



# Bond Future Definition and Valuation



**FinPricing**



## Summary

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- Practical Guide
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## 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.

# Bond Futures



## 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.



# Bond Futures

## Valuation

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

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

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



## Bond Futures

### 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.

# Bond Futures



## Practical Guide

- 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

Buy Sell	Sell
Currency	USD
Contract Size	50000
Conversion Factor	0.8272
First Delivery Date	6/1/2017
Last Delivery Date	6/30/2017
Future Ticker	TYM17
Future Ticker Size	64
Future Ticker Value	15.625
Number of Contract	83
Quote Price	124.46875
Trade Date	2/23/2017
Future Maturity Date	6/21/2017
Underlying Bond Type	UST
Underlying Bond Coupon	0.0275
Underlying Bond Maturity Date	2/15/2024





# Thank You

You can find more information at

<https://finpricing.com/lib/EqConvertible.html>