Fixed Income

Term Structure & Interest Rate Dynamics

FIXED INCOME TOPICS:

Schweser → 1.) The Term Structure and interest rate dynamics.

CBOK 2.) Arbitrage-free valuation framework

3.) Valuation & Analysis of Bonds with embedded options

4.) Credit Analysis Models

5.) Credit Default Swaps

TERM STRUCTURE & INTEREST RATE DYNAMICS

→ z-spread

→ Interpreting the shape of yield curve

→ TED spread

→ key rate duration

→ MRR-OIS spread

→ spot rates

→ forward rates

→ zero rates

LEARNING OBJECTIVES

23. The Term Structure and Interest Rate Dynamics

The candidate should be able to:

a. describe relationships among spot rates, forward rates, yield to maturity, expected and realized returns on bonds, and the shape of the yield curve.
b. describe how zero-coupon rates (spot rates) may be obtained from the par curve by bootstrapping.
c. describe the assumptions concerning the evolution of spot rates in relation to forward rates implicit in active bond portfolio management.
d. describe the strategy of rolling down the yield curve.
e. explain the swap rate curve and why and how market participants use it in valuation.
f. calculate and interpret the swap spread for a given maturity.
g. describe short-term interest rate spreads used to gauge economy-wide credit risk and liquidity risk.
h. explain traditional theories of the term structure of interest rates and describe the implications of each theory for forward rates and the shape of the yield curve.
i. explain how a bond's exposure to each of the factors driving the yield curve can be measured and how these exposures can be used to manage yield curve risks.
j. explain the maturity structure of yield volatilities and their effect on price volatility.
k. explain how key economic factors are used to establish a view on benchmark rates, spreads, and yield curve changes.

Term structure of interest rates → graph of interest rates at different maturities.

changes over time → How?

can be interpreted as yields on zero-coupon bonds
∴ also known as <u>zero-coupon rates</u>.

Spot rates : annualized market interest rates for a single payment to be received in the future.

Spot rate curve :

Forward rate → interest rate (agreed to today) for a loan to be made at some future date.

* Bond Stripping

Forward pricing model

Forward rate model

TWS Portal videos.

125 (a) ✓ – Concept of spot rates, fwd. rates, & YTM

125 (b) 34 min – link b/w spot rates & YTM

125 (c) 27 min – link b/w spot rates, fwd. rates, & YTM

125 (d) 42 min – Concept of Par rate

125 (e) 16 min – Summary discussion (a)-(d) + CBOK tracking

125 (f) 60 min – Forward Pricing model

125 (g) 48 min – Evolution as per forecast

125 (h) 18 min – Evolution NOT as per forecast

125 (i) 5 min – Maturity spread carry trade

126 (a) 10 min – Interest Rate Swap – Basics

126 (b) 52 min – Computation of Swap Fixed Rate (SFR)

126 (c) 16 min – Measures of spread

126 (d) 11 min – Measures of spread incl. Z-spread

126 (e) 2 min – Clarification about the term – Eurodollar

126 (f) 22 min – Term Structure theories

127 (a) 36 min – Yield curve risk

127 (b) 19 min – Yield curve risk – CBOK tracking

127 (c) 7 min – Maturity structure of yield curve volatility

127(d) 2 min - Maturity structure of yield curve volatility - CBOK tracking
127(e) 19 min - Key rate duration - tracking CBOK
127(f) 14 min - Macro economic factors

01 March 2026.

Question: 1 yr zcb costs \$925.93
2 yr zcb costs \$826.45

A. Compute the spot rates
B. Compute the YTM of a 2 yr. 5% coupon paying bond.
C. Would your answer differ if the coupon rate in the above bond is 12%?

Answer. A. $\frac{(\text{Face value})}{(1+y_1)^1} = \$925.93$ ← for the 1 yr zcb

$\Rightarrow y_1 = \frac{1000}{925.93} - 1 = 8\%$

$\frac{1000}{(1+y_2)^2} = 826.45 \Rightarrow (1+y_2)^2 = \frac{1000}{826.45} \Rightarrow y_2 = \sqrt{\frac{1000}{826.45}} - 1$

$y_2 = 10\%$

* Easier way is to simply use the TVM module on the BA II + Calc.

