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Revision

CA Final

STRATEGIC FINANCIAL MANAGEMENT

May 2021

FINAL CA

PORTFOLIO MANAGEMENT

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Chapter 5 : PORTFOLIO MANAGEMENT

CHAPTER INDEX

1. INTRODUCTION

1. Meaning of Portfolio Management:

Investment in the securities such as bonds, debentures and shares etc. is lucrative as well as exciting for the investors. Though investment in these securities may be rewarding, it is also fraught with risk. Therefore, investment in these securities requires a good amount of scientific and analytical skill. As per the famous principle of not putting all eggs in the same basket, an investor never invests his entire investable funds in one security. He invests in a well - diversified portfolio of a number of securities which will optimize the overall risk-return profile. Investment in a portfolio can reduce risk without diluting the returns. An investor, who is expert in portfolio analysis, may be able to generate trading profits on a sustained basis.

Every investment is characterized by return and risk. The concept of risk is intuitively understood by investors. In general, it refers to the possibility of the rate of return from a security or a portfolio of securities deviating from the corresponding expected/ average rate and can be measured by the standard deviation/variance of the rate of return.

2. Activities in Portfolio Management:

The following three major activities are involved in the formation of an Optimal Portfolio suitable for any given investor:

(a) Selection of securities.

(b) Construction of all Feasible Portfolios with the help of the selected securities.

(c) Deciding the weights/proportions of the different constituent securities in the portfolio so that it is an Optimal Portfolio for the concerned investor.

The activities are directed to achieve an Optimal Portfolio of investments commensurate with the risk appetite of the investor.

3. Some of the important objectives of portfolio management are:

(i) Security/Safety of Principal: Security not only involves keeping the principal sum intact but also its purchasing power.

(ii) Stability of Income: To facilitate planning more accurately and systematically the reinvestment or consumption of income.

(iii) Capital Growth: It can be attained by reinvesting in growth securities or through purchase of growth securities.

(iv) Marketability i.e. the case with which a security can be bought or sold: This is essential for providing flexibility to investment portfolio.

(v) Liquidity i.e. nearness to money: It is desirable for the investor so as to take advantage of attractive opportunities upcoming in the market.

(vi) Diversification: The basic objective of building a portfolio is to reduce the risk of loss of capital and/or income by investing in various types of securities and over a wide range of industries.

(vii) Favorable Tax Status: The effective yield an investor gets from his investment depends on tax to which it is subjected to. By minimising the tax burden, yield can be effectively improved.

4. Phases of Portfolio Management:

Portfolio management is a process and broadly it involves following five phases and each phase is an integral part of the whole process and the success of portfolio management depends upon the efficiency in carrying out each of these phases.

1. Security Analysis:

The securities available to an investor for investment are numerous in number and of various types. The securities are normally classified on the basis of ownership of securities such as equity shares, preference shares, debentures and bonds, In recent times a number of new securities with innovative features are available in the market e.g. Convertible Debentures, Deep Discount Bonds, Zero Coupon Bonds, Flexi Bonds, Floating Rate Bonds, Global Depository Receipts, Euro-currency Bonds, etc. are some examples of these new securities. Among

this vast group of securities, an investor has to choose those ones which he considers worthwhile to be included in his investment portfolio. This requires a detailed analysis of the all securities available for making investment.

Security analysis constitutes the initial phase of the portfolio formation process and consists in examining the risk-return characteristics of individual securities and also the correlation among them. A simple strategy in securities investment is to buy underpriced securities and sell overpriced securities. But the basic problem is how to identify underpriced and overpriced securities and this is what security analysis is all about.

As discussed in the chapter of Security Analysis, there are two alternative approaches to analyse any security viz. fundamental analysis and technical analysis. They are based on different premises and follow different techniques. Fundamental analysis, the older of the two approaches, concentrates on the fundamental factors affecting the company such as:

- the EPS of the company,
- the dividend pay-out ratio,
- the competition faced by the company,
- the market share, quality of management, etc.
- fundamental factors affecting the industry to which the company belongs.

The fundamental analyst compares this intrinsic value (true worth of a security based on its fundamentals) with the current market price. If the current market price is higher than the intrinsic value, the share is said to be overpriced and vice versa. This mispricing of securities gives an opportunity to the investor to acquire the share or sell off the share profitably. An intelligent investor would buy those securities which are underpriced and sell those securities which are overpriced. Thus it can be said that fundamental analysis helps to identify fundamentally strong companies whose shares are worthy to be included in the investor's portfolio.

