INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT – SEMESTER-6

Marks

Q.2 (a) Steps of the Portfolio Management Process:

- ❏ Specification of investment objectives and constraints:
  - ◉ Objectives: current income, capital appreciation, safety of principal
  - ◉ Constraints: liquidity, time horizon, tax and other special circumstances
- ❏ Choice of Asset Mix:
  - ◉ Generally stocks and bonds
  - ◉ Stock-bond mix depends on risk tolerance and investment horizon
- ❏ Formulation of Portfolio Strategy:
  - ◉ Broad strategy types: Active portfolio strategy and passive portfolio strategy
- ❏ Selection of Securities:
  - ◉ For stocks: on the basis of fundamental analysis and technical analysis
  - ◉ For bonds: on the basis of yield-to-maturity, credit rating, term to maturity, tax shelter and liquidity
- ❏ Portfolio Execution:
  - ◉ Actual implementation of portfolio plan by buying and/or selling of securities in given amounts
- ❏ Portfolio Revision:
  - ◉ Rebalancing of portfolio to maintain its original composition (which might have changed over time due to fluctuation in asset prices
- ❏ Performance Evaluation:
  - ◉ Ensuring that the portfolio performance is commensurate with the risk and return objectives specified previously

Any three (3) points @ 1 mark each =   3

(b) Equal Weighted Index, and Value Weighted Index:

	1	2	3	4	5	6
Share	Price in Base Year (Rs.)	Price in Year "t" (Rs.)	Price Relative	No. of Outstanding Shares (in millions)	Market Capitalisation in the Base Year (1 x 4)	Market Capitalisation in Year "t" (2 x 4)
A	50	68	136	10	500	680
B	63	54	86	18	1,134	972
C	18	25	139	15	270	375
D	22	35	159	32	704	1,120
E	39	41	105	21	819	861
			625		3,427	4,008

3

The equal weighted index for year "t" is: $\dfrac{625}{5}$ = 125   1

The value weighted index for year "t" is: $\dfrac{4,008}{3,427}$ x 100 = 117   1

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(c) **(i)** Current Return:

Periodic cash flows (income) such as dividends, coupon payments or interest, generated by the investment, measured against the beginning price of investment   1

(ii) Capital Return:

Price change (appreciation or depreciation) divided by the beginning price of investment   1

(iii) Business Risk:

Holder of stocks or debentures are exposed to the risk of poor business performance which may result from management quality, regulatory environment, increased competition, emergence of new technology etc.   1

(iv) Interest Rate Risk:

Market interest rate fluctuation causes the prices of fixed income securities to fluctuate in opposite direction (rising interest rate cause the bond prices to decline and vice versa).   1

(d) **(i)** For a portfolio consisting of these two stocks to have a standard deviation of zero, the returns on the stocks must perfectly negatively correlated (i.e., the correlation must be – 1).   1

(ii) The weights that drive the standard deviation of portfolio to zero, when the returns are in perfect negative correlation, are as under:

$$\text{Weightage of Stock "A"} = w_A = \frac{\sigma_B}{\sigma_A + \sigma_B} = \frac{14}{10 + 14} = 0.583$$

$$\text{Weightage of Stock "B"} = w_B = 1 - w_A = 0.417 \qquad 1$$

The expected return of the portfolio is:

$$0.583 \times 15\% + 0.417 \times 21\% = 8.75\% + 8.76\% = 17.51\% \qquad 1$$

(e) **(i)** Covariance $(X,Y) = \rho_{XY} \times \sigma X \times \sigma Y$ 2
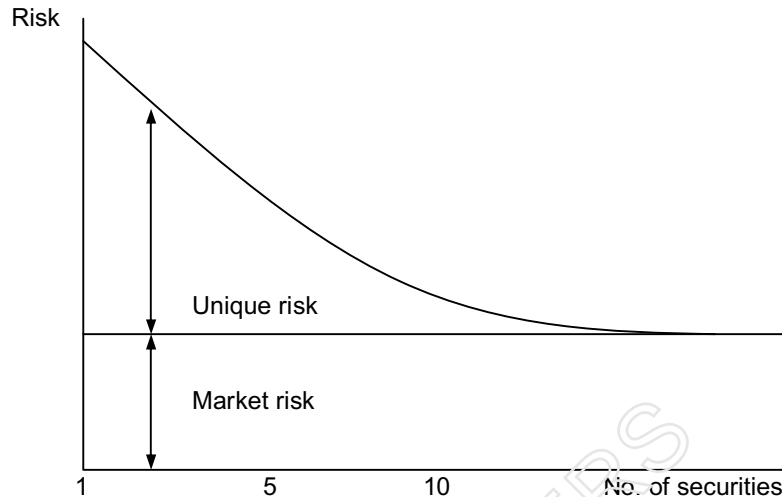
$$= 0.65 \times 15 \times 20 = 195$$

(ii) Expected Return $= 0.5 \times 27 + 0.5 \times 32 = 13.50 + 16 = 29.5\%$ 1

$$\text{Risk (standard deviation)} = [w_X^2 \sigma_X^2 + w_Y^2 \sigma_Y^2 + 2w_A w_B \, Cov(X,Y)]^{\frac{1}{2}}$$

$$= [(0.5)^2(15)^2 + (0.5)^2(20)^2 + 2(0.5)(0.5)(195)]^{\frac{1}{2}}$$

$$= [56.25 + 100 + 97.50]^{\frac{1}{2}}$$

$$= [253.75]^{\frac{1}{2}}$$

$$= 15.93\% \qquad 2$$

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Q.3 **(a)** **(i)** Graphical Relationship of Portfolio Risk with the Number of Securities:

2

(ii) Concept of Covariance and its Importance:

Covariance reflects the degree to which the returns of two securities vary or change together. A positive covariance means that the return of the two securities move in the same direction whereas a negative covariance means that the return of the two securities move in the opposite direction. Using this relationship in price movements, a portfolio may be constructed to yield maximum return for a given level of combined price fluctuation, or in other words, risk.   2

(iii) Total Risk:

Total Risk = Unique Risk + Market Risk   1

Unique risk is diversifiable by combining multiple securities in a portfolio while considering their inter-relationship.   ½

Market Risk cannot be diversified as it arises from economy wide factors such as GDP growth, inflation, interest rate structure etc.   ½

(b) **(i)** Calculation of Expected Returns and Standard Deviation:

E(PLC)	$= [0.3 \times 5] + [0.4 \times 18] + [0.3 \times 30]$	$=$	**17.7**	½
E(Set Cement)	$= [0.3 \times 15] + [0.4 \times 8] + [0.3 \times 12]$		**11.3**	½
E(Fine Corporation)	$= [0.3 \times (-)10] + [0.4 \times 16] + [0.3 \times 24]$		**10.6**	½
E(KSE)	$= [0.3 \times (-)2] + [0.4 \times 17] + [0.3 \times 26]$	$=$	**14**	½

σ_{PLC} $= [0.3(5 - 17.7)^2 + 0.4(18 - 17.7)^2 + 0.3(30 - 17.7)^2]^{1/2}$

$= [48.4 + 0.1 + 45.4]^{1/2}$ $=$ **9.7**   1

$\sigma_{Set\ Cement}$ $= [0.3(15-11.3)^2 + 0.4(8-11.3)^2 + 0.3(12-11.3)^2]^{1/2}$

$= [4.11 + 4.36 + 0.15]^{1/2}$ $=$ **2.94**   1

$\sigma_{Fine\ Corporation}$ $= [0.3(-10 - 10.6)^2 + 0.4(16 - 10.6)^2 + 0.3(24 - 10.6)^2]^{1/2}$

