C9: Accounting and Finance Course

Module 6

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Contents

Module overview

Welcome to Module 6

This module contains two main topics. First, the concept of risk and return and, in particular, how to assess and measure these.

Secondly, the introduction to the two main ways to fund an organisation – bonds and shares. In this introduction we will discuss the valuation of these two sources of funds.

Opportunities will be given throughout the course for students to use and make appropriate decisions using these concepts. The ultimate object is for the student to identify the correct data to make business decisions.

Upon completion of this module you will be able to:

Outcomes

- *Demonstrate* knowledge and understanding of risk and return and how these are applied in decision-making.
- *Demonstrate* knowledge and understanding of bonds and their valuation.
- *Demonstrate* knowledge and understanding of shares and their valuation.

Unit 14

Understanding risk and return

COURSE MANUAL

Introduction

This unit focuses on the fundamentals of the risk and return relationship of assets and their valuation. For the single asset held in isolation, risk is measured with the probability distribution and its associated statistics: the mean, standard deviation and beta. The capital asset pricing model (CAPM) is then presented as a valuation tool for securities and as a general explanation of the risk-return trade-off involved in all types of financial transactions.

The unit comprises six main sections:

1. The relationship between risk and return
2. Types of risk
3. Required returns
4. Measuring risk
5. The capital asset pricing model
6. Managing risk

Upon completion of this unit you will be able to:

Outcomes

- *Understand* the meaning and fundamentals of risk, return and risk preferences.
- *Describe* procedures for assessing and measuring the risk of a single asset.
- *Discuss* the measurement of return and standard deviation for a portfolio and the concept of correlation.
- *Explain* the capital asset pricing model (CAPM) and its relationship to the security market line (SML).

Terminology

Terminology

Beta:	A measure of non-diversifiable risk.
Return:	The total gain or loss experienced on an investment over a given period of time.
Risk:	The chance of financial loss, or more formally, the

variability of returns associated with a given asset.

Risk-free rate:	The current market yield for Treasury (or other government) bonds is usually associated with the market's risk-free rate of interest.
Security market line:	The depiction of CAPM as a graph that reflects the required return for each level of non-diversifiable risk (beta).
Total risk:	The combination of a security's non-diversifiable and diversifiable risk.

Relationship of risk and return

Introduction

The relationship between risk and return is a fundamental financial relationship that affects expected rates of return on every existing asset investment. The risk-return relationship is characterised as being a "positive" or "direct" relationship meaning that if there are expectations of higher levels of risk associated with a particular investment then greater returns are required as compensation for that higher expected risk. Alternatively, if an investment has relatively lower levels of expected risk then investors are satisfied with relatively lower returns.

This risk-return relationship holds for individual investors and business managers. Greater degrees of risk must be compensated for with greater returns on investment. Since investment returns reflect the degree of risk involved with the investment, investors need to be able to determine how much of a return is appropriate for a given level of risk. This process is referred to as "pricing the risk". In order to price the risk, we must first be able to measure the risk (or quantify the risk) and then we must be able to decide an appropriate price for the risk we are being asked to bear.

This unit provides the student with an understanding of various forms of risk that allow the incorporation of risk adjustments into financial management decision-making and the asset pricing processes.

Expectational nature of the relationship

It should be noted that the risk-return relationship is stated in expectational terms. That is, it focuses on expected risk and expected returns. When an investment decision is made, the decisions reflect expectations about future performance. After the investment has been made, actual returns and actual risks may be different from what was originally anticipated. The important point, however, is that when investment decisions are made, greater levels of expected risk should be compensated for by greater expected returns on the investment.

Definition of risk

In its most general definition, risk is nothing more than the possibility of something unexpected happening. These unexpected occurrences could either have a positive or a negative effect on our personal financial well-being or the financial well-being of your company. In its broadest sense, then, risk is essentially the unknown or uncertainty.

Finance-related risks can then be thought of as the impact of the unknown on an individual's economic wealth or a business firm's economic value. Note that risk of the unknown could work either in your favour (upside risk) or against you (downside risk). So this can be expressed as follows:

- risk = the possibility of something unexpected happening, or
- risk = the possibility of an unexpected outcome occurring.

Importance of the risk-return relationship

The risk-return relationship has implications for many of the areas of finance. If, for example, two different alternative investments are being considered by a business, the existence of the risk-return relationship dictates that the comparison of alternative investments has to take both expected risks and expected returns into account. The decision cannot be made solely on the basis of the expected return.

If two investments have differing risk levels associated with their future cash flows, the risk must be accounted for in the investment decision process. A number of different methods can be used to incorporate risk into the project investment decision.

The risk-return relationship also has implications for the pricing of various financial assets. If two sets of identical cash flows with the same risk levels are available, the risk-return relationship dictates that the two investments must have the same market value and market price. If the prices differ, the opportunity exists for arbitrage activities and the earning of riskless profits.

Risk is a fundamental, underlying concept that has to be taken into account during any financial decision-making process.

Risk aversion

Risk aversion refers to the aspect of human nature that causes people to avoid unnecessary risk. In general, people tend to be risk averse. In order to overcome this risk aversion, the investor must be adequately compensated. This concept of risk aversion carries over into the business and financial world as well.

In business, people also tend to be risk averse. If they choose to expose themselves to higher levels of risks, they do so only if they are going to be compensated in some financial way for taking on the additional risk. In finance, since risk and return are positively related, the taking on of

greater expected levels of risk is always associated with a higher expected financial return.

Types of risk

Unfortunately, the concept of risk is not a simple concept in finance. There are many different types of risk identified and some types are relatively more or relatively less important in different situations and applications. In some theoretical models of economic or financial processes, for example, some types of risks or even all risk may be entirely eliminated. For the practitioner operating in the real world, however, risk can never be entirely eliminated. It is ever-present and must be identified and dealt with.

In the study of finance, there are a number of different types of risk that have been identified. It is important to remember, however, that all types of risks exhibit the same positive risk-return relationship.

Some of the most important types of risk are defined below.

Default risk

The uncertainty associated with the payment of financial obligations when they come due. Put simply, the risk of non-payment.

Interest rate risk

The uncertainty associated with the effects of changes in market interest rates. There are two types of interest rate risk identified: price risk and reinvestment rate risk. The price risk is sometimes referred to as maturity risk since the longer the maturity of an investment, the greater the change in price for a given change in interest rates. Both types of interest rate risks are important in investments, corporate financial planning, and banking.

Price risk

The uncertainty associated with potential changes in the price of an asset caused by changes in interest rate levels and rates of return in the economy. This risk occurs because changes in interest rates affect changes in discount rates which, in turn, affect the present value of future cash flows. The relationship is an inverse relationship. If interest rates (and discount rates) rise, prices fall. The reverse is also true.

Reinvestment rate risk

The uncertainty associated with the impact that changing interest rates have on available rates of return when reinvesting cash flows received from an earlier investment. It is a direct or positive relationship.

Liquidity risk

The uncertainty associated with the ability to sell an asset on short notice without loss of value. A highly liquid asset can be sold for fair value on

short notice. This is because there are many interested buyers and sellers in the market. An illiquid asset is hard to sell because there are few interested buyers. This type of risk is important in some project investment decisions.

Inflation risk (purchasing power risk)

This is the loss of purchasing power due to the effects of inflation. When inflation is present, the currency loses its value due to the rising price level in the economy. The higher the inflation rate, the faster the money loses its value.

Market risk

This is the economy-wide uncertainty that all assets are exposed to and cannot be diversified away. This is often referred to as systematic risk, beta risk, non-diversifiable risk, or the risk of the market portfolio. This type of risk is discussed in more detail later in this module.

Firm specific risk

The uncertainty associated with the returns generated from investing in an individual firm's equity. This type of investment risk can be eliminated through the holding of a well-diversified portfolio. This is often referred to as un-systematic risk or diversifiable risk. This type of risk is discussed in more detail later in this module.

Project risk

This is the total risk associated with an investment project. This is sometimes referred to as stand-alone project risk.

Financial risk

The uncertainty brought about by the choice of a firm's financing methods (that is, the amount of debt and equity the company has used) and is reflected in the variability of earnings before taxes (EBT), a measure of earnings that has been adjusted for and is influenced by the cost of debt financing (interest expense).

Business risk

The uncertainty associated with a firm's operating environment and reflected in the variability of earnings before interest and taxes (EBIT). Since this earnings measure has not had financing expenses removed, it reflects the risk associated with business operations rather than amounts of debt financing.

Foreign exchange risks

Uncertainty that is associated with potential changes in the foreign exchange value of a currency. There are two major types: translation risk and transaction risk.

Translation risks

Uncertainty associated with the translation of foreign currency denominated accounting statements into the home currency.

Transaction risks

Uncertainty associated with the home currency values of transactions that may be affected by changes in foreign currency values.

