INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION AND MANAGEMENT

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Books
- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio," Ohio State University.

Contributions to books
- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

Journal and other articles
- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

Conference papers
- Chandel K.S. (2009): "Ethics in Commerce Education." Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

Unpublished dissertations and theses
- Kumar S. (2006): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

Online resources
- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

Website
- Kelkar V. (2009): Towards a New Natural Gas Policy, Economic and Political Weekly, Viewed on February 17, 2011 http://epw.in/epw/user/viewabstract.jsp

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RISK MANAGEMENT STRATEGIES AND PRACTICES USING MARKOWITZ THEORY AT KARVY STOCK-BROKING LIMITED

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ABSTRACT

Investing in securities is one of the ways where an individual mostly like to adopt as a source of income, because securities are those which may give more returns and they are also more risky. This paper gives information about how to manage Portfolio and a study is done on securities by taking 2 sectors with two companies with their annual returns. This paper also explains the selected portfolios is yielding a satisfactory and constant return to the investor.

KEYWORDS

Portfolio Risk, Return On Portfolio, Risk Management,

INTRODUCTION

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; 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 (in particular specific 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.

Portfolio management involves deciding what assets to include in the portfolio, given the goals of the portfolio owner and changing economic conditions. Selection involves deciding what assets to purchase, how many to purchase, when to purchase them, and what assets to divest. These decisions always involve some sort of performance measurement, most typically expected return on the portfolio, and the risk associated with this return (i.e. the standard deviation of the return). Typically the expected returns from portfolios, comprised of different asset bundles are compared.

The unique goals and circumstances of the investor must also be considered. Some investors are more risk averse than others. Mutual funds have developed particular techniques to optimize their portfolios holdings.

Thus, portfolio management is all about strengths, weaknesses, opportunities and threats in the choice of debt vs. equity, domestic vs. international, growth vs. safety and numerous other trade-offs encountered in the attempt to maximize return at a given appetite for risk.

OBJECTIVES

To find out optimal portfolio, which gave optimal return at a minimize risk to the investor.
1.   To see whether the portfolio risk is less than individual risk on whose basis the portfolios are constituted
2.   To see whether the selected portfolios is yielding a satisfactory and constant return to the investor and to analyze and select the best portfolio.

RESEARCH METHODOLOGY

1.   Market prices of the companies have been taken for the years of different dates, A final portfolio is made at the end of the year to know the changes (increase/decrease) in the portfolio at the end of the year.

SOURCES OF DATA

The primary data information is gathered from Karvy finpolis by interviewing Karvy executives. The secondary data is collected from various financial books, magazines and from stock lists of various newspapers and Karvy.

PERIOD OF THE STUDY

The present study it covers the last 5 years information about the portfolio performance evaluation using Markowitz theory, from the period of 2004-2009. Study was taken up to 45 days.

ASPECTS OF PORTFOLIO MANAGEMENT

Basically portfolio management involves
1. A proper investment decision making of what to buy & sell

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2. Proper money management in terms of investment in a basket of assets so as to satisfy the asset preferences of investors.
3. Reduce the risk and increase returns.

PROCESS OF PORTFOLIO MANAGEMENT

The Portfolio Program and Asset Management Program both follow a disciplined process to establish and monitor an optimal investment mix. This six-stage process helps ensure that the investments match investor's unique needs, both now and in the future.
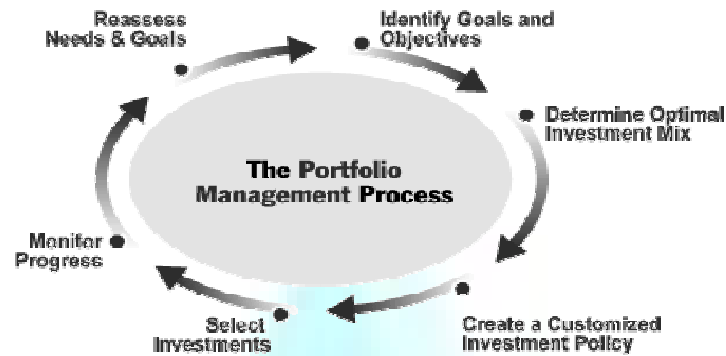
RISK

Risk refers to the probability that the return and therefore the value of an asset or security may have alternative outcomes. Risk is the uncertainty (today) surrounding the eventual outcome of an event which will occur in the future. Risk is uncertainty of the income/capital appreciation or loss of both. The higher the risk taken, the higher is the return. But proper management of risk involves the right choice of investments whose risks are compensation.

RETURN

Return-yield or return differs from the nature of instruments, maturity period and the creditor or debtor nature of the instrument and a host of other factors. The most important factor influencing return is risk return is measured by taking the price income plus the price change.

PORTFOLIO RISK

Risk on portfolio is different from the risk on individual securities. This risk is reflected by in the variability of the returns from zero to infinity. The expected return depends on probability of the returns and their weighted contribution to the risk of the portfolio. **Return On Portfolio**

Each security in a portfolio contributes returns in the proportion of its investment in security. Thus the portfolio of expected returns, from each of the securities with weights representing the proportionate share of security in the total investments.

