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ACCOUNTING FOR RISK

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ABSTRACT

Risk is an indomitable reality which every investor should undertake to achieve returns on investment. In the equity market, risk constitutes the undiversifiable systematic risk and an avoidable unsystematic risk. There are several measures that stock analysts apply to get a better feel for a stock's risk profile. Risk-adjusted return is of how much return the investment has made in relation to the quantum of risk assumed for that investment over a given period of time. Risk measures are statistical measures that help predict investment risk. Risk-adjusted returns have a tremendous outcome on portfolios. In strong markets, stocks with lower risk than the market index can limit and have lower returns and a stock with inherent more risk than the market index may achieve enormous returns. While losses accrue in higher-risk stocks during periods of uncertainty, investors with a greater appetite for risk are can outperform their benchmarks during stable times. The article is an attempt to assess the performance of top stocks with Relative risk adjusted measures of Alpha, Information ratios, Absolute risk adjusted measures Sharpe Ratio, Treynor Ratio and certain commonly used measures as Beta, Standard Deviation, R Squared in the analysis of stocks. The paper also explicitly gives a practical explanation on the calculation of the measures and annual forecasts prices for sample included in the sample. The outcome of this paper is to create an overall understanding to the forthcoming investors on how to use these measures in practice.

KEY WORDS

Alpha, Beta, Information Ratio, R Squared, Sharpe Ratio, Standard Deviation, Treynor Ratio

INTRODUCTION

Today, India is the biggest among the emerging market economies. The Indian stock market holds a place of prominence with bourses such as Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). The BSE is one of the world's oldest stock exchanges with a total number of companies double that of the London Stock Exchange, NASDAQ and NYSE companies quoted in its market today. The National Stock Exchange is the best in terms of sophistication and advancement of technology. Risk-adjusted return is a technique to measure and analyze the returns on an investment for which the financial, market and adjusted so that an individual can take a decision on whether the investment is worth it with all the risks it poses to the capital invested. Risk measures can be used individually or collectively to perform a risk assessment. When comparing investments, it is appropriate to compare like the various measures of risk and how they validate their relationship with returns. The following is an introduction of the statistical measures¹ used in the study.

Alpha

Alpha is commonly used to assess the performance of a portfolio manager as it's an indicator of their ability to provide returns in excess of a benchmark. If $\alpha < \text{risk-free investment return}$, then the firm has destroyed value; if $\alpha = \text{risk-free investment return}$, then the firm has neither created nor destroyed value; and if $\alpha > \text{risk-free investment return}$, then the firm has created value.

Beta

One of the most important measures of stock risk or volatility is a stock's beta. The beta value is calculated using price movements of the stock which is analysed. The movements are then compared to the movements of an overall market indicator, such as a market index, over the same period of time. Beta values are easy to interpret. If the stock's price experiences movements that are greater and more volatile than the stock market, then the beta value will be greater than 1. If a stock's price movements, are less than those of the market, then the beta value will be less than 1. An increased volatility of stock price means more risk to the investor, its reasonable expecting greater returns from stocks with betas over 1. The reverse is true if a stock's beta is less than 1; expect less volatility, lower risk, and therefore lower overall returns.

Standard Deviation

Standard deviation measures dispersion of a particular data set from the mean value and provides a measurement of investment's volatility. A lower Standard deviation represents lower risk with less volatility and higher vice versa..

R-Squared

R-Squared measures the percentage of an investment's movement that can be attributed to movements in its benchmark index. An R-squared value represents the correlation between a particular stock and the benchmark. For example, an R-squared value of 95 depicts a high correlation, while the R-squared value of 50 may be measured to have a low correlation.

Sharpe Ratio

The Sharpe ratio measures performance as adjusted by the associated risks. This is done by removing the rate of return on a risk-free investment, here it is the rate of the 364 days Treasury Bills in India which is deducted from the rate of return. This difference is then divided by the respective investment's standard deviation and serves as an indicator of whether an investment's return is due to prudent investing or due to the assumption of excess risk.

