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A RISK-RETURN ANALYSIS ON OPTIMUM PORTFOLIO OF VARIOUS ASSET CLASSES

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ABSTRACT

Every investors looking for maximum returns with minimum risk, but this is not possible to all investor. The desire of every inventor is optimum the risk and returns. The performance of different securities is varying at different point of time. The study is about to analysis the risk and returns of different portfolio combinations and correlate with selected sectors, in order to verify whether there is positive correlated or negative correlated. This paper helps to known the best combinations of portfolio by analyzing the standard deviation and expected rate of returns of selected industries. It definitely helps to investors to take suitable decision with respect to choose right combination of optimum portfolio and quantum of investment of SBI, CIPLA and MPHASIS.

KEYWORDS

optimum portfolio, expected rate of returns.

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INTRODUCTION

It is often said that 'Don't Put All the Eggs in a Single Basket'.

Investment means sacrifice of present consumption with hope of future gain. Investment in a single or individual security having a certain amount of risk, but the amount of risk is varying from one security to another. The risk defines as standard deviation around the expected returns or variability of expected returns. The shares and currency are consider to be high risk and bonds, T-bills are has low risk or zero risk. In other words some securities having high risk as well as low risk. If an investor parks his investment in only a signal security, the changes in return could very easily affect the entire investment of an investor. If share values are suddenly decreased, the risk of shares is increased. This types of risk can't be minimized. The investment is made in a group of securities instead of single securities, is called portfolio. In other words the combination of different types of securities such as shares, bonds, gold and money market instrument or group of assets an investor own it may be financial assets and real assets. Portfolio diversification was done within the group that is same industry, it involved risk. Investment in a single industry carries a certain amount of risk.

FIGURE 1

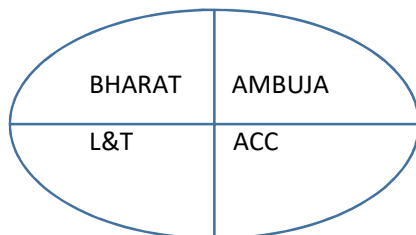
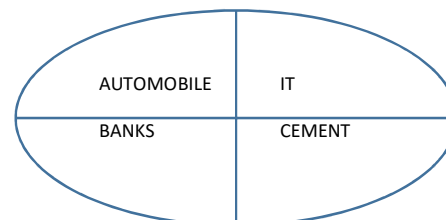


FIGURE 2



For example: from above figure 1, investment in within cement industry. This did not save him from the risk exposure to the industry. If RBI increased the reserve ratio, it could affect the bank interest rate that means bank increased lending rate to housing sector, which could affect the construction industry. Consequently a demand pull down can cause price reduction leading to profit decline and falling off in share prices of these companies. This type of portfolio selection and diversification may not meet the desired results or may not full fill the desire goal of the investor. If portfolio diversification into different sectors such as banks, information technology automobiles, cement from figure 2 in this type of portfolio is loss in one sector would have been compensated by gain in other sectors.so this portfolio have a balanced approach and enjoy a steady or progressive returns.

Portfolios of securities enhance the rate of returns compared to investment in a single security. The portfolio diversification of investment by allocation of resources to different classes of securities. It believed that by increasing number of securities in an existing portfolio, the returns could be improved.

PORTFOLIO CONSTRUCTION

Simply you determine the securities in which you are going to invest and how much you are going to invest in each security given your total investment resources. As, proportion changes the portfolio also changes. So, you invest Rs. 70,000 in Z securities and Rs. 30000 in Y securities. The proportion is 7:3. This is a different portfolio. So, as you change the proportion of investment of the different securities, your portfolio changes. Similarly, when you change the mix of securities then also different portfolios result. So, by changing the proportion and the mix, numerous portfolios can be constructed.

