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PORTFOLIO SELECTION IN NSE EXPECTED RETURN & RISK THROUGH MARKOWITZ PORTFOLIO THEORY

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ABSTRACT

This article tells us about selection of portfolio from National Stock Exchange. Investors are more concerned about their objective minimizing risk and maximizing returns. They considering their tradeoff b/w risk and return from the portfolio, a financial economist, Harry Markowitz, proposed the So-called optimal portfolio theory in 1952. The aim of this article is to provide a practical study of Markowitz model on the Indian Stock Market (NSE) from 1st June 2009 to 30th June 2019.The Markowitz model has been widely used by investors, its application on National Stock Exchange is limited. From the data input which are monthly adjusted closing & daily adjusted closing prices. As a result, investors can select the optimal portfolio that maximizes portfolio return with respect to risk. It is vividly manifest that the investor tends to be risk averters, the attitude towards risk and return tends to play a vital role for the selection of the portfolio. Thus, there is the need to comprehend the investor's attitude towards different portfolio choices. Diversification always reduces the non-systematic risk, it is also given by Morgan Kelly in 1994 gives the benefits of diversification (all the eggs in one basket: portfolio diversification of US households). In other words, diversification allows an opportunity for investments to grow with minimum volatility, security behave differently in different market conditions.

Keywords: *Markowitz, Beta, Regression, Variance, Covariance, Risk & Return.*

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Markowitz model assumed that investors prefer towards high level of return at given level of risk. For optimal portfolio analysis, first step is that an investor needs to specify the list of securities eligible for selection or inclusion in the portfolio then to generate the risk return expectations for these securities expressed as the expected rate of return (mean) and the variance or standard deviation of the return. The expected return of assets is the weighted average of the return of the individual securities held in the portfolio. The variance or the standard deviation of return is alternative statistical measures which are used for measuring the risk in investment. This explains how return of the portfolio move with overall risk of the portfolios

LITERATURE REVIEW

Hamed Soleimani, Hamid Reza Golmakani, Mohmaad Hossein Sailmi in 2009 Markowitz based portfolio selection with min transaction lots by using Genetic algorithm. In this approach the author find that no study has ever proposed and solved that expands model. To solve the mixed integer non-linear programming and corresponding to genetic algorithm is utilized. Again Markowitz, himself studies more complex objective function, based on the notion of semi variance (Markowitz, Todd, Xu, & Yamane, 1993). His dissertation finding, entitled, "portfolio selection" (1952), were first published in the Journal of finance. Subsequently these findings were significantly expanded by publishing the book, selection of efficient portfolio on the basis of diversification by the year 1959. He got a Nobel Prize for his contribution on the field of economic and corporate finance. According to Modern Portfolio Theory (MPT) is comprised of Markowitz' Portfolio Selection theory, which is first introduced in 1952, and William Sharpe's assistance to the theory of financial asset price formation in 1964. This came to be known as the Capital Asset Pricing Model (Veneeya) by the year 2006.

Modern portfolio theory is an investment framework for the selection & structure of investment portfolios based on the maximization of expected returns by minimization of the portfolio investment risk by Markowitz & Fabozzi in 2002. There are various mathematical formulations for the purpose of measurement of risk of the portfolio. The risk of the portfolio can be reducing via diversification by the aim of properly selecting the weights of the investments. Diversification is one of the core concept of the modern portfolio theory as directly relies on the basis of conventional wisdom such that 'never put your all eggs in a single basket' by Fabozzi Gupta & Markowitz in 2002, McClure.

METHODOLOGY

The main objective of this study is to assess the optimal portfolio in the National Stock Exchange (NSE).

The specific objectives of the study are:

1. To examine the expected return of different portfolios in NSE in relation to Nifty.
2. To assess the risk level of different Portfolios in the NSE.
3. To examine the beta of the different portfolios.
4. To assess the optimal portfolios in NSE.

This research methodology followed in the study of exploratory and empirical research. The secondary data is to be used; the data for this study is collected from the NSE website, from the published data by RBI, Yahoo Finance and Investing. The benchmark of the index such as Nifty 50, Nifty 100, Nifty 500 & Nifty midcap 100 data are to be collected in two sets such as daily& monthly closures. The data was collected from the period 1 JUNE 2009 to 30 JUNE 2019. The analysis of the data is to be done on the basis of above framework. The analysis is done in the study including the expected return from

different portfolios and their risk with the respective levels. The risk level has been analyzed through variance, standard deviation, and covariance & correlation matrix.

