Ex 3.1: Bond Valuation

Valuation refers to the process of determining the value of an asset, such as bonds, stocks, gold, and real estate.

The objective of financial management is to maximize the profit of a business; therefore, it is extremely important for finance managers to determine the value of bonds and stocks. Such knowledge helps them to decide whether to buy, hold, or sell securities (such as bonds and stocks) depending on the prices prevailing in the market. If the value of the security is higher than the market price, the finance manager can decide to buy that security. On the contrary, if the value of the security is less than the market price, the finance manager should not make any new purchase.

Different methods are used for valuation; these are:

- **Liquidation value:** It is the amount that can be realized when an asset or a group of assets representing a part or whole of a business is sold separately from the operating organization to which it belongs.

- **Going concern value:** It represents the amount that can be realized if a business is sold as a continuing operating entity.

- **Book value:** It is the accounting value of an asset. For example:

  Book value of a company's equity = Book value of its assets - Book value of its liabilities

- **Market value:** It is the price at which an asset is currently being traded in the market.

- **Intrinsic value:** It is the present value of the cash flow stream expected from the security discounted at a rate of return appropriate for the risk associated with the security. Intrinsic value is also called the "economic value of a security." In an ideal scenario, the market price of a security should be equal to the intrinsic value of the security.

Of all these methods, determining the liquidation value, going concern value, and book value requires access to the company's book of accounts. Market value is dependent on factors such as demand and supply, speculation, and changes in government rules and regulations.

Calculation of intrinsic value is possible with the knowledge of relevant information. The focus of this session will be on establishing the intrinsic value of securities.
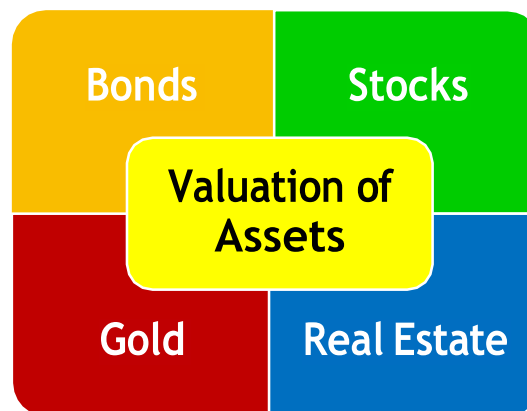
Bond

- Represent a contract under which a borrower promises to pay interest and principle on a specific date to the holders of the bonds.

- These are long-term debt instruments or security issued to raise finance.

- It is issued by several organizations such as central and state governments, public sector undertakings, private sector companies, and municipal bodies.

- Bonds are of different types:
  - Bonds issued by the central government are called **Treasury bonds**.
    - These bonds have maturity ranging up to 20 years.
    - These bonds generally pay interest semi-annually.
  - State government bonds:
    - Have maturities ranging from 3 to 20 years
    - Pay interest semi-annually
  - Private sector bonds are also called **debentures**. These bonds:
    - Generally have maturity ranging from 1 to 15 years
    - Pay interest semi-annually
- Some of the bonds issued by private sector undertakings enjoy a **tax-free status** whereas others are taxable. These bonds:
  - Generally have maturity ranging from 1 to 15 years
  - Pay interest semi-annually

Terminology Associated with Bond Valuation

- **Par value:** This is the value stated on the face of the bond. It represents the amount the firm borrows and promises to repay at the time of maturity.

- **Coupon rate and interest:** A bond carries a specific interest rate called the coupon rate. For example, a debenture having a par value of $1,000 and a coupon rate of 11%, payable semi-annually, will pay an interest of $55 every 6 months.

- **Maturity period:** Typically bonds have a maturity period of 15 years. Sometimes, they have a longer maturity also.

