

A Project Report on “Portfolio Management at India Infoline Limited”

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Abstract - A portfolio is a collection of investments held by an institution or a private individual. In building up an investment portfolio a financial institution will typically conduct its own investment analysis, whilst a private individual may make use of the services of a financial advisor or a financial institution which offers portfolio management services. Holding a portfolio is part of an investment and risk-limiting strategy called diversification. By owning several assets, certain types of risk can be reduced. The assets in the portfolio could include stocks, bonds, options, warrants, gold certificates, real estate, futures contracts, production facilities, or any other item that is expected to retain its value.

Index Terms - Diversification, Financial Institution, Portfolio Management.

INTRODUCTION

Portfolio management is all about strengths, weakness, opportunity, threats in the choice of debt, vs., equity, domestic, vs., international vs., growth vs., safety, and numerous other trades-offs encountered in the attempt to maximize return at a given appetite for risk. Thus it seems logical that the expected return on a portfolio should depend on the expected return of each of the security contained in the portfolio. Portfolio analysis considers the determination of future risk and return in holding various blends of individual securities.

OBJECTIVES

The main objectives of the study are to analyze the risk and return characteristics of individual securities, to calculate correlation coefficient for different portfolios and to explain the construction of a portfolio.

RESEARCH METHODOLOGY

Here, the exploratory research is used to execute the study. Exploratory research is generally carried out by studying secondary sources. The Secondary data is obtained from reference textbooks and various websites.

COMPANY PROFILE

India Info line Ltd: It is listed on both the leading stock exchanges in India, viz. the Stock Exchange, Mumbai (BSE) and the National Stock Exchange (NSE) and is also a member of both the exchanges. It is engaged in the businesses of Equities broking, Wealth Advisory Services and Portfolio Management Services. It offers broking services in the Cash and Derivatives segments of the NSE as well as the Cash segment of the BSE. It is registered with NSDL as well as CDSL as a depository participant, providing a one-stop solution for clients trading in the equities market.

DATA ANALYSIS AND INTERPRETATION

Average returns: The arithmetic average measures the central tendency. The main objective of averaging is to arrive at a single value, which is a representative of the characteristics of the entire mass of data and arithmetic average or mean of a series (usually denoted by \bar{x}) is the value obtained by dividing the sum of the values of various items in a series ($\sum x$) divided by the number of items (N) constituting the series.

Thus, if X_1, X_2, \dots, X_n are the given N observations. Then, $\bar{x} = \frac{X_1 + X_2 + \dots + X_n}{N}$

Return = $\frac{\text{Closing Price} - \text{Opening Price}}{\text{Opening Price}} \times 100$

Standard Deviation: S.D may be defined as “Root Mean Square Deviation from Mean”

For a set of N observations X1, X2...Xn with mean X,
 Deviations from Mean: (X1-X), (X2-X),...(Xn-X)

Variance: Variance = (S.D) ²; Variance = (1/(n-1)) * Σ(R-r)² T=1

Correlation: Correlation is a statistical technique, which measures and analyses the degree or extent to which two or more variables fluctuate with reference to one another. An correlation coefficient between two variables X & Y usually denoted by 'r' is a measure of linear relationship and is defined as the ratio of the covariance between X and Y written as Cov(X, Y) to the product of standard deviation of X and Y.

Symbolically, $r = \text{Cov}(X, Y) / \text{S.D of } X, Y$
 $= \sum XY / N$

Where, x = X-X, y = Y-Y

ΣXY = sum of the product of deviations in X and Y series calculated with reference to their arithmetic means.

X = standard deviation of the series X, Y = standard deviation of the series Y.

A maximum expected return: n

$R_p = \sum X_1 R_1$

T=1

To solve the above set of equations, analyst need the data estimates on S.D and expected returns for all 'n' securities along with the correlation coefficient between all possible securities pairs.

In order to know the return of each stock or security, the formula, which is used, is given.

Closing price-Opening price

R: -----*100

Opening Price

To know the average (R) the following formula has been used.

Average(R) = $\frac{\sum R}{N}$

1 Risk and Return calculation of ACC Ltd

Date	Open Price	Close Price	RETURNS R	Average Returns r	Deviations (R-r)	Sqr. Dev (R-r) ²
1-Sep-19	530.25	524.75	-1.3072	0.4682	-1.5055	2.2664
2-Sep-19	537.8	530.55	-1.3481	0.4682	-1.8163	3.2990
4-Sep-19	533	539.8	1.2758	0.4682	0.8076	0.6522
5-Sep-19	548.85	528.55	-3.6986	0.4682	-4.1669	17.3627
6-Sep-19	515	530.2	2.9515	0.4682	2.4832	6.1665
7-Sep-19	524.95	519.05	-1.1239	0.4682	-1.5921	2.5349
8-Sep-19	527	540.95	2.6471	0.4682	2.1788	4.7473

The next step is to know the risk of the stock or security, the following formula is used.

S.D = √variance

Variance = 1/n-1 Σ(R-r)²

T=1

Where; (R-R) ² = squares of difference between sample and mean.

N=Number of sample observation.

After that, the correlation of the securities is calculated by using the following formula.