Commodity risk

Uncertainty associated with future market values and of the size of the future income, caused by the fluctuation in the prices of commodities. These commodities may be oil, grains, metals, gas, electricity, and so on. An organisation that depends on commodities needs to deal with the following kinds of risks:

- Price risk (risk arising out of adverse movements in the world prices, exchange rates, basis between local and world prices)
- Quantity risk
- Cost risk (input price risk)
- Political risk

Required returns

The future is uncertain. Investors do not know with certainty whether the economy will be growing rapidly or be in recession. As such, they do not know what rate of return their investments will yield. Therefore, they base their decisions on their expectations concerning the future.

The expected rate of return on a share represents the mean of a probability distribution of possible future returns on the share.

Case study/example

The table below provides a probability distribution for the returns on shares A and B.

State	Probability	Return on Share A	Return on Share B
1	20%	5%	50%
2	30%	10%	30%
3	30%	15%	10%
4	20%	20%	-10%

Figure 1

In this probability distribution, there are four possible states of the world one period into the future. For example, state 1 may correspond to a recession. A probability is assigned to each state. The probability reflects how likely it is that the state will occur. The sum of the probabilities must equal 100 per cent, indicating that something must happen. The last two columns present the returns or outcomes for shares A and B that will occur in the four states.

Given a probability distribution of returns, the expected return can be calculated using the following equation:

$$E[R] = \sum_{i=1}^{N} p_i R_i$$

Where:

- E[R] = the expected return on the share
- N = the number of states
- p_i = the probability of state i, and
- R_i = the return on the share in state i.

Expected return on shares A and B
Share A $E[R_A]$= .20(5%)+.30(10%)+.30(15%)+.20(20%)=12.5% Share B $E[R_B]$= .20(50%)+.30(30%)+.30(10%)+.20(-10%)=20%

So we see that share B offers a higher expected return than share A. However, that is only part of the story; we haven't yet considered risk.

In this example we can also determine the range of returns for each share. The greater the range for a given asset, the more variability, or risk, it is said to have.

Share A = 20% - 5% = 15%

Share B = 50% - (-10%) = 60%

So we can see that share B has a much wider range, 60 per cent, than share A, 15 per cent, and so share B would be considered to be more risky.

Measuring risk

Because risk means different things to different people, there's no perfect way to measure risk. But through decades of mostly academic research, investors have largely settled on standard deviation and also beta.

Standard deviation

Standard deviation is a readily available and easily understood statistic that measures how often an event strays from the norm.

A share price that tends to go up and down frequently, in large moves, would have a high standard deviation. A volatile share is riskier because there's a greater chance of the investor facing a large loss at any given time – especially a time when the investor might need to sell the share.

By contrast, a slow-and-steady share price would be less scary, and less risky.

The standard deviation measures the amount by which a share's or portfolio's returns vary around its average return, which provides a measure of volatility. Measuring the standard deviation of shares can show you which shares are the least volatile.

The standard deviation is a quantitative measure of the share's risk. The lower the standard deviation, the lower is the variability or risk of the investment.

In a normal distribution of data, two-thirds of returns in the distribution fall within plus or minus one standard deviation from the mean.

Case study/example

Using the same probability information for shares A and B as noted in the previous section, we can calculate each share's variance from the expected return and then the share's standard deviation.

You will recall that the expected returns on stocks A and B were calculated in the previous section. The expected return on Stock A was found to be 12.5per cent and the expected return on Stock B was found to be 20 per cent.

Given an asset's expected return, its variance can be calculated using the following equation:

$$\mathrm{Var}(R) = \sigma^2 = \sum_{i=1}^{N} p_i (R_i - E[R])^2$$

Where:

- N = the number of states
- p_i = the probability of state i
- R_i = the return on the stock in state i, and
- E[R] = the expected return on the stock.

The standard deviation is calculated as the positive square root of the variance.

$$SD(R) = \sigma = \sqrt{\sigma^2} = \left(\sigma^2\right)^{\frac{1}{2}}$$

Variance and standard deviation on shares A and B
Note: $E[R_A] = 12.5\%$ and $E[R_B] = 20\%$
Share A
$\sigma_A^2 = .20(.05-.125)^2 + .30(.10-.125)^2 + .30(.15-.125)^2 + .20(.20-.125)^2 = .00263$
$\sigma_A = \sqrt{.00263} = .0512 = 5.12\%$
Share B
$\sigma_B^2 = .20(.50-.20)^2 + .30(.30-.20)^2 + .30(.10-.20)^2 + .20(-.10-.20)^2 = .04200$
$\sigma_B = \sqrt{.04200} = .2049 = 20.49\%$

Although share B offers a higher expected return than share A, it also is riskier since its variance and standard deviation are greater than share A's. This, however, is only part of the picture because most investors choose to hold securities as part of a diversified portfolio.

The disadvantage of the standard deviation as a measure of risk is the assumption that returns will be normally distributed as in a bell-shaped curve. Stock markets can have crashes that would not be predicted in the normal distribution of data. However, the standard deviation is a useful measure to compare the volatility of different shares and portfolios.

Beta

Another measure of risk is the beta coefficient which is a measure of the sensitivity of the rate of return on a share in relation to the movement of the market. In other words, it measures the share's systematic risk.

To determine the beta coefficient, you plot or graph the monthly returns for a share in relation to the monthly returns for the market, for example the S&P 500 Index or the FTSE 100 or any other measurement of the market. This shows the average movements in the price of the share relative to the price movements in the market index. The slope of the line is the beta coefficient, which determines how the share will react to the movement in the market.

The market always has a beta coefficient of 1, so a share with a beta coefficient of 1 has systematic risk equal to that of the market. If a share's beta coefficient is 1.2, for example, this means that the stock is 20 per cent more volatile than the market. A share with a beta coefficient of 0 has no systematic risk; a stock with a beta coefficient of less than 1 is less volatile to changes in the price movements of the market. Beta coefficients for shares generally range between 0.6 and 1.6, but this does not mean that beta coefficients cannot be more or less.

The beta coefficient seems like a simple and easy way to measure market risk. When you invest in shares with beta coefficients higher than the market (>1), the returns in rising markets should be greater than the market returns. Similarly, when you invest in shares with beta coefficients lower than the market (<1), your potential losses in a declining market should be less than the market losses. Unfortunately, the

beta coefficient does not provide a foolproof way to measure market risk because of the following four factors:

1. The beta coefficient for a company's share varies if you use different measures of the market (for example, the value line index instead of the S&P 500 Index).
2. The beta coefficient for a company's stock varies if you use different time frames, for example 12, 24, 36, 48, or 60 months.
3. The risk-return relationship may differ from that predicted by the theory. Low-risk shares have earned higher returns than expected and high-risk shares have earned lower returns than expected.
4. Relationships between share prices and market prices change and do not always reflect past relationships.

Capital asset pricing model (CAPM)

The most important aspect of risk is the overall (or total) risk of the firm as viewed by investors. Overall risk significantly affects investment opportunities and owners' wealth. The basic theory that links together risk and return for all assets is commonly called the capital asset pricing model (CAPM).

The total risk of a security consists of two parts:

Total risk = non-diversifiable risk + diversifiable risk:

1. **Diversifiable risk**, which is sometimes called **unsystematic risk**, represents the portion of an asset's risk associated with random causes that can be eliminated through diversification. It is attributable to firm-specific events, such as strikes, lawsuits, regulatory action or loss of key customers.
2. **Non-diversifiable risk**, which is sometimes called **systematic risk**, is attributable to market factors that affect all firms, and it cannot be eliminated through diversification. Factors such as war, inflation, international incidents and political events account for non-diversifiable risk.

Because any investor can create a portfolio of assets that will eliminate all, or virtually all, diversifiable risk, the only relevant risk is non-diversifiable risk. Any investor (or firm) must therefore be concerned solely with non-diversifiable risk, which reflects the contribution of an asset to the risk of the portfolio. The measurement of non-diversifiable risk is therefore of primary importance in selecting those assets possessing the most desired risk-return characteristics.

CAPM provides an expression which relates the expected return on an asset to its systematic risk. The relationship is known as the **security market line** (SML) equation and the measure of systematic risk in the CAPM is called beta.

The SML equation is expressed as follows:

$$E[R_i] = R_f + (E[R_m] - R_f)\beta_i$$

Where:

- E[Ri] = the expected return on asset i
- Rf = the risk-free rate
- E[Rm] = the expected return on the market portfolio
- bi = the Beta on asset i, and
- E[Rm] - Rf = the market risk premium.

The graph below depicts the SML. Note that the slope of the SML is equal to (E[Rm] - Rf) which is the market risk premium and that the SML intercepts the y-axis at the risk-free rate.