Treynor Ratio

Treynor is a measurement of the returns made in excess of that which could have been earned on an investment that has no diversifiable risk. In short, it is also a reward-volatility ratio, just like the Sharpe's ratio, but with just one difference. The Treynor ratio uses a beta coefficient in place of standard deviations to capture the market performance

Information Ratio

The Information and the Sharpe ratio are similar. Both ratios determine the risk-adjusted returns of a security or portfolio. The information ratio measures the risk-adjusted returns relative the market index whereas the Sharpe ratio compares the risk-adjusted returns to the risk-free rate.

REVIEW OF LITERATURE

(Krishnamurthy & Murugesan) their study on risk adjusted methods of Sharpe, Treynor, and Jensen alpha measure had done performance evaluation of dividend open-ended schemes of equity funds of mutual with an analysis of yearly return showed that all the funds earned positive returns in the excess of the risk free rate of return. It was also observed from the market and other reliable sources that mutual funds have not reached to their expectation. Amir Rehman (2018) Risk return analysis along with the assessment of risk-adjusted performance measures such as Sharpe ratio, Treynor ratio, Jensen measure, and Sharpe-differential measure were used for evaluating the investment performance of the selected sample schemes. The findings revealed that private sector funds outperformed the public sector funds against their benchmark index in terms of risk-return analysis as well as risk-adjusted measures of performance evaluation throughout the study period. Pahuja, Anurag and Sahi, Anu and Dogra, Balram, (2016) paper compared both the traditional and VaR performance measures and investigated for the differences in the ranking of funds using both the approaches. Results indicated that Sharpe ratio and Normal VaR results are same when used independently, while there is difference in results using Treynor and Jensen's Alpha. Manoj Kumar Dash1 & Dr. Gouri Shankar Lall (2018) observed the performance of fifteen equity based mutual fund schemes from 1st April, 2011 to 31st May, 2016 for India with monthly NAV for calculate returns of different schemes. They concluded that its performance depends on the performance of underlying portfolio as one or more schemes perform badly in the portfolio it could affect the investment decisions of investors may get them out from scenario of wealth creation process for saving investors' money. Evaluation of performance of mutual portfolio is necessary, it helps to the investors for taking rational decisions. This study evaluated the performance of selected mutual fund schemes using Sharpe and Treynor's ratio and sensitivity to the market fluctuation in terms of beta

OBJECTIVES OF THE STUDY

The following are described as the objectives of the study:

1. To measure the various risk measures of Alpha, beta, Standard Deviation, RSquared, Sharpe, Treynor and Information ratios. of the selected companies with the use of the market index SENSEX.
2. To evaluate the relationship between the risk measures and test for its significance.
3. To forecast prices of the firm for a five year period on the basis of the determined beta values.

METHODOLOGY

Both alpha and beta values using data for a twelve month period are computed with the help of a spreadsheet application risk.xls developed by Professor Aswath Damodaran, Stern School of Business, New York. Share price data from the website yahoofinance.com and market index values of BSE SENSEX from the BSE website. To calculate a stock's beta the data needed includes

Closing daily stock prices for the stock being examined

Closing daily prices for the index (BSE SENSEX Index) being chosen as a proxy for the stock market.

- Annual Dividend

The formula for this metric can be written as:

Beta = Covariance (stock versus market returns) / Variance of the Stock Market

using the following CAPM formula we can calculate the expected rate of return on an investment as:

Expected Rate of Return = $r = r_f + B (r_m - r_f)$

Where:

- r_f = The risk-free interest rate i.e the rate of the 364 days Treasury Bills in India.(4.96%)
- B = A stock beta
- r_m = The expected market return is the return the investor would expect to receive from a broad stock market index. In the current study it is the BSE SENSEX

R Squared values are the result of the spreadsheet. While the other values of Standard Deviation, Sharpe, Treynor and Information ratios were computed. The formula for Sharpe is

$R_p - R_f / S_{dp}$.

In this paper the ratio has been annualised by multiplying with square root of total number of days traded.

Treynor ratio is computed with a beta coefficient in place of standard deviations. . The formula for Treynor ratio is

$R_p - R_f / SD_m$

The formula for information error is given as $R_p - R_m / SD_{pm}$ where SD_{pm} denotes the tracking error.

In this paper the ratio has been annualised by multiplying with square root of total number of days traded.