Co-Variance (COVAB) = 1/n Σ (RA-RA) (RB-RB)

T=1

Where, (RA-RA) (RB-RB) = combined deviations of A&B

(σ A) (σ B) =standard deviation of A&B

COVAB =Covariance between A&B; N= no of observation

The next would be the construction of the optimal portfolio on the basis of what Percentage of investment should be invested when two securities and stocks are combined i.e., calculation of two assets portfolio weights by using minimum variance equation, which is given below.

Where, WA= proportion of investment in A, WB= proportion of investment in B

The next and final step is to calculate the portfolio risk (combined risk) that shows how much is the risk is reduced by combining two stocks or securities by using the formula.

Formula:

Where.

σ A = Standard Deviation of security A; WA = portfolio of investment s securities A

σ B = Standard Deviation of security B; WB= proportion of investment in security B

rAB = Correlation coefficient between security A&B.

9-Sep-19	544	562.45	3.3915	0.4682	2.9233	8.5458
11-Sep-19	562	564.35	0.4181	0.4682	-0.0501	0.0025
12-Sep-19	566	556.5	-1.6784	0.4682	-2.1467	4.6082
18-Sep-19	557	548.5	-1.5260	0.4682	-1.9943	3.9770
19-Sep-19	550	544.95	-0.9182	0.4682	-1.3864	1.9221
20-Sep-19	541.1	543.6	0.4620	0.4682	-0.0062	0.0000
23-Sep-19	536.65	558.5	4.0716	0.4682	3.6033	12.9840
24-Sep-19	541.1	549.2	1.4970	0.4682	1.0287	1.0583
25-Sep-19	550	563.05	2.3727	0.4682	1.9045	3.6272
26-Sep-19	567	562.1	-0.8642	0.4682	-1.3324	1.7753
28-Sep-19	565	581.15	2.8584	0.4682	2.3902	5.7130
29-Sep-19	574.9	566.2	-1.5133	0.4682	-1.9815	3.9264
30-Sep-19	568	574.4	1.1268	0.4682	0.6585	0.4337
		Total	9.3644			85.6026

Total number of trading days in the month of September-2019 (n) = 20

Total returns = 9.3644

Average returns (r) = Total Returns/No. of trading days
 = 9.3644/20
 = 0.4682

Variance (σ^2) = $(1/(n-1)) * \sum(R-r)^2$
 = $1/(20-1) * 85.6026$
 = 4.5054

Standard Deviation = $\sqrt{\sigma^2}$
 = $\sqrt{4.5054}$
 = 2.1225

Interpretation: The calculated total returns for ACC Ltd is 9.3644 and square deviation is 85.6026. Thus, the Average Returns of ACC Ltd for the month of September-2019 is 46.82 and Standard Deviation (Risk) is 2.1226

2 Risk and Return calculation of Bajaj Auto Ltd.

Date	Open Price	Close Price	RETURNS R	Average Returns r	Deviations (R-r)	Sqr. Dev (R-r) 2
1-Sep-19	525.25	506.2	-3.627	0.4843	-4.1111	16.9013
2-Sep-19	503.65	486.15	-3.475	0.4843	-3.9589	15.6730
4-Sep-19	487	490.85	0.791	0.4843	0.3063	0.0938
5-Sep-19	490.05	487.2	-0.582	0.4843	-1.0659	1.1360
6-Sep-19	485	486.75	0.361	0.4843	-0.1235	0.0152
7-Sep-19	494	494.05	0.010	0.4843	-0.4742	0.2248
8-Sep-19	496	517.1	4.254	0.4843	3.7698	14.2111
9-Sep-19	540	520.1	-3.685	0.4843	-4.1695	17.3844
11-Sep-19	525	535.6	2.019	0.4843	1.5348	2.3555
12-Sep-19	526.1	542.5	3.117	0.4843	2.6330	6.9327
18-Sep-19	546	577.6	5.788	0.4843	5.3033	28.1247
19-Sep-19	578	561.7	-2.820	0.4843	-3.3043	10.9187
20-Sep-19	550	558.2	1.491	0.4843	1.0066	1.0133
23-Sep-19	578	579.75	0.303	0.4843	-0.1815	0.0329
24-Sep-19	588	588.55	0.094	0.4843	-0.3907	0.1527
25-Sep-19	584.95	615.95	5.300	0.4843	4.8153	23.1873
26-Sep-19	625	619.35	-0.904	0.4843	-1.3883	1.9273

28-Sep-19	613.5	624.4	1.777	0.4843	1.2924	1.6703
29-Sep-19	617	610.4	-1.070	0.4843	-1.5540	2.4148
30-Sep-19	615.1	618.45	0.545	0.4843	0.0604	0.0036
		Total	9.6855			144.3736

Total number of trading days in the month of September-2019 (n) = 20.

Total returns = 9.6855

Average returns (r) = Total Returns/No. of trading days
= 0.4843

Variance (σ^2) = $(1/(n-1)) * \sum(R-r)^2$
= $1/(20-1) * 144.3736$
= 7.5986

Standard Deviation = $\sqrt{\sigma^2}$

$$= \sqrt{(7.5986)}$$

$$= 2.7566$$

Interpretation: The calculated total returns for Bajaj Auto Ltd is 9.6855 and square deviation is 144.3736. Thus, the Average Returns of Bajaj Auto Ltd for the month of September-2019 is 48.43 and Standard Deviation (Risk) is 2.7566.

