KASNEB

PART 3

SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

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STUDY PACK

INTRODUCTION

Following our continued effort to provide quality study and revision materials at an affordable price for the private students who study on their own, full time and part time students, we partnered with other team of professionals to make this possible.

This Study Text covers KASNEB syllabus and contains past examination past papers and our suggested answers as examples which are provided by a team of lecturers who are experts in their area of training. The book is intended to help the learner do enough study and practice on how to handle exam questions and this makes it easy to pass kasneb exams.

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GENERAL OBJECTIVE

This paper is intended to equip the candidate with knowledge, skills and attitudes that will enable him/her to value, analyse and determine risk associated with fixed income securities.

14.0 LEARNING OUTCOMES

A candidate who passes this paper should be able to:

- Identify various types of fixed income instruments
- Assess various types of risks associated with fixed income instruments
- Analyse interest rate volatility using the term structure of interest rate approach
- Value and analyse fixed income instruments
- Value bonds using interest rate models
- Determine the value of bonds using yield and spread analysis
- Apply pricing strategies and evaluate the risk of fixed income securities
- Apply the models to determine credit default rates.

CONTENT

14.1 Overview of fixed income securities

- Basic features of fixed income securities
- Types of fixed income securities
- Bond indenture; affirmative and negative covenants; effect of legal, regulatory and tax considerations on the issuance and trading of fixed income securities
- Structure of cash flows of fixed income securities; contingency provisions affecting the timing and/or nature of cash flows of fixed income securities
- Risks associated with fixed income securities

14.2 Markets of fixed income securities: Issuance, trading and funding

- Classifications of global fixed income markets

- Interbank offered rates as reference rates in floating-rate debt; mechanisms available for issuing bonds in primary markets; secondary markets for bonds; securities issued by sovereign governments, non-sovereign governments, government agencies and supranational entities; debt securities issued by corporations; short-term funding alternatives available to banks; repurchase agreements (repos)

14.3 Fundamentals of fixed income valuation

- Determination of price of the bond given a market discount rate
- Relationships among a bond's price, coupon rate, maturity and market discount rate (yield-to- maturity)
- Bonds price quotation: spot rates; flat price(clean price), accrued interest and the full price of a bond(dirty price)
- Matrix pricing of a bond
- Yield measures for fixed-rate bonds, floating-rate notes and money market instruments
- Term structure of interest rate: pure expectation theory, liquidity preference theory, market segmentation theory; implications of the yield curve for the yield-curve theories
- Spot curves, yield curve on coupon bonds, par curve and forward curve
- Forward rates; determination of spot rates from forward rates, forward rates from spot rates and the price of a bond using forward rates; yield spread measures
- Bond refinancing/refunding

14.4 Fixed income risk and return

- Return from investing in a fixed-rate bond
- Bond duration measures: Macaulay duration, modified duration and effective durations, portfolio duration ; money duration of a bond and price value of a basis point (PVBP)
- Effective duration as a measure of interest rate risk for bonds with embedded options
- Key rate duration as a measure of sensitivity of bonds to changes in the shape of the benchmark yield curve

- Effect of a bond's maturity, coupon, embedded options and yield level to its interest rate risk
- Bond convexity: approximate convexity; effective convexity; determination of percentage price change of a bond for a specified change in yield, given the bond's approximate duration and convexity
- Effect of term structure of yield volatility on the interest rate risk of a bond; relationships among a bond's holding period return, its duration and the investment horizon
- Effect of changes in credit spread and liquidity on yield-to-maturity of a bond and how duration and convexity can be used to estimate the price effect of the changes

14.5 Credit risk management

- Credit risk and credit-related risks affecting corporate bonds; seniority rankings of corporate bonds; potential violation of the priority of claims in a bankruptcy proceeding; corporate issuer credit ratings; issue credit ratings ; rating agency practice of "notching"; risks in relying on ratings from credit rating agencies; components of traditional credit analysis
- Financial ratios used in credit analysis; credit quality of a corporate bond issuer given key financial ratios of the issuer and the industry
- Factors influencing the level and volatility of yield spreads; determination of return impact of spread changes; special considerations when evaluating the credit of high yield, sovereign and municipal debt issuers and issues

