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Name:

Registration No.:

Course Code: 1415

Program: BS/ADC

Semester: Autumn 2026

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

Course: Introduction to Business Finance (1415) • Level: BS/ADC

Semester: Autumn 2026

Assignment No. 2 (Units: 5–9)

Total Marks: 100 • Pass Marks: 50

SOLVED ASSIGNMENT GUIDE

(For Study & Reference)

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Note: This guide is prepared for study and reference purposes. Students are advised to read the relevant units of the course book, understand the concepts, and then write the assignment in their own words.

Question 1: Coupon Rate and Current Yield; Pure Discount Bonds vs Perpetual Bonds (20 Marks)

Q.1 (a) Define coupon rate and current yield, and explain how and why they differ in bond valuation. (10) (b) How does valuation of pure discount bonds differ from valuation of perpetual bonds? (10)

Introduction

A bond is a promise of future cash flows, and its value is the present value of those cash flows discounted at the return investors require. Two yields are quoted constantly in bond markets,

the coupon rate and the current yield, and students often confuse them because both are expressed as percentages. Part (a) defines each, shows with a worked example how and why they differ, and explains what each contributes to bond valuation. Part (b) then contrasts the valuation of the two limiting types of bond: the pure discount bond, which makes only one payment at maturity, and the perpetual bond, which makes payments for ever and never repays its principal.

Part (a): Coupon Rate

The coupon rate is the fixed annual interest rate stated on the face of the bond at the time of issue. It is applied to the bond's face (par) value to determine the periodic interest payment, called the coupon. If a bond has a face value of Rs 1,000 and a coupon rate of 10%, the issuer pays Rs 100 of interest every year for the whole life of the bond, whatever happens to market interest rates or to the bond's market price. The coupon rate is therefore fixed at issue, is set by the issuer so that the bond can be sold at or near par given the market rates and the issuer's credit standing at that time, and never changes afterwards. It describes what the issuer promised, based on face value.

Part (a): Current Yield

The current yield relates the same annual coupon payment not to face value but to the price the investor actually pays in the market today: Current yield = Annual coupon payment ÷ Current market price. Using the same bond, if it can be bought for Rs 950, the current yield is Rs 100 ÷ Rs 950 = 10.53%. If instead the bond is trading at Rs 1,100, the current yield is Rs 100 ÷ Rs

1,100 = 9.09%. The current yield therefore changes every time the market price changes, even though the coupon payment itself is completely unchanged.

Table 1: Coupon Rate vs Current Yield (bond: face value Rs 1,000, coupon 10%, coupon payment Rs 100)

Market price	Coupon rate	Current yield	Relationship
Rs 950 (discount)	10%	100 ÷ 950 = 10.53%	Current yield > coupon rate
Rs 1,000 (par)	10%	100 ÷ 1,000 = 10.00%	Current yield = coupon rate
Rs 1,100 (premium)	10%	100 ÷ 1,100 = 9.09%	Current yield < coupon rate

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How and Why They Differ

The two rates differ for one root reason: they have different denominators and different reference points. The coupon rate is anchored to the face value written in the bond contract at issue; the current yield is anchored to the live market price, which moves daily with general interest rates, the issuer's creditworthiness, and the time left to maturity. They are equal only in the special case where the bond trades exactly at par. Whenever the required return in the market rises above the coupon rate, investors will not pay full face value for a below-market interest stream, so the price falls to a discount and the current yield rises above the coupon

rate until it matches the market. When market rates fall below the coupon rate, the generous interest stream is bid up to a premium, and the current yield falls below the coupon rate.

In bond valuation this distinction matters because neither rate alone measures the investor's true return. The coupon rate ignores price altogether and so cannot be used to compare bonds trading at different prices. The current yield is better, because it is based on the actual investment, but it is still incomplete: it counts only the interest income and ignores the capital gain or loss that occurs as a discount or premium bond moves towards its face value at maturity. The complete measure is the yield to maturity, which discounts all coupons plus the redemption value and equates them to the price. Valuation therefore proceeds by pricing cash flows, and the coupon rate merely supplies the size of those cash flows, while current yield is a quick, partial indicator of the return on today's price, useful for comparing income but not a substitute for full valuation.

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Part (b): Valuation of Pure Discount Bonds

A pure discount bond, also called a zero-coupon bond, makes no interest payments at all. It is issued at a price well below its face value and redeemed at face value at maturity; the investor's whole return is the difference. Its valuation is the simplest in finance, because there is only one cash flow to discount: Value = Face value ÷ (1 + r)^n, where r is the required rate of return and n is the number of years to maturity. For example, a pure discount bond with a face value of Rs 1,000, five years to maturity and a required return of 10% is worth Rs 1,000 ÷ (1.10)^5 = Rs 1,000 ÷ 1.61051 = Rs 620.92. As time passes and maturity approaches, the price

rises steadily towards Rs 1,000, a process called accretion. Treasury bills are short-term examples of pure discount instruments.