MARKOWITZ DIVERSIFICATION

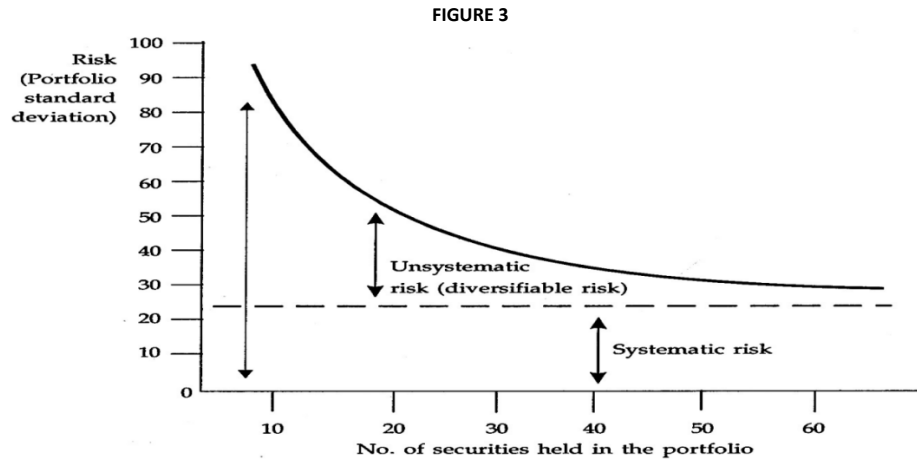
Portfolio construction is based on the concept of diversification. Simple diversification and Markowitz diversification.

Simple diversification is diversification for the interest of diversification. It will reduce risk, but not to the maximum possible level. Here diversification is randomly done selected different securities. 10 to 20 securities forming the portfolio will help substantially reducing portfolio risk. As against simple diversification, Markowitz Diversification involves combining securities or assets that are less than perfectly positively correlated, in an effort to lower portfolio risk without sacrificing

returns. The correlation between returns of pairs of securities influences portfolio risk. And this is achieved through choosing securities that have negative or less positive correlation coefficients between their returns.

DIVERSIFICATION OF RISK

Diversification helps to minimize risks. It is done by creating a portfolio of securities. In case of shares, the diversification reduces the unsystematic or unique risk.



The total risk of a portfolio security consists of two components; the market related risk is called systematic risk and the unique risk of that particular security is called unsystematic risk. By combining securities into a portfolio the unsystematic risk specific to different securities is rolled out. Consequently, the risk of the portfolio as a whole is reduced as the size of the portfolio increases. Ultimately when the size of the portfolio reaches a maximum, it will contain only the systematic risk of securities involved in the portfolio. The systematic risk, however, can't be eliminated. Thus, a fairly large portfolio has only systematic risk and has somewhat little unsystematic risk. That is why there is no improvement (gain) in adding securities to a portfolio beyond a certain portfolio size. The figure 3, it shows the portfolio risk declining as the number of securities in the portfolio increases, but the risk reduction ceases when the unsystematic risk is eliminated

REVIEW OF LITERATURE

According To Vikkraman P and Vardharajan P (2009), "The objective of maximizing return can be pursued only at the cost of incurring risk. While selecting the firm for investment, the investor has to consider both the return potential and the risk involved."

According To Vikkraman P and Vardharajan P (2009) "The security with a beta value of more than 1 for the particular year or a period is considered to be more risky than the market, and the asset with a lower than 1 beta is less risky than the market."

It is important to know the risk-return characteristics of quoted firms in the stock market to enable investors take rational investment decisions (Bello A.I. and Adedokun L.W.)

According to Srivastava A (2012), "Risk measurement and analysis has been a critical issue for any investment decision because risk can be transferred but cannot be eliminated from the system. The nature and degree of risk varies from industry to industry."

According to **NEERAJ GUPTA and Dr. DEEPIKA SINGH** the objective of maximizing return can be obtained when one incurs higher risk before selecting a firm for investment, risk involves in the particular security and the return potential of the stock should be considered. Generally, the relationship of risk and return trade off prevails between the two companies selected from IT sector, Infosys Ltd. is highly recommended.

Jack Clark Francis 2 (1986): revealed the importance of the rate of return in investments and reviewed the possibility of default and bankruptcy risk. He opined that in an uncertain world, investors cannot predict exactly what rate of return an investment will yield. However he suggested that the investors can formulate a probability distribution of the possible rates of return. He also opined that an investor who purchases corporate securities must face the possibility of default and bankruptcy by the issuer. Financial analysts can foresee bankruptcy. He disclosed some easily observable warnings of a firm's failure, which could be noticed by the investors to avoid such a risk.