The second approach to security analysis is 'Technical Analysis'. As per this approach the share price movements are systematic and exhibit certain consistent patterns. Therefore, properly studied past movements in the prices of shares

help to identify trends and patterns in security prices and efforts are made to predict the future price movements by looking at the patterns of the immediate past. Thus Technical analyst concentrates more on price movements and ignores the fundamentals of the shares.

In order to construct well diversified portfolios, so that Unsystematic Risk can be eliminated or substantially mitigated, an investor will like to select securities across diverse industry sectors which should not have strong positive correlation among themselves.

The efficient market hypothesis holds that-share price movements are random and not systematic. Consequently, neither fundamental analysis nor technical analysis is of value in generating trading gains on a sustained basis. The EMH thus does not subscribe to the belief that it is possible to book gains in the long term on a sustained basis from trading in the stock market. Markets, though becoming increasingly efficient everywhere with the passage of time, are never perfectly efficient. So, there are opportunities all the time although their durations are decreasing and only the smart investors can look forward to booking gains consistently out of stock market deals.

2. Portfolio Analysis

Once the securities for investment have been identified, the next step is to combine these to form a suitable portfolio. Each such portfolio has its own specific risk and return characteristics which are not just the aggregates of the characteristics of the individual securities constituting it. The return and risk of each portfolio can be computed mathematically based on the risk-return profiles for the constituent securities and the pair-wise correlations among them.

From any chosen set of securities, an indefinitely large number of portfolios can be constructed by varying the fractions of the total investable resources allocated to each one of them. All such portfolios that can be constructed out of the set of chosen securities are termed as Feasible Portfolios.

3. Portfolio Selection

The goal of a rational investor is to identify the Efficient Portfolios out of the

whole set of Feasible Portfolios mentioned above and then to zero in on the Optimal Portfolio suiting his risk appetite. An Efficient Portfolio has the highest return among all Feasible Portfolios having identical Risk and has the lowest Risk among all Feasible Portfolios having identical Return. Harry Markowitz's portfolio theory (Modern Portfolio Theory) outlines the methodology for locating the Optimal Portfolio for an investor (unlike the CAPM, the Optimal Portfolio as per Markowitz Theory is investor specific).

4. Portfolio Revision

Once an optimal portfolio has been constructed, it becomes necessary for the investor to constantly monitor the portfolio to ensure that it does not lose it optimality. Since the economy and financial markets are dynamic in nature, changes take place in these variables almost on a daily basis and securities which were once attractive may cease to be so with the passage of time. New securities with expectations of high returns and low risk may emerge. In light of these developments in the market, the investor now has to revise his portfolio. This revision leads to addition (purchase) of some new securities and deletion (sale) of some of the existing securities from the portfolio. The nature of securities and their proportion in the portfolio changes as a result of the revision.

This portfolio revision may also be necessitated by some investor-related changes such as availability of additional funds for investment, change in risk appetite, need of cash for other alternative use, etc.

Portfolio revision is not a casual process to be taken lightly and needs to be carried out with care, scientifically and objectively so as to ensure the optimality of the revised portfolio. Hence, in the entire process of portfolio management, portfolio revision is as important as portfolio analysis and selection.

5. Portfolio Evaluation

This process is concerned with assessing the performance of the portfolio over a selected period of time in terms of return and risk and it involves quantitative measurement of actual return realized and the risk borne by the portfolio over the period of investment. The objective of constructing a portfolio and revising it periodically is to maintain its optimal risk return characteristics. Various types of alternative measures of performance evaluation have been developed for use

by investors and portfolio managers.

This step provides a mechanism for identifying weaknesses in the investment process and for improving these deficient areas.

It should however be noted that the portfolio management process is an ongoing process. It starts with security analysis, proceeds to portfolio construction, and continues with portfolio -revision and end with portfolio evaluation. Superior performance is achieved through continual refinement of portfolio management skill.

PRACTICAL PROBLEMS

Q.1. ABC Ltd., has the following dividend per share and the market price per share for the period 2000- 2005:

Year	Dividend per share (₹)	Market Price
2000	1.53	31.25
2001	1.53	20.75
2002	1.53	30.88
2003	2.00	67.00
2004	2.00	100.00
2005	3.00	154.00

Calculate the annual rate of returns for 5 years.

How risky is the share?