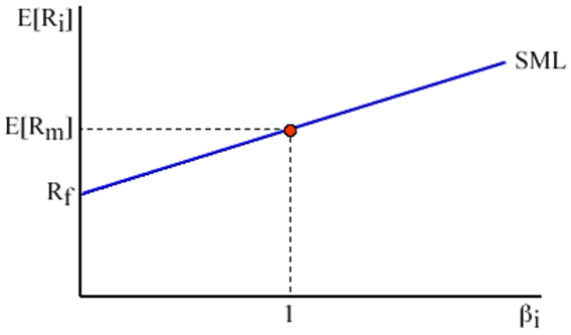

Figure 2

In capital market equilibrium, the required return on an asset must equal its expected return. Thus, the SML equation can also be used to determine an asset's required return given its beta.

Case study/example

Find the expected return on a share given that the risk-free rate is 6 per cent, the expected return on the market portfolio is 12 per cent, and the beta of the share is 2.

Solution:

$$E[R_i] = 6\% + (12\% - 6\%)2 = 18\%$$

Case study/example

Find the beta on a share given that its expected return is 16 per cent, the risk-free rate is 4 per cent, and the expected return on the market portfolio is 12 per cent.

Solution:

$$16\% = 4\% + (12\% - 4\%)\beta_i$$

$$\therefore \beta_i = \frac{16\% - 4\%}{12\% - 4\%} = \frac{12\%}{8\%} = 1.5$$

CAPM is simple and is widely used. There are, however, some critical assumptions that underpin the model, as follows:

- **Zero transaction costs**. The CAPM assumes trading is costless so investments are priced to all fall on the capital market line. If not, some investments would hover below and above the line – with transaction costs discouraging obvious swaps. But we know that many investments (such as acquiring a small business) involve significant transaction costs. Perhaps the capital market line is really a band whose width reflects trading costs.
- **Zero taxes**. The CAPM assumes investment trading is tax-free and returns are unaffected by taxes. Yet we know this to be false:
    - Many investment transactions are subject to capital gains taxes, thus adding transaction costs.
    - Taxes reduce expected returns for many investors, thus affecting their pricing of investments.
    - Different returns (dividends versus capital gains, taxable versus tax-deferred) are taxed differently, thus inducing investors to choose portfolios with tax-favoured assets.
    - Different investors (individuals versus pension plans) are taxed differently, thus leading to different pricing of the same assets.
- **Homogeneous investor expectations**. The CAPM assumes investors have the same beliefs about expected returns and risks of available investments. But we know that there is massive trading of shares and bonds by investors with different expectations. We also know that investors have different risk preferences. Again, it may be that the capital market line is an amalgamation of many different investors' capital market lines.
- **Available risk-free assets**. The CAPM assumes the existence of zero-risk securities, of various maturities and sufficient quantities to allow for portfolio risk adjustments. But we know even Treasury bills have various risks:
    - Reinvestment risk – investors may have investment horizons beyond the T-bill maturity date.
    - Inflation risk – fixed returns may be devalued by future inflation.
    - Currency risk – the purchasing power of fixed returns may diminish compared to that of other currencies.
- **Borrowing at risk-free rates**. The CAPM assumes investors can borrow money at risk-free rates to increase the proportion of risky assets in their portfolio. We know this is not true for smaller, non-institutional investors. In fact, we would predict that the capital market line should become kinked downward for riskier portfolios ($\beta > 1$) to reflect the higher cost of risk-free borrowing compared with risk-free lending.

- **Beta as a full measure of risk**. The CAPM assumes that risk is measured by the volatility (standard deviation) of an asset's systematic risk, relative to the volatility (standard deviation) of the market as a whole. But we know that investors face other risks:
    - Inflation risk – returns may be devalued by future inflation.
    - Liquidity risk – investors in need of funds or wishing to change their portfolio's risk profile may be unable to readily sell at current market prices.

Managing risk

There are five methods generally used to manage risk:

1. **Avoidance.** This method can result in lost opportunities.
2. **Retention.** Risk retention can be both ***active*** and ***passive***:
    a. ***Active risk*** retention is a conscious decision to retain risk, such as self-insurance, or remaining exposed to interest rate or foreign exchange rate movements in financial markets. Risk retention should be considered when the cost of loss is regarded as small. Managed appropriately it can save money for the organisation.
    b. ***Passive risk*** retention is the retention of risk due to ignorance, indifference or laziness. It often has the potential for destroying the organisation.
3. **Non-insurance transfers**. This technique results in risk being transferred to a party other than an insurance company. It includes transfer of risk by contracts, hedging price risks (for example, interest rate, foreign exchange and commodity prices) and incorporation of a business firm. Typically, the sub-prime mortgage crisis is said to have originated by certain mortgage organisations actively transferring the high risks of mortgage defaults to other organisations through packaged bonds, without the bond holders' awareness of taking over part of the risks from these mortgage organisations.
4. **Loss control.** This consists of activities undertaken by the organisation to control the frequency and severity of losses. It has the objective of loss prevention and loss reduction.
5. **Insurance transfer.** This has traditionally been seen as the most practical method of handling risk. On the payment of a premium to the insurance company, the organisation transfers normally significant risks to the insurance company.

The manager must understand these techniques as they apply to the financial and non-financial risks of the company. The impact of these risk events occurring on the financial position of the company must also be understood.

Activity 6.1

Activity

1. What is risk in the context of financial decision-making?
2. Define return, and describe how to find the rate of return on an investment.
3. Explain how the range is used in assessing risk.
4. What relationship exists between the size of the standard deviation and the degree of asset risk?
5. What risk does beta measure?
6. Given the following information about the two assets A and B, determine which asset is preferred.

	A	B
Initial investment	$5,000	$5,000
Annual rate of return		
Pessimistic	9%	7%
Most likely	11	11
Optimistic	13	15
Range	4	8

7. Assuming the following returns and corresponding probabilities for asset A, compute its expected return and standard deviation.

Asset A	
Rate of Return	Probability
10%	50%
15	30
20	20

8. Carter Furniture must choose between two asset purchases. The annual rate of return and related probabilities given below summarise the firm's analysis.

Asset A		Asset B	
Rate of return	Probability	Rate of return	Probability
10%	30%	5%	40%
15	40	15	20
20	30	25	40

Required:

a. Calculate the expected rate of return.

b. Calculate the standard deviation of the expected return.

c. Explain which asset Carter should select.

9. How are total risk, non-diversifiable risk and diversifiable risk related? Why is non-diversifiable risk the only relevant risk?
10. Russell Limited wants to determine the required return on a share portfolio with a beta coefficient of 0.5. Assuming the risk-free rate of 6 per cent and the market return of 12 per cent, calculate the required rate of return.
11. Assuming a risk-free rate of 8 per cent and a market return of 12 per cent, would a wise investor acquire a security with a beta of 1.5 and a rate of return of 14 per cent given these facts?
12. Mr Thomas is considering investment in a project with beta coefficient of 1.75. What would you recommend him to do if this investment has an 11.5 per cent rate of return, risk-free rate is 5.5 per cent, and the rate of return on the market portfolio of assets is 8.5 per cent?

Unit summary

Summary

In this unit you learned that:

- There is a fundamental relationship between risk and return.
- There are numerous types of risk.
- Investors (or firms) have expected or required returns.
- There are various ways to measure risk.
- The capital asset pricing model provides an expression which relates the expected return on an asset to its systematic risk.
- There are various ways in which risk can be managed.

Unit 15

Bonds and shares

Introduction

This unit begins with a discussion of the features of the major types of bond issues together with their legal issues, risk characteristics, and indenture convents. The unit then introduces you to the important concept of valuation and demonstrates the impact of cash flows, timing and risk on value. It explains models for valuing bonds and the calculation of yield-to-maturity.

The unit continues on the valuation process with a discussion on models for valuing preferred and common shares. For common shares, the zero growth, constant growth and variable growth models are examined.

The unit concludes with a brief discussion on hybrid securities.

The unit comprises:

- Nature and types of bonds
- Valuation principles
- Nature and types of shares
- Share valuations
- Hybrid securities

Upon completion of this unit you will be able to:

Outcomes

- *Discuss* the general features, quotations, ratings, popular types, and international issues of corporate bonds.
- *Understand* the key inputs and the basic model used in the valuation process.
- *Apply* the basic valuation model to bonds and describe the impact of required return and time to maturity on bond values.
- *Explain* yield to maturity (YTM), its calculation, and the procedure used to value bonds that pay interest semi-annually.
- *Differentiate* between debt and equity capital.
- *Discuss* the rights, characteristics, and features of both common and preferred shares.
- *Understand* the basic common share valuation using zero growth, constant growth and variable growth models.
- *Understand* the composition of hybrid securities

Terminology

Terminology

Bond:	A debt instrument which indicates that a firm has borrowed a certain amount of money and promises to repay it in the future under clearly defined terms.
Constant growth model:	A dividend valuation approach that assumes dividends will grow at a constant rate that is less than the required return.
Equity:	Long-term funds provided by the firm's owners (shareholders) through the issuance of shares by the company.
Expected return:	The return expected to be earned each period on a given asset over an infinite time horizon.
Hybrid security:	A form of debt or equity financing that possesses characteristics of both debt and equity financing.
Interest rate:	The compensation paid by the borrower of the funds to the lender; from the borrower's perspective, the cost of borrowing funds.
Required return:	A specified return required by investors for a given level of risk.
Valuation:	The process that links risk and return to determine the worth of an asset.
Yield to maturity:	Annual rate of return earned on a debt security purchased on a given day and held to maturity.