- **Yield:** The income return on a bond is called yield. It is usually expressed annually as a percentage based on the investment cost - its current market value or its face value. For example, the current yield of a 10-year, 12% coupon bond with a par value of $1,000 and selling for $950 will be:

  = 120 / 950 x 100 =12.63%

- **Yield to maturity (YTM):** It is the Internal Rate of Return (IRR) earned by an investor who buys the bond today at the market price, assuming that the bond will be held till maturity and all coupons and principle payments will be made on schedule.

The intrinsic value of a bond or any other asset is equal to the present value of the cash flows expected from it. Therefore, determining the value of a bond requires an estimate of:

- The expected cash flows
- The required returns

An estimate of the expected cash flows can be easily derived by adding the future interest earnings from the bond, the sale price, and the purchase price. For example: If a 5-year, 10% coupon bond with a par value of $1,000 is purchased at $850, the total cash flow can be derived as follows:

Sum of the interests received for the next 5 years ($80 per year for 5 years)	= $400
Sale price	= $1,000
Purchase price	= $850
Total cash flows: ($400 + $1,000 - $850)	= $550

The required return is the minimum return that an investor should accept given all other options available to purchase the bond.

The intrinsic value of a bond can be calculated using the PRICE function in Excel. The PRICE function returns the price per $100 face value of a security that pays periodic interest. The syntax for the PRICE function is as follows:

PRICE(settlement, maturity, rate, yld, redemption, frequency, basis)

To use the PRICE function to calculate bond valuation, the following information is required:

- **Settlements:** Settlement is the security's settlement date, which is the date after the issue date when the security is traded to the buyer.

- **Maturity:** Maturity is the security's maturity date, i.e., the date when the security expires. If the maturity date is not mentioned and if only the maturity period is given, then determine the maturity date using Settlement date+365*Maturity period.

- **Rate:** Rate is the security's annual coupon rate.

- **Yield:** Yield is the security's annual yield.

- **Redemption:** Redemption is the security's redemption value per $100 face value.

- **Frequency:** Frequency is the number of coupon payments per year.

  For annual payments, frequency = 1; for semi-annual, frequency = 2; for quarterly, frequency = 4.

- **Basis:** Basis is the type of day count basis to use.

Basis	Day count basis
0 or omitted	US (NASD) 30/360
1	Actual/actual
2	Actual/360
3	Actual/365
4	European 30/360

- **Date:** Important dates should be entered by using the DATE function or as results of other formulas or functions. For example, a date should be entered as (2008, 5, 23) for the 23rd day of May, 2008. Problems can occur if dates are entered as text.

Example: 01

Carlos Pelf Corp. issued an 8-year, 10% coupon bond on 01/01/ 2008 with a par value of $100. Calculate the price of this bond if the required return on this bond is 14%. Interest paid annually.

Solution:

Settlement	01/01/2008
Maturity	30/12/2015
Rate	10%
Yield	14%
Par Value	100
Frequency	1
Basis	3
Price	81.44824508

Formula:

=Price (settlement, Maturity, Rate, Yield, Par Value, Frequency, Basis)

Maturity =settlement + 365 * 8

Ex 3.2: Common Yield Measures

As you learned so far, the price and yield of a bond are interrelated. Therefore, to understand bond valuation, it is important to determine bond yield. The yield measures used commonly are:

- Current yield
- Yield to maturity (YTM)
- Yield to call (YTC)

Each of these yield measures is discussed in detail, next.

Common Yield Measures		
Current yield	YTM	YTC

Current Yield

Current yield is the amount of cash income that a bond will generate in a given year.

It is calculated as the interest divided by the bond's current value.

For example, if the annual interest is $80 on the current investment of $850, the current yield will be 80/850 = 9.41 %

It reflects the coupon interest rate and does not consider the capital (gain or loss) that the investor will realize if the bond is purchased at a discount (or premium) and held till maturity.

It also ignores the time value of money or the fact that the value of money decreases over time, till the bond is held, because of inflation.

Hence, current yield is an incomplete measure of yield and it does not provide an accurate measure of the bond's total expected return.