Q.2. A portfolio consists of 3 securities A, B & C with the following relevant information:

	A	B	C
Expected Returns (%)	27	24	22
Standard deviation (%)	33	28	26

Correlation Coefficient between:

A & B	0.20
B & C	0.32
A & C	0.50

If the weights of securities is equal, find out the risk & expected return of the portfolio.

Q.3.

State of Economy	Probability	A's Return	B's Return
Boom	0.2	30%	10%
Normal	0.6	20%	20%
Recession	0.2	10%	30%

(i) What is expected return of securities A and B?

What is the risk attached to securities A and B?

(ii) Calculate risk and return of portfolio consisting of:

(a) 50% of A & 50% of B (b) 60% of A & 40% of B.

Q.4. The general rate of return which is considered risk free is 7%. The standard deviation of the market portfolio is 18% with mean return of 12%. What should be the standard deviation and mean return for an investor who has invested all his wealth only in risk free asset? What will be your answer if the investment in risk free assets and in market portfolio is in the ratio of 80 : 20? If the investor has invested the entire wealth plus 25% of net wealth by borrowing in the market portfolio, then what will be the result?

Q.5. Suppose Mr. X in a world there are only two assets, gold and stocks. He is interested in investing his money in one, the other or both assets. Consequently he collects the following data on the returns on the two assets over the last six years.

	Gold	Stock Market
Average return	8%	20%
Standard deviation	25%	22%
Correlation	----	-0.4

(a) Mr. X is constrained to pick just one, which one he would choose?

(b) Mr. Y, a friend of Mr. X argues that this is wrong. He says that Mr. X is ignoring the big payoffs that he can get on gold. How would Mr. X go about alleviating his concern?

(c) How would a portfolio composed to equal proportions in gold and stocks do in terms of mean and variance?

(d) Mr. X came to know that GPEC (a cartel of gold - producing countries) is going to vary the amount of gold it produces with stock prices in the country. (GPEC will produce less gold when stock markets are up and more when it is down). What effect will this have on his portfolios? Explain.

Q.6. X Co., Ltd., invested on 1.4.2005 in certain equity shares as below

Name of Co.	No. of Shares	Cost (₹)
M Ltd.	1,000 (₹ 100 each)	2,00,000
N Ltd.	500 (₹ 10 each)	1,50,000

M Ltd. 1,000 (₹ 100 each) 2,00,000

In September, 2005, 10% dividend was paid out by M Ltd. and in October, 2005, 30% dividend paid out by N Ltd. On 31.3.2006 market quotations showed a value of ₹ 220 and ₹ 290 per share of M Ltd. and N Ltd. respectively.

On 1.4.2006, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.3.2007 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2007 are as below:

Probability factor	Price / Share of M Ltd.	Price / Share of N Ltd.
0.2	220	290
0.5	250	310
0.3	280	330

You are required to:

(i) Calculate the average return from the portfolio for the year ended 31.3.2006;

(ii) Calculate the expected average return from the portfolio for the year 2006-07; and

(iii) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each cases.

Q.7. (May 17 – 8 marks)

A stock costing ₹ 150 pays no dividends. The possible prices that the stock might sell for at the end of the year with the respective probabilities are:

Price	Probability
130	0.2
150	0.1
160	0.1
165	0.3
175	0.1
180	0.2

Required:

(i) Calculate the expected return.

(ii) Calculate the Standard deviation of returns.

Q.8. (May 18 – New Course – 10 marks)

Consider the following information on two stocks, A and B :

Year	Return on A (%)	Return on B (%)
2016	10	12
2017	16	18

You are required to determine:

(i) The expected return on a portfolio containing A and B in the proportion of 40% and60% respectively.

(ii) The Standard Deviation of return from each of the two stocks.

(iii) The covariance of returns from the two stocks.

(iv) Correlation coefficient between the returns of the two stocks.

(v) The risk of a portfolio containing A and B in the proportion of 40% and 60%.

2. CAPITAL ASSET PRICING MODEL

(William Sharpe)

1. Meaning

The CAPM distinguishes between risk of holding a single asset and holding a portfolio of assets. There is a trade off between risk and return. Modern portfolio theory concentrates on risk and stresses on risk management rather than on return management. Risk may be security risk involving danger of loss of return from an investment in a single financial or capital asset. Security risk differs from portfolio risk, which is the probability of loss from investment in a portfolio of assets. Portfolio risk is comprised of unsystematic risk and systematic risk. Unsystematic risks can be averted through diversification and is related to random variables. Systematic risk is market related component of portfolio risk. It is commonly measured by regression coefficient Beta or the Beta coefficient. Low Beta reflects low risk and high Beta reflects high risk.