0	1	2
−1000	50	1050

~~N=2 PMT = 50 FV = 1000 PV = −1000~~

~~CPT I/Y~~

* Using the above spot rates.

$$\Rightarrow \quad PV(CF_0) = -1000$$

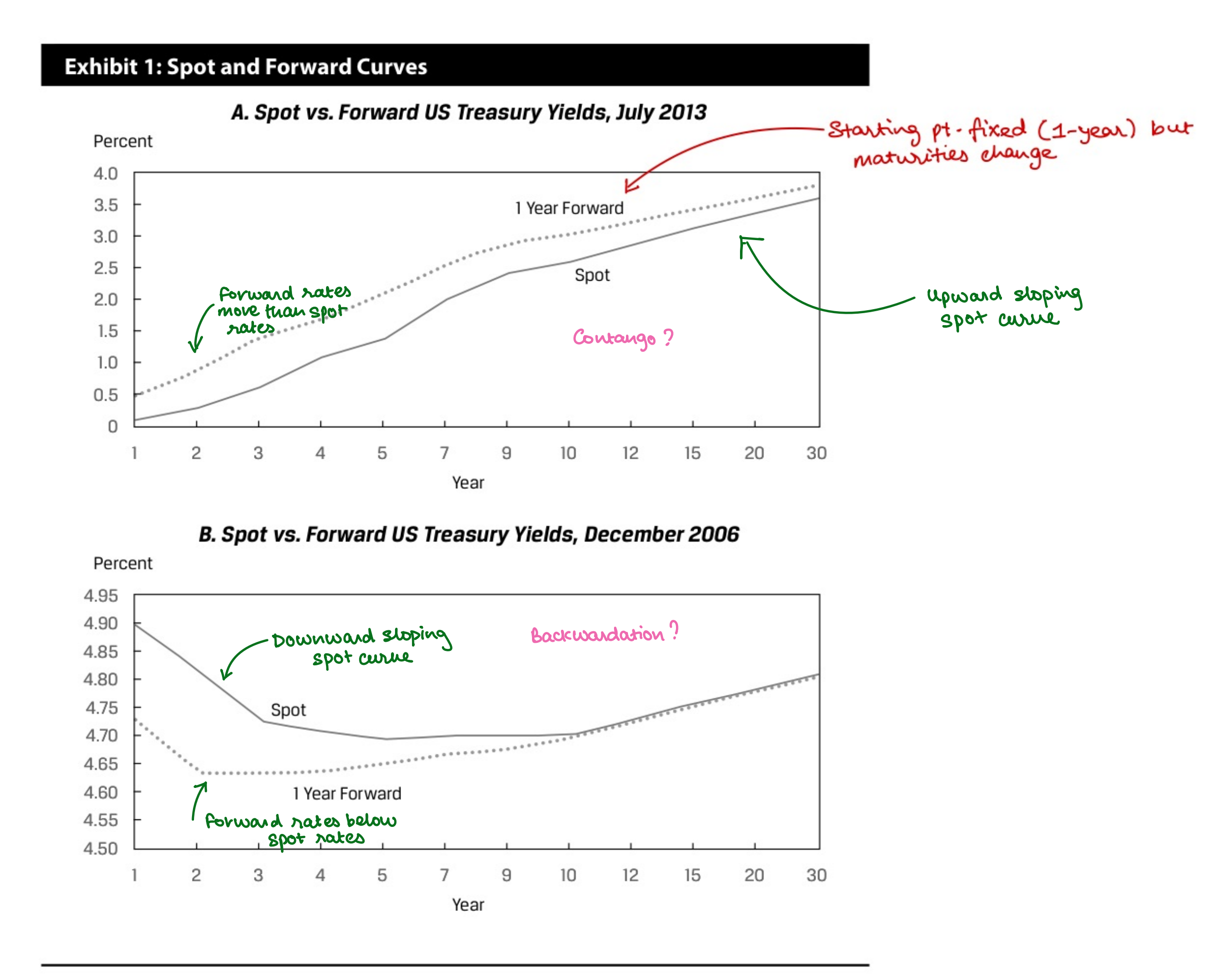
$$PV(CF_1) = \frac{50}{1.08}$$

$$PV(CF_2) = \frac{1050}{(1.1)^2}$$

02 March 2026

CH1- TERM STRUCTURE OF INTEREST RATES

TERMS : (1) Spot rates & spot curve (2) Discount factor (3) Forward rates, price, & curve (4) Expected & realized bond ret".