OBJECTIVES

1. To analyze the risk and returns of selected individual companies.
2. To analyze the risk and returns of group of selected companies.
3. To construct an effective optimum portfolio, it offer the maximum returns with minimum risk.
4. To evaluate different portfolio combination by using Markowitz model.

RESEARCH METHODOLOGY

In this study, we will focus on the subject of optimum portfolio analysis. It is a method of selecting the best portfolio combinations by analyzing risk and returns of selected sectors securities. It's a broad topic, so we will just take three sectors and analysis their standard deviation, correlation coefficient and returns to understand the relation of three sectors.

PERIOD OF STUDY

This study is conducted for two years, i.e., from January 2016 to December 2017. The stock price were taken from the NSE. Stock price has been used for calculating mean return, standard deviation and coefficient of variation. The objectives for calculating mean return, standard deviation and coefficient of variation is to help the investors to arrive at a decision of invest in the shares which offer maximum return with minimum risk and also to gain knowledge of the stock market. The findings and suggestion certainly would help the investors.

RESEARCH DESIGN

The research design, we followed secondary data based on the monthly share price of the selected sectors companies in NSE for the two years.

TOOLS FOR EVALUATION: STATISTICAL TOOLS FOR EVALUATIONS

Average Return (R)

Standard deviation (d) (Risk)

Variance (SD) *(SD)

Co-efficient of variation (CV)

Daily return of securities has been calculated by applying the following formula:

RETURNS= $(P1-P0) / P0 * 100$

P1= closing price of individual security
 P0 = opening price of individual security

STANDARD DEVIATION

$$\sigma = \text{Square root } ((\text{mean return} - \text{expected return})^2 / N)$$

COVARIANCE

When security returns are perfectly positively correlated the correlation coefficient between the two securities will be +1. The returns of the two securities then move up or down together. When security returns are perfectly negatively correlated, the correlation coefficient between them becomes -1. The two returns always move in exactly opposite directions

$$\text{COV } (X, Y) = 1/N \sum [(R_x - R_x) (R_y - R_y)]$$

EXPECTED RETURN OF A PORTFOLIO CALCULATION

The expected return of a portfolio of assets is the weighted average of the return of the individual securities held in the portfolio. The weight applied to each return is the fraction of the portfolio invested in that security.

$$\text{PORTFOLIO RETURN} = [(X_x * R_x) + (X_y * R_y)]$$

WHERE

X_x= proportion of total portfolio invested in security X

X_y= proportion of total portfolio invested in security Y

R_x= expected return to security X

EXPECTED RISK CALCULATION

The variance of return and standard deviation of return are alternative statistical measures that are used for measuring risk in investment. These statistics measure the extent to which returns are expected to vary around an average over time. The variance or standard deviation of an individual security measures the riskiness of a security in absolute sense.

$$\text{PORTFOLIO RISK} = \text{SQRT } [((X_x^2 * SD_x^2) + (X_y^2 * SD_y^2) + (2 * X_x * X_y * (r_{xy} * SD_x * SD_y)))]$$

WHERE

X_x, X_y= proportion of total portfolio invested in security X & Y respectively

sd_x, sd_y= standard deviation of stock X & stock Y respectively

r_{xy}= correlation coefficient of x & y

R_y = expected return to security Y

SAMPLE SELECTION: SAMPLES SELECTED ARE LISTED IN NIFTY INDEX

Randomly one company is selected for this study each from three selected industries.

TABLE 1

TYPE OF INDUSTRY	COMPANY
PHARMACEUTICAL	CIPLA
BANKING	SBI
INFORMATION TECHNOLOGY	MPHASIS

The source of data for the Research Project is mainly secondary data which was collected from the websites, documents.

SCOPE OF THE STUDY

This study mainly focuses on investment decisions in portfolio by analyzing expected rate of return, standard deviation and correlated with Cipla, Mphasis and SBI. This study is based on three sectors from those listed in National Stock Exchange.

LIMITATIONS OF THIS STUDY

1. The analysis is focused on only three sectors.
2. The study is confined to a period of two years from January 2016 to December 2017.
3. The accuracy is limited as the data collection was strictly confined to secondary sources.