As the unsystematic risk can be diversified by building a portfolio, the relevant risk is the non-diversifiable component of the total risk. As mentioned earlier, it can be measured by using Beta (β) a statistical parameter which measures the market sensitivity of returns. The beta for the market is equal to 1.0. Beta explains the systematic relationship between the return on a security and the return on the market by using a simple linear regression equation. The return on a security is taken as a dependent variable and the return on market is taken as independent variable then $Rj = Rf + \beta (Rm - Rf)$. The beta parameter β in this William Sharpe model represents the slope of the above regression relationship and measures the sensitivity or responsiveness of the security returns to the general market returns.

The portfolio beta is merely the weighted average of the betas of individual securities included in the portfolio.

$$\beta p = W_A \beta_A + W_B \beta B + W_C \beta c + ...+ W_n \beta_n$$

CAPM provides a conceptual framework for evaluating any investment decision where capital is committed with a goal of producing future returns. CAPM is based on certain assumptions to provide conceptual framework for evaluating risk and return. Some of the important assumptions are discussed below:

(i) Efficient market: It is the first assumption of CAPM. Efficient market refers to the existence of competitive market where financial securities and capital assets are bought and sold with full information of risk and return available to all participants. In an efficient market, the price of individual assets will reflect a real or intrinsic value of a share as the market prices will adjust quickly to any new situation, John J. Hampton has remarked in "Financial decision making" that although efficient capital market is not much relevant to capital budgeting decisions, but CAPM would be useful to evaluate capital budgeting proposal because the company can compare risk and return to be obtained by investment in machinery with risk and return from investment in securities.

(ii) Rational investment goals: Investors desire higher return for any acceptable level of risk or the lowest risk for any desired level of return. Such a rational choice is made on logical and consistent ranking of proposals in order of preference for higher good to lower good and this is the scale of the marginal efficiency of capital. Beside, trans active preferences and certainty equivalents are other parameters of rational choice.

(iii) Risk aversion in efficient market is adhered to although at times risk seeking behavior is adopted for gains

(iv) CAPM assumes that all assets are divisible and liquid assets.

(v) Investors are able to borrow freely at a risk less rate of interest i.e. borrowings can fetch equal return by investing in safe Government securities.

(vi) Securities can be exchanged without payment of brokerage, commissions or taxes and without any transaction cost.

(vii) Securities or capital assets face no bankruptcy or insolvency.

Based on above assumptions the CAPM is developed with the main goal to formulate the return required by investors from a single investment or a portfolio of assets. The required rate of return is defined as the minimum expected return needed so that investors will purchase and hold an asset.

Risk and return relationship in this model stipulates higher return for higher level of risk and vice versa. However, there may be exception to this general rule where markets are not efficient.

Three aspects are worth consideration:

(a) Stock market is not concerned with diversifiable risk

(b) It is not concerned with an investor having a diversified portfolio

(c) Compensation paid is restricted to non-diversifiable risk.

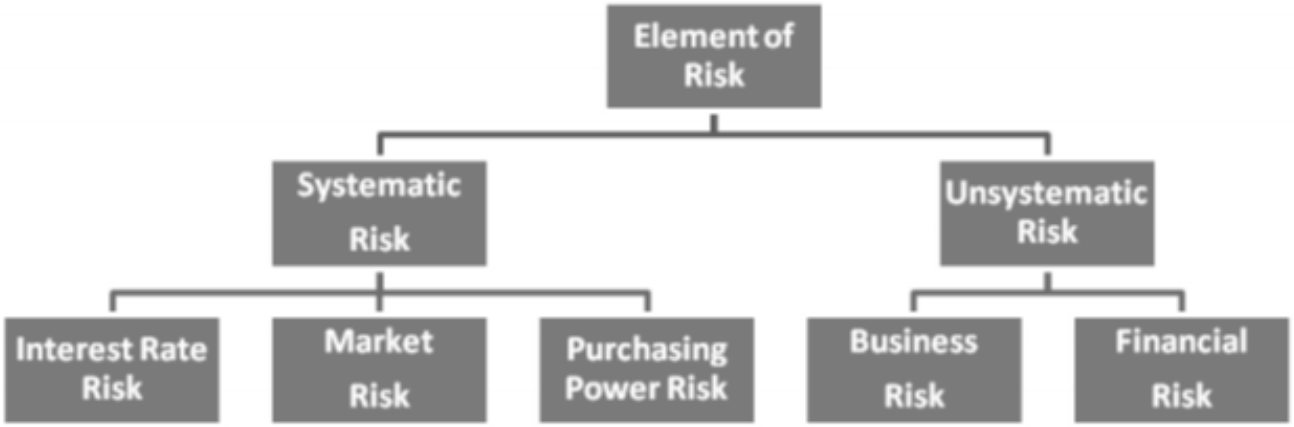
Thus an investor has to look into the non-diversifiable portion of risk on one side and returns on the other side. To establish a link between the two, the required return one expects to get for a given level of risk has been mandated by the Capital Asset Pricing Model.