3 Risk and Return calculation of Cipla Ltd.

Date	Open Price	Close price	RETURNS R	Average Returns r	Deviations (R-r)	Sqr. Dev (R-r) 2
1-Sep-19	188	191	1.5957	0.8724	0.7233	0.5232
2-Sep-19	190.25	192.5	1.1827	0.8724	0.3102	0.0963
4-Sep-19	192.25	202.55	5.3576	0.8724	4.4852	20.1170
5-Sep-19	203	201.6	-0.6897	0.8724	-1.5621	2.4400
6-Sep-19	201	203.65	1.3184	0.8724	0.4460	0.1989
7-Sep-19	202.5	202.3	-0.0988	0.8724	-0.9712	0.9432
8-Sep-19	202.5	203.75	0.6173	0.8724	-0.2551	0.0651
9-Sep-19	204	202.95	-0.5147	0.8724	-1.3871	1.9241
11-Sep-19	203	201.7	-0.6404	0.8724	-1.5128	2.2886
12-Sep-19	202	200.6	-1.6931	0.8724	-1.5655	2.4507
18-Sep-19	201	199.7	-0.6468	0.8724	-1.5192	2.3079
19-Sep-19	200.1	197	-1.5492	0.8724	-2.4216	5.8643
20-Sep-19	197	197.65	0.3299	0.8724	-0.5425	0.2943
23-Sep-19	198	201.7	1.8687	0.8724	0.9963	0.9926
24-Sep-19	201	203.3	1.1443	0.8724	0.2719	0.0739
25-Sep-19	203	203.55	0.2709	0.8724	-0.6015	0.3618
26-Sep-19	203.6	208.5	2.4067	0.8724	1.5343	2.3540
28-Sep-19	209.75	219.4	4.6007	0.8724	3.7283	13.9003
29-Sep-19	214.05	217.4	1.5651	0.8724	0.6926	0.4798
30-Sep-19	220	220.05	0.0227	0.8724	-0.8497	0.7220
		Total	17.4481			58.3978

Total number of trading days in the month of September-2019 (n) = 20

Total returns = 17.4481

Average returns (r) = Total Returns/No. of trading days
= 0.8724

Variance (σ^2) = $(1/(n-1)) * \sum(R-r)^2$
= $1/(20-1) * 58.3978$
= 3.0736

Standard Deviation = $\sqrt{\sigma^2}$
= $\sqrt{(3.0736)}$
= 1.7532

Interpretation: The calculated total returns for Cipla Ltd is 17.4881 and square deviation is 58.3978. Thus, the Average Returns of Cipla Ltd for the month of September-2019 is 87.24 and Standard Deviation (Risk) is 1.7532.

4 Risk and Return calculation of Dr.Reddy's Laboratories Ltd.

Date	Open Price	Close Price	RETURNS R	Average Returns r	Deviations (R-r)	Sqr. Dev (R-r) 2
1-Sep-19	390	398.75	2.2436	0.9266	1.3170	1.7344
2-Sep-19	400	397.2	-0.7000	0.9266	-1.6266	2.6459
4-Sep-19	399.65	389.8	-2.4647	0.9266	-3.3913	11.5008
5-Sep-19	392	374	-4.5918	0.9266	-5.5185	30.4535
6-Sep-19	372	385.6	3.6559	0.9266	2.7293	7.4490
7-Sep-19	380.1	376.65	-0.9077	0.9266	-1.8343	3.3646
8-Sep-19	365.65	398.05	8.8609	0.9266	7.9343	62.9532
9-Sep-19	419.1	412.5	-1.5748	0.9266	-2.5014	6.2572
11-Sep-19	415.5	433.9	4.4284	0.9266	3.5018	12.2624
12-Sep-19	434.9	424.95	-2.2879	0.9266	-3.2145	10.3331
18-Sep-19	429	436.8	1.8182	0.9266	0.8916	0.7949
19-Sep-19	435	436.4	0.3218	0.9266	-0.6048	0.3658
20-Sep-19	443.4	422.45	-4.7249	0.9266	-5.6515	31.9393
23-Sep-19	422.95	435.7	2.2890	0.9266	1.3624	1.8561
24-Sep-19	440.2	425.2	-3.4075	0.9266	-4.3342	18.7850
25-Sep-19	426	425.25	-0.1761	0.9266	-1.1027	1.2159
26-Sep-19	430	444.85	3.4535	0.9266	2.5269	6.3850
28-Sep-19	444	474.25	6.8131	0.9266	5.8864	34.6501
29-Sep-19	465	466.35	0.2903	0.9266	-0.6363	0.44049
30-Sep-19	466	490.2	5.1931	0.9266	4.2665	18.2031
		Total	18.5326			263.5540

Total number of trading days in the month of September-2019 (n) = 20

Total returns = 18.5326

Average returns (r) = Total Returns/No. of trading days

$$= 0.9266$$

Variance (σ^2) = $(1/(n-1)) * \sum(R-r)^2$

$$= 1/(20-1) * 263.554$$

$$= 13.873$$

$$\begin{aligned} \text{Standard Deviation} &= \sqrt{\sigma^2} \\ &= \sqrt{13.873} \\ &= 3.7244 \end{aligned}$$