Objectives:

- It is the amount of cash income that a bond will generate in a given year
- It is calculated as the annual interest divided by the bond's current value
- Reflects only the coupon interest rate
- Does not consider the capital gain (or loss)
- Ignores the time value of money
- Is an incomplete and simplistic measure of yield

- Does not provided an accurate measure of the bond's total expected return

Current Yield: Annual Interest / Bond's Current value

> **Example: 02**
> Current investment = $850
> Annual interest = $80
> Current yield = 80/850 = **9.41%**

Yield to maturity (YTM)

- It is the internal rate of return (IRR) of the bond, given the current market price, interest charges, and maturity value.

- The YTM is also a discount rate at which the present value (PV) of future cash inflow equals to current price of the bond.

- Therefore, PV of future interest including principal is equal to PV of cash outflow of a bond.

- The YTM of a bond is the interest rate (compound rate) that would equate interest and principal to be received in the future related to the present past.

- In other words, it is the yield/return that investors will earn if they hold the bond till maturity.

The **YTM**:

Can be calculated in Excel using:

- IRR formula

- RATE function

- YIELD function

In the example shown, the following details are considered to calculate the YTM using the IRR formula:

- Current price: $850

- Face value: $1,000

- Interest rate: 8%

- Maturity period: 5 years

The YTM is calculated as 12.18%.

B8		fx	=IRR(B7:G7)			
	A	B	C	D	E	F	G
1	Face Value	$1,000.00					
2	Interest Rate	8.00%					
3	Year	0	1	2	3	4	5
4	Current Price	-$850.00					
5	Interest		$80.00	$80.00	$80.00	$80.00	$80.00
6	Maturity Value						$1,000.00
7	Cash Flow	-$850.00	$80.00	$80.00	$80.00	$80.00	$1,080.00
8	Yield-to-Maturity	12.18%					

Hint: =IRR (cash flow)
RATE Function of Excel

YTM calculation using the RATE function calculates the interest rate per period for the YTM of a security.

The RATE function is located as part of the financial formulas in the Excel ribbon. It calculates the interest rate per period for the YTM of a security.

- A $1000 par value bond

- A coupon rate of 9%

- Maturing after 8 years

- Currently selling at $800

	A		B	C
1			Formula Used	
2	Price of the bond at present (PV)	$-		$800.00
3	Par Value/Maturity value of the bond	$-		$1,000.00
4	Coupon rate period (FV)			9.00%
5	Coupon amount payable per period (PMT)	$-	= C3*C4	90
6	Number of periods (NPER)			8
7	Yield to maturity (RATE)		RATE	13.20%

YIELD Function of Excel

- YTM calculation using the YIELD function is used when the bond pays periodic interest such as:
  - Half-yearly interest
  - Monthly interest

Using the earlier example, let's see how the YTM can be calculated using the YIELD function of Excel.

The YIELD function is also available as part of the financial formulas on the Excel ribbon. It is used when the bond pays periodic interest such as half yearly or monthly interest.

Example: 05

Carlos Pelf Corp. issued an 8-year, 10% coupon bond on 01/01/ 2011 with a par value of $100. Price of the bond is $ 80. Calculate the yield to maturity if Interest is paid annually.

Solution:

Settlement	01/01/2011
Maturity	30/12/2018
Rate	9%
Redemption	100
Frequency	1
Basis	3
Price	80
Yield to Maturity	13.20%

Formula:
=Price (settlement, Maturity, Rate, price, redemption, Frequency, Basis)
Maturity =settlement + 365 * 8

Ex 3.3: Yield to Call (YTC)

It is the rate of return that investors will earn if they hold the bond till the time of the lock-in period if the call ability option expires. In this case, the assumption is that the investor will call upon and cancel the bond immediately at expiry.

The YTC is calculated for some bonds, which carry a feature that entitles the issuer to buy back (call back) the bond, before the maturity date. The price at which the buy back happens is specified in a call schedule published at the time of issuing the bond. This call schedule specifies the price for each buy back or call date.