If the risk free investment Rf is 5%, an investor can earn this return of 5% by investing in risk free investment. Again if the stock market earns a rate of return Rm which is 15% then an investor investing in stocks constituting the stock market index will earn also 15%. Thus the excess return earned over and above the risk free return is called the risk premium (Rm – Rf) ie (15% - 5%) = 10% which is the reward for undertaking risk, So, if an investment is as risky as the stock market, the risk premium to be earned is 10%.

If an investment is 30% riskier than the stock market, it would carry risk premium i.e. 30% more than the risk premium of the stock market i.e. 10% + 30% of 10% = 10% + 3% = 13%. β identifies how much more risky is an investment with reference to the stock market. Hence the risk premium that a stock should earn is β times the risk premium from the market [β × (Rm – Rf)]. The total return from an investment is the risk free rate of return plus the risk premium. So the required return from a stock would be Rj = Rf + [β × (Rm – Rf)]. In the above example 5% + 1.3 × (15-5) = 18%

The risk premium on a stock varies in direct proportion to its Beta. If the market risk premium is 6% and β of a stock is 1.2 then the risk premium for that stock is 7.2% (6% × 1.2) where (Rm – Rf) = 6% and β =1.2

2. Systematic risk & Unsystematic risk



Systematic Risk	Unsystematic Risk
1. It is also known as Market Risk	1. It is known as specific or unique risk.
2. It affects all securities across the market.	2. It affects a particular security only.
3. It cannot be eliminated by process of diversification	3. It can be reduced or eliminated by diversification
4. Market only compensates for systematic risk.	4. Market does not compensate for unsystematic risk.
5. Example: Interest rate risk, inflation rate risk, GDP risk, etc	5. Example: Labour unrest, fire, raw material shortage, etc.

3. Calculation of Systematic Risk:

It can be calculated with the following formula:

β_A X σm

or

β_A^2 X σm^2

or

Co efficient of determination X σ_A^2

Calculation of Un - Systematic Risk:

Total Risk = Systematic Risk + Unsystematic Risk

Unsystematic Risk = Total Risk – Systematic Risk.

PRACTICAL PROBLEMS

Q.9. As an investment manager you are given the following information:

Investment in equity shares of	Initial price (₹)	Dividends (₹)	Market price at the end of the year (₹)	Beta risk factor
A. Cement Ltd.	25	2	50	0.8
Steel Ltd.	35	2	60	0.7
Liquor Ltd.	45	2	135	0.5
B. Government of India Bonds	1,000	140	1,005	0.99

Risk free return. may be taken at 14%

You are required to calculate :

(i) Expected rate of returns of portfolio in each case using Capital Asset Pricing Model (CAPM).

(ii) Average return of portfolio.

Q.10. Nisha Ltd. has substantial cash flow and until the surplus funds are utilised to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short - term equity investments, details for which are given below:

Investment	No. of shares	Beta	Market price per share	Expected yield
I	60,000	1.16	4.29	19.50%
II	80,000	2.28	2.92	24.00%
III	1,00,000	0.90	2.17	17.50%
IV	1,25,000	1.50	3.14	23.00%

The current market return is 19% and the risk free rate is 11%.

Required to:

(i) Calculate the risk of Nisha's short - term investment portfolio relatives to that of the market;

(ii) Whether Nisha should change the composition of its portfolio.

Q.11 (Nov 19 – New Course – 8 marks)

Mr X holds the following securities:

Your client is holding the following securities:

Particulars of Securities	Cost ₹	Dividends ₹	Market Price ₹	BETA
Co. X	16,000	1600	16,400	0.9
Co. Y	20,000	1600	21,000	0.8
Co. Z	32,000	1600	44,000	0.6
PSU Bonds	68,000	6,800	64,600	0.4

Assuming a Risk-free rate of 12%, calculate:

– Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).