Part (b): Valuation of Perpetual Bonds

A perpetual bond, or perpetuity (the historic British consols are the classic case), stands at the opposite extreme: it pays a fixed coupon every year for ever and has no maturity date and no repayment of principal. Its value is the present value of an infinite stream of equal payments, which reduces to the elegant formula: Value = Annual coupon ÷ Required rate of return. Thus a perpetual bond paying Rs 100 a year, when the required return is 10%, is worth Rs 100 ÷ 0.10 = Rs 1,000. If the required return rises to 12.5%, the value falls to Rs 800, and if it falls to 8%, the value rises to Rs 1,250.

Table 3: Pure Discount Bonds vs Perpetual Bonds

Feature	Pure discount bond	Perpetual bond
Cash flows	One payment: face value at maturity	Fixed coupon every year, for ever
Principal repayment	Yes, at maturity	Never
Valuation formula	F ÷ (1 + r)^n	Coupon ÷ r
Main driver of value	Face value, required return and time to maturity	Coupon and required return only; no time element
Interest-rate sensitivity	High for long maturities, but price is anchored to face value	Very high and permanent, because the cash flows stretch

	as maturity nears	to infinity
Example value at r = 10%	Rs 1,000 due in 5 years = Rs 620.92	Rs 100 per year for ever = Rs 1,000

The differences in valuation follow directly from those structures. The pure discount bond's value depends on time: the longer the wait for the single payment, the deeper the discount, and the value is certain to converge to face value at maturity, so interest-rate changes have a shrinking effect as maturity approaches. The perpetual bond's value has no time dimension at all; it depends only on the coupon and the required return, and because its cash flows extend to infinity it is extremely sensitive to interest rates, a small change in r producing a large, permanent change in value, with no maturity date to pull the price back to par. In technical language, the perpetuity has the longest possible duration. An ordinary coupon bond lies between the two extremes, being valued as the sum of an annuity of coupons plus a discounted face value, and its behaviour can be understood as a blend of the two patterns described here.

Conclusion

To conclude, the coupon rate is the fixed contractual rate on face value set at issue, while the current yield is the coupon divided by the current market price, so the two coincide only at par and diverge whenever the price moves, which is precisely why full valuation must discount cash flows rather than rely on either rate alone. As for the bond types, the pure discount bond is valued by discounting a single future face value, while the perpetual bond is valued by

capitalising an endless coupon at the required return, and these differences in cash-flow pattern explain their very different responses to changes in interest rates.

Question 2: Future Value of an Annuity — Ordinary Annuity and Annuity Due (20 Marks)

Q.2 Calculate the future value of an annuity for each case in the accompanying table (Case U: Rs 5,000, 7%, 6 years; V: Rs 2,500, 8%, 4 years; W: Rs 15,000, 11%, 5 years; X: Rs 10,000, 6%, 8 years; Y: Rs 8,000, 4%, 12 years; Z: Rs 12,000, 9%, 7 years), assuming that it is (a) an ordinary annuity, and (b) an annuity due. (20)

Introduction

An annuity is a series of equal payments or receipts made at equal intervals, such as a fixed deposit made every year into a savings plan, a pension contribution or an insurance premium. The future value of an annuity is the amount to which that stream of equal payments will grow by the end of the period, when every payment has been accumulated forward with compound interest. The answer depends critically on when each payment is made. In an ordinary annuity the payment is made at the end of each period, while in an annuity due the payment is made at the beginning of each period. This answer states the formula for each type, works through all six cases in the table, and then explains the pattern of the results.

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The Formulas

For an ordinary annuity, each payment of amount PMT earns interest for the periods remaining after it is made; the last payment, made at the very end, earns no interest at all. Summing this geometric series gives: Future value of an ordinary annuity = PMT × [((1 + r)^n − 1) ÷ r], where r is the interest rate per period and n is the number of payments. The bracketed term is the future value interest factor for an annuity. For an annuity due, every payment is made one period earlier, so every payment earns exactly one extra period of interest. The result is simply the ordinary-annuity value multiplied by (1 + r): Future value of an annuity due = PMT × [((1 + r)^n − 1) ÷ r] × (1 + r). It follows immediately that the annuity due is always worth more, by exactly r percent, for identical payments, rates and periods.

Worked Calculations, Case by Case

Case U: PMT = Rs 5,000, r = 7%, n = 6. Factor = ((1.07)^6 − 1) ÷ 0.07 = (1.500730 − 1) ÷ 0.07 = 7.153291. Ordinary annuity = 5,000 × 7.153291 = Rs 35,766.45. Annuity due = 35,766.45 × 1.07 = Rs 38,270.11. The six deposits total only Rs 30,000, so compounding adds Rs 5,766.45 of interest in the ordinary case.

Case V: PMT = Rs 2,500, r = 8%, n = 4. Factor = ((1.08)^4 − 1) ÷ 0.08 = (1.360489 − 1) ÷ 0.08 = 4.506112. Ordinary annuity = 2,500 × 4.506112 = Rs 11,265.28. Annuity due = 11,265.28 × 1.08 = Rs 12,166.50. Here the four deposits total Rs 10,000, and the short period limits the interest earned to Rs 1,265.28.