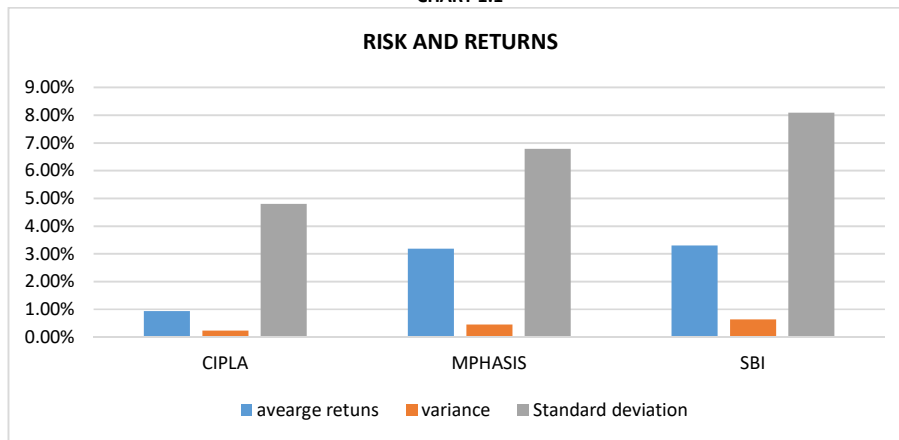
ANALYSIS AND INTERPRETATION

1. RISK AND RETURNS OF INDIVIDUAL SECTORS COMPANY

TABLE 1.1

	CIPLA	MPHASIS	SBI
average returns	0.94%	3.19%	3.31%
Variance	0.0023	0.0046	0.0065
Standard deviation	4.80%	6.79%	8.09%

CHART 1.1



INTERPRETATION

From above chart 1.1, The Standard deviation is high in SBI when compare to the Cipla and Mphasis. The average returns of SBI and Mphasis is similar when compare to cipla. The SBI and Mphasis are similar returns but substandard deviation is high in SBI when compare to mphasis. As a concern of individual sectors Mphasis is the right choice of the investor when compare to Cipla and SBI.