14.6 The term structure and interest rate dynamics

- Relationships among spot rates, forward rates, yield to maturity, expected and realised returns on bonds and the shape of the yield curve
- Forward pricing and forward rate models: determination of forward and spot prices and rates using those models
- Assumptions concerning the evolution of spot rates in relation to forward rates implicit in active bond portfolio management; the strategy of riding the yield curve
- Swap rate curve: its use in valuation by market participants; determination and interpretation of the swap spread for a default-free bond; the Z-spread;

treasury and Euro dollar(TED) spread and London interbank offer rate(LIBOR) – OIS spreads

- Review of traditional theories of the term structure of interest rates; the implications of each theory to forward rates and the shape of the yield curve
- Modern term structure models and their use; measuring the bond's exposure to each of the factors driving the yield curve and how these exposures can be used to manage yield curve risks; maturity structure of yield volatilities and their effect on price volatility

14.7 The arbitrage-free valuation framework

- Overview of arbitrage-free valuation of a fixed-income instrument
- Computation of the arbitrage-free value of an option-free, fixed-rate coupon bond
- Binomial interest rate tree framework: the backward induction valuation methodology and computation of the value of a fixed-income instrument given its cash flow at each node; process of calibrating a binomial interest rate tree to match a specific term structure
- Pricing using the zero-coupon yield curve and pricing using an arbitrage-free binomial lattice; path wise valuation in a binomial interest rate framework and computation of the value of a fixed-income instrument given its cash flows along each path
- Monte Carlo forward-rate simulation and its application

14.8 Valuation and analysis of bonds with embedded options

- Overview of fixed-income securities with embedded options
- Relationships between the values of a callable or putable bond, the underlying option-free (straight) bond and the embedded option; Use of the arbitrage-free framework to value a bond with embedded options
- Effect of interest rate volatility on the value of a callable or putable bond
- Effect of changes in the level and shape of the yield curve on the value of a callable bond
- Determination of the value of a callable or putable bond from an interest rate tree; option - adjusted spreads (OAS); effect of interest rate volatility on option-adjusted spreads

- Effective duration of callable, putable and straight bonds; use of one-sided durations and key rate durations to evaluate the interest rate sensitivity of bonds with embedded options
- Effective convexities of callable, putable and straight bonds
- Determination of the value of a capped or floored floating-rate bond
- Defining features of a convertible bond; components of a convertible bond's value; valuation of convertible bond in an arbitrage-free framework; risk–return characteristics of a convertible bond, straight bond and underlying common stock.

14.9 Credit analysis models

- Overview of credit analysis models; probability of default, loss given default, expected loss and present value of the expected loss and relative importance of each across the credit spectrum
- Credit scoring and credit ratings ; ordinal rankings
- Strengths and weaknesses of credit ratings
- Structural models of corporate credit risk: reasons for equity being viewed as a call option on the company's assets; reduced form models of corporate credit risk
- Reasons for debt being valued as the sum of expected discounted cash flows after adjusting for risk
- Assumptions, strengths and weaknesses of both structural and reduced form models of corporate credit risk
- Determinants of the term structure of credit spreads; present value of the expected loss on a bond over a given time horizon
- Credit analysis required for asset-backed securities
- Credit analysis of corporate debt

14.10 Emerging issues and trends

TOPIC **PAGE**

1. Overview of fixed income securities……9
2. Markets of fixed income securities, trading and funding……...41
3. Fundamentals of fixed income valuation…….....58
4. Fixed income risk and return……..93
5. Credit risk management…….……...112
6. The term structure and interest rate dynamics……..118
7. The arbitrage-free valuation framework…….....138
8. Valuation and analysis of bonds with embedded options…….....150
9. Credit analysis models……...……...158

CHAPTER ONE

OVERVIEW OF FIXED INCOME SECURITIES

In investment management, the most important decision made is the allocation of funds among asset classes. The two major asset classes are equities and fixed income securities. Other asset classes such as real estate, private equity, hedge funds, and commodities are referred to as ‘‘alternative asset classes.’’ Our focus in this book is on one of the two major asset classes: fixed income securities.