Case W: PMT = Rs 15,000, r = 11%, n = 5. Factor = ((1.11)^5 − 1) ÷ 0.11 = (1.685058 − 1) ÷ 0.11 = 6.227801. Ordinary annuity = 15,000 × 6.227801 = Rs 93,417.02. Annuity due = 93,417.02 × 1.11 = Rs 103,692.89. The high payment and the highest interest rate in the table together produce the second-largest accumulated sum, even though the period is only five years.

Case X: PMT = Rs 10,000, r = 6%, n = 8. Factor = ((1.06)^8 − 1) ÷ 0.06 = (1.593848 − 1) ÷ 0.06 = 9.897468. Ordinary annuity = 10,000 × 9.897468 = Rs 98,974.68. Annuity due = 98,974.68 × 1.06 = Rs 104,913.16. Eight deposits total Rs 80,000, so interest contributes Rs 18,974.68, showing how a longer period compensates for a moderate rate.

Case Y: PMT = Rs 8,000, r = 4%, n = 12. Factor = ((1.04)^12 − 1) ÷ 0.04 = (1.601032 − 1) ÷ 0.04 = 15.025805. Ordinary annuity = 8,000 × 15.025805 = Rs 120,206.44. Annuity due = 120,206.44 × 1.04 = Rs 125,014.70. Despite having the lowest rate in the table, Case Y produces the largest future value of all, because twelve years of compounding give interest the longest time to build on itself.

Case Z: PMT = Rs 12,000, r = 9%, n = 7. Factor = ((1.09)^7 − 1) ÷ 0.09 = (1.828039 − 1) ÷ 0.09 = 9.200435. Ordinary annuity = 12,000 × 9.200435 = Rs 110,405.22. Annuity due = 110,405.22 × 1.09 = Rs 120,341.69. Seven deposits total Rs 84,000, and interest adds a substantial Rs 26,405.22.

Table 1: Future Value of the Annuity in Each Case

Case	Payment (Rs)	Rate	Years	Annuity factor	(a) Ordinary annuity (Rs)	(b) Annuity due (Rs)

U	5,000	7%	6	7.153291	35,766.45	38,270.11
V	2,500	8%	4	4.506112	11,265.28	12,166.50
W	15,000	11%	5	6.227801	93,417.02	103,692.89
X	10,000	6%	8	9.897468	98,974.68	104,913.16
Y	8,000	4%	12	15.025805	120,206.44	125,014.70
Z	12,000	9%	7	9.200435	110,405.22	120,341.69

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Discussion of the Results

Three lessons emerge from the table. First, the annuity due exceeds the ordinary annuity in every case, and the percentage advantage equals the interest rate exactly, 4% in Case Y and 11% in Case W, confirming the theory that shifting every payment one period earlier adds one period of interest to the whole accumulated sum. In rupee terms the advantage is largest where the accumulated sum is large: Rs 10,275.87 in Case W and Rs 9,936.47 in Case Z. This is why, in practice, paying instalments at the start of a period, as with rent or insurance premiums, is worth more than paying at the end.

Second, time is the most powerful ingredient in compounding. Case Y has the lowest rate, 4%, and only a middle-sized payment, yet its twelve-year horizon carries it to the highest future value, Rs 120,206.44. By contrast Case V, with a respectable 8% rate but only four years and small payments, reaches only Rs 11,265.28. Savers who begin early therefore enjoy a structural advantage that no later catch-up payment easily replaces. Third, the interest rate still matters

greatly when periods are similar: comparing Cases W and a hypothetical longer plan shows that the 11% rate builds value very fast per rupee deposited, Rs 75,000 of deposits growing to Rs 93,417.02 in just five years. A complete reading of the table therefore weighs all three variables together, payment, rate and time, exactly as the formulas direct.

A note on checking is worthwhile. Every ordinary-annuity figure exceeds the simple sum of the deposits, as it must once interest is added, and every annuity-due figure exceeds its ordinary counterpart by the factor (1 + r), which was verified case by case. These internal consistency checks confirm that no case has been mis-keyed.

Conclusion

To conclude, applying the formula PMT × [((1 + r)^n − 1) ÷ r] gives ordinary-annuity future values of Rs 35,766.45 (U), Rs 11,265.28 (V), Rs 93,417.02 (W), Rs 98,974.68 (X), Rs 120,206.44 (Y) and Rs 110,405.22 (Z). Multiplying each by (1 + r) gives the annuity-due values of Rs 38,270.11, Rs 12,166.50, Rs 103,692.89, Rs 104,913.16, Rs 125,014.70 and Rs 120,341.69 respectively. The annuity due is always the more valuable arrangement for the receiver, and the longest period, Case Y, produces the largest accumulation despite the lowest interest rate.