2. RISK AND RETURNS OF VARIOUS COMBINATION OF CIPLA and MPHASIS or EFFICIENT SET FOR CIPLA AND MPHASIS

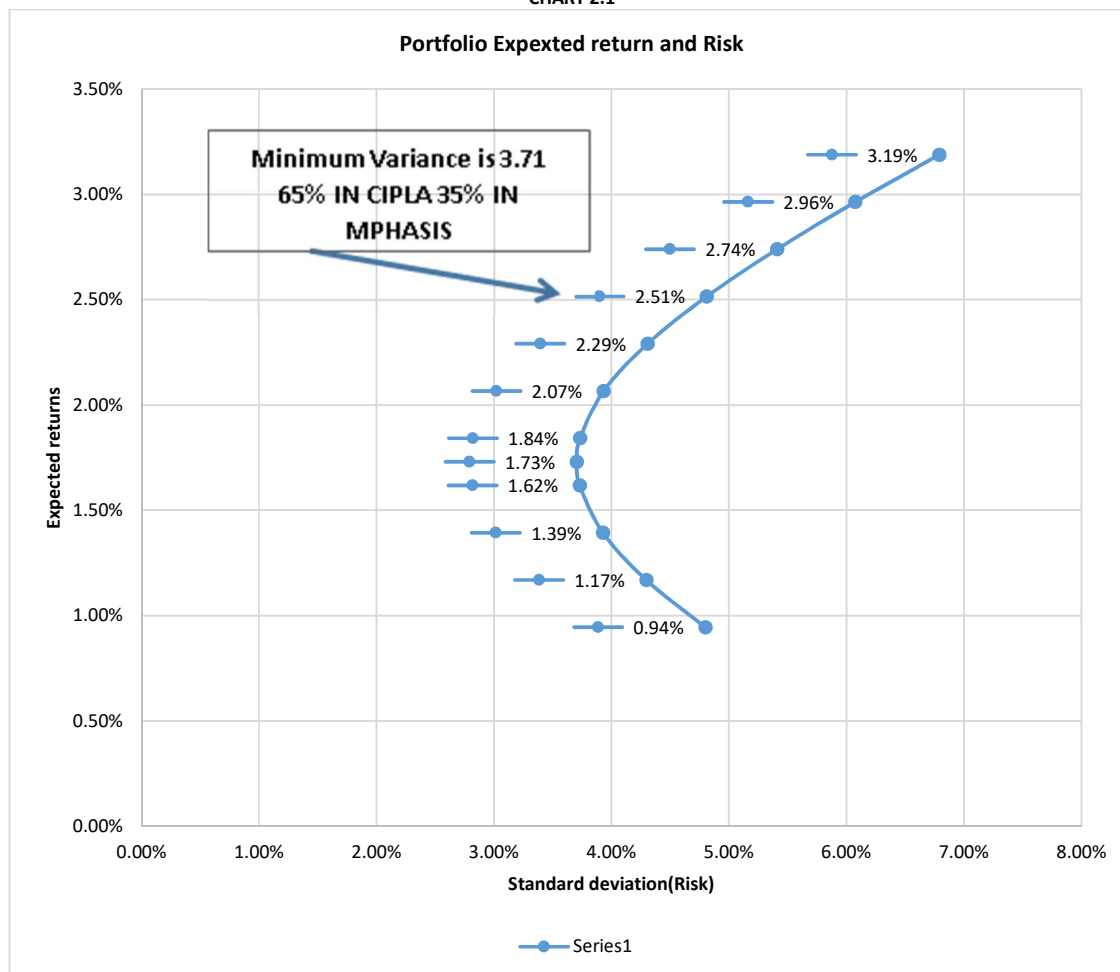
TABLE 2.1

CIPLA	MPHASIS	Mean	Variance	standard deviation
0%	100%	3.19%	0.46%	6.79%
10%	90%	2.96%	0.37%	6.08%
20%	80%	2.74%	0.29%	5.41%
30%	70%	2.51%	0.23%	4.81%
40%	60%	2.29%	0.19%	4.31%
50%	50%	2.07%	0.15%	3.93%
60%	40%	1.84%	0.14%	3.73%
65%	35%	1.73%	0.14%	3.71%
70%	30%	1.62%	0.14%	3.73%
80%	20%	1.39%	0.15%	3.93%
90%	10%	1.17%	0.18%	4.30%
100%	0%	0.94%	0.23%	4.80%

TABLE 2.2

	CIPLA	MPHASIS	total weight
	0.65	0.3489751	1.00
Portfolio returns	0.017271		
variance	0.001373		
std	0.037057		

CHART 2.1



INTERPRETATION

An efficient can set to be generated, where the two individual sectors stock are placed in a portfolio. The table 2. 1 is diversified portfolio of CIPLA and MPHASIS. The expected returns, standard deviation and correlation co efficient were calculated over the period from 1/1/2015 to 31/12/2017. The CIPLA portfolio, which has a standard deviation of 4.80%, is less risky than the MPHASIS portfolio, which has standard deviation about 6.79%. The combining a small percentage of MPHASIS stock portfolio with CIPLA portfolio, actually it's reduce the risk, as can be seen by backward-bending curve in chart 2.1. The diversification benefits from combining two different portfolios more than offset the introduction of riskier set of stocks into ones holding. The minimum variance portfolio occurs with about 65% of fund in CIPLA and 35% of in MPHASIS stock. Addition of MPHASIS stock beyond this point increases the risk of entire portfolio. Optimum portfolio is 65% in CIPLA and 35% in MPHASIS. It is placed in table 2.2. This combination gives standard deviation is 3.71 and expected returns is 1.73%. It is the right choice of

investors to invest money in the above combination. There is negative correlation coefficient between CIPLA and MPHASIS. It indicating that there is no relation between CIPLA and MPHASIS. It moves opposite directions that is when Cipla stock prices is increasing automatically Mphasis stock prices are decreased.