$= [127.31 + 11.66 + 53.87]^{1/2}$ $=$ **13.89**   1

σ_{KSE} $= [0.3(-2-14)^2 + 0.4(17-14)^2 + 0.3(26-14)^2]^{1/2}$

$= [76.8 + 3.6 + 43.2]^{1/2}$ $=$ **11.1**   1

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(ii) Determining Overpricing and Under-pricing Using CAPM:

β_{PLC} = 1.7 β_{Set} = 0.8 $\beta_{Fine\ Corporation}$ = 1.36 $E(R_{KSE})$ = 14 R_f =7%

Security market line (SML)	= 7 + (14 –7) x Beta
	= 7 + 7 x Beta

Required return on PLC	= 7 + (7 x 1.7)	= **18.9%**	½
Required return on Set Cement	= 7 + (7 x 0.8)	= **12.6%**	½
Required return on Fine Corporation = 7 + (7 x 1.36)		= **16.5%**	½

As the expected return of 17.7 % on PLC is less than the required return of 18.9%, it indicates that its market price should come down. So it is slightly overvalued.   ½

In the case of Set Cement stock, as the expected return of 11.3% is again less than the required return of 12.6%, it indicates that its market price should come down. So it is also slightly overvalued.   ½

In the case of Fine Corporation the expected return is 10.6% against the required return of 16.5%. So it is considerably overvalued and the market price is likely to come down.   ½

(c) Intrinsic Value of ABN Limited's Equity Share:

g_1 = 15%, g_2 = 9%, n = 3 yrs, r = 17%   ½

D_1 = 15 (1.15) = Rs. 17.25

$$P_0 = D_1 \left[\frac{1 - \left[\frac{1 + g_1}{1 + r}\right]^n}{r - g_1} + \frac{D_1 (1 + g_1)^{n-1} (1 + g_2)}{r - g_2} \times \frac{1}{(1 + r)^n} \right]$$ 1.5

$$= 4.72 \left[\frac{1 - \left[\frac{1.15}{1.17}\right]^3}{0.17 - 0.15} \right] + \frac{17.25 (1.15)^2 (1.09)}{0.17 - 0.09} \times \frac{1}{(1.17)^3}$$

= [4.72 (0.0504 ÷ 0.02)] + [310.83 x 0.624]

= 11.89 + 193.96

= Rs. 205.85   1

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Q.4 (a) (i) Forecasting the Free Cash Flows (FCF):

Rs. 'Million'

Year	1	2	3	4	5	6
Asset value (beginning)	750.00	975.00	1,267.50	1,647.75	1944.35	2,294.33
Net operating profit after tax (NOPAT)	135.00	175.50	228.15	296.60	349.98	412.98
Net investment	225.00	292.50	380.25	296.60	349.98	229.43
FCF	(90.00)	(117.00)	(152.10)	—	—	183.55
Growth rate (%)	30	30	30	20	20	10

(ii) The weighted average cost of capital is:

WACC = (2/3) x 24 + (1/3) x 10 (1-0.34) = 18.2%   1

(iii) The weighted average cost of capital is:

The horizon value of the firm = (183.55 x 1.10)/(0.182-0.10) = **Rs. 2,462.26 million**   1

(iv) The enterprise value is:

$$EV = \frac{90.00}{(1.182)} - \frac{117}{(1.182)^2} - \frac{152.1}{(1.182)^3} + \frac{0}{(1.182)4}$$

$$+ \frac{0}{(1.182)^5} + \frac{183.55}{(1.182)^6} + \frac{2462.26}{(1.182)^6} \quad = \textbf{Rs. 718.19 million} \quad 1$$

(v) The equity value is:

Enterprise value – debt value   =   718.19 – 250.0   = **Rs. 468.19 million**   1

(vi) The value per share is:

Rs. 468.19/20 million   = **Rs. 23.41**   1

(b) Arguments Against Technical Analysis:

▢ There is no convincing explanation of the tools employed in technical analysis.

▢ Empirical evidence in favour of random walk hypothesis raises questions on the usefulness of technical analysis.

▢ By the time an upward or downward trend may have been signalled by technical analysis, it may already have happened.