PORTFOLIO OPTIMIZATION: ANALYSIS AND INTERPRETATION:

The Optimum portfolio selection is to be done on the basis of risk & return swap between different industry sectors. Performance of the economy can be manipulated by different industry sectors where return are changing over the time .This changing pattern of correlation b/w sectors is essential for the purpose of portfolio optimization. Common objective of financial investors is to achieve an optimal risk-return combination. Consequently, analysis of all the risks and returns for all sectors in the form of portfolio has done to assess the optimal choice of the portfolio.

*Expected Risk and Returns – Mean, Standard Deviation and Portfolio Choice:

The risk and return of the portfolios have been analyzed with the help of arithmetic mean or average mean, standard deviation and the ratio b/w these two.

The ratio was computed with the help of the formula:

$$R = (\mu - d)/\sigma$$

Here 'μ' denotes the arithmetic mean of the daily data;

'σ' refers to standard deviation;

'd' refers to the disaster level, which is also called by the name lowest level of return.

These three results show the relationship b/w the expected return and the risk of the different portfolio.

From the table 1 it is found that nifty media portfolio gives the lowest return with the comparison to the other portfolio during the last 10 years. This indicates the worst performing sectors among other sectors, the standard deviation also tends to be high. This indicates that there is lots of volatility or risk in this sector. The portfolio choice ratio indicate that the least priority sector remain media. The ratio among the benchmarks nifty bank is the most favorable sectors among the other sectors. The return of the nifty FMCG is also high but this indicates negative result to exhibits resistance to the portfolios as comparison to nifty bank. Nifty FMCG& Nifty Pharma having lower level of risk as compared to other sectors.

Table:1 Mean, Standard Deviation and their Ratio for the daily data from June2009 to June2019

	MEAN	STD	MIN	MAX	R=(μ-d)/σ
Nifty 50	0.04	1.01	-5.92	3.81	5.99
Nifty 100	0.05	1.01	-6.13	3.72	6.11
Nifty 500	0.05	1.43	-29.59	42.56	20.72
Nifty midcap 100	0.05	1.11	-8.77	4.44	7.94
Nifty auto	0.06	1.25	-7.26	5.98	5.85
Nifty Bank	0.07	1.42	-8.19	9.46	5.81
Nifty FMCG	0.07	1.06	-6.73	-5.83	6.41
Nifty IT	0.07	1.27	-11.74	9.33	9.29

	MEAN	STD	MIN	MAX	R=(μ-d)/σ
Nifty Media	0.03	1.44	-16.37	8.37	11.38
Nifty Pharma	0.05	1.11	-6.99	5.22	6.34
Nifty Financial Service	0.07	1.34	-8.35	7.28	6.28
Nifty Reality	-0.0018	2.18	-11.60	10.23	5.32

Thus table 1 clearly indicates that the most preferable shares were from the Nifty 50, Nifty 100 as compared to Nifty 500 and Nifty midcap 100. The most suitable portfolio tends to be FMCG, IT, Bank &Financial services on the basis of return and risk level of the portfolios. The result tends to be discouraging the support of the portfolios like Reality and Media hence, the portfolio choice indicates resistance of these portfolios.

Table:2 Mean, Standard Deviation and their Ratio for the monthly data from June2009 to June2019

	MEAN	STD	MIN	MAX	R=(μ-d)/σ
Nifty 50	0.95	4.58	-10.25	12.43	2.44
Nifty 100	0.98	4.60	-10.33	13.23	2.46
Nifty 500	0.96	4.63	-10.45	13.48	2.46
Nifty midcap 100	1.14	5.53	-13.89	16.18	2.71
Nifty auto	1.38	6.36	-15.64	25.27	2.67
Nifty Bank	1.45	7.01	-14.27	24.48	2.24
Nifty FMCG	1.46	4.56	-9.58	18.81	2.42
Nifty IT	1.45	6.07	-16.23	23.80	2.91
Nifty Media	0.69	6.32	-15.31	19.05	2.53
Nifty Pharma	1.08	5.26	-12.74	13.76	2.62
Nifty Financial Service	1.46	6.25	-12.83	20.89	2.28
Nifty Reality	0.23	10.71	-22.69	33.57	2.14

The analysis of the monthly average closing data shows in the Table 2 confirms the results of the previous table. The Bank, FMCG, IT& Financial services portfolio performed very well , while the Reality and Media shows very poor performance. The portfolio choice ratio does not substantiate the same. The ratio value is very low in case of Bank, Reality & financial services in comparison to the other sectors of the industry. It shows that in case of Bank, Reality is very high unlike the data results; the monthly data shows more stability. In case of Pharma, though the returns are low, the risk is considered to be low.