3. RISK AND RETURNS OF VARIOUS COMBINATION OF CIPLA and SBI or EFFICIENT SET FOR CIPLA AND SBI

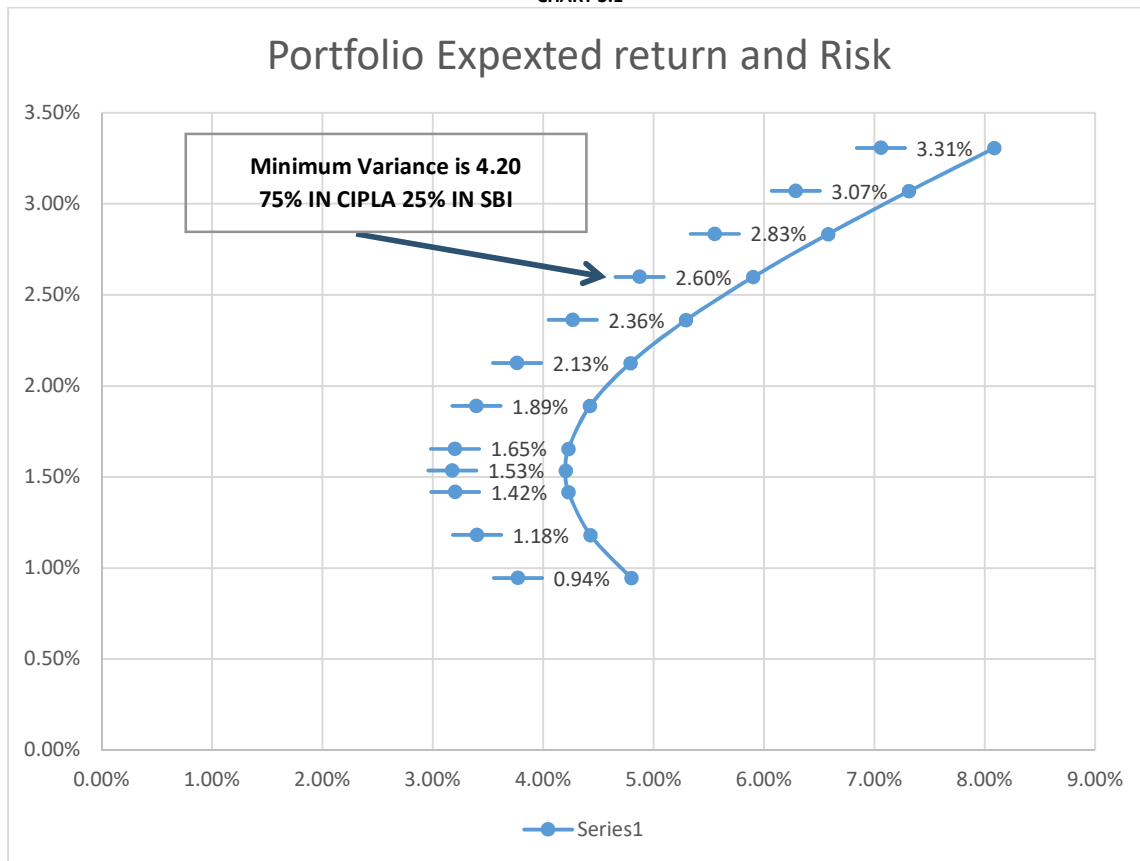
TABLE 3.1

CIPLA	SBI	Mean	Variance	Standard deviation
0%	100%	3.31%	0.65%	8.09%
10%	90%	3.07%	0.54%	7.31%
20%	80%	2.83%	0.43%	6.58%
30%	70%	2.60%	0.35%	5.90%
40%	60%	2.36%	0.28%	5.29%
50%	50%	2.13%	0.23%	4.79%
60%	40%	1.89%	0.20%	4.42%
70%	30%	1.65%	0.18%	4.23%
75%	25%	1.53%	0.18%	4.20%
80%	20%	1.42%	0.18%	4.23%
90%	10%	1.18%	0.20%	4.43%
100%	0%	0.94%	0.23%	4.80%