* Forward rates are above spot rates when spot curve is upward sloping but below spot rates when spot curve slopes downward.

$$\boxed{DF_N = \frac{1}{(1+Z_N)^N}}$$

Discount Factor

* Discount factor is the price of an N-year single currency unit, zero coupon bond.

E.g. The 3-year spot rate is 9%. Calculate the discount factor.

→ $DF_3 = \frac{1}{(1.09)^3} = 0.7722$

cont...

NOTATION :

* Discount Factor for N-year ZCB → DF_N

* Forward rate $f_{A,B-A}$

* Forward rate $f_{A,B-A}$ is the discount rate for a risk-free unit principal payment B periods from today valued at time A

FORWARD RATE MODEL

The Forward Rate Model quantifies the relationship between spot rates & forward rates.

$$\boxed{(1+z_B)^B = (1+z_A)^A \times (1+f_{A,B-A})^{B-A}}$$

Example: Given the spot rates below, calculate:

Maturity (T)	**1**	**2**	**3**
Spot rates	$z_1 = 9\%$	$z_2 = 10\%$	$z_3 = 11\%$

using formula

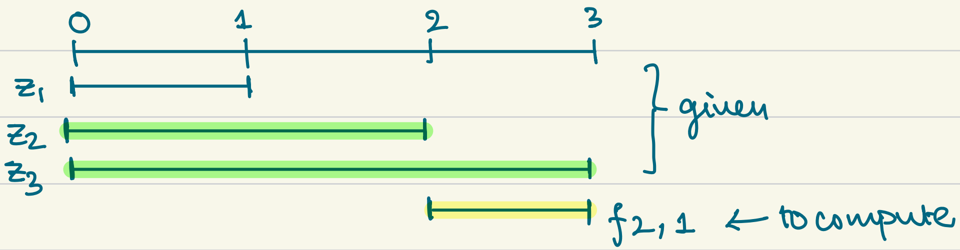
1. Forward rate for a 1-year zcb issued one year from today → we have to compute $f_{1,1}$ ⇒ $A = 1$; $B = 1+1 = 2$

$$(1+z_B)^B = (1+z_A)^A \times (1+f_{A,B-A})^{B-A}$$

$$\Rightarrow (1+z_2)^2 = (1+z_1)^1 \times (1+f_{1,1}) \Rightarrow (1.1)^2 = (1.09)(1+f_{1,1}) \Rightarrow f_{1,1} = \frac{1.1^2}{1.09} - 1 = 0.11 = 11\%$$

using logical reasoning, intuition, & visualization

2. 1-year forward rate starting 2 years from today → we have to compute $f_{2,1}$



$$f_{2,1} = \frac{(1+z_3)^3}{(1+z_2)^2} - 1 = \frac{1.11^3}{1.10^2} - 1 = 13.03\%$$