Question 3: The Tax Shield; Real vs Nominal Cost of Finance (20 Marks)

Q.3 (a) What is meant by a tax shield, and why do bonds provide a tax shield while preference shares do not? Explain your answer. (10) (b) Explain the difference between the real cost of finance and the nominal cost of finance, and give an example of each. (10)

Introduction

The cost of raising finance is not simply the rate written in the contract. Two adjustments, both examined in this question, stand between the headline rate and the truth. The first is taxation: because interest payments receive tax relief and dividends do not, debt carries a hidden subsidy called the tax shield, which preference shares and ordinary shares lack. The second is inflation: a rate that looks expensive in money terms may be cheap, or even negative, once the fall in the purchasing power of money is removed, and the distinction between nominal and real cost decides many real financing decisions.

Part (a): What Is a Tax Shield?

A tax shield is the reduction in a company's tax bill that results from an expense being deductible in computing taxable profit. If an expense of Rs 1,000,000 is deductible and the corporate tax rate is, for illustration, 29%, taxable profit falls by Rs 1,000,000 and the tax payable falls by Rs 290,000. That Rs 290,000 saving is the tax shield: the expense effectively costs the company only Rs 710,000 after tax, because the government, through the tax system, bears the rest. The general formula is: Tax shield = Deductible expense × Tax rate. The shield is valuable only to a firm that has taxable profits to shelter; a loss-making firm gains no immediate benefit from extra deductions.

Why Bonds Provide a Tax Shield

A bond is a loan, and the coupon interest paid on it is a cost of earning income, charged in the income statement before profit is struck. Tax law in Pakistan, as in most countries, treats

interest on money borrowed for business purposes as an allowable deduction. Suppose a company has bonds of Rs 100 million carrying 12% interest, so it pays Rs 12 million of interest a year. At a 29% tax rate, that deduction saves Rs 12 million × 0.29 = Rs 3.48 million of tax annually, so the after-tax cost of the interest is Rs 8.52 million, an effective after-tax cost of debt of 12% × (1 − 0.29) = 8.52%. This shield is one of the principal reasons companies use a measure of debt in their capital structure: the state effectively subsidises borrowing, the weighted average cost of capital falls, and, within prudent limits, firm value rises.

Why Preference Shares Do Not

Preference shares, despite their fixed dividend and debt-like appearance, are legally shares, part of the ownership capital of the company, not a loan. Their dividend is therefore not an expense of earning income but an appropriation of profit: it is paid out of profit after tax, just like the ordinary dividend, and it is not deductible in computing taxable income. If the same company instead raised Rs 100 million in preference shares at a 12% dividend, the full Rs 12 million must come from after-tax profits; to pay Rs 12 million after tax at a 29% rate the company must first earn about Rs 16.9 million before tax. The effective cost is thus the whole 12% (indeed more, measured on pre-tax earnings), against 8.52% after tax for the equivalent bonds. The difference is entirely due to the missing tax shield.

The dividing line is the legal and tax distinction between a creditor and an owner. Interest is the price of using someone else's money and ranks as a business cost; a dividend, however fixed or cumulative, is a share of the owners' profit, and the tax system taxes the company's profit before owners take their share. This asymmetry has real consequences: it biases financing

towards debt, encourages gearing, and must be balanced against the financial risk that fixed interest obligations create, which is why tax relief alone never justifies unlimited borrowing. It also explains why hybrid instruments are designed carefully, since their tax treatment follows their legal substance.

Part (b): Nominal Cost of Finance

The nominal cost of finance is the cost expressed in money terms, exactly as quoted and contracted, with no adjustment for inflation. When a bank lends at 18% per annum, or a bond carries a 12% coupon, or a company promises preference shareholders 11%, those are nominal costs: they state how many rupees must be paid for each hundred rupees used, regardless of what those rupees will buy when they are repaid. Nominal rates are what appear in agreements, budgets and accounts, and they can be thought of as containing three elements: compensation for the time value of money (the real return), compensation for expected inflation, and a premium for risk.

Part (b): Real Cost of Finance

The real cost of finance is the nominal cost stripped of inflation, measuring the cost in purchasing-power terms. The exact relationship is given by the Fisher equation: (1 + nominal rate) = (1 + real rate) × (1 + inflation rate), so Real rate = [(1 + nominal) ÷ (1 + inflation)] − 1. A common approximation is simply nominal rate minus inflation rate. For example, if a company borrows at a nominal 18% while inflation is 12%, the exact real cost is (1.18 ÷ 1.12) − 1 = 5.36% (the approximation gives 6%). The lender receives 18% more rupees, but each rupee buys

about 12% less, so the true reward, and the borrower's true burden, is about 5.36% in real terms.