Nature and types of bonds

In finance, a bond is a debt security, in which the authorised issuer owes the holders a debt and, depending on the terms of the bond, is obliged to pay interest (the coupon) and/or to repay the principal at a later date, termed maturity. A bond is a formal contract to repay borrowed money with interest at fixed intervals.

Thus a bond is like a loan:

- the issuer is the borrower (debtor),
- the holder is the lender (creditor), and
- the coupon is the interest.

Bonds provide the borrower with external funds to finance long-term investments, or, in the case of government bonds, to finance current expenditure. Certificates of deposit (CDs) or commercial paper are considered to be money market instruments and not bonds. Bonds must be repaid at fixed intervals over a period of time.

Bonds and shares are both securities, but the major difference between the two is that (capital) shareholders have an equity stake in the company (that is, they are owners), whereas bondholders have a creditor stake in the company (they are lenders). Another difference is that bonds usually have a defined term, or maturity, after which the bond is redeemed, whereas shares may be outstanding indefinitely. An exception is a consol bond, which is a perpetuity (bond with no maturity).

Issuing bonds

Bonds are issued by public authorities, credit institutions, companies and supranational institutions in the primary markets. The most common process of issuing bonds is through underwriting. In underwriting, one or more securities firms or banks form a syndicate and buy an entire issue of bonds from an issuer and re-sell them to investors. The security firm takes the risk of being unable to sell on the issue to end investors. Primary issuance is arranged by book-runners who arrange the bond issue, have the direct contact with investors and act as advisors to the bond issuer in terms of timing and price of the bond issue. The book-runners' willingness to underwrite must be discussed before opening books on a bond issue as there may be limited appetite to do so.

In the case of government bonds, these are usually issued by auctions, where both members of the public and banks may bid for a bond. Since the coupon is fixed, but the price is not, the per cent return is a function both of the price paid as well as the coupon.

Bond features

The most important features of a bond are explained below.

- **Nominal, principal or face amount:** The amount on which the issuer pays interest, and which, most commonly, has to be repaid at the end of the term. Some structured bonds can have a redemption amount which is different from the face amount and can be linked to performance of particular assets such as a share or commodity index, foreign exchange rate or a fund. This can result in an investor receiving less or more than his original investment at maturity.
- **Issue price:** The price at which investors buy the bonds when they are first issued, which will typically be approximately equal to the nominal amount. The net proceeds that the issuer receives are thus the issue price, less issuance fees.
- **Maturity date:** The date on which the issuer has to repay the nominal amount. As long as all payments have been made, the issuer has no more obligation to the bond holders after the

maturity date. The length of time until the maturity date is often referred to as the term or tenor or maturity of a bond. The maturity can be any length of time, although debt securities with a term of less than one year are generally designated money market instruments rather than bonds. Most bonds have a term of up to 30 years. Some bonds have been issued with maturities of up to 100 years, and some even do not mature at all. In early 2005, a market developed in euros for bonds with a maturity of 50 years. In the market for United States Treasury securities, there are three groups of bond maturities:

  - **Short-term (bills):** maturities between one to five years; (instruments with maturities less than one year are called money market instruments).
  - **Medium-term (notes):** maturities between six to 12 years.
  - **Long-term (bonds):** maturities greater than 12 years.

- **Coupon:** The interest rate that the issuer pays to the bond holders. Usually this rate is fixed throughout the life of the bond. It can also vary with a money market index, such as the London Inter-Bank Offer Rate (LIBOR). The name coupon originates from the fact that in the past, physical bonds were issued which had coupons attached to them. On coupon dates the bondholder would give the coupon to a bank in exchange for the interest payment.
- **The "quality" of the issue** refers to the probability that the bondholders will receive the amounts promised at the due dates. This will depend on a wide range of factors.
  - **Indentures:** An indenture is a formal debt agreement that establishes the terms of a bond issue, while covenants are the clauses of such an agreement.
  - **Covenants:** This specifies the particular clauses of the debt agreement. Normally this details the rights of bondholders and the duties of issuers, such as actions that the issuer is obligated to perform or is prohibited from performing.
- **High yield bonds** are bonds that are rated below investment grade by the credit rating agencies. As these bonds are more risky than investment grade bonds, investors expect to earn a higher yield (or return). These bonds are also-called junk bonds.
- **Coupon dates:** The dates on which the issuer pays the coupon to the bond holders. In the United States, the United Kingdom and Europe, most bonds are semi-annual, which means that they pay a coupon every six months.
- **Options:** Sometimes a bond may contain an embedded option; that is, it grants option-like features to the holder or the issuer:
  - **Callability:** Some bonds give the issuer the right to repay the bond before the maturity date on the call dates.

These bonds are referred to as callable bonds. Most callable bonds allow the issuer to repay the bond at par. With some bonds, the issuer has to pay a premium, the so-called call premium. This is mainly the case for high-yield bonds. These have very strict covenants, restricting the issuer in its operations. To be free from these covenants, the issuer can repay the bonds early, but only at a high cost.

- **Putability:** Some bonds give the holder the right to force the issuer to repay the bond before the maturity date on the put dates.
- **Call dates and put dates:** The dates on which callable and putable bonds can be redeemed early. There are four main categories:
- A **Bermudan callable bond** has several call dates, usually coinciding with coupon dates.
- A **European callable bond** has only one call date. This is a special case of a Bermudan callable.
- An **American callable bond** can be called at any time until the maturity date.
- A **death put** is an optional redemption feature on a debt instrument allowing the beneficiary of the estate of the deceased to put (sell) the bond (back to the issuer) in the event of the beneficiary's death or legal incapacitation. Also known as a "survivor's option".

- **Sinking fund provision** of the corporate bond indenture requires a certain portion of the issue to be retired periodically. The entire bond issue can be liquidated by the maturity date. If that is not the case, then the remainder is called balloon maturity. Issuers may either pay to trustees, which in turn call randomly selected bonds in the issue, or, alternatively, purchase bonds in open market, then return them to trustees.
- **Convertible bond** lets a bondholder exchange a bond to a number of shares of the issuer's common stock.
- **Exchangeable bond** allows for exchange to shares of a company other than the issuer.

Types of bonds

The following descriptions are not mutually exclusive and more than one of them may apply to a particular bond.

- **Fixed rate bonds** have a coupon that remains constant throughout the life of the bond.
- **Floating rate notes** (FRNs) have a variable coupon that is linked to a reference rate of interest, such as LIBOR or Euribor. For example the coupon may be defined as three-month USD LIBOR

+ 0.20 per cent. The coupon rate is recalculated periodically, typically every one or three months.

- **Zero-coupon bonds** pay no regular interest. They are issued at a substantial discount to par value, so that the interest is effectively rolled up to maturity. The bondholder receives the full principal amount on the redemption date. Zero-coupon bonds may be created from fixed rate bonds by a financial institution separating (stripping off) the coupons from the principal. In other words, the separated coupons and the final principal payment of the bond may be traded separately.
- **Inflation-linked bonds** are those in which the principal amount and the interest payments are indexed to inflation. The interest rate is normally lower than for fixed rate bonds with a comparable maturity. However, as the principal amount grows, the payments increase with inflation.
- **Other indexed bonds**, for example equity-linked notes and bonds indexed on a business indicator (income, added value) or on a country's GDP.
- **Asset-backed securities** are bonds whose interest and principal payments are backed by underlying cash flows from other assets. Examples of asset-backed securities are mortgage-backed securities (MBSs), collateralised mortgage obligations (CMOs) and collateralised debt obligations (CDOs).
- **Subordinated bonds** are those that have a lower priority than other bonds of the issuer in case of liquidation. In case of bankruptcy, there is a hierarchy of creditors. First the liquidator is paid, then government taxes, and so on. The first bondholders in line to be paid are those holding what are known as senior bonds. After they have been paid, the subordinated bondholders are paid. As a result, the risk is higher for subordinated bonds and these bonds usually have a lower credit rating than senior bonds.
- **Perpetual bonds** are also often called perpetuities or "perps". They have no maturity date. The most famous of these are the UK Consols, which are also known as Treasury Annuities or Undated Treasuries. Some of these were issued back in 1888 and still trade today, although the amounts are now insignificant. Some ultra-long-term bonds (sometimes a bond can last centuries: West Shore Railroad issued a bond which matures in 2361 [the 24th century]) are virtually perpetuities from a financial point of view, with the current value of principal near zero.
- **Bearer bond** is an official certificate issued without a named holder. In other words, the person who has the paper certificate can claim the value of the bond. Often they are registered by a number to prevent counterfeiting, but may be traded like cash. Bearer bonds are very risky because they can be lost or stolen.
- **Registered bond** is a bond whose ownership (and any subsequent purchaser) is recorded by the issuer, or by a transfer

agent. It is the alternative to a bearer bond. Interest payments, and the principal upon maturity, are sent to the registered owner.