* Correlation and Covariance Matrices:

The correlation coefficient reveals the magnitude and the direction of the relationships. Direction tells whether large values on one variable are associated with large value of others.

When the value corresponds in the way, the two variables have a positive relation and vice a versa. The correlation coefficient value ranges from '+1' to '-1'. It is denoted by symbol 'r'. In a portfolio as the value of an 'r' moves from '+1' to '-1' the risk of the portfolio is to be reduces. '+1' is the perfectly positive correlation and '-1', which give the most diversification benefits to portfolio.

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where:

r_{xy} – the correlation coefficient of the linear relationship between the variables x and y

x_i – the values of the x-variable in a sample

$\bar{x}$ – the mean of the values of the x-variable

y^i – the values of the y-variable in a sample

$\bar{y}$ – the mean of the values of the y-variable

The correlation matrix was computed for all the portfolios and benchmark indices to understand the relationship b/w the returns similarly, the relationship b/w the risk of all portfolios was assessed through covariance. Covariance is the statistical measures that indicate the interactive risk of a security related to others in a portfolio of securities; covariance b/w portfolio is to be calculated as follow:

$$\text{Cov}(X, Y) = \frac{\sum(X_i - \bar{X})(Y_j - \bar{Y})}{n}$$

Where:

Cov(X, Y) is the covariance b/w the portfolio 'I' and 'J'

X_i – the values of the X-variable

Y_j – the values of the Y-variable

$\bar{X}$ – the mean (average) of the X-variable

$\bar{Y}$ – the mean (average) of the Y-variable

n – the number of the data points.

The covariance is a measure of how deviation in the return of the portfolios moves together. If the returns of the two portfolios move in the same direction consistently would be positive and vice versa. If the movements of the returns are independent of each other, covariance would be close to zero. Thus, the covariance indicates the direction and risk of the portfolios.

The table 3 shows the correlation matrix of the daily return data of all portfolio Nifty 100 indexes having very high positive correlation with all portfolios as compared to other benchmark. Only Nifty 50, Nifty IT and Nifty FMCG portfolio displayed a very low correlation as compared to other portfolio from the given table no 3. Bank nifty is having highest correlation with financial services among all of the portfolios. Only FMCG and IT shows negative correlation, indicating the risk dispersion among them. Diversification of risk is possible only in these portfolios.

Table 3: correlation matrix of daily data of all the portfolio and benchmarks Indices

	Financial Services	Nifty 50	Nifty 100	Nifty Auto	Nifty FMCG	Nifty IT	Nifty 500	Nifty Bank	Nifty Media	Nifty Pharma	Nifty Realty	Nifty Midcap 100
Financial Services	1											
Nifty 50	0.02752	1										
Nifty100	0.90331	0.03480	1									
Nifty Auto	0.68879	0.01363	0.79592	1								
Nifty FMCG	0.48291	0.02776	0.61194	0.47336	1							
Nifty IT	0.34036	0.02397	0.52853	0.32969	0.27574	1						
Nifty500	0.61521	0.02677	0.67740	0.53748	0.40508	0.34234	1					
Nifty Bank	0.96385	0.02674	0.88181	0.66976	0.44667	0.32605	0.59579	1				
Nifty Media	0.51760	0.01373	0.59648	0.53905	0.35082	0.25908	0.41443	0.50066	1			
Nifty Pharma	0.41882	0.04159	0.54705	0.44587	0.37789	0.28194	0.38632	0.39663	0.39010	1		
Nifty Reality	0.67990	0.02555	0.74616	0.61168	0.40085	0.28512	0.53492	0.67729	0.53216	0.3901	1	
Nifty Midcap 100	0.77747	0.04241	0.87439	0.75409	0.49564	0.36086	0.63093	0.77372	0.64286	0.5655	0.79812	1

Similarly to the daily data, monthly data analysis shows that the benchmark indexes have a very high positive correlation with all portfolios. Thus, the correlation analysis indicates that there is the high scope of the systematic market risk in NSE. NIFTY IT, NIFTY FMCG& NIFTY 50 have shown very low correlation with other portfolios, indicating the possibilities for the diversification of risk in all case of daily data. IT and FMCG have very low correlation which has greater risk reduction or we can say greater possibility for the risk reduction. Hence, correlation analysis has indicated the existence of high scope for the systematic market.

