REPORT ON PORTFOLIO MANAGEMENT

Introduction:

In this report I have taken stock prices of 4 companies all belonging to different sectors to create a diversified portfolio. Adjusted close prices are taken from 1st September 2020 to 30th August 2021 (1 year period) listed on BSE from Yahoo Finance website. The companies chosen are VI (VODAFONE-IDEA), INDIAN OIL CORPORATION (IOC), JUSTDIAL and TATA MOTORS. All the analysis part is done in MS Excel.

The aim of this project is to study portfolio management with these 4 companies and calculating and studying the statistical properties of the individual stocks and together as a portfolio to get a better understanding of the performance of these companies.

Here, I have chosen S&P BSE 500 market index to compare overall market with the chosen portfolio.

❖ Calculating Stock Returns

We consider stock returns and not stock prices for any analysis because stock prices are volatile whereas stock returns are uniform and constant for a given time period.

I have calculated two types of stock returns- Simple Stock return and Log Stock returns.

	Stock Prices					Simple Returns					Log returns				
Date	IDEA	IOC	JUSTDIAL	TATAMOT	BSE500	IDEA	IOC	JUSTDIAL	TATAMOT	BSE500	IDEA	IOC	JUSTDIAL	TATAMOT	BSE500
01-09-2020	8.89	72.48106	364.8	143.8	15006.09										
02-09-2020	9.91	72.99419	379.6	150.4	15122.35	0.114736	0.00708	0.04057	0.045897	0.007748	0.108617	0.007055	0.039769	0.044875	0.007718
03-09-2020	12.56	72.73763	390.8	151.75	15145.3	0.267407	-0.00351	0.029505	0.008976	0.001518	0.236973	-0.00352	0.029078	0.008936	0.001516
04-09-2020	12.01	71.79687	389.65	147.75	14897.1	-0.04379	-0.01293	-0.00294	-0.02636	-0.01639	-0.04478	-0.01302	-0.00295	-0.02671	-0.01652
07-09-2020	12.3	71.62582	387.85	149.35	14899.35	0.024147	-0.00238	-0.00462	0.010829	0.000151	0.02386	-0.00239	-0.00463	0.010771	0.000151
08-09-2020	11.34	70.77059	369.7	142.25	14820.99	-0.07805	-0.01194	-0.0468	-0.04754	-0.00526	-0.08126	-0.01201	-0.04793	-0.04871	-0.00527
09-09-2020	11.07	68.88908	368.1	140.25	14764.14	-0.02381	-0.02659	-0.00433	-0.01406	-0.00384	-0.0241	-0.02695	-0.00434	-0.01416	-0.00384
10-09-2020	11.42	71.49754	366.1	143.25	14973.23	0.031617	0.037865	-0.00543	0.02139	0.014162	0.031127	0.037165	-0.00545	0.021165	0.014063
11-09-2020	11.13	71.06992	373.2	144.3	15012.16	-0.02539	-0.00598	0.019394	0.00733	0.0026	-0.02572	-0.006	0.019208	0.007303	0.002597
14-09-2020	11.57	70.6423	385.25	148.4	15088.37	0.039533	-0.00602	0.032288	0.028413	0.005077	0.038771	-0.00604	0.031778	0.028017	0.005064
15-09-2020	11.75	70.30021	396	148.3	15217.34	0.015557	-0.00484	0.027904	-0.00067	0.008548	0.015438	-0.00485	0.027522	-0.00067	0.008511
16-09-2020	11.52	70.68507	390.95	151.6	15313.21	-0.01957	0.005475	-0.01275	0.022252	0.0063	-0.01977	0.00546	-0.01283	0.022008	0.00628
17-09-2020	11.27	69.95813	384.55	147.6	15211.61	-0.0217	-0.01028	-0.01637	-0.02639	-0.00663	-0.02194	-0.01034	-0.01651	-0.02674	-0.00666
18-09-2020	11.27	68.9746	379.4	147.9	15202.64	0	-0.01406	-0.01339	0.002032	-0.00059	0	-0.01416	-0.01348	0.00203	-0.00059
21-09-2020	10.39	66.4089	365.15	137.4	14804.2	-0.07808	-0.0372	-0.03756	-0.07099	-0.02621	-0.0813	-0.03791	-0.03828	-0.07364	-0.02656
22-09-2020	10.25	65.12605	364.65	133.1	14652.22	-0.01347	-0.01932	-0.00137	-0.0313	-0.01027	-0.01357	-0.01951	-0.00137	-0.0318	-0.01032
23-09-2020	9.22	64.99777	360.8	131.35	14617.61	-0.10049	-0.00197	-0.01056	-0.01315	-0.00236	-0.1059	-0.00197	-0.01061	-0.01324	-0.00236
24-09-2020	9.12	61.53407	343.9	122.8	14221.19	-0.01085	-0.05329	-0.04684	-0.06509	-0.02712	-0.01091	-0.05476	-0.04797	-0.06731	-0.02749
25-09-2020	10.36	63.41558	371.15	127.35	14557.67	0.135965	0.030577	0.079238	0.037052	0.02366	0.127482	0.030119	0.076255	0.036382	0.023385
28-09-2020	10.34	64.69843	376.15	132.85	14834.26	-0.00193	0.020229	0.013472	0.043188	0.019	-0.00193	0.020027	0.013382	0.042282	0.018821
29-09-2020	9.81	64.05701	369.95	131.7	14819.57	-0.05126	-0.00991	-0.01648	-0.00866	-0.00099	-0.05262	-0.00996	-0.01662	-0.00869	-0.00099
30-09-2020	9.56	63.24453	380.1	133.3	14851	-0.02548	-0.01268	0.027436	0.012149	0.002121	-0.02581	-0.01276	0.027066	0.012076	0.002119
01-10-2020	9.24	63.41558	394.2	133.5	15038.24	-0.03347	0.002705	0.037096	0.0015	0.012608	-0.03405	0.002701	0.036424	0.001499	0.012529
05-10-2020	9.02	64.52739	378.8	133.9	15126.05	-0.02381	0.017532	-0.03907	0.002996	0.005839	-0.0241	0.01738	-0.03985	0.002992	0.005822
06-10-2020	8.8	64.44186	375.1	144.85	15295.38	-0.02439	-0.00133	-0.00977	0.081778	0.011195	-0.02469	-0.00133	-0.00982	0.078606	0.011132
07-10-2020	8.53	64.27081	385.65	141	15343.36	-0.03068	-0.00265	0.028126	-0.02658	0.003137	-0.03116	-0.00266	0.027738	-0.02694	0.003132
08-10-2020	8.93	64.57015	436.95	140.9	15435.38	0.046893	0.004657	0.133022	-0.00071	0.005997	0.045827	0.004647	0.124889	-0.00071	0.005979