Interpretation: The calculated total returns for Dr.Reddy's ltd is 18.5326 and square deviation is 263.554. Thus, the Average Returns of Dr.Reddy's Ltd for the month of September-2019 is 92.66 and Standard Deviation (Risk) is 3.7244

5 Risk and Return Calculation of Reliance Petroleum Ltd.

Date	Open Price	Close price	RETURNS R	Average Returns r	Deviations (R-r)	Sqr. Dev (R-r) 2
1-Sep-19	77.5	75.3	-2.8387	0.5819	-3.4207	0.8554
2-Sep-19	75	73.35	-2.2000	0.5819	-2.7819	-2.7819
4-Sep-19	73	74.1	1.5068	0.5819	0.9249	1.1009
5-Sep-19	75.3	70.3	-6.6401	0.5819	-7.2221	52.1581
6-Sep-19	70.5	71.65	1.6312	0.5819	1.0493	1.1009
7-Sep-19	71	71.05	0.0704	0.5819	-0.5115	0.2617
8-Sep-19	72.5	73.8	1.7931	0.5819	1.2112	1.4669
9-Sep-19	75	78.5	4.6667	0.5819	4.0847	16.6849
11-Sep-19	78.95	81.4	3.1032	0.5819	2.5213	6.3569
12-Sep-19	81.1	81.55	-0.1032	0.5819	-0.8286	0.6865

18-Sep-19	81.75	83.85	2.2018	0.5819	1.6199	2.6240
19-Sep-19	84	83.85	-0.1786	0.5819	-0.7605	0.5784
20-Sep-19	83.55	83.3	-0.2992	0.5819	-0.8812	0.7765
23-Sep-19	86.4	89.1	3.1250	0.5819	2.5431	6.4671
24-Sep-19	89	90.1	1.2360	0.5819	0.6540	0.4277
25-Sep-19	90	94.7	5.2222	0.5819	4.6403	21.5321
26-Sep-19	95.9	96.1	0.2086	0.5819	-0.3734	0.1394
28-Sep-19	96.5	95.6	-0.9326	0.5819	-1.5416	2.2940
29-Sep-19	94	93.45	-0.5851	0.5819	-1.1671	1.3620
30-Sep-19	94.35	95.1	0.7949	0.5819	0.2130	0.0454
		Total	11.6390		Total	135.2581

Total number of trading days in the month of September-2019 (n) = 20

Total returns = 11.6390

Average returns (r) = Total Returns/No. of trading days

$$= 0.5819$$

$$\begin{aligned} \text{Variance } (\sigma^2) &= (1/ (n-1)) * \sum (R-r)^2 \\ &= 1/ (20-1) * 135.2581 \\ &= 7.1188 \end{aligned}$$

$$\begin{aligned} \text{Standard Deviation} &= \sqrt{\sigma^2} \\ &= \sqrt{(7.1188)} \\ &= 2.6681 \end{aligned}$$

Interpretation: The calculated total return of Reliance Petroleum Ltd is 11.6390 and square deviation is 135.2581. Thus, the Average Returns of Reliance Petroleum Ltd for the month of September-2019 is 58.19 and Standard Deviation (Risk) is 2.6681

6 Calculation of Covariance & Correlation Coefficient of ACC and Bajaj Auto Ltd.

Date	ACC		BAJAJ			Dy	dx.dy
	Returns	Avg returns	Dx	Returns	Avg-returns		
1-Sep-19	-1.037	0.468	-1.505	-3.627	0.484	-4.111	6.8915
2-Sep-19	-1.348	0.468	-1.816	-3.475	0.484	-3.959	7.19059
4-Sep-19	1.276	0.468	0.808	0.791	0.484	0.306	0.24734
5-Sep-19	-3.699	0.468	-4.167	-0.582	0.484	-1.066	4.44125
6-Sep-19	2.951	0.468	2.483	0.361	0.484	-0.123	-0.3066
7-Sep-19	-1.124	0.468	-1.592	0.010	0.484	-0.474	0.75492
8-Sep-19	2.647	0.468	2.179	4.254	0.484	3.770	8.21369
9-Sep-19	3.392	0.468	2.923	-3.685	0.484	-4.169	-12.189
11-Sep-19	0.418	0.468	-0.050	2.019	0.484	1.535	-0.0768
12-Sep-19	-1.678	0.468	-2.147	3.117	0.484	2.633	-5.6522
18-Sep-19	-1.526	0.468	-1.994	5.788	0.484	5.303	-10.576
19-Sep-19	-0.918	0.468	-1.386	-2.820	0.484	-3.304	4.58115
20-Sep-19	0.462	0.468	-0.006	1.491	0.484	1.007	-0.0062
23-Sep-19	4.072	0.468	3.603	0.303	0.484	-0.182	-0.654
24-Sep-19	1.497	0.468	1.029	0.094	0.484	-0.391	-0.402
25-Sep-19	2.373	0.468	1.905	5.300	0.484	4.815	9.17082
26-Sep-19	-0.864	0.468	-1.332	-0.904	0.484	-1.388	1.84976
28-Sep-19	2.858	0.468	2.390	1.777	0.484	1.292	3.08911
29-Sep-19	-1.513	0.468	-1.982	-1.070	0.484	-1.554	3.07923
30-Sep-19	1.127	0.468	0.659	0.545	0.484	0.060	0.03974
						Total	18.9842