– Average return of the portfolio.

3. SECURITY MARKET LINE

A graphical representation of CAPM is the Security Market Line, (SML). This line indicates the rate of return required to compensate at a given level of risk. Plotting required return on Y axis and Beta on the X-axis we get an upward sloping line which is given by ($R_m - R_f$), the risk premium.

The higher the Beta value of a security, higher would be the risk premium relative to the market. This upward sloping line is called the Security Market Line. It measures the relationship between systematic risk and return.

If yield as per other calculations = Yield as per CAPM, then it will be plotted on the Security Market Line and hence market value = Intrinsic Value. (Buy or Hold)

If yield as per other calculations > Yield as per CAPM, then it will be plotted above the Security Market Line and hence market value < Intrinsic Value. (Buy because shares are undervalued)

If yield as per other calculations < Yield as per CAPM, then it will be plotted under the Security Market Line and hence market value > Intrinsic Value. (Sell because shares are overvalued)

PRACTICAL PROBLEMS

Q.12. The following data relate to two securities, A and B.

	A	B
Expected Return	22%	17%
Beta Factor (b)	1.5	0.7

Assume : I_{RF} = 10% and R_M = 18%.

Find out whether the securities, A and B are correctly priced ? Also show the graphic presentation of the above situation.

Q.13. You are presented with the following information concerning the returns on the shares of C Ltd. and on the market portfolio, according to the various conditions of the economy.

Condition of economy	Probability of condition occurring	Return on C Ltd.	Return on the market
1	0.2	15%	10%
2	0.4	14%	16%
3	0.4	26%	24%

The current risk - free interest rate is 9 per cent.

Required:

(a) Calculate the coefficient of correlation between the returns on C Ltd. and the market portfolio.

(b) Calculate the total risk (i.e., standard deviation) of C Ltd. and discuss why this is not the most appropriate measure of risk to be used in making investment decisions.

(c) Calculate the beta factor for C Ltd. and briefly discuss its significance. Is C Ltd. efficiently priced according to the CAPM and the information given above?

Q.14. You have invested in four securities (A, B, C and D), the following sums :

A : ₹ 10,000 ; B : ₹ 20,000 ; C : ₹ 16,000 ; D : ₹ 14,000.

The values of the securities are 0.80, 1.20, 1.40 and 1.75 respectively. If the risk free return is 4.25% and the market return is 11%, what is the expected return on the portfolio? If you encash your Investment in security B and reinvest the funds in RBI Bonds yielding a return of 4.25%, what is the of the portfolio and its expected return?

Q.15. The following information is available in respect of security X and Y.

Security	B	Expected Return
X	1.8	22.00%
Y	1.6	20.40%

If the risk free rate is 7%, are these securities correctly priced ? What would the risk free rate has to be if they are correctly priced?

4. ARBITRAGE PRICING THEORY

Arbitrage pricing theory (APT) is used as an alternative to Capital Assets Pricing Model (CAPM). While the CAPM formula helps to calculate the market's expected return, APT uses the risky asset's expected return and the risk premium of a number of macroeconomic factors.

In the 1970's Mr. Stephen Alan Ross, professor and economist, introduced the concept of 'multiple factors' that can influence the risk component – motley of 'macro-economic factors'. So, the basic idea is to breakdown risks into individual identifiable elements that influence the overall risk in a proportion (called 'factor'), and each factor gets assigned its own beta; and the sum total of all the assets' 'sensitivities' to 'n' factors will give the 'expected rate of return for the asset'.

In a simplistic way, if a particular asset, say a stock, has its major influencers as the 'interest rate fluctuations' and the 'sectoral growth rate', then the stocks' return would be calculated by using the Arbitrage Pricing Theory (APT) in the following manner:

a) Calculate the risk premium for both these two risk factors (beta for the risk factor 1 – interest rate, and beta of the risk factor 2 – sector growth rate; and,

b) Adding the risk free rate of return.

Thus, the formula for APT is represented as –

$$R(f) + B1(RP1) + B2(RP2) + \ldots\ldots Bj(RPn)$$

It is thereby clear that APT strives to model E(R) as 'a linear function of various macro-economic factors' where sensitivity to changes in each factor is represented by a factor-specific beta coefficient.

Note that the APT by itself doesn't provide for the macro-economic factors that will be needed to be tested for its sensitivity – however these have to be judicially developed by the financial analysts keeping in mind the economy they are put in.