Simple stock return is the ratio of change in stock price between time t and t-1 to the price at time t-1.

However, Simple stock return depends on the previous day's stock price i.e., stock prices are generally considered as independent of everything. Hence, we calculate the log stock returns where we find natural logarithm of the ratio of stock price for time t to time t-1.

All the analysis and study in this project is calculated on log stock returns.

❖ Statistical properties of Individual stock returns

		Statistical properties			
		IDEA	IOC	JUSTDIAL	TATAMOTORS
4	Mean	-0.00163	0.00146	0.003932	0.002901589
5	Median	-0.0059	0	-0.00031	0.003089567
6	Standard Deviation	0.044296	0.017505	0.039971	0.029906254
7	Sample Variance	0.001962	0.000306	0.001598	0.000894384
8	Kurtosis	6.142821	2.277299	4.275385	3.272031486
9	Skewness	0.84054	-0.18351	1.35268	0.389330009
10	Range	0.441706	0.144226	0.287281	0.246021819
11	Minimum	-0.20473	-0.07743	-0.10561	-0.104435414
12	Maximum	0.236973	0.066796	0.18167	0.141586404
13	Sum	-0.39651	0.356255	0.959426	0.707987791
14	Count	244	244	244	244

Statistical properties of returns of all stocks can be calculated using Data analysis tab available in Excel.

The two most important properties are highlighted in the given table.