While many people are intrigued by the exciting stories sometimes found with equities - who has not heard of someone who invested in the common stock of a small company and earned enough to retire at a young age?— we will find in our study of fixed income securities that the multitude of possible structures opens a fascinating field of study. While frequently overshadowed by the media prominence of the equity market, fixed income securities play a critical role in the portfolios of individual and institutional investors.

In its simplest form, a fixed income security is a financial obligation of an entity that promises to pay a specified sum of money at specified future dates. The entity that promises to make the payment is called the **issuer** of the security. Some examples of issuers are central governments such as the U.S. government and the French government, government-related agencies of a central government such as Fannie Mae and Freddie Mac in the United States, a municipal government such as the state of New York in the United States and the city of Rio de Janeiro in Brazil, a corporation such as Coca-Cola in the United States and Yorkshire Water in the United Kingdom, and supranational governments such as the World Bank.
Fixed income securities fall into two general categories: debt obligations and preferred stock. In the case of a debt obligation, the issuer is called the **borrower**. The investor who purchases such a fixed income security is said to be the **lender** or **creditor**. The promised payments that the issuer agrees to make at the specified dates consist of two components: interest and principal (principal represents repayment of

funds borrowed) payments. Fixed income securities that are debt obligations include **bonds, mortgage-backed securities, asset-backed securities**, and **bank loans**.

In contrast to a fixed income security that represents a debt obligation, **preferred stock** represents an ownership interest in a corporation. Dividend payments are made to the preferred stockholder and represent a distribution of the corporation's profit. Unlike investors who own a corporation's common stock, investors who own the preferred stock can only realize a contractually fixed dividend payment. Moreover, the payments that must be made to preferred stockholders have priority over the payments that a corporation pays to common stockholders. In the case of the bankruptcy of a corporation, preferred stockholders are given preference over common stockholders. Consequently, preferred stock is a form of equity that has characteristics similar to bonds.

Prior to the 1980s, fixed income securities were simple investment products. Holding aside default by the issuer, the investor knew how long interest would be received and when the amount borrowed would be repaid. Moreover, most investors purchased these securities with the intent of holding them to their maturity date. Beginning in the 1980s, the fixed income world changed. First, fixed income securities became more complex. There are features in many fixed income securities that make it difficult to determine when the amount borrowed will be repaid and for how long interest will be received. For some securities it is difficult to determine the amount of interest that will be received. Second, the hold-to-maturity investor has been replaced by institutional investors who actively trades fixed income securities.

We will frequently use the terms ''fixed income securities'' and ''bonds'' interchangeably. In addition, we will use the term bonds generically at times to refer collectively to mortgage-backed securities, asset-backed securities, and bank loans. In this chapter we will look at the various features of fixed income securities. The majority of our illustrations throughout this book use fixed income securities issued in the United States. While the U.S. fixed income market is the largest fixed income market in the world with a diversity of issuers and features, in recent years there has been significant growth in the fixed income markets of other countries as borrowers have shifted from funding via bank loans to the issuance of fixed income securities. This is a trend that is expected to continue.

I. INDENTURE AND COVENANTS

The promises of the issuer and the rights of the bondholders are set forth in great detail in a bond's **indenture**. Bondholders would have great difficulty in determining from time to time whether the issuer was keeping all the promises made in the indenture. This problem is resolved for the most part by bringing in a trustee as a third party to the bond or debt contract. The indenture identifies the trustee as a representative of the interests of the bondholders.

As part of the indenture, there are **affirmative covenants** and **negative covenants**.

Affirmative covenants set forth activities that the borrower promises to do. The most common affirmative covenants are:

1. To pay interest and principal on a timely basis,
2. To pay all taxes and other claims when due,
3. To maintain all properties used and useful in the borrower's business in good condition and working order, and
4. To submit periodic reports to a trustee stating that the borrower is in compliance with the loan agreement.

Negative covenants set forth certain limitations and restrictions on the borrower's activities. The more common restrictive covenants are those that impose limitations on the borrower's ability to incur additional debt unless certain tests are satisfied.