- **Municipal bond** is a bond issued by a state, US territory, city, local government, or their agencies.
- **Book-entry bond** is a bond that does not have a paper certificate. As physically processing paper bonds and interest coupons became more expensive, issuers (and banks that used to collect coupon interest for depositors) have tried to discourage their use. Some book-entry bond issues do not offer the option of a paper certificate, even to investors who prefer them.
- **Lottery bond** is a bond issued by a state, usually a European state. Interest is paid the same as a traditional fixed rate bond, but the issuer will redeem randomly selected individual bonds within the issue according to a schedule. Some of these redemptions will be for a higher value than the face value of the bond.
- **War bond** is a bond issued by a country to fund a war.
- **Serial bond** is a bond that matures in instalments over a period of time. For example, a $100,000, five-year serial bond would mature in a $20,000 annuity over a five-year interval.
- **Revenue bond** is a special type of municipal bond distinguished by its guarantee of repayment solely from revenues generated by a specified revenue-generating entity associated with the purpose of the bonds. Revenue bonds are typically “non-recourse”, meaning that in the event of default, the bondholder has no recourse to other governmental assets or revenues.

Bonds issued in foreign currencies

Some companies, banks, governments, and other sovereign entities may decide to issue bonds in foreign currencies as it may appear to be more stable and predictable than their domestic currency. Issuing bonds denominated in foreign currencies also gives issuers the ability to access investment capital available in foreign markets.

The proceeds from the issuance of these bonds can be used by companies to break into foreign markets, or can be converted into the issuing company’s local currency to be used on existing operations through the use of foreign exchange swap hedges. Foreign issuer bonds can also be used to hedge foreign exchange rate risk. Some foreign issuer bonds are called by their nicknames, such as the “samurai bond”. These can be issued by foreign issuers looking to diversify their investor base away from domestic markets.

These bond issues are generally governed by the law of the market of issuance, for example, a samurai bond, issued by an investor based in Europe, will be governed by Japanese law. Not all of the following bonds are restricted for purchase by investors in the market of issuance.

- **Eurodollar bond**, a United States dollar-denominated bond issued by a non-US entity outside the US.

- **Yankee bond**, a US dollar-denominated bond issued by a non-US entity in the US market.
- **Kangaroo bond**, an Australian dollar-denominated bond issued by a non-Australian entity in the Australian market.
- **Maple bond**, a Canadian dollar-denominated bond issued by a non-Canadian entity in the Canadian market.
- **Samurai bond**, a Japanese yen-denominated bond issued by a non-Japanese entity in the Japanese market.
- **Uridashi bond**, a non-yen-denominated bond sold to Japanese retail investors.
- **Shibosai bond** is a private placement bond in the Japanese market with distribution limited to institutions and banks.
- **Shogun bond**, a non-yen-denominated bond issued in Japan by a non-Japanese institution or government.
- **Bulldog bond**, a pound sterling-denominated bond issued in London by a foreign institution or government.
- **Matrioshka bond**, a Russian rouble-denominated bond issued in the Russian Federation by non-Russian entities. The name derives from the famous Russian wooden dolls, Matrioshka, popular among foreign visitors to Russia.
- **Arirang bond**, a Korean won-denominated bond issued by a non-Korean entity in the Korean market.
- **Kimchi bond**, a non-Korean won-denominated bond issued by a non-Korean entity in the Korean market.
- **Formosa bond**, a non-New Taiwan dollar-denominated bond issued by a non-Taiwan entity in the Taiwan market.
- **Panda bond**, a Chinese renminbi-denominated bond issued by a non-Chinese entity in the People's Republic of China market.
- **Dimsum bond**, a Chinese renminbi-denominated bond issued by a Chinese entity in Hong Kong. Enables foreign investors forbidden from investing in Chinese corporate debt in mainland China to invest in and be exposed to Chinese currency in Hong Kong.

Valuation principles

In financial management the true value of a physical or financial asset is determined by discounting its future expected net benefits to the present values. The value of the bond is the sum of present values of the interest payments (contractually agreed upon at the stated rate of interest) discounted at the required rate of return plus the present value of par value repayable at the end of maturity period. The required rate of return is the equivalent of the prevailing interest rate and risk.

Annual interest and bond value

The key inputs to valuation process are expected returns in terms of cash flows together with their timings and risk in terms of required returns. Bond valuation model can be presented as follows:

$$B = I \times (PVIFA)_{kd,n} + M \times (PVIF)_{kd,n}$$

Where:

- B = Value of the bond
- I = Annual interest payment
- $_n$ = life of the bond in years
- M = Maturity value of par value
- $_{kd}$ = Required rate of return.

Case study/example

A firm issued a 10 per cent coupon interest bonds for a period of 10 years with a face value of $1000. The required rate of interest is also 10 per cent and interest is paid annually. Find out the value of the bond.

Solution:

Annual Interest (I) = $1000 x 10% = $100

$(PVIFA)_{10\%, 10}$ = 6.145 (from the annuity table)

$(PVIF)_{10\%, 10}$ = 0.386

B = ($100 x 6.145) + 1000 x 0.386 = $1000

In the above example the bond value is equal to the par value – $1,000. This is due to the fact that when the required return is equal to the coupon rate the bond value equals the par value. But in reality it seldom happens when required rates and coupon rates are equal, therefore market value of the bond generally remains lower or greater than the par value.

As mentioned above, that market value of the bond will differ from its par value if required return is different from the coupon rate. These two rates differ for the following reasons:

- changes in the basic cost of long-term funds, and
- changes in the basic risk of the firm.

When the required return is more than coupon rate of interest the bond market value is less than par value or the bond will sell at discount. Alternatively, if the required return is less than coupon rate the market value of the bond would be more than its par value or bond will sell at premium. The following examples demonstrate this relationship.

Case study/example

A firm issued a 10 per cent coupon interest bonds for a period of 10 years with a face value of $1000. The required rate of interest is 12 per cent and interest is paid annually. Find out the value of the bond.

Solution:

Annual Interest (I) = $1000 x 10% = $100

(PVIFA) $_{12\%, 10}$ = 5.650 (from the annuity table)

(PVIF) $_{12\%, 10}$ = 0.322

B = ($100 x 5.650) + 1000 x 0.322 = $887

Because the required return is greater than coupon rate in the above example the bond value is less than its par value.

Case study/example

A firm issued 10 per cent coupon interest bonds for a period of 10 years with a face value of $1000. The required rate of interest is 8 per cent and interest is paid annually. Find out the value of the bond.

Solution:

Annual interest (I) = $1000 x 10% = $100

(PVIFA) $_{8\%, 10}$ = 6.710 (from the annuity table)

(PVIF) $_{8\%, 10}$ = 0.463

B = ($100 x 6.710) + 1000 x 0.463 = $1134

Because the required return is less than coupon rate in the above example the bond value is greater than its par value.

The above two examples clearly show that required rate of return is the major determinant of market value of the firm's bonds.

If the required rate of return remains constant over the life of the bond the bond's market price approaches its par value. On the other hand, under the changing circumstances of required returns, the shorter the time to maturity, the smaller the impact on bond value caused by given changes in the required return.

Semi-annual interest and bond value

The calculation for a bond's value paying interest semi-annually is similar to that described above. However, as interest is two times in a year, half yearly interest should be calculated to find the present value. The required return over the period that the interest payments are discounted must also be divided by two. Number of years in the maturity period is converted to discounting period by multiplying by two. Symbolically:

$$B = I / 2 \times (PVIFA)_{kd/2\,,\,2n} + M \times (PVIF)_{kd/2\,,\,2n}$$

Case study/example

A firm issued 10 per cent coupon interest bonds for a period of 10 years with a face value of $1000. The required rate of interest is 14 per cent and interest is paid semi-annually. Find out the value of the bond.

