Module 6

Introduction

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

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.

Upon completion of this module students 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

Upon completion of this unit students 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).

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?

Activity 6.1 Feedback

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

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

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

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

$\overline{\hspace{2cm}}$ 15%

Standard deviation of A = 3.87%

Asset B

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

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

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

$\underline{\hspace{2cm}}$ 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).

Unit 15

Bonds and shares

Learning outcomes

Upon completion of this unit students will be able to:

Outcomes

- *Discuss* the general features, quotations, ratings, popular types, and international issues of corporate bonds.

- *Understand* the key inputs and 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.

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?

Activity 6.2 Feedback

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 \times 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

$D5 = 2.43 (1 + 0.03) = \$2.50$

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

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