TABLES 3.2

CIPLA	75%	
SBI	25%	100%
returns	1.54%	
variance	0.18%	
Std	0.042040036	

CHART 3.1



INTERPRETATION

An efficient set can be generated, where the two individual sectors stocks are portfolio themselves. The two stocks in table 3.1 are diversified portfolio of CIPLA and SBI. The expected returns, standard deviation and correlation coefficient were calculated over the period from 1/1/2015 to 31/12/2017. The CIPLA portfolio, which has a standard deviation of 4.80% is less risky than the SBI portfolio, which has standard deviation about 8.90%. The combining a small percentage of SBI stock portfolio with CIPLA portfolio, actually its reduce the risk, as can be seen by backward-bending curve in chart 3.1. The diversification benefits from combining two different portfolios more than offset the introduction of riskier set of stocks into ones holding. The minimum variance portfolio occurs with about 75% of fund in CIPLA and 25% of in SBI stock. Addition of SBI stock beyond this point increases the risk of entire portfolio. Optimum portfolio is 75% in CIPLA and 25% in SBI in table 3.2. This combination gives standard deviation is 4.20% and expected returns is 1.54%. It is the right choice of investors to invest money in the above combination. There is positive correlation coefficient between CIPLA and SBI. It indicates that there is close relation between CIPLA and SBI. It moves a same direction that is when CIPLA stock prices are increasing automatically SBI stock prices also increasing.

4. RISK AND RETURNS OF VARIOUS COMBINATION OF MPHASIS SBI Or EFFICIENT SET FOR MPHASIS SBI :

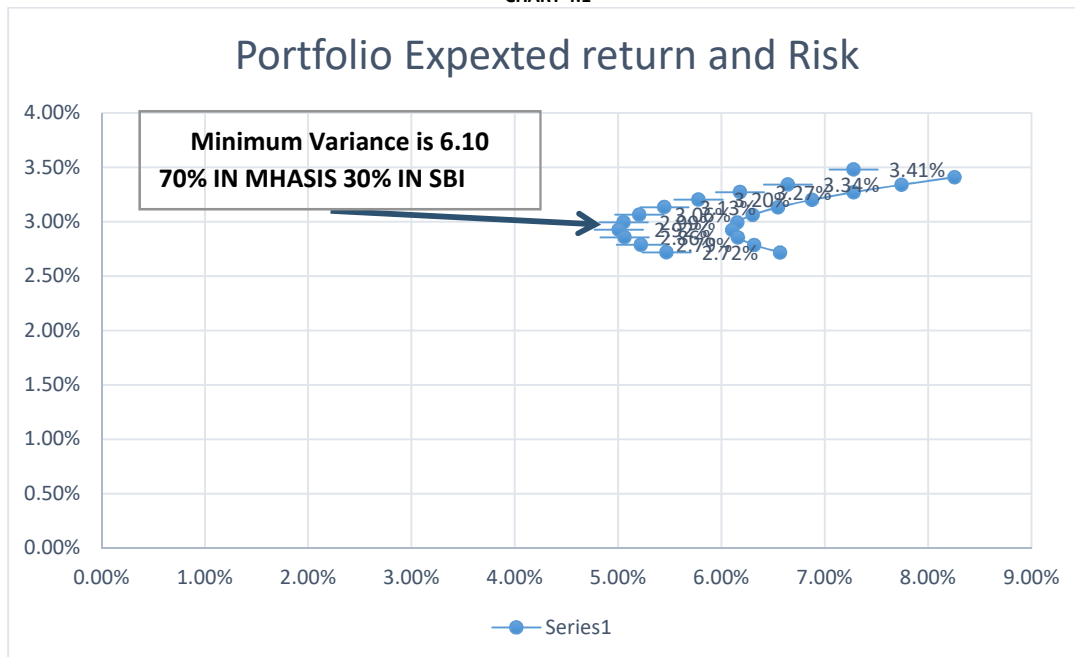
TABLE 4.1

MPHASIS	SBI	Mean	Variance	Standard deviation
0%	100%	3.41%	0.68%	8.25%
10%	90%	3.34%	0.60%	7.74%
20%	80%	3.27%	0.53%	7.28%
30%	70%	3.20%	0.47%	6.87%
40%	60%	3.13%	0.43%	6.54%
50%	50%	3.06%	0.40%	6.30%
60%	40%	2.99%	0.38%	6.15%
70%	30%	2.92%	0.37%	6.10%
80%	20%	2.86%	0.38%	6.16%
90%	10%	2.79%	0.40%	6.31%
100%	0%	2.72%	0.43%	6.57%