Solution:

Semi-annual interest (I / 2) = $1000 x 10% x 6 / 12 = $50

(PVIFA) $_{14\% / 2,\ 10 \times 2}$ = 10.594 (from the annuity table)

(PVIF) $_{14\% / 2,\ 10 \times 2}$ = 0.258

B = ($50 x 10.594) + 1000 x 0.258 = $787.7

Yield to maturity (YTM)

The yield to maturity on a bond is the rate of return that an investor would earn if he bought the bond at its current market price and held it until maturity. It represents the discount rate which equates the discounted value of a bond's future cash flows to its current market price. This is illustrated by the following equation:

$$B_0 = \frac{C}{2}\left[\frac{1-\left(1+\frac{YTM}{2}\right)^{-2t}}{\frac{YTM}{2}}\right] + \frac{F}{\left(1+\frac{YTM}{2}\right)^{2t}}$$

Where:

- B_0 = the bond price
- C = the annual coupon payment
- F = the face value of the bond
- YTM = the yield to maturity on the bond, and
- t = the number of years remaining until maturity.

Case study/example

Find the yield to maturity on a semi-annual coupon bond with a face value of $1,000, a 10 per cent coupon rate, and 15 years remaining until maturity given that the bond price is $862.35.

Solution:

$$\$862.35 = \frac{100}{2}\left[\frac{1-\left(1+\frac{YTM}{2}\right)^{-2(15)}}{\frac{YTM}{2}}\right] + \frac{1000}{\left(1+\frac{YTM}{2}\right)^{2(15)}}$$

$$\therefore YTM = 12\%$$

Nature and types of shares

Introduction

The share capital (or just shares) of a business entity represents the capital paid into or invested in the business by its members (shareholders). It serves as a security for the creditors of a business since it cannot be withdrawn to the detriment of the creditors.

A share normally has a certain declared face value, commonly known as the par value of a share. The par value is the *de minimis* (minimum) amount of money that a business may issue and sell shares for in many jurisdictions and it is the value represented as capital in the accounting of the business. In other jurisdictions, however, shares may not have an associated par value at all. This type of share is often called non-par stock. Shares represent a fraction of ownership in a business. A business may declare different types (classes) of shares, each having distinctive ownership rules, privileges, or share values.

Ownership of shares is documented by issuance of a share certificate. A share certificate is a legal document that specifies the amount of shares owned by the shareholder, and other specifics of the shares, such as the par value, if any, or the class of the shares.

Types of shares

Shares typically take the form of either **common shares** or **preferred shares**. As a unit of ownership, common shares typically have voting rights that can be exercised in corporate decisions. Preferred shares differ from common shares in that they typically do not carry voting rights but the owner is legally entitled to receive a certain level of dividend payments before any dividends can be issued to other shareholders.

Convertible preferred shares include an option for the holder to convert the preferred shares into a fixed number of common shares, usually any time after a predetermined date. This type of share is called convertible preferred shares (or convertible preference shares in the United Kingdom).

New equity issues may have specific legal clauses attached that differentiate them from previous issues of the issuer. Some common shares may be issued without the typical voting rights, for instance, or some shares may have special rights unique to them and issued only to certain parties. Often, new issues that have not been registered with a securities governing body may be restricted from resale for certain periods.

Some preferred shares may be hybrid by having the qualities of bonds of fixed returns and common shares of voting rights. They also have preference in the payment of dividends over common shares and also have been given preference at the time of liquidation over common shares. They have other features of accumulation in dividend. There is further discussion on hybrid securities at the end of this unit.

Share valuation

Firms obtain their long-term sources of equity financing by issuing common and preferred shares. The payments of the firm to the holders of these securities are in the form of dividends. Unlike interest payments on debt which are normally tax deductible, dividends must be paid out of after-tax income.

The common shareholders are the owners of the firm. They have the right to vote on important matters to the firm such as the election of the board of directors. Preferred shares, on the other hand, are a hybrid form of financing, sharing some features with debt and some with common equity. For example, preferred dividends like interest payments on debt are generally fixed. In addition, the claims against the assets of the firm of the preferred shareholders, like those of the debt-holders, are also fixed.

The common shareholders have a residual claim against the assets and cash flows of the firm. That is, the common shareholders have a claim against whatever assets remain after the debt-holders and preferred shareholders have been paid. Moreover, the cash flow that remains after interest and preferred dividends have been paid belongs to the common shareholders.

The priority of the claims against the assets of the firm belonging to debt-holders, preferred shareholders, and common shareholders differs. The owners of the firm's debt securities have the first claim against the assets of the firm. This means that the debt-holders must receive their scheduled interest and principal payments before any dividends can be paid to the equity holders. If these claims are not paid, the debt-holders can force the firm into bankruptcy. The preferred shareholders have the next claim. They must be paid the full amount of their scheduled dividends before any dividends may be distributed to the common shareholders.

The value of these securities, as with other assets, is based upon the discounted value of their expected future cash flows. So, similar to the preceding bond valuation section, the time value of money principles are applied to value common and preferred shares.

Two approaches are presented for the valuation of common shares:

1. The first approach illustrates the valuation of a constant growth share, that is, a share whose dividends are growing at a rate which mirrors the long-term growth rate of the economy.
2. The second approach is a more general approach that can be applied to value shares whose growth is not constant in the near term.

Constant growth valuation

Share valuation is more difficult than bond valuation because shares do not have a finite maturity and the future cash flows – dividends – are not

specified. Therefore, the techniques used for share valuation must make some assumptions regarding the structure of the dividends.

A constant growth share is a share whose dividends are expected to grow at a constant rate in the foreseeable future. This condition fits many established firms, which tend to grow over the long run at the same rate as the economy. The value of a constant growth stock can be determined using the following equation:

$$P_0 = \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$

Where:

- P_0 = the stock price at time 0
- D_0 = the current dividend
- D_1 = the next dividend (i.e., at time 1)
- g = the growth rate in dividends
- r = the required return on the stock, and
- $g < r$.

Case study/example

Find the stock price given that the current dividend is $2 per share, dividends are expected to grow at a rate of 6 per cent in the foreseeable future, and the required return is 12 per cent.

Solution:

$$P_0 = \frac{2(1+.06)}{.12-.06} = \$35.33$$

The constant growth share equation can be rearranged to obtain an expression for the expected return on the stock as follows:

$$r = \frac{D_1}{P_0} + g$$

When expressed in this manner, the expected return on the share equals the expected *dividend yield* plus the expected *capital gains yield* where the dividend yield and capital gains yield are defined as follows:

$$\text{Dividend Yield} = \frac{D_1}{P_0}; \quad \text{Capital Gains Yield} = g$$

A more general form of the constant growth share valuation formula, which can be used to find the price of the share at any period in the future, is given by the following:

$$P_t = \frac{D_t(1+g)}{r-g} = \frac{D_{t+1}}{r-g}$$

Non-constant growth share valuation

Many firms enjoy periods of rapid growth. These periods may result from the introduction of a new product, a new technology, or an innovative marketing strategy. However, the period of rapid growth cannot continue indefinitely. Eventually, competitors will enter the market and catch up with the firm.

These firms cannot be valued properly using the constant growth share valuation approach. This section presents a more general approach which allows for the dividends/growth rates during the period of rapid growth to be forecast. Then, it assumes that dividends will grow from that point on at a constant rate, which reflects the long-term growth rate in the economy.

Shares which are experiencing the above pattern of growth are called non-constant, supernormal, or erratic growth stocks.

The value of a non-constant growth stock can be determined using the following equation:

$$P_0 = \sum_{t=1}^{T} \frac{D_T}{(1+r)^t} + \left(\frac{D_{T+1}}{r - g_c}\right)(1+r)^{-T}$$

Where:

- P_0 = the stock price at time 0
- D_t = the expected dividend at time t
- T = the number of years of non-constant growth
- g_c = the long-term constant growth rate in dividends
- r = the required return on the stock, and
- $g_c < r$.

Case study/example

The current dividend on a share is $2 per share and investors require a rate of return of 12 per cent. Dividends are expected to grow at a rate of 20 per cent per year over the next three years and then at a rate of 5 per cent per year from that point on. Find the price of the stock.

Solution:

There are three years of non-constant growth, thus, T = 3. Before substituting into the formula given above it is necessary to calculate the expected dividends for years one through four using the provided growth rates.

$$D_1 = 2(1+.20) = \$2.40$$
$$D_2 = 2.40(1+.20) = \$2.88$$
$$D_3 = 2.88(1+.20) = \$3.456$$
$$D_4 = 3.456(1+.05) = \$3.6288$$
$$P_0 = \frac{2.40}{(1+.12)^1} + \frac{2.88}{(1+.12)^2} + \frac{3.456}{(1+.12)^3} + \frac{3.6288}{.12-.05}(1+.12)^{-3} = \$43.80$$

Preferred share valuation

Preferred shares are defined as equity with priority over common shares with respect to the payment of dividends and the distribution of assets in a liquidation. As stated previously, a preferred share is a hybrid security which has similar features to both common shares and debt.

Preferred shares are similar to common shares in that it entitles its owners to receive dividends that the firm must pay out of after-tax income. Moreover, the use of preferred shares as a source of financing does not increase the probability of bankruptcy for the firm.

However, like the coupon payments on debt, the dividends on preferred shares are generally fixed. Also, the claims of the preferred shareholders against the assets of the firm are fixed as are the claims of the debt holders.