▢ As more and more people employ technical analysis, its effectiveness declines. (self-defeating proposition).

▢ The numerous claims that have been made for different chart patterns are simply untested assertions.

▢ The same technical chart may be interpreted differently by different analysts hence there is a lack of standard analysis framework.

Any three (3) points @ 1 mark each =   3

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(c) **(i)** Approximate Yield to Maintain (YTM):

$$YTM \sim \frac{120 + (1,000 - 1040)/5}{0.6 \times 1,040 + 0.4 \times 1,000} = \frac{112}{1,024} \qquad = 10.94\%$$ 2

(ii) Realised YTM:

The terminal value will be

120 x FVIFA (7%, 5yrs) + 1,000   =   120 x 5.751 + 1,000 = 1,690.12   1.5

The realised YTM will be:

$$\left[\frac{1,690.12}{1,040}\right]^{1/5} - 1 \qquad = 1.10198 - 1 \qquad = 10.2\%$$ 1.5

(d) **(i)** Yield to Maturity:

Yield to maturity of Pakistan Investment Bond, PIB-1, using the approximate formula, is:

$$\frac{130 + (1,000 - 950)/3}{0.4 \times 1,000 + 0.6 \times 950} = \frac{146.67}{970} \qquad = 15.12\%$$ 2

(ii) Duration of Bond:

Duration of PIB-1 is calculated as under:

Year	Cash Flow	Present Value Factor at 15.12%	Proportion of the Bond's Value	Proportion of the Bond's Value x Time
1	130	112.93	0.1187	0.1187
2	130	98.10	0.1030	0.2060
3	1,130	740.72	0.7783	2.3349
	Sum =	951.75	Duration =	2.6596

        1   +   1   +   1   =   3

(iii) Volatility:

Volatility of PIB-1 = Duration of PIB-1 ÷ (1 + YTM of PIB-1)
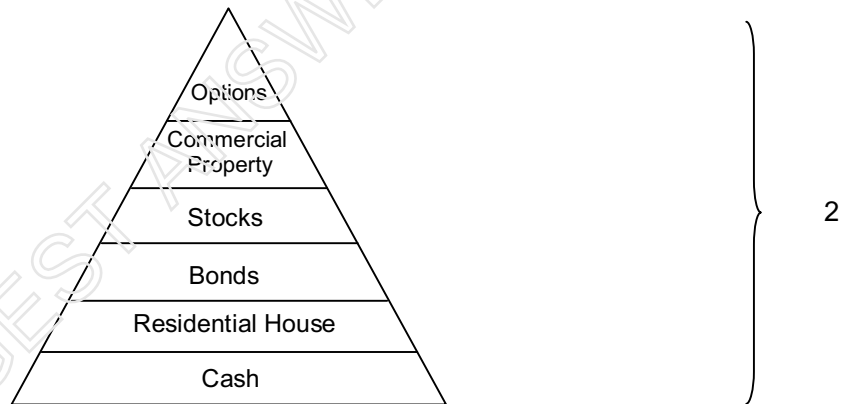
$$\frac{2.6596}{(1.1512)} \qquad = \qquad 2.31$$ 1

(e) Concept of Immunization in Bond Portfolio Management:

- Immunization is a hybrid strategy

- Interest rate risk in bonds may be explained by two parts; price risk and reinvestment risk

- Price risk stems from the relationship of bond price with market interest rates whereas reinvestment risk arises from the rate at which future cash flows from bonds may be invested again

- Price risk and reinvestment risk move in opposite direction

- Immunization strategy targets to equalize the price risk and reinvestment risk so that the total value of the investment may be preserved

- For immunization, the investor must select the bonds whose duration is equal to the investor's own investment horizon

Six (6) points @ ½ mark each =   3

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Q.5 (a) Heuristic-Driven Biases:

- Representativeness:
  Tendency to form judgments based on stereotypes — 1
- Overconfidence:
  Tendency to overestimate the accuracy of forecasts — 1
- Anchoring:
  Reluctance to revise opinions even in the presence of relevant new information — 1
- Aversion to ambiguity:
  Preference to familiar stocks, aversion from unfamiliar stocks — 1
- Innumeracy:
  Difficulty with numbers leading to formation of opinion based on inadequate analysis — 1

Indicating all biases = 1
Five (5) brief explanations @ 1 mark each = 5

6

(b) Behavioural portfolio pyramid:

Pyramid from top to bottom: Options, Commercial Property, Stocks, Bonds, Residential House, Cash — 2

(c) (i) Calls with strike prices 360 and 380 are out-of-the-money. — 2

(ii) Relative Pros and Cons:

- If the firm sells Feb/380 call on 5000 shares, it will earn a call premium of Rs. 25,000 now. The risk however is that the firm will forfeit the gains that it would have enjoyed if the share price rises above Rs. 380. — 1
- If the firm sells March/320 calls on 5,000 shares, it will earn a call premium of Rs. 215,000 now. It would however forfeit the gains if the share price remains above Rs. 320. — 1

(iii) Maximum Associated Profit:

Maximum profit	= Profit from lower strike call (March/340) − Profit from higher strike call (March/360)	
Profit from March/340 call	= Spot price − Strike Price − Price of Call	
	= 350 − 340 − 21 = −11	½
Profit from March/360 call	= Spot price − Strike Price − Price of Call	
	= 350 − 360 − 16 = −26	½
Maximum profit	= −11 − (−26)	
	= 15	1

Marks

(iv) Implications for the Firm:

If the stock price goes below Rs. 320, the firm can execute the put option and ensure that its portfolio value does not go below Rs. 320 per share. However, if stock price goes above Rs. 380, the call will be exercised and the stocks in the portfolio will have to be delivered/ sold to meet the obligation, thus limiting the upper value of the portfolio to Rs. 380 per share. So long as the share price hovers between Rs. 320 and Rs. 380, the firm will lose Re.1 (net premium received) per pair of call and put.   2

Q.6 (a) Difference between active portfolio management and passive portfolio management:

Active Management	Passive Management
▫ Attempts to beat benchmark performance	▫ Attempts to match benchmark performance
▫ Contends pricing inefficiencies in the market create investing opportunities	▫ Contends that it is difficult or impossible to "beat the market"
▫ Securities selected by portfolio manager	▫ Securities selected based on an index
▫ Focuses on choice of specific securities and timing of trades	▫ Focuses on overall sector or asset class
▫ Trading and the degree of liquidity for individual securities may increase portfolio costs	▫ Infrequent trading tends to minimize portfolio expenses

Any two (2) differences @ 1 mark each =   2

(b) (i) Treynor Measure:

$$\text{Treynor Measure} = \frac{\overline{R}_p - R_f}{\beta_p}$$ ½

$$\text{Fund-A} = \frac{25 - 10}{1.7} = 8.82$$ ½

$$\text{Fund-B} = \frac{19 - 10}{0.9} = 10.00$$ ½

$$\text{KSE-100} = \frac{16 - 10}{1.0} = 6.00$$ ½

(ii) Sharpe Ratio:

$$\text{Sharpe Measure} = \frac{R_p - R_f}{\sigma_p}$$ ½

$$\text{Fund-A} = \frac{25 - 10}{20} = 0.75$$ ½

$$\text{Fund-B} = \frac{19 - 10}{12} = 0.75$$ ½

$$\text{KSE-100} = \frac{16 - 10}{10} = 0.60$$ ½

(iii) Jensen Measure:

Jensen Measure:	$\overline{R}_p - [R_f + \beta_p (R_M - R_f)]$			½
Fund-A:	25 – [10 + 1.7 (16-10)]	= 25 – 20.2	= 4.8	½
Fund-B:	19 – [10 + 0.9 (16-10)]	= 19 – 15.4	= 3.6	½
KSE-100:	0 (By definition)			½

THE END