

Yield Curve





Yield Curve Introduction

- Yield curve is defined as the relationship between the yield-to-maturity and the bond's maturity.
- Yield curves play an essential role in the valuation of all financial products.
- Yield curves can be derived from government bonds or swap instruments.
- The swap term structure offers several advantages over government curves, and is a robust tool for pricing and hedging financial products.



Yield Curve Introduction (Cont.)

- Correlations among governments and other fixed-income products have declined, making the swap term structure a more efficient hedging and pricing vehicle.
- With the supply of government issues declining, swap markets are more liquid and efficient than government debt markets.
- LIBOR curves constructed from the most liquid interest rate instruments have become the standard funding curves in the market.



Yield Curve Introduction (Cont.)

- Yield curve is constructed from a set of market quotes of some liquid market instruments such as short term cash instruments, middle term futures or forward rate agreement, long term swaps and spreads.
- In past, financial institutions performed valuation and risk management of any interest rate derivative on a given currency using a single-curve approach. This approach consisted of building a unique curve and using it for both discounting and forecasting cashflows.

Yield Curve Introduction (Cont.)

- However, after the financial crisis, market practitioners started to use a new valuation approach referred to as multicurve approach, which is characterized by a unique discounting curve and multiple forecasting curves
- The current methodology for pricing securities and derivatives is to estimate and discount future cash flows using rates derived from the appropriate term structure. The yield term structure is increasingly used as the foundation for deriving relative term structures and as a benchmark for pricing and hedging.



Yield Curve Construction

- Yield curves are derived or bootstrapped from observed market instruments that represent the most liquid and dominant interest rate products for certain time horizons.
- Normally the curve is divided into three parts. The short end of the term structure is determined using LIBOR rates. The middle part of the curve is constructed using Eurodollar futures or forward rate agreements (FRA). The far end is derived using mid swap rates.



Yield Curve

Yield Curve Construction (Cont.)

- All bootstrapping methods build up the term structure from shorter maturities to longer ones.
- Given a Future price, the yield or zero rate can be directly calculated as

$$r = \frac{(100 - P)}{100} - \frac{CvxAdj}{10000}$$

where

P the quoted interest rate Future price

r the derived yield or zero rate

CvxAdj the Future convexity adjustment quoted in basis points
(bps)



Yield Curve Construction (Cont.)

- Assuming that we have all yields up to 4 years and now need to derive up to 5 years.
 - Given the 5 year market swap rate, we can use a root-finding algorithm to solve the x that makes the value of the 5 year inception swap equal to zero.
 - Therefore we get all yields or equivalent discount factors up to 5 years

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Yield Curve Construction (Cont.)

- Repeat the above procedure till the longest swap maturity.
- There are two keys in yield curve construction: interpolation and root finding.



Thank You

Reference:

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