RISK – RETURN RELATIONSHIP

The risk/return relationship is a fundamental concept in not only financial analysis, but in every aspect of life. If decisions are to lead to benefit maximization, it is necessary that individuals/institutions consider the combined influence on expected (future) return or benefit as well as on risk/cost. The requirement that expected return/benefit be commensurate with risk/cost is known as the "risk/return trade-off" in finance.

MARKOWITZ MODEL

THE MEAN VARIANCE CRITERION

Dr. Harry M. Markowitz is credited with developing the first modern portfolio analysis model in order to arrange for the optimum allocation of assets with in portfolio. To reach these objectives, Markowitz generated portfolio with in a reward risk context. In essence, Markowitz model is a theoretical framework for the analysis of risk return choices. Decisions are based on the concept of efficient portfolios.

Markowitz model is a theoretical framework for the analysis of risk, return choices and this approach determines an efficient set of portfolio return through three important variable that is,

1.   Return
2.   Standard Deviation
3.   Coefficient of correlation

Markowitz model is also called as a "Full Covariance Model". Through this model the investor can find out the efficient set of portfolio by finding out the trade off between risk and return, between the limits of zero and infinity. According to this theory, the effect of one security purchase over the effects of the other security purchase is taken into consideration and then the results are evaluated. Markowitz had given up the single stock portfolio and introduced diversification. The single stock portfolio would be preferable if the investor is perfectly certain that his expectation of highest return would turn out to be real. In the world of uncertainty, most of the risk averse investors would like to join Markowitz rather than keeping a single stock, because diversification reduces the risk.

A portfolio is efficient when it is expected to yield the highest return for the level of risk accepted or, alternatively the smallest portfolio risk for a specified level of expected return level chosen, and asset are substituted until the portfolio combination expected returns, set of efficient portfolio is generated.

ASSUMPTIONS

The Markowitz model is based on several assumptions regarding investor behavior:

1.   Investors consider each investment alternative as being represented by a probability distribution of expected returns over some holding period.
2.   Investors maximize one period-expected utility and possess utility curve, which demonstrates diminishing marginal utility of wealth.
3.   Individuals estimate risk on the basis of variability of expected return.
4.   Investors base decisions solely on expected return and variance of return only.
5.   For a given risk level, investors prefer high returns to lower returns. Similarly for a given level of expected return, investors prefer less risk to more risk.

Under these assumptions, a single asset or portfolio of assets is considered to be "efficient" if no other asset or portfolio of assets higher expected return with the same expected return.

THE SPECIFIC MODEL

In developing this model, Markowitz first disposed of the investor behavior rule that the investor should maximize expected return. This rule implies non-diversified single security analysis portfolio with the highest expected return is the most desirable portfolio. Only by buying that single security portfolio would obviously be preferable if the investor were perfectly certain that this highest expected return would turn out to be the actual return. However, under real world conditions of uncertainty, most risk adverse investors join with Markowitz in discarding the role of calling for maximizing the expected returns. As an alternative, Markowitz offers the "expected returns/variance" rule.

Markowitz has shown the effect of diversification by regarding the risk of securities. According to him, the security with the covariance, which is either negative or low amongst them, is the best manner to reduce risk. Markowitz has been able to show that securities, which have, less than positive correlation will reduce risk without, in any way, bringing the return down. According to his research study a low correlation level between securities in the portfolio will show less risk. According to him, investing in a large number of securities is not the right method of investment. It is the right kind of security that brings the maximum results. Henry Markowitz has given the following formula for a two-security portfolio and three security portfolios.

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$$\sigma_p = \sqrt{(x_1)^2(\sigma_1)^2 + (X_2)^2(\sigma_2)^2 + 2(X_1)(X_2)(r_{12})(\sigma_1)(\sigma_2)}$$

$$\sigma_p = \sqrt{(x_1)^2(\sigma_1)^2 + (X_2)^2(\sigma_2)^2 + (X_3)^2(\sigma_3)^2 + 2(X_1)(X_2)(r_{12})(\sigma_1)(\sigma_2) + 2(X_1)(X_3)(r_{13})(\sigma_1)(\sigma_3) + 2(X_2)(X_3)(r_{23})(\sigma_2)(\sigma_3)}$$

σ_p = Standard deviation of the portfolio return

X_1 = proportion of the portfolio invested in security 1

X_2 = proportion of the portfolio invested in security 2

X_3 = proportion of the portfolio invested in security 3

σ_1 = standard deviation of the return on security 1

σ_2 = standard deviation of the return on security 2

σ_3 = standard deviation of the return on security 3

r_{12} = coefficient of correlation between the returns on securities 1 and 2

r_{13} = coefficient of correlation between the returns on securities 1 and 3

r_{23} = coefficient of correlation between the returns on securities 2 and 3

MEASURING THE EXPECTED RETURN AND STANDARD DEVIATION OF A PORTFOLIO

The expected return on a portfolio is the weighted average of the returns of individual assets, where each asset's weight is determined by its weight in the portfolio.