For these kinds of bonds, it is important to calculate the YTC along with the YTM.

YTC calculation is exactly the same as that for the YTM, except the fact that the maturity date will be taken as the call date.

For example, a $100 par value bond, carrying a coupon rate of 9% maturing after 8 years may have an option that the issuer can buy back the bond after 5 years at $90, 6 years at $94, and 7 years at $97.

> **Example: 06**
> A $100 par value bond
> Coupon rate of 9%
> Maturing after 8 years
> Option that the issuer can buy back the bond:
> - After 5 years at $90
> - After 6 years at $94
> - After 7 years at $97

Ex 3.4: Stock

The stock of an incorporated business represents the equity stakes of the owner. It represents the residual assets of the company that would be due to the stockholders/shareholders after discharge of all superior claims such as secured and unsecured debt.

A single unit of stock is known as share. Shares can be classified into:

- Ordinary shares/ Equity Shares
- Preference shares

Ordinary Shares/ Equity Shares

- Ordinary shareholders are the owners of a company and they enjoy voting rights in company meetings.
- When a company winds up its business, ordinary shareholders receive any remaining funds after the bond-holders, creditors (including employees), and preferred shareholders are paid.
- The dividend amount is not fixed and varies as per the company's performance.

Preference Shares

- Preference shareholders have preference over ordinary shareholders in terms of payment of dividend and repayment of capital in case the company winds up its business.
- These shareholders generally do not have voting rights and have a right to receive dividends at a fixed rate.

- Preference shares can be of the following types:
  - Redeemable preference shares have a fixed maturity period.
  - Irredeemable preference shares are without any fixed maturity period.
  - Cumulative preference shares have accumulating unpaid dividends that are payable in future.
  - Noncumulative shares do not accumulate arrear dividends.

The P/E Ratio

It approach can be calculated as the market value per share divided by earnings per share (EPS)

It considers the estimated price, estimated EPS, and the justified price-earnings ratio.

It is the most widely practiced method of equity valuation. It is widely used by investment analysts because:

- It is simple to calculate.
- It displays more or less accurately the relationship between the market price and the company earnings.

Example: 07

If the price of a share is $30, and the EPS is $5, the P/E ratio will be 6, i.e., ($30/$5).

If the EPS of the company moves to $7, it is expected that the price of the share should also increase to $7 * 6

(P/E ratio) = 42.

Before proceeding further in the P/E ratio approach, we must understand a few terms related to this approach of equity valuation.

> **Example: 07**
> Price of a share = $30
> EPS = $5
> P/E ratio = $30 / $5 = 6
> Suppose the EPS of the company moves to $7.
> Then, the price of the share should also increase to:
> $7 * 6 (P/E ratio) = 42

Ex 3.5: Investment Risk & Returns

Risk is present in virtually every decision. Starting a new product line, purchasing a portfolio of securities, and selecting an advertisement campaign are all examples of uncertainty that a business may face time and again. It is not possible to eliminate or avoid risk, but it is extremely important to understand and assess the risk and determine whether the returns expected are worth taking that risk.

Some of the critical questions regarding risks that a finance manager has to answer are:

- What is the risk of a potential investment?
- What is the return expected?
- Is the risk justifiable with the associated returns?

Therefore, risk and return are considered as two of the most important concepts in finance. In fact, these concepts are often considered the foundation of modern finance theory.

Risk and return are directionally proportional. Higher the risk, higher will be the returns and lower the risk, lower will be the returns.

Risk of an asset can be divided into 2 parts:

- **Diversifiable risk:**

  Diversifiable risk arises from company-specific factors and therefore can be avoided through a diversification of the portfolio.

- **Market risk:**

  Market risk arises from general market movements and external factors and hence cannot be diversified away.