Table 1: Nominal vs Real Cost of Finance

Feature	Nominal cost	Real cost
Basis of measurement	Money (rupees actually paid)	Purchasing power
Includes inflation?	Yes	No; inflation removed
Where seen	Loan agreements, bond coupons, quoted rates	Calculated for economic decisions
Example	Bank loan at 18% per annum	18% loan with 12% inflation = 5.36% real
Behaviour in high inflation	High figures that can mislead	Reveals the true, often much lower, burden

A second example sharpens the point from the saver's side. A depositor earning a nominal 10% when inflation is 13% faces a real return of (1.10 ÷ 1.13) − 1 = −2.65%: his balance grows in rupees yet shrinks in what it will buy, so the real cost of finance to the bank paying him is negative. Conversely, in a low-inflation economy a nominal rate of 6% with inflation of 2% gives a real cost of 3.92%, which is a heavier real burden than the 5.36% example above might at first suggest when compared across countries or periods. The practical lesson for financial management is that long-term projects should be appraised consistently, nominal cash flows

discounted at nominal rates or real cash flows at real rates, never mixing the two, and that financing decisions taken in inflationary times, such as Pakistan has experienced, can be badly distorted if managers look only at imposing nominal figures and reject projects or loans whose real cost is in fact modest.

Conclusion

To conclude, a tax shield is the tax saved because an expense is deductible, worth the expense multiplied by the tax rate. Bonds provide one because interest is a deductible business expense, while preference shares do not because their dividend is an appropriation of after-tax profit, a distinction that materially lowers the after-tax cost of debt and shapes capital structure. Separately, the nominal cost of finance is the quoted money cost, such as an 18% loan rate, while the real cost removes inflation through the Fisher relation, 5.36% in that example at 12% inflation; sound decisions require knowing both the tax-adjusted and the inflation-adjusted truth behind the headline rate.

Question 4: Methods of Valuing Ordinary Shares and the Investors Who Prefer Them (20 Marks)

Q.4 What are the different methods for valuing ordinary shares, and which type of investor is likely to prefer each method? Explain your answer clearly. (20)

Introduction

An ordinary share has no maturity date and no promised payments, so its value cannot be read off a contract as a bond's can; it must be estimated. In principle, the value of a share is the present value of all the future cash flows its owner expects to receive, but turning that principle into a number can be done in several quite different ways, each resting on different information and different assumptions. This answer describes the main methods of valuing ordinary shares, dividend-based models, earnings multiples, asset-based measures and discounted cash flow, and then explains which type of investor is likely to prefer each method and why.

Dividend Valuation Methods

Dividend discount models value a share as the present value of its expected future dividends, discounted at the shareholder's required rate of return. The simplest version, the zero-growth model, suits a company whose dividend is expected to stay constant for ever: Value = Dividend ÷ Required return. If a share pays Rs 5 a year indefinitely and investors require 10%, it is worth Rs 50. The most widely used version is the constant-growth (Gordon) model, Value = Expected dividend next year ÷ (Required return − Growth rate), which fits mature companies whose dividends grow steadily. Where growth is expected to be high for a few years and then settle down, a variable-growth or multi-stage model discounts the dividends of each phase separately. These models are theoretically the purest, since dividends are the actual cash a minority shareholder receives, but they are useless for companies that pay no dividend and very sensitive to the growth and discount-rate assumptions.

Earnings Multiples and Market-Based Methods

The price/earnings approach values a share by applying a justified or comparable P/E ratio to earnings per share: Value = EPS × P/E ratio. The ratio may be taken from similar listed companies, from the company's own history, or built up from its growth, risk and payout. Related market measures include the dividend yield, price-to-book and price-to-sales ratios. These methods are quick, need only published figures plus a judgement about the right multiple, and express value in the same language the market itself uses every day. Their weakness is circularity: if the whole market or sector is overpriced, multiples import that overpricing into the valuation, and earnings themselves can be flattered by accounting choices.

Asset-Based Methods

Asset-based methods value the share from the balance sheet rather than from future income. Book value per share divides net assets by the number of shares, as illustrated in the companion assignment where net assets of Rs 8,400 million over 400 million shares gave Rs 21 per share. Liquidation value goes further and estimates what the assets would actually fetch if sold and all liabilities paid, the break-up value of the company. Replacement-cost value asks what it would cost to recreate the company's assets today. These methods give a floor value anchored in existing resources, but they ignore earning power and intangibles, and book figures rest on historical cost, so they understate the worth of a profitable going concern and are most meaningful for asset-heavy or failing businesses.

Discounted Cash Flow (Free Cash Flow) Methods

Institutional and professional analysts commonly value the whole firm by forecasting its free cash flow to the firm, that is, operating cash flow after tax, capital expenditure and working-capital needs, discounting it at the weighted average cost of capital to obtain enterprise value, then deducting net debt and dividing by the number of shares. Variants discount free cash flow to equity directly. This approach captures growth, margins, investment needs and risk in one framework and does not depend on dividend policy, which makes it suitable for young, growing or non-dividend-paying companies. Its weakness is its appetite for assumptions: small changes in forecast growth or in the terminal value, which often dominates the answer, swing the valuation widely.