PRACTICAL PROBLEMS

Q.16. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

FACTOR	BETA	EXPECTED VALU E (%)	ACTUAL VALUE (%)
GNP	1.20	7.70	7.70
Inflation	1.75	5.50	7.00
Interest rate	1.30	7.75	9.00
Stock market index	1.70	10.00	12.00
Industrial production	1.00	7.00	7.50

If the rise free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

5. COVARIANCE BETWEEN 2 SECURITIES WITH BETA AND MARKET VARIANCE

$COV_{AB} = \beta A \times \beta B \times$ Market Variance

If standard deviation of portfolio is required to be calculated then interactive risk between the securities can be established by 2 ways:

Correlation co efficient

$$r_{AB} = \frac{COV_{AB}}{\sigma A \, \sigma B}$$

Covariance

$$COV_{(A,B)} = \frac{\sum (R_A - R_{\bar{A}})(R_B - R_{\bar{B}})}{n}$$

$$COV_{(A,B)} = \frac{\sum (R_A - R_{\bar{A}})(R_B - R_{\bar{B}})}{n}$$

Covariance an also be calculated using the above relationship if beta of both the securities and market variance is available.

PRACTICAL PROBLEMS

Q.17. The following details are given for X and Y companies' stocks and the Bombay Sensex for a period of one year. Calculate the systematic and unsystematic risk for the companies' stocks. If equal amount of money is allocated for the stocks what would be the portfolio risk?

	X Stock	Y Stock	Sensex
Average return	0.15	0.25	0.06
Variance of return	6.30	5.86	2.25
β	0.71	0.27	
Correlation Co-efficient	0.424		
Co-efficient of determination (r^2)	0.18		

6. PERFORMANCE EVALUATION MEASURES

This process is concerned with assessing the performance of the portfolio over a selected period of time in terms of return and risk and it involves quantitative measurement of actual return realized and the risk borne by the portfolio over the period of investment. The objective of constructing a portfolio and revising it periodically is to maintain its optimal risk return characteristics. Various types of alternative measures of performance evaluation have been developed for use by investors and portfolio managers.

This step provides a mechanism for identifying weaknesses in the investment process and for improving these deficient areas.

It should however be noted that the portfolio management process is an ongoing process. It starts with security analysis, proceeds to portfolio construction, and continues with portfolio -revision and end with portfolio evaluation. Superior performance is achieved through continual refinement of portfolio management skill.

Following three ratios are used to evaluate the portfolio:

1. SHARPE'S INDEX:

Sharpe Ratio measures the Risk Premium per unit of Total Risk for a security or a portfolio of securities. The formula is as follows:

$$\frac{\text{Return of Portfolio} - \text{Risk Free Rate}}{\sigma_p}$$

2. TREYNOR'S INDEX

This ratio is same as Sharpe ratio with only difference that it measures the Risk Premium per unit of Systematic Risk (β) for a security or a portfolio of securities. The formula is as follows:

$$\frac{\text{Return of Portfolio} - \text{Risk Free Rate}}{\beta_p}$$

Treynor ratio is based on the premise that unsystematic or specific risk can be diversified and hence, only incorporates the systematic risk (beta) to gauge the portfolio's performance. It measures the returns earned in excess of those that could have been earned on a riskless investment per unit of market risk assumed.

While Sharpe ratio measures total risk (as the degree of volatility in returns captures all elements of risk - systematic as well as systematic), the Treynor ratio captures only the systematic risk in its computation.

When one has to evaluate the funds which are sector specific, Sharpe ratio would be more meaningful. This is due to the fact that unsystematic risk would be present in sector specific funds. Hence, a truer measure of evaluation would be to judge the returns based on the total risk.

On the contrary, if we consider diversified equity funds, the element of unsystematic risk would be very negligible as these funds are expected to be well diversified by virtue of their nature. Hence, Treynor ratio would me more apt here.

It is widely found that both ratios usually give similar rankings. This is based on the fact that most of the portfolios are fully diversified. To summarize, we can say that when the fund is not fully diversified, Sharpe ratio would be a better measure of performance and when the portfolio is fully diversified, Treynor ratio would better justify the performance of a fund

3. JENSEN ALPHA

Aplha signifies the excess return of portfolio over the expected return as per capital asset pricing model. Higher the alpha better it is.

α = Returns – Expected Return as per CAPM.