Covariance = $\sum dx.dy/n$

= 18.984/20

$$=0.9492$$

$$\begin{aligned} \text{Coefficient of correlation} &= \text{Covariance} / \sigma_1 * \sigma_2 \\ &= 0.9492 / (2.1226) * (2.7566) \\ &= 0.1623 \end{aligned}$$

Interpretation: Here the standard deviation of ACC Ltd is 2.1226 whereas standard deviation of Bajaj Auto

limited is 2.7566. Calculated Covariance for the equities of ACC Ltd and Bajaj Auto Ltd. is 0.9492 and calculated Correlation Coefficient between the equities ACC Ltd & Bajaj Auto Ltd is 0.162.

7 Calculation of Covariance & Correlation Coefficient of Bajaj Auto and Cipla Ltd.

Date	BAJAJ			CIPLA			dx.dy
	Returns	Avg. returns	Dx	Returns	Avg. returns	dy	
1-Sep-19	-3.6268	0.4843	-4.1111	1.5957	0.8724	0.7233	-2.9737
2-Sep-19	-3.4746	0.4843	-3.9589	1.1827	0.8724	0.3102	-1.2282
4-Sep-19	0.7906	0.4843	0.3063	5.3576	0.8724	4.4852	1.37372
5-Sep-19	-0.5816	0.4843	-1.0659	-0.6897	0.8724	-1.5621	1.66492
6-Sep-19	0.3608	0.4843	-0.1235	1.3184	0.8724	0.4460	-0.0551
7-Sep-19	0.0101	0.4843	-0.4742	-0.0988	0.8724	-0.9712	0.46049
8-Sep-19	4.2540	0.4843	3.7698	0.6173	0.8724	-0.2551	-0.9618
9-Sep-19	-3.6852	0.4843	-4.1695	-0.5147	0.8724	-1.3871	5.78352
11-Sep-19	2.0190	0.4843	1.5348	-0.6404	0.8724	-1.5128	-2.3218
12-Sep-19	3.1173	0.4843	2.6330	-0.6931	0.8724	-1.5655	-4.1219
18-Sep-19	5.7875	0.4843	5.3033	-0.6468	0.8724	-1.5192	-8.0566
19-Sep-19	-2.8201	0.4843	-3.3043	-1.5492	0.8724	-2.4216	8.00191
20-Sep-19	1.4909	0.4843	1.0066	0.3299	0.8724	-0.5425	-0.5461
23-Sep-19	0.3028	0.4843	-0.1815	1.8687	0.8724	0.9963	-0.1808
24-Sep-19	0.0935	0.4843	-0.3907	1.1443	0.8724	0.2719	-0.1062
25-Sep-19	5.2996	0.4843	4.8153	0.2709	0.8724	-0.6015	-2.8963
26-Sep-19	-0.9040	0.4843	-1.3883	2.4067	0.8724	1.5343	-2.13
28-Sep-19	1.7767	0.4843	1.2924	4.6007	0.8724	3.7283	4.81852
29-Sep-19	-1.0679	0.4843	-1.5540	1.5651	0.8724	0.6926	-1.0764
30-Sep-19	0.5446	0.4843	0.0604	0.0227	0.8724	-0.8497	-0.0513
						Total	-4.603

$$\begin{aligned} \text{Covariance} &= \sum dx.dy/n \\ &= -4.603/20 \\ &= -0.2302 \end{aligned}$$

$$\begin{aligned} \text{Coefficient of correlation} &= \text{Covariance} / \sigma_1 * \sigma_2 \\ &= -0.2302 / (2.7566) \\ & * (1.7532) \\ &= -0.0476 \end{aligned}$$

Interpretation: Here the standard deviation of Bajaj Auto Ltd is 2.7566 whereas standard deviation of Cipla Ltd is 1.7532. Calculated Covariance for the equities of Bajaj Auto Ltd and Cipla Ltd. is (0.2302) and calculated Correlation Coefficient between the equities Bajaj Auto Ltd & Cipla Ltd. is (-0.0476).

8 Calculation of Covariance & Correlation Coefficient of Cipla and Dr.Reddy's Ltd.

Date	Cipla			Dr.Reddy			dx.dy
	Returns	Avg. returns	Dx	Returns	Avg. returns	dy	
1-Sep-19	1.5957	0.8724	0.7233	2.2436	0.9266	1.3170	0.95261
2-Sep-19	1.1827	0.8724	0.3102	0.7000	0.9266	-1.6266	-0.5047
4-Sep-19	5.3576	0.8724	4.4852	-2.4647	0.9266	-3.3913	-15.211
5-Sep-19	-0.6897	0.8724	-1.5621	-4.5918	0.9266	-5.5185	8.62019