The various risk measures have been ranked and Spearman's Rank Correlation Test has been performed using SPSS.

SAMPLE

The following companies have been included in the sample. While selecting of the sample it has been ensured that they have a minimum turnover of 5 crores and fall in the top list of companies in the respective sector in 2019.

Industry	Companies
Paints & Varnishes	Akzo Nobel,Asian Paints,Kansai Nerolac
FMCG	Colgate,Godrej,HLL
Engineering & Construction	Hindustan Construction Company,L&T,NCC
Steel	Jindal South West Steel,Tata Steel,Vizag Steel
Automobiles	Maruti Suzuki,Eicher,Mahindra & Mahindra
Food & Beverage	Nestle,Britannia
Oil & Natural Gas	BPCL,HPCL,ONGC
Information Technology	Infosys,Wipro,HCL
Tobacco	ITC,Godfrey Philips,Kothari Products
Banking & Finance	ICICI,Kotak Mahindra, HDFC,Bajaj Finance

DATA COLLECTION

This study is based on secondary data with select top ten rated companies which are listed in the Bombay Stock Exchange. Listing on exchange is a prerequisite since the stock price information is required. The study has an inclusive sample of thirty companies with three companies from each industry pertinent for the growth of the economy such as Paints and Varnishes, FMCG, Engineering and Construction, Automobiles, Food and Beverages, Banking, Steel, Oil and Natural Gas, Computer Software, Tobacco and Finance. As the study aims to draw inferences across the sectors in India, three companies from each of the above category of industries were chosen for the study.

The share prices and dividend information for a period of twelve months from 1st March 2019 to 28th February 2020 was collected from www.yahoofinanceindia.com. The market index values for BSE SENSEX were taken from www.bseindia.com. BSE SENSEX was chosen because it is regarded as the pulse of the domestic stock market with thirty most actively traded stocks representing the various industrial sectors of the Indian economy.

RESULTS AND DISCUSSION

The following table provides the measures computed.

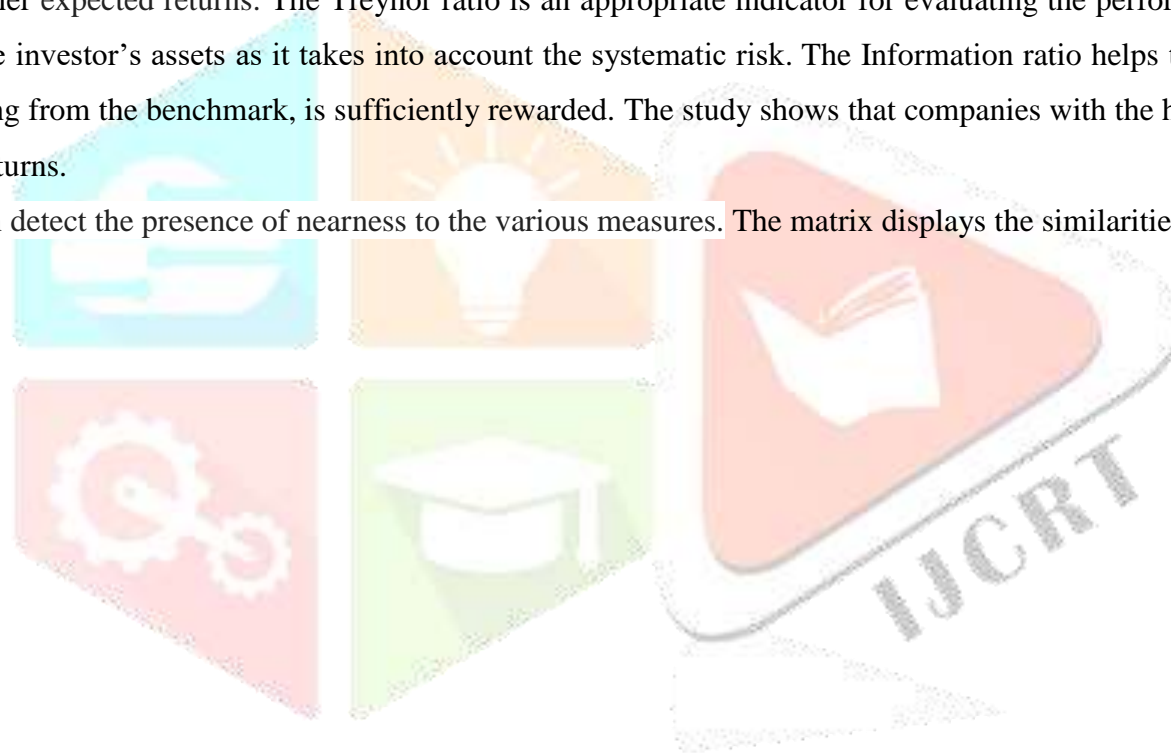
	Co1	Co2	Co3	Co4	Co5	Co6	Co7	Co8	Co9	Co10	Co11	Co12	Co13	Co14	Co15
Alpha	0.007	0.007	0.008	0.008	0.008	0.009	0.011	0.009	0.012	0.009	0.010	0.012	0.009	0.010	0.010
Beta	0.141	-0.211	0.014	-1.364	-0.038	-0.161	0.430	0.169	0.355	0.191	0.368	0.234	0.151	0.160	-0.192
SD of stock	0.066	0.064	0.067	0.066	0.066	0.066	0.073	0.067	0.073	0.069	0.069	0.075	0.067	0.069	0.069
R squared	0.000	0.001	0.000	0.034	0.000	0.000	0.003	0.001	0.002	0.001	0.002	0.001	0.000	0.000	0.001
Sharpe Measure	5.460	0.934	3.745	-14.109	3.111	1.552	8.294	5.773	7.386	5.819	7.976	5.877	5.498	5.478	1.086
Treynor Measure	0.164	-0.018	1.162	0.044	-0.347	-0.041	0.091	0.146	0.098	0.136	0.097	0.121	0.157	0.152	-0.025
Information Ratio	0.007	0.007	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.011	0.009	0.010	0.009
Expected Returns	0.073	0.053	0.066	-0.010	0.063	0.056	0.089	0.074	0.084	0.075	0.085	0.078	0.073	0.074	0.054

