bond Future Introduction

- A bond future is a future contract in which the asset for delivery is a government bond.
- Any government bonds that meet the maturity specification of a future contract are eligible for delivery.
- All eligible delivery bonds construct the delivery basket where each bond has its own conversion factor.
- Conversion factors are used to equalise the coupon and accrued interest differences of all the deliverable bonds.
- The seller usually picks up the cheapest bond in the basket to deliver, called the cheapest-to-deliver (CTD).
- The CTD bond is normally delivered on the last delivery day of the month.
The Use of Bond Futures

- Bond futures are exchange-traded with maturities of 2, 5, 10, 30 years, where the typical underlings are treasury notes or bonds.
- There are established global markets for bond futures.
- Bond futures provide a liquid alternative for managing interest rate risk.
- Investors use bond futures to hedge an existing portfolio against adverse interest rate movements or enhance the long-term performance of the portfolio.
- Arbitrageurs profit from the price difference between the spot bonds and the bond futures.
- Speculators use bond futures in the hope of making a profit on short-term movements in prices.
Valuation

- The present value of a bond future contract is represented as:

\[
PV(t) = nN \left( \frac{F_B(t,T)}{CF} - K \right) \exp(-tTT)/100
\]

where
- \( t \) the valuation date
- \( K \) the delivery price
- \( n \) the number of contracts
- \( N \) the amount value for the bond future
- \( T \) the future maturity date
- \( CF \) the conversion factor for a bond to deliver in a bond futures contract
Valuation (Cont)

- \( F_B(t, T) = (P - C_\Sigma) \exp(r_T T) - A \) the forward clean price of the delivered bond (CTD) at \( t \)
- \( P \) the bond dirty price at \( t \)
- \( r_T \) the continuously compounded interest rate between \( t \) and \( T \)
- \( C_\Sigma = \sum_{t_i \leq T} C \exp(-r_i t_i) \) the present value sum of all coupons of the underlying bond between \( t \) and \( T \)
- \( A \) the accrual interest before \( T \).
The key for pricing a bond future is to compute the forward clean bond price.

The forward clean bond price is equal to the forward price of the underlying bond price at today $t$ plus some coupon and accrual interest adjustment.

$P \exp(r_T T)$ is the raw forward price from $t$ to $T$.

$C_\Sigma \exp(r_T T)$ is the forward price of all the coupons between $t$ and $T$. Those coupons should be excluded from the forward bond price at $T$.

$A$ is the accrual interest before.

Bond clean price = bond dirty price – accrual interest
## Bond Futures

### A Real World Example

<table>
<thead>
<tr>
<th><strong>Buy Sell</strong></th>
<th><strong>Sell</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency</td>
<td>USD</td>
</tr>
<tr>
<td>Contract Size</td>
<td>50000</td>
</tr>
<tr>
<td>Conversion Factor</td>
<td>0.8272</td>
</tr>
<tr>
<td>First Delivery Date</td>
<td>6/1/2017</td>
</tr>
<tr>
<td>Last Delivery Date</td>
<td>6/30/2017</td>
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<td>Future Ticker</td>
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<td>Future Ticker Size</td>
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<td>Future Ticker Value</td>
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<td>Number of Contract</td>
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<tr>
<td>Quote Price</td>
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<tr>
<td>Trade Date</td>
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<tr>
<td>Future Maturity Date</td>
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<td>Underlying Bond Type</td>
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<td>Underlying Bond Coupon</td>
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<tr>
<td>Underlying Bond Maturity Date</td>
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</tbody>
</table>
Thank You

You can find more information at https://finpricing.com/lib/IrCurveIntroduction.html