PRACTICAL PROBLEMS

Q.18. Six portfolio's experienced the following results during at 7 - year period:

Portfolio	Average Annual Return	Standard Deviation	Correlation with Market
A	18.6	27.0	0.81
B	14.8	18.0	0.65
C	15.1	8.0	0.98
D	22.0	21.2	0.75
E	-9.0	4.0	0.45
F	26.5	19.3	0.63
Market	13.0	12.0	
Risk Free Rate	9.0		

(a) Rank these portfolios using (i) Sharpe's method, and (ii) Treynor's method.

(b) Compare the ranking in part (a) and explain the reasons behind the differences.

7. EFFICIENT MARKET HYPOTHESIS

The efficient market hypothesis (EMH), alternatively known as the efficient market theory, is a hypothesis that states that share prices reflect all information and consistent alpha generation is impossible.

According to the EMH, stocks always trade at their fair value on exchanges, making it impossible for investors to purchase undervalued stocks or sell stocks for inflated prices. Therefore, it should be impossible to outperform the overall market through expert stock selection or market timing, and the only way an investor can obtain higher returns is by purchasing riskier investments.

The efficient market hypothesis holds that-share price movements are random and not systematic. Consequently, neither fundamental analysis nor technical analysis is of value in generating trading gains on a sustained basis. The EMH thus does not subscribe to the belief that it is possible to book gains in the long term on a sustained basis from trading in the stock market. Markets, though becoming increasingly efficient everywhere with the passage of time, are never perfectly efficient. So, there are opportunities all the time although their durations are decreasing and only the smart investors can look forward to booking gains consistently out of stock market deals.

There are 3 types of information:

1. Weak Form: Investors have access to only market information

2. Semi Strong: Investors have access to market and public information. (i.e. all public announcements)

3. Strong form: Investors has access to market, public information and insider trading,

PRACTICAL PROBLEMS

Q.19. You are required, using the following information, to predict the share prices of A and B on day 4, 6 and 12 if the market is:

(i) semi - strong efficient (ii) strong - form efficient

Day 1	A has 4 million shares with a market price of ₹ 4 per share. Beta has 2 million shares with a market price of ₹ 2 per share.
Day 4	The management of A, meeting in private, decided to make a cash takeover bid for B at a price of ₹ 4 per share. Both companies have the same earnings per share (EPS) of 40 paise but A has a P/E ratio of 10 while B has a P/E ratio of only 5. The management of A also expect to obtain synergistic benefits from the takeover amounting in present value terms of ₹ 6 million.
Day 6	A publicly announces the unconditional offer to purchase all the shares of B; details of the expected savings are not announced and therefore are not public knowledge.
Day 12	Alpha announces details of the savings which will be derived from the takeover.

8. SHARPE'S OPTIMAL PORTFOLIO

This model is based on desirability of an investor for excess return of risk free rate of return to beta. Accordingly, the ranking of securities shall be based on the Sharpe Ratio and unique cut off point C* discussed below.

The steps for finding out the stocks to be included in the optimal portfolio are given below:

Step 1: Find out the "excess return to beta" ratio for each stock under consideration.

Therefore as per Treynor's Index:

$$\frac{RA - RF}{\beta A}$$

Step 2: Rank the securities based on step 1 (Higher the better)

Step 3: Calculate the cut – off point as under:

$$C = \left\{\sigma m^2 \times \sum \frac{(RA - RF \times \beta A}{\sigma E^2}\right\}$$

$$\left\{1 + \sigma m^2 \times \sum \frac{\beta A^2}{\sigma E^2}\right\}$$

Where, σE^2 is a measurement of unsystematic risk (Epsilon)

Cumulative concept should be used from highest rank to lowest rank.

Step 4: Select securities whose 'Excess Return to Beta' ratio is greater than C*

Where C* = highest cut off point.

Step 5: Calculation of proportion of each security based on z values:

$$Z = \frac{\beta A}{\sigma E^2}\left\{\frac{RA - RF}{\beta A} - C^*\right\}$$

PRACTICAL PROBLEMS

Q.20. Ramesh wants to invest in stock market. He has got the following information about individual securities:

SECURITY	EXPECTED RETURN	BETA	Standard Deviation (Random error)
A	15	1.5	40
B	12	2	20
C	10	2.5	30
D	9	1	10
E	8	1.2	20
F	14	1.5	30

Market Variance is 10% %, Risk Free Rate is 7 %. What should be the optimum portfolio assuming no short sales?