6-Sep-19	1.3784	0.8724	0.4460	3.6559	0.9266	2.7293	1.21726
7-Sep-19	-0.0988	0.8724	-0.9712	-0.9077	0.9266	-1.8343	1.78141
8-Sep-19	0.6173	0.8724	-0.2551	8.8609	0.9266	7.9343	-2.0242
9-Sep-19	-0.5147	0.8724	-1.3871	-1.5748	0.9266	-2.5014	3.46977
11-Sep-19	-0.6404	0.8724	-1.5128	4.4284	0.9266	3.5018	-5.2975
12-Sep-19	-0.6931	0.8724	-1.5655	-2.2879	0.9266	-3.2145	5.03224
18-Sep-19	-0.6468	0.8724	-1.5192	1.8182	0.9266	0.8916	-1.3544
19-Sep-19	-1.5492	0.8724	-2.4216	0.3218	0.9266	0.6048	1.46458
20-Sep-19	0.3299	0.8724	-0.5425	-4.7249	0.9266	-5.6515	3.06569
23-Sep-19	1.8687	0.8724	0.9963	2.2890	0.9266	1.3624	1.3573
24-Sep-19	1.1443	0.8724	0.2719	-3.4075	0.9266	-4.3342	-1.1783
25-Sep-19	0.2709	0.8724	-0.6015	-0.1761	0.9266	-1.1027	0.66323
26-Sep-19	2.4067	0.8724	1.5343	3.4535	0.9266	2.5269	3.87689
28-Sep-19	4.6007	0.8724	3.7283	6.8131	0.9266	5.8864	21.9464
29-Sep-19	1.5651	0.8724	0.6926	0.2903	0.9266	-0.6363	-0.4407
30-Sep-19	0.0227	0.8724	-0.8497	5.1931	0.9266	4.2665	-3.6252
						Total	23.812

Covariance = $\sum dx.dy/n$
 = -23.812/20
 = -1.1906

Coefficient of correlation = $Covariance / (\sigma_1 * \sigma_2)$
 = $-1.1906 / (1.7532 * 3.7544)$
 = 0.1823

Interpretation: Here the standard deviation of Cipla Ltd is 1.7532 where as standard deviation of Dr.Reddy's Ltd is 3.7244. Calculated Covariance for the equities of Cipla Ltd and Dr.Reddy's Ltd. is 1.1906 and calculated Correlation Coefficient between the equities Cipla Ltd and Dr.Reddy's Ltd is 0.1823.

9 Calculation of Covariance & Correlation Coefficient of Dr.Reddy's and Reliance Petroleum

Date	REDDY'S			REL-PETRO			dx.dy
	Returns	Avg. returns	Dx	Returns	Avg. Returns	dy	
2-Sep-19	2.2436	0.9266	1.3170	-2.8387	0.5819	-3.4207	-4.5049
3-Sep-19	-0.7000	0.9266	-1.6266	-2.2000	0.5819	-2.7819	4.5252
4-Sep-19	-2.4647	0.9266	-3.3913	1.5068	0.5819	0.9249	-3.1366
5-Sep-19	-4.5918	0.9266	-5.5185	-6.6401	0.5819	-7.2221	39.8547
6-Sep-19	3.6559	0.9266	2.7293	1.6312	0.5819	1.0493	2.86372
9-Sep-19	-0.9077	0.9266	-1.8343	0.0704	0.5819	-0.5115	0.93829
12-Sep-19	8.8609	0.9266	7.9343	1.78931	0.5819	1.2112	9.60967
13-Sep-19	-1.5748	0.9266	-2.5014	4.6667	0.5819	4.0847	-10.218
16-Sep-19	4.4284	0.9266	3.5018	3.1032	0.5819	2.5213	8.82895
17-Sep-19	-2.2879	0.9266	-3.2145	-0.2466	0.5819	-0.8286	2.66341
18-Sep-19	1.8182	0.9266	0.8916	2.2018	0.5819	1.6199	1.44421
19-Sep-19	0.3218	0.9266	-0.6048	-0.1786	0.5819	-0.7605	0.45996
20-Sep-19	-4.7249	0.9266	-5.6515	-0.2992	0.5819	-0.8812	4.97992
23-Sep-19	2.2890	0.9266	1.3624	3.1250	0.5819	2.5431	3.46458
24-Sep-19	-3.4075	0.9266	-4.3342	1.2360	0.5819	0.6540	-2.8346
25-Sep-19	-0.1761	0.9266	-1.1027	5.2222	0.5819	4.6403	-5.1168
26-Sep-19	3.4535	0.9266	2.5269	0.2086	0.5819	-0.3734	-0.9435
27-Sep-19	6.8131	0.9266	5.8864	-0.9326	0.5819	-1.5146	-8.9155

30-Sep-19	0.2903	0.9266	-0.6363	-0.5851	0.5819	-1.1671	0.7426
31-Sep-19	5.1931	0.9266	4.2665	0.7949	0.5819	0.2130	0.90861
						TOTAL	45.6143

Covariance = $\sum dx.dy/n$
 = 45.6143/20
 = 2.2807

Coefficient of correlation = $Covariance / (\sigma_1 * \sigma_2)$
 = 2.2807 / (3.7244) * (2.6681)
 = 0.2295

Interpretation: Here the standard deviation of Dr.Reddy's Ltd is 3.7244 where as standard deviation of Reliance Petroleum Ltd is 2.6681. Calculated Covariance for the equities of Dr.Reddy's Ltd & Reliance Petroleum Ltd. is 2.2807 and calculated Correlation Coefficient between the equities Dr.Reddy's Ltd & Reliance Petroleum Ltd. is 0.2295.

