

# STUDY SESSION

# 12

## Fixed Income (1)

**T**his study session introduces the yield curve and key relationships underlying its composition. Traditional and modern theories and models explaining the shape of the yield curve are presented. An arbitrage-free framework using observed market prices is introduced for valuing option-free bonds. This approach also holds for more complex valuation of bonds with embedded options and other bond types.

### READING ASSIGNMENTS

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| <b>Reading 32</b> | The Term Structure and Interest Rate Dynamics<br>by Thomas S.Y. Ho, PhD, Sang Bin Lee, PhD, and Stephen E. Wilcox, PhD, CFA |
| <b>Reading 33</b> | The Arbitrage-Free Valuation Framework<br>by Steven V. Mann, PhD  |

### LEARNING OUTCOMES

#### READING 32. 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 the forward pricing and forward rate models and calculate forward and spot prices and rates using those models;
- c** describe how zero-coupon rates (spot rates) may be obtained from the par curve by bootstrapping;

- d** describe the assumptions concerning the evolution of spot rates in relation to forward rates implicit in active bond portfolio management;
- e** describe the strategy of riding the yield curve;
- f** explain the swap rate curve and why and how market participants use it in valuation;
- g** calculate and interpret the swap spread for a given maturity;
- h** describe the Z-spread;
- i** describe the TED and Libor–OIS spreads;
- j** 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;
- k** describe modern term structure models and how they are used;
- l** 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;
- m** explain the maturity structure of yield volatilities and their effect on price volatility.

### **READING 33. THE ARBITRAGE-FREE VALUATION FRAMEWORK**

The candidate should be able to:

- a** explain what is meant by arbitrage-free valuation of a fixed-income instrument;
- b** calculate the arbitrage-free value of an option-free, fixed-rate coupon bond;
- c** describe a binomial interest rate tree framework;
- d** describe the backward induction valuation methodology and calculate the value of a fixed-income instrument given its cash flow at each node;
- e** describe the process of calibrating a binomial interest rate tree to match a specific term structure;
- f** compare pricing using the zero-coupon yield curve with pricing using an arbitrage-free binomial lattice;
- g** describe pathwise valuation in a binomial interest rate framework and calculate the value of a fixed-income instrument given its cash flows along each path;
- h** describe a Monte Carlo forward-rate simulation and its application.