	Co16	Co17	Co18	Co19	Co20	Co21	Co22	Co23	Co24	Co25	Co26	Co27	Co28	Co29	Co30
Alpha	0.007	0.009	0.008	0.010	0.011	0.009	0.008	0.009	0.008	0.007	0.008	0.010	0.009	0.009	0.007
Beta	0.030	-0.222	-0.081	0.317	0.213	0.039	-0.445	0.022	0.154	0.096	-0.029	0.283	0.389	0.383	0.221
SD of stock	0.065	0.066	0.068	0.072	0.068	0.077	0.070	0.067	0.066	0.066	0.067	0.065	0.070	0.071	0.068
R Squared	0.000	0.001	0.000	0.002	0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.001
Sharpe Measure	4.062	0.745	2.490	7.085	6.155	3.546	-2.016	3.861	5.635	4.854	3.199	7.380	8.128	7.954	6.245
Treynor Measure	0.560	-0.014	-0.135	0.104	0.127	0.448	0.020	0.751	0.155	0.215	-0.470	0.109	0.095	0.095	0.125
Information Ratio	0.011	0.009	0.008	0.010	0.011	0.008	0.008	0.009	0.008	0.007	0.008	0.065	0.008	0.009	0.019
Expected Returns	0.067	0.053	0.061	0.082	0.077	0.067	0.041	0.066	0.073	0.070	0.063	0.081	0.086	0.086	0.077

All stocks depict positive alpha values while nine of the stocks show negative betas. It is seen that all stocks which show negative beta also show lower expected returns. The standard deviation of certain sectors like Engineering and Construction, Automobiles, Software and Banking and Finance show higher volatility but they have also provided adequate returns to the investor. Most of the R Squared measures are very low.

The results of the Proximity Values and Spearman's Rank Correlation Test are given below. R-squared reflects the percentage of the stock's movements that can be explained by movements in its benchmark index. The Sharpe ratios are positive except two companies and higher Sharpe ratios have higher expected returns. The Treynor ratio is an appropriate indicator for evaluating the performance of a portfolio that only constitutes a part of the investor's assets as it takes into account the systematic risk. The Information ratio helps to check that the risk taken by the investor, in deviating from the benchmark, is sufficiently rewarded. The study shows that companies with the highest information ratios have the highest expected returns.