Table 4: Covariance in relation to the Benchmark Indices for the Daily data

	Nifty 50	Nifty 100	Nifty 500	Nifty Midcap 100
Financial Services	0.00037%	0.01225%	0.01185%	0.01156%
Nifty Auto	0.00017%	0.01004%	0.00963%	0.01042%
Nifty FMCG	0.00030%	0.00657%	0.00618%	0.00583%
Nifty IT	0.00031%	0.00679%	0.00624%	0.00508%
Nifty Bank	0.00038%	0.01260%	0.01209%	0.01211%
Nifty Media	0.00020%	0.00865%	0.00854%	0.01022%

	Nifty 50	Nifty 100	Nifty 500	Nifty Midcap 100
Nifty Pharma	0.00047%	0.00611%	0.00613%	0.00693%
Nifty Reality	0.00057%	0.01644%	0.01674%	0.01928%

The covariance results of the daily data have been presented in the Table 4. It is shown that the covariance of the Auto sector has been very low covariance with Nifty 50, Pharma has very low covariance with the benchmark Nifty 100 & Nifty 500,& IT sector has low covariance with the benchmark Nifty Midcap 100.

Auto, Pharma & IT portfolio displays a very low covariance asset value. The low value of covariance indicating the low level of risk. These portfolios have a very low risk level in comparison with the Nifty 50, Nifty 100, and Nifty 500 & Nifty midcap 100.

*Beta values of the portfolio in relation to Benchmark indices:

The regression line or the characteristics regression line is a simple linear regression model for a particular stock against the market index return to measure its systematic and unsystematic risk.

$\mathbf{R_i = \alpha_i + \beta_i R_m + e_i}$

Where,

R_i = Return of the ith portfolio;

α_i = Intercept;

β_i = slope of the ithportfolio;

R_m = Return of the market index;

e_i = the error term.

***Beta:** Beta is the slope of the characteristics regression line. Beta describes the relationship b/w the stock's return and the index return. It indicates that one percentage change in Nifty index would cause the beta value to changes in the particular stock return.

***Beta=** +1 indicates that one percentage changes in the market index return causes exactly one percentage changes in stock return. It indicates that stock moves in the direction of the Market.

***Beta=** -1 indicates that stock return moves in opposite direction to the market return, i.e. one percent increases in the index would cause one percent decline in the return of the share. Stock with negative beta resist the decline in the market return, but stocks with negative returns in the long run are very rare. It enables the risk diversification.

***Alpha** (α): The intercept of the characteristics line is alpha i.e. the distance b/w the intersection and the horizontal axis. It indicates that the stock return is independent of the market index return. Positive alpha values would yield profitable returns. According to the portfolio theory, in a well-diversified portfolio, the average value of alpha of all stocks turns out to be zero.

Table 5:Beta values for the portfolio in the relation to benchmark Indexes based on the daily data

	FINANCIAL SERVICES	FMCG	IT	BANK	PHARMA	AUTO	MEDIA	REALITY
NIFTY 50	1.1950	0.6450	0.6878	1.2257	0.5782	0.9651	0.8125	1.5510
NIFTY 100	1.2024	0.6447	0.6661	1.2363	0.6001	0.9850	0.8494	1.6138
NIFTY 500	0.5765	0.3004	0.3037	0.5880	0.2983	0.4682	0.4155	0.8145
MIDCAP 100	0.9442	0.4764	0.4149	0.9897	0.5661	0.8514	0.8353	1.5750
R SQUARE	0.8167	0.38111	0.3380	0.7776	0.3334	0.7482	0.4212	0.74737

Beta values of the portfolio in the relation to the benchmark indexes such as Nifty 50, Nifty 100, Nifty 500 and Nifty midcap 100 has been computed in the table no 5. The beta values of the portfolios Pharma are the lowest one in comparison to the other portfolio, where the beta of the portfolio bank is the highest in comparison to the other portfolios. Even other portfolio such as FMCG & IT are also having low beta in comparison to the other portfolios.

In case of Nifty 500 as an independent variable, all portfolios in comparison to other index are analyzed. After analysis it clearly manifests that NIFTY 50 & NIFTY 100 have the positive influence on the portfolios in NSE, whereas Nifty 500 has low impact as compared to Nifty 100& Nifty 500. The value of 'R square' is about 0.7, indicating the 70 % fitness of the model.