Suppose in a portfolio, there are three stocks pertaining to three industries - media, construction, and transport. Of these three stocks, if any one company does not perform well, the stock price of only that particular company will go down, while the other two will remain unaffected. Therefore, the loss from one stock can be recovered with the profits from the other two company stocks.

However, if there is any change in government policy, as a result of which the entire stock market goes down, all the three stocks in the portfolio will also go down. Diversification of stocks, in this scenario, will not be enough to prevent losses.

Some of the various risk associated with investments are:

1. **Interest rate risk:** It is the possibility that is fixed rate debt instruments will decline in value. As a result of a rise in interest rates.

2. **Business risks:** It is the risk which is the measure of risk associated with a particular security. It is also known as unsystematic risk and refers to the risk associated with a specific issuer of securities.

3. **Credit risk:** This refers to the possibility that a particular bond issuer will not be able to make expected interest rates payments. The higher the credit risk the higher the interest rate on bond.

4. **Taxability risk:** It applies to municipal bond offerings and refers to the risk i.e. security that was issued with tax exempt status could potentially lose the status prior to maturity.

5. **Call risk:** This risk is specific to bond issues and refers to the possibility that a dead security will be called prior to maturity. Call risk usually goes hand in hand with re investment risk.

6. **Inflation risk:** It is also known as purchasing power risk, inflator risk is a chance that the value of an asset or income will be eroded as inflation shrinks the value of a country currency.

Ex 3.6: Historical Returns

To make an investment decision, it helps to estimate the distribution of returns expected in future. Before estimating prospective returns, it is important to understand the computation of historical returns.

Historical returns are the past returns from an investment. To illustrate this, let us consider the following information for an equity stock:

Objectives:

- These are the past returns from an investment.
- It help to estimate the distribution of returns expected in future.

- It can be an important determinant in making a new investment decision.

> **Example: 08**
> Price at the beginning of the year = $60
> Dividend paid at the end of the year = $2.40
> Price at the end of the year = $69
> The total return for that period = ($2.40 + $69 - $60) / $60 = 19%

$$R = C + (P_E - P_B) / P_B$$

R = Historical Returns

C = Dividend paid in the year

P_E = Price of the bond at the beginning of the year

P_B = Price of the bond at the end of the year

Ex 3.7: Average Annual Return by AM

- It is the simple AM of an investment during a given historical period. Given the yearly historical returns of a particular stock, the average or mean return can be calculated. The average rate of return is the sum of various one-period rates of return divided by the number of periods.

- It helps to know the central tendency of a series of returns.

- It cannot be used to find the average compound rate of growth that occurred over multiple periods.

Limitations of AM: To determine the average compound rate of growth that has actually occurred over multiple periods, AM is not an appropriate measure. Let's consider an example to understand this better.

Suppose the value of a stock of Dewdrops Mobile Corp. at the beginning of year 1 is 100. At the end of year 1, it declines to $80 and at the end of year 2, it recovers to $100 again.

- The return for year 1 will be = (80 - 100) / 100 = -20%

- The return for year 2 will be = (100 - 80) / 80=25%

Therefore, the arithmetic mean return = (-20+25) / 2 = 2.5%.

However, an investor who had invested in this stock at the beginning of year 1 has a growth of 0%. Therefore, the AM of the annual return does not provide the true picture.

	A	B
1	Year	Total return (%)
2	1	25
3	2	14
4	3	7
5	4	-4
6	5	8
7	Average Return =AVERAGE(B3:B7)	10

Ex 3.8: Average Annual Return by GM

- GM of annual returns calculates the average compound rate of growth over a period of time.

- GM is always less than AM, except when all the return values being considered are equal.

GM can be mathematically calculated using the formula:

GM = [(1 + R$_1$) (1 + R$_2$).......(1 + R$_n$)]$^{1/n}$ − 1, where:

- **GM** is the geometric mean return

- **R$_1$** is the total return for period I (i=1,…......,n

- **n** is the number of time periods

The factor (1+R$_n$) is called the return relative.