A proximity matrix can detect the presence of nearness to the various measures. The matrix displays the similarities in the measures.



PROXIMITY MATRIX

	Correlation between Vectors of Values						
	Alpha	Beta	SD	Rsq	Sharpe	Treynor	IR
Alpha	1.000	.505	-.605	.317	.469	-.059	.591
Beta	.505	1.000	-.519	.352	.994	.261	.471
SD	-.605	-.519	1.000	-.305	-.461	.018	-.238
Rsq	.317	.352	-.305	1.000	.348	-.406	.225
Sharpe	.469	.994	-.461	.348	1.000	.268	.472
Treynor	-.059	.261	.018	-.406	.268	1.000	.084
IR	.591	.471	-.238	.225	.472	.084	1.000

SPEARMAN RANK CORRELATION TEST

The following table provides the results of the Spearman Rank Correlation Test

Alpha	With Beta	With Std Dev	With R Squared	With Sharpe Ratio	With Treynor Ratio	With Information ratio
Correlation Coefficient	.505**	-.602**	.312	.469**	-.051	.578**
Significance	.004	.000	.093	.009	.790	.001
Beta	With Std Dev	With R Squared	With Sharpe Ratio	With Treynor Ratio	With Information ratio	With Alpha
Correlation Coefficient	-.519**	.352	.994**	.261	.471**	.505**
Significance	.003	.056	.000	.163	.009	.004
Std Dev	With R Squared	With Sharpe Ratio	With Treynor Ratio	With Information ratio	With Alpha	With Beta
Correlation Coefficient	-.305	-.461*	.018	-.238	-.602**	-.519**
Significance	.101	.010	.926	.204	.000	.003
R Squared	With Sharpe Ratio	With Treynor Ratio	With Information ratio	With Alpha	With Beta	With Std Dev
Correlation Coefficient	.348	-.406	.225	.312	.352	-.305
Significance	.060	.026	.232	.093	.056	.101
Sharpe Ratio	With Treynor Ratio	With Information ratio	With Alpha	With Beta	With Std Dev	With R Squared
Correlation Coefficient	.268	.472**	.469**	.994**	-.461*	.348
Significance	.153	.008	.009	.000	.010	.060
Treynor Ratio	With Information ratio	With Alpha	With Beta	With Std Dev	With R Squared	With Sharpe Ratio
Correlation Coefficient	.084	-.051	.261	.018	-.406	.268
Significance	.658	.790	.163	.926	.026	.153
Information ratio	With Alpha	With Beta	With Std Dev	With R Squared	With Sharpe Ratio	With Treynor Ratio
Correlation Coefficient	.578**	.471**	-.238	.225	.472**	.084
Significance	.001	.009	.204	.232	.008	.658

** denotes significance at 1% level two tailed

It is seen that Alpha Beta, Sharpe ratio the correlation is found significant at 1% level with four of the measures whereas for the Standard Deviation and Information ratios the correlations were found significant at 1% level with three measures. The Treynor measure does not give meaningful values as nine out of thirty companies have negative beta values in the sample.

The following are the forecasts of prices for years one, two, three, four and five years ahead from now