Table 1: Valuation Methods and the Investors Who Prefer Them

Method	Basis	Investor most likely to prefer it	Reason for the preference
Zero-growth dividend model	Constant dividend capitalised	Retired / income investor in stable utilities	Wants a dependable income valued like a perpetuity
Constant-growth (Gordon) model	Dividends growing steadily	Long-term income-and-growth investor	Matches mature, dividend-paying companies held for years
Variable-growth model	Different growth	Growth investor	Captures a high-growth

	phases		phase before maturity
P/E and other multiples	EPS × comparable multiple	Active trader and general investor	Fast, market-based, easy comparison between shares
Book / liquidation value	Net assets per share	Value investor, lender-oriented investor	Provides a margin of safety and a floor value
Discounted free cash flow	Forecast cash flows discounted	Professional analyst, fund manager, takeover bidder	Fundamental, policy-independent, values the whole business

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Matching Methods to Investors

The pattern in the table reflects a simple truth: investors value what they intend to receive. The income investor, such as a retired person or a pension fund matching regular outgoings, lives on dividends, so dividend models speak his language directly, and he is content with the steady company those models suit. The growth investor, who expects his return mainly as capital gain from expansion, prefers the variable-growth model or discounted cash flow, because both give explicit credit for future growth instead of anchoring on today's dividend. The value investor hunts for shares priced below their underlying worth, so he leans on book value, liquidation value and a low P/E, buying only when market price offers a margin of safety below a conservatively estimated value.

The short-term trader, by contrast, has little use for any slow fundamental model; he prefers multiples and market comparisons because his question is not what a share is ultimately worth but how it is priced relative to its peers today. At the other extreme, a takeover bidder or controlling investor, who will own the whole cash-generating machine and can change its policy, naturally uses discounted free cash flow, valuing the entire firm rather than a minority's dividend stream, and checks the result against the asset and liquidation values that set his downside. Professional fund managers typically triangulate, running a cash-flow model as their primary method and multiples as a market cross-check, which illustrates the soundest general advice: no single method is complete, and agreement between methods based on different information is what gives a valuation credibility.

One further practical point applies to every method: a valuation is a range, not a single sacred number. Sensible investors test how the answer changes when the growth rate, required return or multiple is varied within reasonable limits, a practice called sensitivity analysis, and they demand a larger margin of safety the wider that range becomes. A share that looks cheap under almost all reasonable assumptions is a far safer purchase than one that looks cheap only under the most optimistic forecast, whatever method produced the estimate.

Conclusion

To conclude, ordinary shares can be valued by capitalising dividends under zero, constant or variable growth; by applying earnings and other market multiples; from balance-sheet assets through book, liquidation or replacement values; or by discounting forecast free cash flow. Income investors prefer the dividend models, growth investors and professionals prefer growth

and cash-flow models, value investors prefer asset values and low multiples, and traders prefer market multiples. The method follows the investor because each method values a different definition of what the share will actually deliver to its holder.

Question 5: Capital Budgeting at Haidar Textile Mills Ltd. — Payback, NPV and Profitability Index (20 Marks)

Q.5 Haidar Textile Mills Ltd. is considering Projects X, Y and Z (capital costs Rs 120m, Rs 1,000m and Rs 850m, with the net cash inflows for Years 1–10 as given in the question table). The cost of finance for all projects is 9%. (a) Calculate the Payback Period for each project. (b) Calculate the Net Present Value for each project. (c) Calculate the Profitability Index of each project. (d) Based on the above calculations, recommend which project should be selected. (20)

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Introduction

Haidar Textile Mills Ltd. must choose between three investment projects of very different sizes. Project X is small, costing Rs 120 million, while Projects Y and Z are large, costing Rs 1,000 million and Rs 850 million respectively, and all three generate cash inflows over ten years (Project X has no inflow in Year 10, and Project Z none in Year 10 either, as printed in the question table). The cost of finance is 9%. This answer applies the three required techniques, payback period, net present value and profitability index, showing the full working for each, and then makes and justifies a recommendation. All figures are in millions of rupees.

Table 1: Project Data (Rs million, as given in the question)

Year	Project X inflow	Project Y inflow	Project Z inflow
Capital cost	120	1,000	850
1	110	400	150
2	140	380	170
3	150	360	200
4	160	330	240
5	230	410	310
6	280	450	460
7	300	460	490
8	60	430	550
9	40	360	500
10	0	270	0
Total inflows	1,470	3,910	3,070

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(a) Payback Period

The payback period is the time taken for cumulative cash inflows to recover the capital cost. For Project X, the Year 1 inflow of Rs 110 million leaves Rs 10 million unrecovered; the Year 2 inflow is Rs 140 million, so recovery completes 10 ÷ 140 = 0.07 of the way through Year 2. Payback for X = 1.07 years (about 1 year and 1 month). For Project Y, cumulative inflows are Rs 400 million

after Year 1 and Rs 780 million after Year 2, leaving Rs 220 million of the Rs 1,000 million cost to be recovered from the Year 3 inflow of Rs 360 million: 220 ÷ 360 = 0.61, so payback for Y = 2.61 years (about 2 years and 7 months). For Project Z, cumulative inflows reach Rs 760 million by the end of Year 4, leaving Rs 90 million to recover from the Year 5 inflow of Rs 310 million: 90 ÷ 310 = 0.29, so payback for Z = 4.29 years (about 4 years and 3 months). On payback alone, X ranks first, Y second and Z third.