GM can be calculated in Excel using the GEOMEAN function in Excel.

The GEOMEAN function is available in Excel on the Formulas tab> More Functions>Statistical options. However, the GEOMEAN function does not work if there is even one zero or negative figure in the past returns data.

Example: 09

Suppose the annual returns from the share of Paperwork Inc. in the last 5 years are 21%, 15.5%, 17.8%, 12.3%, and 18.7%, respectively.

The compounded annual growth rate or GM of annual returns can be calculated in Excel using the GEOMEAN function.

The GM is calculated as **16.79%**.

	B7		f_x	=GEOMEAN(B2:B6)
	A		B	C
1	Year		Anuual Return	
2	1		21.00%	
3	2		15.50%	
4	3		17.80%	
5	4		12.30%	
6	5		18.70%	
7	GM of the Annual Returns		16.79%	

Ex 3.9: Variance of Returns

To analyze the return of an equity stock, it is important to know the variability of returns. It may be defined as the extent of the deviation of individual rates of return from the average rate of return. This means that the more is the deviation from the average return, the more volatile is the stock. On the contrary, if the deviation is relatively less, it means the stock movement over a period is less volatile.

There are two measures of this deviation (dispersion):

- Variance
- Standard deviation

Standard deviation

- It is the square root of variation.

- It can be calculated in Excel by the following formula =(STDEV)

Variance can be calculated in Excel with the formula =VAR.

Deviation or dispersion is used when comparing two or more stocks. Let's see how.

Year	Total Return (%) of Stock A	Total Return (%) of Stock B
1	25	35
2	14	-18
3	7	-2
4	-4	40
5	8	-5
Average Return	10	10
Variance	112.5	669.5
Standard Deviation	10.60660172	25.87469807

Summary

In this chapter, you learned that:

- Value of a bond requires:
  - An estimate of expected cash flows
  - An estimate of the required returns risk
- Terminology associated with bond valuation is:
  - Par value
  - Coupon rate and interest
  - Maturity period
  - Yield
  - YTM
- Present value of bond can be measured by using the PRICE function in Excel.
- Current yield and the YTM are important terms associated with bond valuation.
- Equity valuation by the P/E ratio approach is one of the most important and popular methods for valuation of a stock.
- The risk of an asset can be classified as:
  - Diversifiable risk
  - Market risk
- Risk and return are inversely proportional.
- Average annual returns of an investment can be calculated by:
  - AM
  - GM
- In Excel, AM can be calculated by using the AVERAGE formula and GM can be calculated by using the GEOMEAN formula.
- Dispersion in annual returns can be measured by:
  - Standard deviation
  - Variance
- In Excel, variance can be calculated by using the VAR formula and standard deviation can be calculated by using the STDEV formula.

Questions Based on this Chapter

1. List out the various types of risk associated with investments.

2. Calculate Average annual return and Standard deviation.

Date	Price of Boxbuns Inc. Share	Annual Returns
31/12/2007	$10.50	
31/12/2008	$12.40	18%
31/12/2009	$12.70	2%
31/12/2010	$10.20	-20%
31/12/2011	$8.90	-13%
31/12/2012	$11.30	27%
Average annual return		?
Standard deviation		?

3. Write down the difference between Equity shares and preference Shares.

4. Alex Pelf Corp. issued a 10-years, 10% coupon bond on 01/01/ 2005 with a par value of $100. Calculate the price of this bond if the required return on this bond is 14%. Interest paid half-annually.

5. What is the current yield of a bond?

   a. Annual interest / Price
   b. Price / Annual interest
   c. Maturity proceeds – Cost price
   d. Only maturity proceeds

6. Calculate the historical returns of XYZ Ltd. When Share price at the beginning of the year is $80, Dividend paid at the end of the year $3 and share price at the end of the year is $92.

7. Explain briefly about YTC.

8. Write a note on following terms:

   a. Intrinsic Value
   b. Market value
   c. Par Value
   d. Yield