10 Calculation of Covariance & Correlation Coefficient of Reliance Petroleum Ltd. and ACC Ltd.

Date	Reliance Petroleum Ltd			ACC Ltd			
	Returns	Avg returns	Dx	Returns	Avg-returns	dy	dx.dy
1-Sep-19	-2.8387	0.5819	-3.4207	-1.037	0.468	-1.505	5.14968
2-Sep-19	-2.2000	0.5819	-2.7819	-1.348	0.468	-1.816	5.05286
4-Sep-19	1.5068	0.5819	0.9249	1.276	0.468	0.808	0.74693
5-Sep-19	-6.6401	0.5819	-7.2221	-3.699	0.468	-4.167	30.0933
6-Sep-19	1.6312	0.5819	1.0493	2.951	0.468	2.483	2.60555
7-Sep-19	0.0704	0.5819	-0.5115	-1.124	0.468	-1.592	0.81442
8-Sep-19	1.78931	0.5819	1.2112	2.647	0.468	2.179	2.63891
9-Sep-19	4.6667	0.5819	4.0847	3.392	0.468	2.923	11.941
11-Sep-19	3.1032	0.5819	2.5213	0.418	0.468	-0.050	-0.1262
12-Sep-19	-0.2466	0.5819	-0.8286	-1.678	0.468	-2.147	1.77864
18-Sep-19	2.2018	0.5819	1.6199	-1.526	0.468	-1.994	-3.2305
19-Sep-19	-0.1786	0.5819	-0.7605	-0.918	0.468	-1.386	1.05439
20-Sep-19	-0.2992	0.5819	-0.8812	0.462	0.468	-0.006	0.00546
23-Sep-19	3.1250	0.5819	2.5431	4.072	0.468	3.603	9.16347
24-Sep-19	1.2360	0.5819	0.6540	1.497	0.468	1.029	0.6728
25-Sep-19	5.2222	0.5819	4.6403	2.373	0.468	1.905	8.83744
26-Sep-19	0.2086	0.5819	-0.3734	-0.864	0.468	-1.332	0.49752
28-Sep-19	-0.9326	0.5819	-1.5146	2.858	0.468	2.390	-3.6102
29-Sep-19	-0.5851	0.5819	-1.1671	-1.513	0.468	-1.982	2.31255
30-Sep-19	0.7949	0.5819	0.2130	1.127	0.468	0.659	0.14025
						Total	76.5283

Covariance = $\sum dx.dy/n$
 = 76.5283/20
 = 3.8264

Coefficient of correlation = $Covariance / (\sigma_1 * \sigma_2)$
 = 3.8264 / (2.6681) * (2.1226)
 = 0.6757

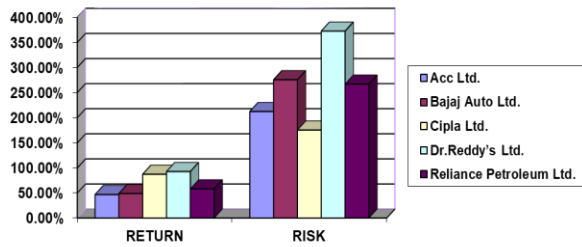
Interpretation: Here the standard deviation of Reliance Petroleum Ltd is 2.6681 whereas standard deviation of ACC Ltd is 2.1226. Calculated Covariance for the equities of Reliance Petroleum Ltd & ACC Ltd is 3.8264 and calculated Correlation Coefficient between

the equities Reliance Petroleum Ltd & ACC Ltd is 0.6757

4.11 COMPARISON OF RETURNS & RISK OF INDIVIDUAL SECURITIES

COMPANY	RETURN	RISK
ACC Ltd.	46.82%	2.1226
Bajaj Auto Ltd.	48.83%	2.7566
Cipla Ltd.	87.24%	1.7532
Dr.Reddy's Ltd.	92.66%	3.7244

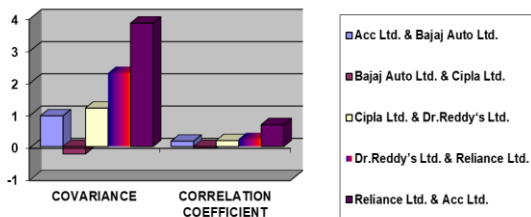
Reliance Petroleum Ltd.	58.19%	2.6681
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Interpretation: In this particular securities Dr.Reddy's Ltd. has the highest risk of 3.7244 when compared with other securities followed by Bajaj Auto Ltd. 2.7566, Reliance Petroleum 2.6681, ACC Ltd. 2.1226 and Cipla Ltd. 1.7532. Dr.Reddy's Company Ltd. has highest returns of 92.66% when compared with the remaining companies. For instance, the reason behind this is their high sales or expanded business. The ACC Company has lowest returns of 46.82% because of their low sales.