Preferred shares have the following features:

- **Par value.** The par value represents the claim of the preferred stockholder against the value of the firm.
- **Preferred dividend/preferred dividend rate.** The preferred dividend rate is expressed as a percentage of the par value of the preferred share. The annual preferred dividend is determined by multiplying the preferred dividend rate times the par value of the preferred share

Since the preferred dividends are generally fixed, preferred shares can be valued as a constant growth share with a dividend growth rate equal to zero. Thus, the price of a preferred share can be determined using the following equation:

$$P_p = \frac{D_p}{r}$$

Where:

- P_p = the preferred share price
- D_p = the preferred dividend, and
- r = the required return on the share.

Case study/example

Find the price of a preferred share given that the par value is $100 per share, the preferred dividend rate is 8 per cent, and the required return is 10 per cent.

Solution:

$$P_p = \frac{.08 * 100}{.10} = \frac{8}{.10} = \$80$$

Hybrid securities — a brief note

Hybrid securities are a broad group of securities that combine the elements of the two broader groups of securities, debt (bonds) and equity (shares).

Hybrid securities pay a predictable (fixed or floating) rate of return or dividend until a certain date, at which point the holder has a number of options including converting the securities into the underlying share.

Therefore, unlike a share (equity) the holder has a "known" cash flow, and, unlike a fixed interest security (debt) there is an option to convert to the underlying equity. More common examples include convertible and converting preference shares.

A hybrid security is structured differently and while the prices of some securities behave more like fixed interest securities, others behave more like the underlying shares into which they convert.

Key features of a hybrid security

Traditionally, hybrids were usually structured in a way that leads the securities to react to the underlying share price. Although each has individual characteristics, there are typical features:

- They have a set dividend until conversion.
- The conversion might occur at a number of dates.
- They are usually issued at a similar price to the underlying share.

- They convert at a set ratio. For example, one hybrid converts into one underlying share.

This fixed conversion ratio means the price of these hybrids reacts to the movement in the underlying share price. In addition, some of these securities include minimum and maximum conversion terms, effectively giving the holder a put and call option if the share price reaches a certain price.

Most of the hybrid securities issued recently have similar characteristics to bonds. Although each has individual characteristics, there are typical features:

- They have a set dividend rate for a five-year period (reset period).
- They are issued at $100.
- The holder has the ability to take the new reset terms, redeem the face value or convert.
- The holder can convert into the shares at a discount to the current ordinary share price, for example 5 per cent.
- The conversion ratio is into a dollar amount of shares, for example, $100 worth of the underlying equity. This "variable" conversion ratio means the price of these hybrids does not react to the movement in the share price and they therefore behave in a similar way to fixed interest securities. This lack of correlation with the underlying shares is sometime referred to as a **zero delta**.

Examples of hybrid securities

Examples of hybrid securities include the following:

- A **convertible bond** is a bond (a loan to the issuer) that can be converted into common shares of the issuer. A convertible bond can be valued as a combination of a straight bond and an option to purchase the company's shares.
- An **income security** is a hybrid between a share and a bond. The bond portion pays interest, and the share portion pays dividends. Income securities are popular in Canada.
- A **PIK** (payment in kind) loan may carry a detachable warrant (the right to purchase a certain number of shares or bonds at a given price for a certain period of time) – the loan is the debt, while the warrant is the equity.
- Preference shares.
- Convertible/exchangeable debentures/bonds.
- Debt with attached warrants.

Activity 6.2

Activity

1. What basic procedure is used to value a bond that pays annual interest? Semi-annual interest?
2. What relationship between the required return and the coupon interest rate will cause a bond to sell at a discount? At a premium? At its face value?
3. If the required return on a bond differs from its coupon interest rate, describe the behaviour of the bond value over time as the bond moves towards maturity.
4. As a risk-averse investor, would you prefer bonds with short or long periods until maturity? Why?
5. What is a bond's yield to maturity?
6. You are provided with the following table of information regarding three bonds:

Bond	Par Value ($)	Annual Coupon Interest Rate (%)	Years to Maturity	Required Return (%)
L	1000	9	5	6
M	100	10	8	10
N	500	18	17	15

Required:

   a. Calculate the current value of Bond L.
   b. What will happen to the value/price of Bond L as the bond approaches maturity?
   c. Calculate the current value of Bond M.
   d. Calculate the current value of Bond M if the time of maturity is six years.
   e. Calculate the current value of Bond N.
   f. What will happen to value/price of Bond N as the bond approaches maturity?

7. How Packing Company has an issue of $1,000 par value bonds with a 14 per cent coupon interest rate outstanding. The issue pays interest semi-annually and has 10 years remaining to its maturity date. Bonds of similar risk are currently selling to yield a 12 per cent rate of return. What is the value of these How Packing Company bonds?
8. To expand its business, the Kingdom Company would like to issue a bond with par value of $1,000, coupon rate of 10 per cent, and maturity of 10 years from now. What is the value of the bond if the required rate of return is:

   a. 8 per cent?
   b. 10 per cent?
   c. 12 per cent?

9. What are the key differences between debt (bond) and equity (share) capital?
10. What claims do preference shareholders have with respect to distribution of earnings (dividends) and assets?
11. Describe, compare and contrast the following ordinary share dividend valuation models:
    a. Zero growth
    b. Constant growth
    c. Variable growth
12. The board of directors of the NCC has declared $5.00 common share dividend and accepted a plan to freeze the dividend at $5 per year indefinitely. What is the value of the NCC's common shares if the required rate of interest is 15 per cent?
13. Kitchen Things has recently sold 1,000 shares of $6.75 preferred shares. What is the value of the share assuming 10 per cent required rate of return?
14. In response to the stock market's reaction to its dividend policy, the Paper Company has decided to increase its dividend payment at a rate of 4 per cent per year. The firm's most recent dividend is $3.25 and the required rate of interest is 9 per cent. What is the maximum you would be willing to pay for a share?
15. The Heating Company has been very successful in the past four years. Over these years, it paid a common share dividend of $4 in the first year, $4.20 in the second year, $4.41 in the third year, and its most recent dividend was $4.63. The company wishes to continue this dividend growth indefinitely. What is the value of the company's shares if the required rate of return is 12 per cent?
16. The National Company paid $2.00 per share in common share dividends last year. The company's policy is to allow its dividend to grow at 5 per cent for four years and then the rate of growth changes to 3 per cent per year from year five and on. What is the value of the shares if the required rate of return is 8 per cent?

Unit summary

Summary

In this unit you learned:

- the nature and types of bonds,
- bond valuation principles,
- the nature and types of shares,
- share valuation principles, and
- the nature of hybrid securities.

Activity feedback

Activity 6.1

1. What is risk in the context of financial decision-making?

   Risk is defined as the chance of financial loss, as measured by the variability of expected returns associated with a given asset. A decision-maker should evaluate an investment by measuring the chance of loss, or risk, and comparing the expected risk to the expected return. Some assets are considered risk-free; the most common examples are United States Treasury issues.

2. Define return, and describe how to find the rate of return on an investment.

   The return on an investment (total gain or loss) is the change in value plus any cash distributions over a defined time period. It is expressed as a percentage of the beginning-of-the-period investment.

3. Explain how the range is used in assessing risk.

   The range is found by subtracting the pessimistic outcome from the optimistic outcome. The larger the range, the more variability of risk associated with the asset.

4. What relationship exists between the size of the standard deviation and the degree of asset risk?

   The standard deviation of a distribution of asset returns is an absolute measure of dispersion of risk about the mean or expected value. A higher standard deviation indicates a greater project risk. With a larger standard deviation, the distribution is more dispersed and the outcomes have a higher variability, resulting in higher risk.

5. What risk does beta measure?

   Beta measures non-diversifiable risk. It is an index of the degree of movement of an asset's return in response to a change in the market return. The beta coefficient for an asset can be found by plotting the asset's historical returns relative to the returns for the market. By using statistical techniques, the "characteristic line" is fit to the data points. The slope of this line is beta. Beta coefficients for actively traded stocks are published in Value Line Investment Survey and in brokerage reports.

6. Asset A is preferred because it has a lower range for the same expected return of 11%, A = (9%+11%+13%)/3; B = (7%+11%+15%)/3.

7.

E	P	EP	$^{-}(E - EP)^{\wedge 2}$ P
10%	50%	5.0	$(10 - 13.5)^{\wedge 2}$ 0.50 = 6.125
15	30	4.5	$(15 - 13.5)^{\wedge 2}$ 0.30 = 0.675
20	20	4.0	$(20 - 13.5)^{\wedge 2}$ 0.20 = 8.450
		13.5%	15.25%

Standard deviation = $\sqrt{15.25}$ = 3.91%

8.

a.