<i>USING BETA</i>	Co1	Co2	Co3	Co4	Co5	Co6	Co7	Co8	Co9	Co10	Co11	Co12	Co13	Co14	Co15
<i>In estimating expected returns:</i>															
Alpha	0.007	0.007	0.008	0.008	0.008	0.009	0.011	0.009	0.012	0.009	0.010	0.012	0.009	0.010	0.010
Beta=	0.141	-0.211	0.014	-1.364	-0.038	-0.161	0.430	0.169	0.355	0.191	0.368	0.234	0.151	0.160	-0.192
Expected return=	0.073	0.053	0.066	-0.010	0.063	0.056	0.089	0.074	0.084	0.075	0.085	0.078	0.073	0.074	0.054
<i>In forecasting prices:</i>															
Current price=	2348.00	1826.55	500.45	1322.85	646.54	1750.43	8.52	1202.10	38.60	235.55	381.55	2348.20	6284.00	456.40	16605.50
Annualized DPS=	24.00	11.00	2.60	48.00	8.00	22.00	0.00	18.00	1.50	4.10	13.00	24.00	80.00	8.50	8.50
Predicted prices:															
- One year from now	2494.88	1913.12	530.76	1261.63	679.20	1826.75	9.28	1273.44	40.36	249.23	401.08	2507.00	6664.48	481.57	17500.67
- Two years from now	2650.94	2003.79	562.91	1203.24	713.51	1906.40	10.10	1349.01	42.20	263.70	421.60	2676.54	7068.00	508.13	18444.10
- Three years from now	2816.77	2098.76	597.01	1147.56	749.56	1989.52	10.99	1429.06	44.13	279.02	443.17	2857.54	7495.95	536.16	19438.38
Four years from now	2992.97	2198.23	633.17	1094.45	787.43	2076.26	11.97	1513.87	46.14	295.22	465.85	3050.78	7949.81	565.73	20486.26
- Five years from now	3180.19	2302.41	671.52	1043.80	827.21	2166.78	13.03	1603.71	48.25	312.37	489.69	3257.10	8431.16	596.93	21590.64

	Co16	Co17	Co18	Co19	Co20	Co21	Co22	Co23	Co24	Co25	Co26	Co27	Co28	Co29	Co30
<i>USING BETA</i>															
<i>In estimating expected returns:</i>															
Alpha	0.007	0.009	0.008	0.010	0.011	0.009	0.008	0.009	0.008	0.007	0.008	0.010	0.009	0.009	0.007
Beta=	0.030	-0.222	-0.081	0.317	0.213	0.039	-0.445	0.022	0.154	0.096	-0.029	0.283	0.389	0.383	0.221
Expected return=	0.067	0.053	0.061	0.082	0.077	0.067	0.041	0.066	0.073	0.070	0.063	0.081	0.086	0.086	0.077
<i>In forecasting prices:</i>															
Current price=	15770.55	2971.5	426.25	197.6	91.95	731.35	534.1	221.1	1177.6	496.05	496.05	197.6	1147.8	1147.8	4452.87
Annualized DPS=	244	15	16	18.8	1.75	16	8	2	7.5	1	1	5.75	34	34	16
Predicted prices:															
- One year from now	16578.08	3113.35	436.05	195.09	97.26	764.46	547.74	233.74	1256.65	529.92	526.49	207.76	1212.98	1212.58	4780.41
- Two years from now	17426.95	3261.97	446.08	192.61	102.87	799.07	561.73	247.10	1341.00	566.10	558.80	218.45	1281.87	1281.02	5132.05
- Three years from now	18319.29	3417.69	456.34	190.16	108.80	835.25	576.07	261.23	1431.02	604.76	593.10	229.69	1354.66	1353.33	5509.55
Four years from now	19257.33	3580.84	466.84	187.74	115.08	873.07	590.79	276.17	1527.07	646.05	629.50	241.51	1431.59	1429.71	5914.82
- Five years from now	20243.39	3751.78	477.57	185.35	121.72	912.60	605.87	291.96	1629.58	690.16	668.13	253.93	1512.89	1510.41	6349.91

MANAGERIAL IMPLICATIONS OF THE STUDY

The current study accentuates the comparison of traditional measures Standard Deviation, Beta, with other measures like Jensen Alpha, Sharpe ratio, Treynor ratio and Information ratio for risk measurement. The study helps an investor to identify and compare the suitable risk measuring techniques for making investment choices. This study also enables the investors to identify the stock and construct their portfolio which would minimize the risk and maximize the return. Investors must always look when evaluating various opportunities at risk-adjusted returns as overlooking risk can prove costly over the long run. While beta and alpha are good ways to do so, investors according to circumstance also apply the Sharpe ratio as it provides absolute rather than relative measures of risk. These metrics can be much more helpful when comparing or stocks across different categories.. Jensen's Alpha uses the capital asset pricing model helps choose stocks with positive relative to the market. Investors should find the measure that best suits their individual needs. This study helps to use efficient risk measuring techniques for creating efficient portfolio for investment. The stock market always offers bright opportunities in the domestic as well as in global market for prudent and smart investors

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