4.12 COMPARISON OF COVARIANCE & CORRELATION COEFFICIENT FOR DIFFERENT PORTFOLIOS

COMPANIES	COVARIANCE	CORRELATION COEFFICIENT
ACC Ltd. & Bajaj Auto Ltd.	0.9492	0.1622
Bajaj Auto Ltd. & Cipla Ltd.	-0.2302	-0.0476
Cipla Ltd. & Dr.Reddy's Ltd.	1.1906	0.1823
Dr.Reddy's Ltd. & Reliance Ltd.	2.2807	0.2295
Reliance Ltd. & ACC Ltd.	3.8264	0.6757



Interpretation: Here Covariance and Correlation Coefficient of ACC Ltd. & Bajaj Auto Ltd is 0.9492 & 0.1622, Bajaj Auto Ltd. & Cipla Ltd. is -0.2302 & -

0.0476, Cipla Ltd. & Dr.Reddy's Ltd. is 1.1906 & 0.1823, Dr.Reddy's Ltd. & Reliance Ltd. is 2.2807 & 0.2295 and Reliance Ltd. & ACC Ltd. is 3.8264 & 0.6757.

Least correlation co-efficient = -0.0476

Least correlation co-variance = -0.2302

$$W1 = \frac{\sigma_2^2 - \sigma_1^2 \rho_{1,2}}{\sigma_1^2 + \sigma_2^2 - 2\rho_{1,2}\sigma_1\sigma_2}$$

$$= \frac{(1.7532)^2 - (2.7566)(1.7532)(-0.0476)}{(1.7532)^2 + (2.7566)^2 - 2(2.7566)(1.7532)(0.0476)}$$

$$= 0.2968$$

$$W1 = 29.68\%$$

$$W2 = 1 - W1$$

$$= 1 - 0.2968$$

$$= 0.7032$$

$$= 70.32\%$$

$$P = W1^2 \sigma_1^2 + W2^2 \sigma_2^2 + 2W1W2 \rho_{1,2} \sigma_1 \sigma_2$$

$$= (0.2968)^2 (1.7532)^2 + (0.7032)^2 (2.7566)^2 + 2(0.2968)(0.7032)(1.7532)(-0.0476)$$

$$= 111.33\%$$

$$R_p = w1r1 + w2r2$$

$$= (0.2968)(-0.0476) + (0.7032)(0.6567)$$

$$= 44.77\%$$

$$W1 = \frac{\sigma_2^2 - \rho_{1,2} \sigma_1 \sigma_2}{\sigma_1^2 + \sigma_2^2 - 2\rho_{1,2} \sigma_1 \sigma_2}$$

$$= \frac{(2.1226)^2 - (2.6681)(2.1226)(0.6756)}{(2.1226)^2 + (2.6681)^2 - 2(2.6681)(2.1226)(0.6756)}$$

$$= 0.17$$

$$W1 = 17.10\%$$

$$W2 = 1 - W1$$

$$= 1 - (0.1710)$$

$$= 0.8290$$

$$= 82.90\%$$

$$P = W1^2 \sigma_1^2 + W2^2 \sigma_2^2 + 2W1W2 \rho_{1,2} \sigma_1 \sigma_2$$

$$= (0.1710)^2 (1.1906)^2 + (0.8290)^2 (2.2807)^2 + 2(0.1710)(0.8290)(1.1906)(2.2807)(0.6756)$$

$$= 2.2199$$

$$= 221.99\%$$

$$R_p = w1r1 + w2r2$$

$$= (0.1710)(-0.0476) + (0.8290)(0.6567)$$

$$= 56.83\%$$

FINDINGS

The analysis part of the study reveals the following:

- On observing the average returns of the selected companies, Cipla Ltd. (87.24%) and Dr. Reddy's Ltd (92.66%) are performing well, of which Dr. Reddy's Ltd. ranks in the first position.
- The standard deviation is least for Cipla Ltd. (1.75) and at the same time, good returns

(87.24%) which indicate that the best company among the selected companies is Cipla Ltd.

- As far as the correlation coefficients are concerned, the negatively correlated securities are selected as suggested by Markowitz. Accordingly, the best correlation is between Bajaj Ltd. and Cipla Ltd. (-0.1476).
- When portfolio return and portfolio risk are calculated to the above portfolios, it is observed that portfolio return is more for Dr.Reddys (92.66%) with high risk (3.7244).

CONCLUSION

- Dr. Reddy's Laboratories Ltd., Cipla Ltd., and Reliance Petroleum Ltd are good to invest because their returns are good when compared to ACC Ltd and Bajaj Auto Ltd.
- As per Standard Deviations Dr.Reddy's has the highest risk security and next highest risk securities are Bajaj Auto Ltd. and Reliance Petroleum Ltd. Cipla Ltd. and ACC Ltd. are having moderate risks.
- As per correlations concerned, the securities of Reliance and Cipla Ltd. are the good combinations because they are having normal returns with normal risk.
- The investor who bears high risk will be getting high returns.
- The investor has to maintain the portfolio of diversified sectors rather than investing in a single sector of different stocks.
- People who are investing in portfolios mostly depend on the advice of their financial advisors, friends, and relatives.
- Most of the investors invest in necessities. They plan to invest in Insurance (LIC & GIC) and pension fund as these give guaranteed returns and are less risky.
- Most of the investors feel that investing in stock, capital market is of high risk therefore they do not invest in them.

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