Asset A	Asset B
Return × Pr	Return × Pr
10% × 0.30 = 3%	5% × 0.40 = 2%
15 × 0.40 = 6	15 × 0.20 = 3
20 × 0.30 = 6	25 × 0.40 = 10

Expected Return = 15% Expected Return = 15%

b. Asset A

$(10\% - 15\%)^{\wedge 2} \times 0.30 = 7.5\%$

$(15\% - 15\%)^{\wedge 2} \times 0.40 = 0\%$

$(20\% - 15\%)^{\wedge 2} \times 0.30 = 7.5\%$

15%

Standard deviation of A = 3.87%

Asset B

$(5\% - 15\%)^{\wedge 2} \times 0.40 = 40\%$

$(15\% - 15\%)^{\wedge 2} \times 0.20 = 0\%$

$(25\% - 15\%)^{\wedge 2} \times 0.40 = 40\%$

80%

Standard deviation of B = 8.94%

c. Asset A; for 15% rate of return and lesser risk.

9. The total risk of a security is the combination of non-diversifiable risk and diversifiable risk. Diversifiable risk refers to the portion of an asset's risk attributable to firm-specific, random events (such as strikes, litigation or loss of key contracts) that can be eliminated by diversification. Non-diversifiable risk is attributable to market factors affecting all firms (war, inflation, political events). Some argue that non-diversifiable risk is the only relevant risk because diversifiable risk can be eliminated by creating a portfolio of assets which are not perfectly positively correlated.

10. Russell Limited wants to determine the required return on a share portfolio with a beta coefficient of 0.5. Assuming the risk-free rate of 6 per cent and the market return of 12 per cent, calculate the required rate of return.

$K = RF + b(Km - RF)$

$= 0.06 + 0.5(0.12 - 0.06) = 0.09 = 9\%$

The company should expect at least 9 per cent return on the share portfolio.

11. Assuming a risk-free rate of 8 per cent and a market return of 12 per cent, would a wise investor acquire a security with a beta of 1.5 and a rate of return of 14 per cent given these facts?

    $K = RF + b(Km - RF)$

    $= 0.08 + 1.5(0.12 - 0.08) = 0.14 = 14\%$

    Yes, a security with a beta of 1.5 should yield 14 per cent rate of return.

12. Mr Thomas is considering investment in a project with beta coefficient of 1.75. What would you recommend him to do if this investment has an 11.5 per cent rate of return, risk-free rate is 5.5 per cent, and the rate of return on the market portfolio of assets is 8.5 per cent?

    $K = RF + b(Km - RF)$

    $= 0.055 + 1.75(0.085 - 0.055) = 0.108 = 10.8\%$

    Mr Thomas should invest in the project because the project's actual rate of return (11.5 per cent) is greater than the project's required rate of return (10.8 per cent).

Activity 6.2

1. What basic procedure is used to value a bond that pays annual interest? Semi-annual interest?

   The basic bond valuation equation for a bond that pays annual interest is:

$$V_0 = I \times \left[\sum_{t=1}^{n} \frac{1}{(1 + k_d)^t} \right] + M \times \left[\frac{1}{(1 + k_d)^n} \right]$$

   Where:

   - V_0 = value of a bond that pays annual interest
   - I = interest
   - n = years to maturity
   - M = dollar par value
   - k_d = required return on the bond.

   To find the value of bonds paying interest semi-annually, the basic bond valuation equation is adjusted as follows to account for the more frequent payment of interest:

- The annual interest must be converted to semi-annual interest by dividing by two.
- The number of years to maturity must be multiplied by two.
- The required return must be converted to a semi-annual rate by dividing it by two.

2. What relationship between the required return and the coupon interest rate will cause a bond to sell at a discount? At a premium? At its face value?

   A bond sells at a discount when the required return exceeds the coupon rate. A bond sells at a premium when the required return is less than the coupon rate. A bond sells at par value when the required return equals the coupon rate. The coupon rate is generally a fixed rate of interest, whereas the required return fluctuates with shifts in the cost of long-term funds due to economic conditions and/or risk of the issuing firm. The disparity between the required rate and the coupon rate will cause the bond to be sold at a discount or premium.

3. If the required return on a bond differs from its coupon interest rate, describe the behaviour of the bond value over time as the bond moves towards maturity.

   If the required return on a bond is constant until maturity and different from the coupon interest rate, the bond's value approaches its $1,000 par value as the time to maturity declines.

4. As a risk-averse investor, would you prefer bonds with short or long periods until maturity? Why?

   To protect against the impact of rising interest rates, a risk-averse investor would prefer bonds with short periods until maturity. The responsiveness of the bond's market value to interest rate fluctuations is an increasing function of the time to maturity.

5. What is a bond's yield to maturity?

   The yield-to-maturity (YTM) on a bond is the rate investors earn if they buy the bond at a specific price and hold it until maturity. The trial-and-error approach to calculating the YTM requires finding the value of the bond at various rates to determine the rate causing the calculated bond value to equal its current value. The approximate approach for calculating YTM uses the following equation:

$$\text{Approximate Yield} = \frac{I + [(M - B_0)/n]}{(M + B_0)/2}$$

   Where:

   - I = annual interest
   - M = maturity value
   - B_o = market value
   - n = periods to maturity.

6.

a. Calculate the current value of Bond L.

$90(4.212) + $1,000(0.747) = $1,126.08

b. What will happen to the value/price of Bond L as the bond approaches maturity?

The bond price will decrease and come closer to par.

c. Calculate the current value of Bond M.

Annual coupon interest rate = required rate of return

Therefore, value = par value = $100

d. Calculate the current value of Bond M if the time of maturity is six years.

The bond is at par, or $100, because the annual coupon interest rate is equal to the required rate of return.

e. Calculate the current value of Bond N.

$90(6.047) + $500(0.093) = $590.73

f. What will happen to value/price of Bond N as the bond approaches maturity?

The bond price will decrease and come closer to par.

7. B = $70(11.470) + $1,000(.312) = $1,114.90

8. Coupon payment = 1,000 × 0.10 = $100

a. $B = 100(PVIFA_{8\%,}10) + 1,000(PVIF_{8\%,}10)$
$= 100(6.710) + 1,000(0.463) = \$1,134.00$

b. B = $1,000 since coupon rate and required rate of return are equal.

c. $B = 100(PVIFA_{12\%,}10) + 1,000(PVIF_{12\%,}10)$
$= 100(5.650) + 1,000(0.322) = \$887$

9. Equity capital is permanent capital representing ownership, while debt capital represents a loan that must be repaid at some future date. The holders of equity capital receive a claim on the income and assets of the firm that is secondary to the claims of the firm's creditors. Suppliers of debt must receive all interest owed before any distribution to equity holders, and in liquidation all unpaid debts must be satisfied before any distribution to the firm's owners. Equity capital is perpetual while debt has a specified maturity date. Both income from debt (interest) and income from equity (dividends) are taxed as ordinary income. To the corporation, debt interest is a tax-deductible expense while dividends are not.

10. The claims of preferred shareholders are senior to those of the common shareholders with respect to the distribution of both earnings and assets.

11.

a. The zero growth model of common stock valuation assumes a constant, non-growing dividend stream. The stock is valued as a perpetuity and discounted at a rate k_s:

$$P_0 = \frac{P_0}{k_s}$$

b. The constant growth model of common stock valuation, also-called the Gordon model, assumes that dividends will grow at a constant rate, g. The stock is valued as the present value of the constantly growing cash flow stream:

$$P_0 = \frac{D_1}{k_s - g}$$

c. The variable growth model of common stock valuation assumes that dividends grow at a variable rate. The stock with a single shift in the growth rate is valued as the present value of the dividend stream during the initial growth phase plus the present value of the price of stock at the end of the initial growth phase:

$$P_0 = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+k_s)^t} + \left(\frac{1}{(1+k_s)^N} \times \frac{D_{N+1}}{(k_s - g_2)} \right)$$

12. P = D/k = 5/0.15 = $33.33

13. P = D/k = 6.75/0.10 = $67.50

14. P = D1/(k – g) = 3.25(1 + 0.04)/(0.09 – 0.04) = $67.60

15. FVIFg, 3 = 4.63/4.00 = 1.158 g = 5%

P = D5/(k – g) = 4.63 (1 + 0.05)/(0.12 – 0.05) = $69.46

16.

t	Do	FVIF5%,t	Dt	PVIF8%,t	PV
1	$2.00	1.050	$2.10	0.926	$1.94
2	2.00	1.102	2.20	0.857	1.89
3	2.00	1.158	2.32	0.794	1.84
4	2.00	1.216	2.43	0.735	1.79
					P1 = $7.46

D5 = 2.43 (1 + 0.03) = $2.50

$$P2 = \frac{2.50}{0.08 - 0.03} \times \frac{1}{(1+0.08)\text{^}4} = \$36.75$$

Value of share = $36.75 + $7.46 = $44.21