TABLES 4.2

	MPHASIS	SBI	
	0.696508	0.303492	1
RETURNS	0.029272		
VARIANCE	0.003724		
STD	0.061024		

CHART 4.1



INTERPRETATION

An efficient set can be generated, where the two individual sectors stocks are portfolio themselves. The two stocks in table 4.1 are diversified portfolio of MPHASIS and SBI. The expected returns, standard deviation and correlation coefficient were calculated over the period from 1/1/2015 to 31/12/2017. The MPHASIS portfolio, which has a standard deviation of 6.57% is less risky than the SBI portfolio, which has standard deviation about 8.25%. The combining a small percentage of SBI stock portfolio with MPHASIS portfolio, actually it reduces the risk, as can be seen by backward-bending curve in chart 4.1. The diversification benefits from combining two different portfolios more than offset the introduction of riskier set of stocks into ones holding. The minimum variance portfolio occurs with about 70% of fund in MPHASIS and 30% of in SBI stock. Addition of SBI stock beyond this point increases the risk of entire portfolio. Optimum portfolio is 70% in MPHASIS and 30% in SBI in table 4.2. This combination gives standard deviation is 6.10% and expected returns is 2.92%. It is the right choice of investors to invest money in the above combination.

There is positive correlation coefficient between MPHASIS and SBI. It indicates that there is close relation between MPHASIS and SBI. It moves same directions that are when MPHASIS stock prices are increasing automatically SBI stock prices also increasing.

5. OPTIMUM COMBINATION OF PORTFOLIO WITH THREE DIFFERENT SECTORS

TABLE 5.1

	CIPLA	MPHASIS	SBI
average returns	0.94%	3.19%	3.31%
variance	0.0023	0.0046	0.0065
Standard deviation	4.80%	6.79%	8.09%

CORRELATION CO-EFFICIENT

TABLE 5.2

Variance and co variance matrix		CIPLA	MPHASIS	SBI	
	WEIGHTS	0.61907	0.29374	0.08719	1
CIPLA	0.61907	0.002408	-0.00036	0.000169	
MPHASIS	0.29374	-0.00036	0.004818	0.002378	
SBI	0.08719	0.000169	0.002378	0.006836	
Contribution to variance		0.000866	0.000411	0.000122	

STANDARD DEVIATION AND MEAN OF PORTFOLIO OF THREE SECTORS

TABLE 5.3

Portfolio	1
portfolio returns	0.018076
Std	0.037405

INTERPRETATION

Optimum portfolio of three Sectors Company is 62% in CIPLA, 29% in MPHASIS rest of the amount invested in SBI that is 9%. With this combination expected returns is 1.8% and standard deviation is 3.7%. From above co variance table 5.2 is variance and co variance shows that, all combinations are positive correlation except CIPLA and MPHASIS combination. The SBI and MPHASIS, CIPLA and SBI stock prices are moving same directions. CIPLA and MPHASIS moves opposite directions.

SUGGESTION

From this analysis I suggest that, investors must take decisions before investing in shares. The MPHASIS and SBI companies having good rate of returns. So that I suggest that invest in both companies. Risk returns analysis can be used as an unflattering level by the investors in establishing the trade-off between portfolio risk and returns. It is recommend that a proper estimation and analysis risk can reliably taken recourse to in understanding the risk involved and returns generated from securities. A portfolio may contain the same securities as another portfolio but with different weights. Thus, new portfolios can be created either by changing the securities in the portfolio or by changing the proportion of investment in the existing securities. Each portfolio is characterized by its expected return and risk. Determining the expected return and risk (variance or standard deviation) of each portfolio that can be created from a set of selected securities. It is advisable to all investors, to follow modern approach in portfolio design.

CONCLUSION

This analysis is testing the relation between standard deviation and expected returns in the selected sectors that is CIPLA, SBI and MPHASIS. The investor should analysis the different industries, market conditions, share prices on continuous basis which will help them to pick the right companies at right time with right combinations (optimum portfolio) to invest their funds. Standard deviation, variance and returns help to investors in selecting of different sectors stocks. However, when a diversified portfolio of various securities class is considered, the risk can be step-down to a large extent and is usually higher for higher expected rate of returns. Finally, it shows that there is a strong positive relation between standard deviation and expected risk of securities, which are CIPLA & SBI and SBI & MPHASIS and one more negative relation between CIPLA and MPHASIS. If securities with less than perfect positive correlation between their price movements are combined, the risk can be reduced considerably. The risk would be nil or standard deviation would be zero.

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