3. Forward rate for a 2-year zcb issued one year from today → compute $f_{1,2}$

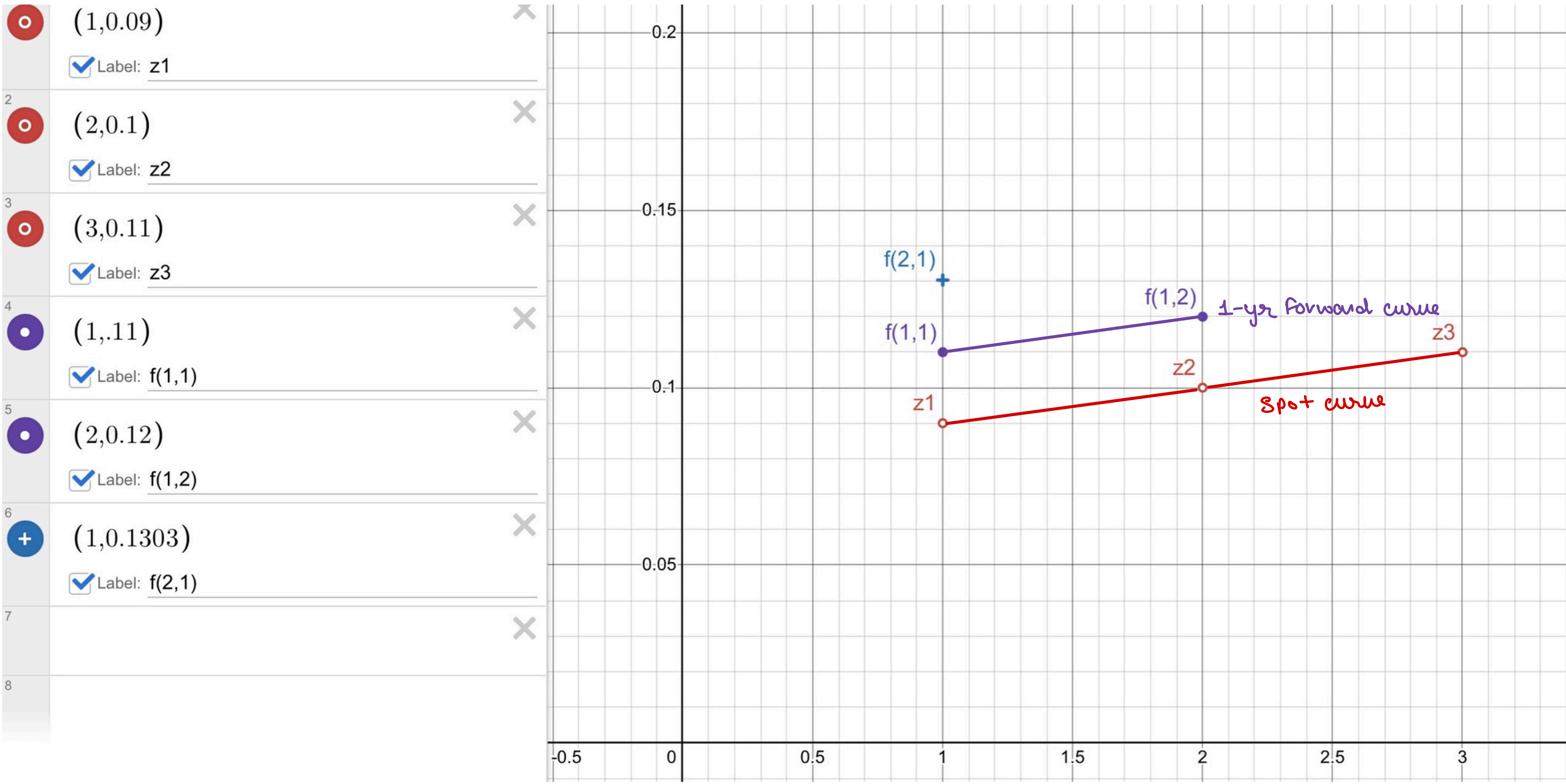
using equation, $(1+z_B)^B = (1+z_A)^A \times (1+f_{A,B-A})^{B-A}$

$A = 1$; $B = 2+1 = 3$

$$(1+z_3)^3 = (1+z_1)^1 \times (1+f_{1,2})^2 \Rightarrow (1+f_{1,2})^2 = \frac{1.11^3}{1.09}$$

$$1+f_{1,2} = \sqrt{1.2547} = 1.120137 \Rightarrow f_{1,2} = 1.120137 - 1 = 0.120137 = 12.01\%$$

Desmos graph



07 March, 2026

Par curve → par curve plots the term structure of yield to maturities of coupon paying government bonds priced at par. On the run government bonds are typically used to construct the par curve due to high liquidity & more accurate pricing data.

Bootstraping is the process of deriving the zero curve from the par curve, i.e., zero rates given the par rates.