II. MATURITY

The **term to maturity** of a bond is the number of years the debt is outstanding or the number of years remaining prior to final principal payment. The **maturity date** of a bond refers to the date that the debt will cease to exist, at which time the issuer will redeem the bond by paying the outstanding balance. The maturity date of a bond is always identified when describing a bond. For example, a description of a bond might state ''due 12/1/2020.''

The practice in the bond market is to refer to the ''term to maturity'' of a bond as simply its ''maturity'' or ''term.'' As we explain below, there may be provisions in the indenture that allow either the issuer or bondholder to alter a bond's term to maturity.

Some market participants view bonds with a maturity between 1 and 5 years as ‘‘short- term.’’ Bonds with a maturity between 5 and 12 years are viewed as ‘‘intermediate-term,’’ and ‘‘long-term’’ bonds are those with a maturity of more than 12 years.
There are bonds of every maturity. Typically, the longest maturity is 30 years. However, Walt Disney Co. issued bonds in July 1993 with a maturity date of 7/15/2093, making them 100-year bonds at the time of issuance. In December 1993, the Tennessee Valley Authority issued bonds that mature on 12/15/2043, making them 50-year bonds at the time of issuance.

There are three reasons why the term to maturity of a bond is important:

1. Term to maturity indicates the time period over which the bondholder can expect to receive interest payments and the number of years before the principal will be paid in full.
2. The yield offered on a bond depends on the term to maturity. The relationship between the yield on a bond and maturity is called the **yield curve.**
3. The price of a bond will fluctuate over its life as interest rates in the market change. The price volatility of a bond is a function of its maturity (among other variables). More specifically, all other factors constant, the longer the maturity of a bond, the greater the price volatility resulting from a change in interest rates.

III. PAR VALUE

The **par value** of a bond is the amount that the issuer agrees to repay the bondholder at or by the maturity date. This amount is also referred to as the **principal value, face value, redemption value**, and **maturity value**. Bonds can have any par value.

Because bonds can have a different par value, the practice is to quote the price of a bond as a percentage of its par value. A value of ‘‘100’’ means 100% of par value. So, for example, if a bond has a par value of $1,000 and the issue is selling for $900, this bond would be said to be selling at

90. If a bond with a par value of $5,000 is selling for $5,500, the bond is said to be selling for 110. When computing the dollar price of a bond in the United States, the bond must first be converted into a price per US$1 of par value. Then the price per $1 of par value is multiplied by the par value to get the dollar price. Here are examples of what the dollar price of a bond is, given the price quoted for the bond in the market, and the par amount involved in the transaction:

Quoted price	Price per $1 of par value (rounded)	Par value	Dollar price
90 1/4	0.9050	$1,000	905.00
102 9/32	1.0275	$5,000	5,137.50
70 5/8	0.7063	$10,000	7,062.50
113 11/32	1.1334	$100,000	113,343.75

Notice that a bond may trade below or above its par value. When a bond trades below its par value, it said to be **trading at a discount**. When a bond trades above its par value, it said to be **trading at a premium**. The reason why a bond sells above or below its par value.

IV. COUPON RATE

The **coupon rate**, also called the **nominal rate**, is the interest rate that the issuer agrees to pay each year. The annual amount of the interest payment made to bondholders during the term of the bond is called the **coupon**. The coupon is determined by multiplying the coupon rate by the par value of the bond. That is,

Coupon = coupon rate × par value

For example, a bond with an 8% coupon rate and a par value of $1,000 will pay annual interest of $80 ($1, 000 0.08).

When describing a bond of an issuer, the coupon rate is indicated along with the maturity date. For example, the expression ‘‘6s of 12/1/2020’’ means a bond with a 6% coupon rate maturing on 12/1/2020. The ‘‘s’’ after the coupon rate indicates ‘‘coupon series.’’ In our example, it means the ‘‘6% coupon series.’’

In the United States, the usual practice is for the issuer to pay the coupon in two semiannual installments. Mortgage-backed securities and asset-backed securities typically pay interest monthly. For bonds issued in some markets outside the United States, coupon payments are made only once per year.

The coupon rate also affects the bond’s price sensitivity to changes in market interest rates.