Table 2: Cumulative Cash Inflows and Payback (Rs million)

Year	X cumulative	Y cumulative	Z cumulative
1	110	400	150
2	250	780	320
3	400	1,140	520
4	560	1,530	760
5	790	1,940	1,070
6	1,070	2,390	1,530
7	1,370	2,850	2,020
8	1,430	3,280	2,570
9	1,470	3,640	3,070
10	1,470	3,910	3,070
Payback	1.07 years	2.61 years	4.29 years

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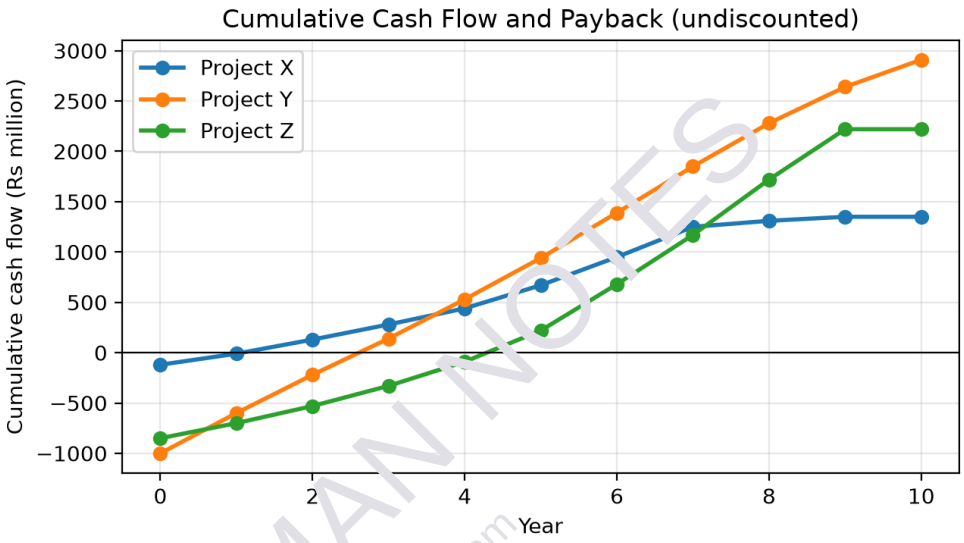


Figure 1: Cumulative cash flow after deducting the capital cost; the point where each line crosses zero is its payback period.

(b) Net Present Value at 9%

Net present value discounts every inflow at the 9% cost of finance and deducts the capital cost: NPV = Sum of [Inflow in year t ÷ (1.09)^t] − Capital cost. The discount factors at 9% are: Year 1, 0.9174; Year 2, 0.8417; Year 3, 0.7722; Year 4, 0.7084; Year 5, 0.6499; Year 6, 0.5963; Year 7, 0.5470; Year 8, 0.5019; Year 9, 0.4604; Year 10, 0.4224. Applying them, the present value of Project X's inflows is 100.92 + 117.84 + 115.83 + 113.35 + 149.48 + 166.95 + 164.11 + 30.11 + 18.42 + 0 = Rs 977.01 million, so NPV of X = 977.01 − 120 = Rs 857.01 million. The present value of Project Y's inflows is 366.97 + 319.84 + 277.99 + 276.29 + 266.47 + 268.32 + 251.64 + 215.80 + 165.75 + 114.05 = Rs 2,523.12 million, so NPV of Y = 2,523.12 − 1,000 = Rs 1,523.12 million. The present value of Project Z's inflows is 137.61 + 143.09 + 154.44 + 170.02 + 201.48 + 274.28

+ 268.05 + 276.03 + 230.21 + 0 = Rs 1,855.21 million, so NPV of Z = 1,855.21 − 850 = Rs 1,005.21 million. All three NPVs are positive, and Y's is by far the largest.

Table 3: Present Value of Inflows at 9% (Rs million)

Year	Discount factor	X: PV of inflow	Y: PV of inflow	Z: PV of inflow
1	0.9174	100.92	366.97	137.61
2	0.8417	117.84	319.84	143.09
3	0.7722	115.83	277.99	154.44
4	0.7084	113.35	276.29	170.02
5	0.6499	149.48	266.47	201.48
6	0.5963	166.95	268.32	274.28
7	0.5470	164.11	251.64	268.05
8	0.5019	30.11	215.80	276.03
9	0.4604	18.42	165.75	230.21
10	0.4224	0.00	114.05	0.00
PV of inflows		977.01	2,523.12	1,855.21
Less: capital cost		120.00	1,000.00	850.00
NPV		857.01	1,523.12	1,005.21