- Mean is average daily return of individual stock calculated for period of 1 year.
- Standard Deviation is the overall individual risk associated with the return.
- Kurtosis measures the distribution of the data points whether they are heavily tailed or lightly tailed. A high value of kurtosis indicates probability of extreme returns and thus a stock with high kurtosis is considered a risk one. Here, IDEA and JUSTDIAL have high kurtosis value which indicates that they have extreme returns whereas IOC and TATA MOTORS are less prone to extreme returns.
- Skewness also measures distribution of data points. A positive value indicates positive skewness which means the probability of more small losses with few large returns. On the other side negative skewness value indicated negative skewness which indicates small wins and few large losses. Here IOC is the only stock with negative skewness, others are positively skewed.

❖ Variance-Covariance matrix

Variance-Covariance matrix				
	IDEA	IOC	JUSTDIAL	TATAMOTORS
IDEA	0.001954	0.000222	0.000419	0.0004521
IOC	0.000222	0.000305	0.000158	0.0002555
JUSTDIAL	0.000419	0.000158	0.001591	0.000286
TATAMOTORS	0.000452	0.000255	0.000286	0.0008907

Variance-Covariance matrix shows how the stocks move together. Now here since all the stocks are of different sectors no two are similar and hence are not showing high values of covariance.

❖ Other Properties:

	IDEA	IOC	JUSTDIAL	TATAMOTO	S&P BSE 500
Average returr	-0.00163	0.00146	0.003932	0.0029016	0.0017361
Annualised ret	-0.46854	0.375426	1.161505	0.8211414	0.5087665
Beta	1.476364	1.076115	1.321583	1.9987855	1
Expected retu	-0.72208	0.399153	1.51454	1.5776629	0.5087665

- Average return: It is the mean or average return of a stock over a period of one year.
- Annualized return: It is the annual return obtained for holding the stock for a period of one year.
- Beta: It is the slope of the stock returns with respect to market return. It shows how the stocks react compared to the reaction of market. Here all these 4 stocks are aggressive stocks since they react more than that of market. For instance, IDEA has Beta value of 1.47; it means when the market reacts by one unit value of IDEA reacts by 1.47 unit.
- Expected return: It is the expected return of the stock calculated based on 10-year Indian Government security bond which is 6.37%.

❖ Statistical properties of Portfolio

	Weights
IDEA	0.25
IOC	0.25
JUSTDIAL	0.25
TATAMOTORS	0.25
	1

Here we assume equal weights to all 4 stocks. The total amount invested is taken as 1 unit and hence 0.25^{th} part is invested in each of the 4 stocks respectively.

Portfolio return	0.001667
Portfolio variance	0.00052
Portfolio risk	0.022811
Portfolio expected return	0.69232
Sharpe Ratio	27.55809
Potfolio Beta	1.468212
Trayner Ratio	0.428154
Jensen Alpha	-0.69065

- Portfolio return: It is simply the weighted average of the stock returns. Weights are the amount invested in stocks. The value of portfolio return as a whole is 0.001667 per unit for 1 year.
- Portfolio risk: It is the risk associated with the portfolio as a whole. It is calculated by taking square root of portfolio variance. The overall portfolio risk is generally lower than that of individual risks of the stocks due to diversification. Here risk associated on the entire portfolio is 0.0228 per unit for a period of 1 year. All the stocks except IOC have individual risks higher than the overall portfolio risk.
- Portfolio expected return: It is simply the weighted expected return of the portfolio.
- Sharpe ratio: It measure excess return on portfolio per unit of risk. Generally, a higher value of Sharpe ratio is good for a portfolio so as to get maximum returns. Here, we have Sharpe Ratio value=27.56 which is considered as very good.

- Portfolio Beta: It shows how the portfolio reacts to changes in market. It is calculated as weighted sum of individual Beta value of stocks. The value of portfolio Beta here is 1.468 which says that portfolio reacts by 1.468 unit when the market reacts by 1 unit.

- Trayner Ratio: Trayner ratio measures excess return earned on portfolio per unit of Beta of portfolio. Higher value of Trayner ratio is good to get maximum returns per unit of Beta. Here we have value of Trayner ratio= 0.428

- Jensen's Alpha: It shows the performance of the portfolio. It is calculated by taking difference between actual portfolio return and expected portfolio return. Here we have Jensen's alpha value = -0.69 which shows that the portfolio has underperformed against its expectations with the value of 0.69 per unit of investment for 1 year.