Table 6:Beta values for the portfolio in the relation to benchmark Indexes based on the monthly data

	FINANCIAL SERVICES	FMCG	IT	BANK	PHARMA	AUTO	MEDIA	REALITY
NIFTY 50	1.1445	0.5987	0.6145	1.3583	0.4559	1.2505	0.9388	1.8258
NIFTY 100	1.1602	0.5977	0.5678	1.3707	0.4652	1.2562	0.9752	1.8705
NIFTY 500	1.1636	0.5773	0.5128	1.3494	0.4496	1.2332	1.0200	1.9477
MIDCAP 100	0.9224	0.4177	0.2454	1.0586	0.3850	0.9436	0.8913	1.6135
R SQUARE	0.7225	0.3702	0.3551	0.8266	0.2154	0.8598	0.7213	0.7520

The beta values of the portfolios in relation to the returns of the index NSE on the monthly data have been computed and are presented in the table 6. It shows that the beta values of the most of the portfolio are to be lower against the Nifty 500. Reality portfolio showed positive Beta value, indicating high risk nature of these portfolios as compared to other portfolios & portfolio Pharma have low beta against all benchmark such as Nifty 50, Nifty 100, and Nifty 500 & Nifty midcap 100. The R square values most of the portfolios have been more than 0.70, indicating the 70percent fitness of the portfolio, thus the regression results as presented in the previous table have shown the beta value, which is goodness fit in the model.

CONCLUSION

The finding of this study indicates that the Indian stock market does not follow the efficient market theory, because in efficient market includes all kinds of information such as past market data, public & private information. But Indian market quickly responds to domestic and global clues. The expected return remains insufficient as compared to systematic risk increasing. Thus the portfolio choice is to be

made looking the beta values & correlation values to beat the market. This manifests that the financial market in Indian economy is in instability. It requires noticing the financial regulation mechanism.

REFERENCES

Acharya, Viral V., and Mathew Richardson (2009) "Restoring the financial stability: how to repair a failed system." John Wiley publications New York. –Chapter V "Enhanced Regulation of Large, Complex Financial Institutions." 139 -156.

Bedanta Bora, A. A. (2015). "Risk and Return Relationship -An Empirical Study of BSE Sensex Companies in India." Universal Journal of Accounting and Finance, 45-51.

Blume, Marshall and Irwin Friend (1978) "The changing role of the individual investor" New York; Wiley. (Book) – Chapter IV: "Market efficiency and the individual investor." 143-185.

Chan, L.K.C., Karceski, J.J. & Lakonishok, J. (1999). "On Portfolio Optimization: Forecasting Covariance and Choosing the Risk Model." The review of financial studies winter 1999 vol12, No. 5, pp937-974

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H. Konno, A. Suzuki, "A mean variance Skewness optimization model" Journal of the Operations Research Society of Japan, 38 (1995), 173-187.

H.M. Markowitz, "Portfolio Selection: Efficient Diversification of Investments", John Wiley, New York (1959). Chapter 5, finding the efficient set H. M. Markowitz 287

Huang, Chi-Fu. "Foundations for Financial Economics", Elsevier Science Publishing Co., (1988) ISBN 10: 0135006538 ISBN 13: 9780135006535

Khare, Sumi and Saima Rizvi (2011), "Factors affecting the capital structure of BSE-100 India firm: A panel data analysis." Indian Journal of Finance; Volume 5, Issue 6, June (2011)

Markowitz HM (1952) Portfolio selection. J Finance 7:77–91.

Morgan Kelly (1995) "All their eggs in one basket: portfolio diversification of US households". Elsevier Journal of Economic Behavior and Organization Vol. 27 (1995) 87-96.

M. Ivanova & L. Dospatliev (2017) "Application of Markowitz portfolio optimization on Bulgarian stock market from 2013- 2016" International Journal of Pure and Applied Mathematics 117(2):291-307 • January 2017

Manas pandey (2012) "Application of Markowitz model in analysis of risk and return A case study on BSE stock." Risk governance & control: financial markets & institutions / Volume 2, Issue 1, 2012

P. Xidonas, G. Mavrotas, J. Psarras, "Portfolio construction on the Athens Stock Ex-change: a multi objective optimization approach, Optimization," A Journal of Mathematical Programming and Operations Research Volume 59, (2010), 1211-1229.

Rajan, M.P (2011) "Volatility estimation in Indian stock market using Heterosecedastic Model." Indian Journal of Finance, 5(6), 26-32, 2011

Subrata K. Mitra (2013) "Diversification of Equity Portfolio: Theory and Practices".nseindia.com/content/press/apr2003a.pdf.