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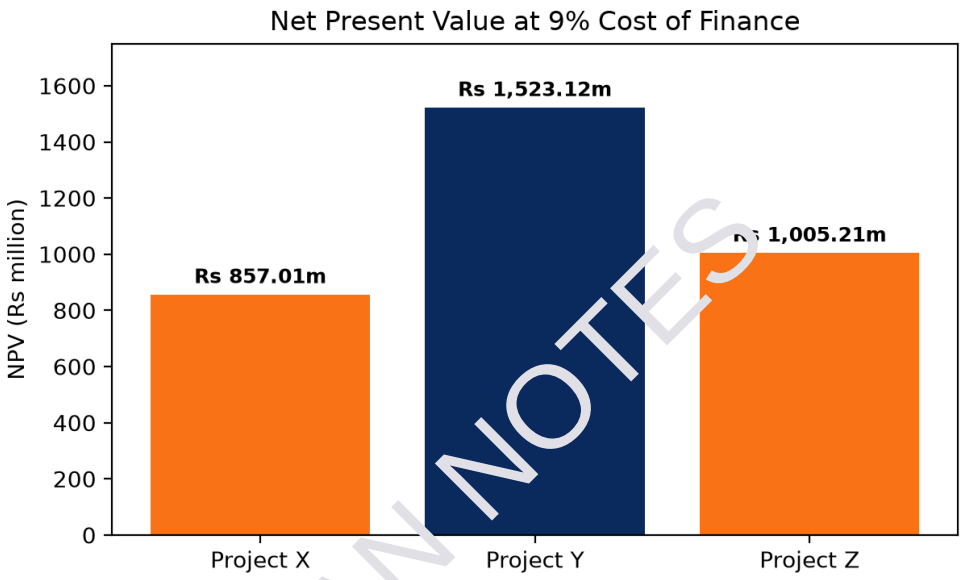


Figure 2: Net present value of each project at the 9% cost of finance.

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(c) Profitability Index

The profitability index is the present value of inflows divided by the capital cost, showing the value created per rupee invested. PI of X = 977.01 ÷ 120 = 8.14. PI of Y = 2,523.12 ÷ 1,000 = 2.52. PI of Z = 1,855.21 ÷ 850 = 2.18. Every PI exceeds 1, which is the same accept signal as a positive NPV, since the two criteria are mathematically linked. On PI, however, the ranking is reversed: X creates the most present value per rupee of capital, because its cost is so small relative to its inflows, followed by Y and then Z.

Table 4: Summary of Results

Project	Capital cost (Rs m)	Payback	PV of inflows (Rs m)	NPV (Rs m)	PI
X	120	1.07 years	977.01	857.01	8.14

Y	1,000	2.61 years	2,523.12	1,523.12	2.52
Z	850	4.29 years	1,855.21	1,005.21	2.18

(d) Recommendation

The recommendation depends on the relationship between the projects, and a good answer must state its assumption. If the projects are independent and funds are available, all three should be accepted: each has a positive NPV at the 9% cost of finance and a PI above 1, so each adds wealth to the shareholders of Haidar Textile Mills. If, as the question's phrasing 'which project should be selected' implies, only one project can be undertaken, because the projects are mutually exclusive alternatives or capital is limited to a single choice, the company should select Project Y.

The justification is that NPV is the theoretically correct criterion for choosing between mutually exclusive projects, because it measures the absolute increase in shareholders' wealth in rupees, which is the objective of financial management. Project Y adds Rs 1,523.12 million of value, roughly Rs 518 million more than Z and Rs 666 million more than X. The rival rankings from the other two techniques are misleading here because of the great difference in scale. Payback ignores all cash flows after recovery and ignores the time value of money: it crowns Project X merely because a tiny outlay is recovered quickly, while saying nothing about the modest total it creates, and it marks down Z for a slow start even though Z's later inflows are large. The profitability index, being a ratio, has the same scale blindness: X's spectacular 8.14 is earned on an investment of only Rs 120 million, and a ratio cannot tell the firm how much wealth it is

actually gaining. Choosing X on PI or payback grounds would leave most of the available value unclaimed if the projects compete for the same site, market or management capacity.

Two practical qualifications complete the recommendation. First, Project Y requires the largest outlay, Rs 1,000 million, so the board should confirm that finance of that size is genuinely available on the assumed 9% terms, and should note that Y's payback of 2.61 years is still the second fastest, so the liquidity risk of choosing Y is not severe; indeed Y dominates Z on every criterion, having a shorter payback, a higher NPV and a higher PI, so Z can be eliminated outright. Second, the analysis rests on forecast inflows, and the board should test the sensitivity of Y's NPV to lower textile demand and higher costs before committing. Subject to those checks, the calculations point one way.

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Conclusion

To conclude, the payback periods are 1.07 years for X, 2.61 years for Y and 4.29 years for Z; the NPVs at 9% are Rs 857.01 million, Rs 1,523.12 million and Rs 1,005.21 million; and the profitability indices are 8.14, 2.52 and 2.18 respectively. All three projects are acceptable in themselves, but if only one can be selected, Haidar Textile Mills Ltd. should select Project Y, because it creates the greatest absolute increase in shareholders' wealth, which is what the NPV criterion, correctly applied, measures.