The formula is:

$$E(R_p) = [W_a X E(R_a)] + [W_a X E(R_a)]$$

Where

E= is stands for expected

R_p = Return on the portfolio

W_a = Weight of asset n where n my stand for asset a, b…etc.

R_a = Return on asset n where n may stand for asset a, b…etc

The portfolio standard deviation (σ_p) measure the risk associated with the expected return of the portfolio.

The formula is $\sigma_p = \sqrt{w_a^2 \sigma^2 + w_a^2 \sigma^2 + 2w_a w_b r_{ab} \sigma_a \sigma_b}$

The term r_{ab} represents the correlation between the returns of investments a and b. The correlation coefficient, r, will always reduce the portfolio standard deviation as long as it is less than +1.00.

PORTFOLIO DIVERSIFICATION

Diversification occurs when different assets make up a portfolio. The benefit of diversification is risk reduction; the extent of this benefit depends upon how the returns of various assets behave over time. The market rewards diversification. We can lower risk without sacrificing expected return, and/or we can increase expected return without having to assume more risk. Diversifying among different kinds of assets is called asset allocation.

The diversification can either be vertical or horizontal.

In **vertical diversification** a portfolio can have scripts of different companies within the same industry. In **horizontal diversification** one can have different scripts chosen from different industries.

An important way to reduce the risk of investing is to diversify your investments. Diversification is akin to *"not putting all your eggs in one basket."*

For example: If portfolio only consisted of stocks of technology companies, it would likely face a substantial loss in value if a major event adversely affected the technology industry.

There are different ways to diversify a portfolio whose holdings are concentrated in one industry. We can invest in the stocks of companies belonging to other industry groups. We can allocate our portfolio among different categories of stocks, such as growth, value, or income stocks. We can include bonds and cash investments in our asset-allocation decisions. We can also diversify by investing in foreign stocks and bonds.

Diversification requires us to invest in securities whose investment returns do not move together. In other words, the investment returns have a low correlation. The correlation coefficient is used to measure the degree to which returns of two securities are related. As we increase the number of securities in our portfolio, we reach a point where likely diversified as much as reasonably possible. Diversification should neither be too much or too less. It should be adequate according to the size of the portfolio.

THE FOUR PILLARS OF DIVERSIFICATION

1.   The yield provided by an investment in a portfolio of assets will be closer to the Mean Yield than an investment in a single asset.
2.   When the yields are independent - most yields will be concentrated around the Mean.
3.   When all yields react similarly - the portfolio's variance will equal the variance of its underlying assets.
4.   If the yields are dependent - the portfolio's variance will be equal to or less than the lowest

PORTFOLIO ANALYSIS

Portfolio analysis includes portfolio construction, selection of securities, revision of portfolio evaluation and monitoring the performance of the portfolio. All these are part of subject of portfolio management which is a dynamic concept. Individual securities have risk-return characteristics of their own. Portfolios, which are combinations of securities may or may not take on the aggregate characteristics of their individual's parts.

Portfolio analysis considers the determination of future risk and return in holding various blends of individual securities. As we know that expected return from individual securities carries some degree of risk. Various groups of securities when held together behave in a different manner and give interest payments and dividends also, which are different to the analysis of individual securities. A combination of securities held together will give a beneficial result if they are grouped in a manner to secure higher return after taking into consideration the risk element.

There are two approaches in construction of the portfolio of securities. They are

1.   Traditional approach
2.   Modern approach

TRADITIONAL APPROACH

Traditional approach was based on the fact that risk could be measured on each individual security through the process of finding out the standard deviation and that security should be chosen where the deviation was the lowest. Traditional approach basically deals with two major decisions. They are

a.   Determining the objectives of the portfolio
b.   Selection of securities to be included in the portfolio

MODERN APPROACH

Modern approach theory was brought out by Markowitz and Sharpe. It is the combination of securities to get the most efficient portfolio. Combination of securities can be made in many ways. Markowitz developed the theory of diversification through scientific reasoning and method.

KARVY CONSULTANTS LIMITED

Karvy Consultants Limited was started in the year 1981, with the vision and enterprise of a small group of practicing Chartered Accountants. Initially it was started with consulting and financial accounting automation, and carved inroads into the field of registry and share accounting by 1985.   Today, Karvy has access to millions of Indian shareholders, KARVY, is a premier integrated financial services provider, and ranked among the top five in the country in all its business segments, services over 16 million individual investors in various capacities, and provides investor services to over 300 corporates, comprising the who is who of

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Corporate India. KARVY covers the entire spectrum of financial services such as Stock broking, Depository Participants, Distribution of financial products - mutual funds, bonds, fixed deposit, equities, Insurance Broking, Commodities Broking, Personal Finance Advisory Services, Merchant Banking & Corporate Finance, placement of equity, IPOs, among others. Karvy has a professional management team and ranks among the best in technology, operations and research of various industrial segments.

DATA ANALYSIS &INFERENCES
CALCULATION OF AVERAGE RETURN OF COMPANIES
Average return = ∑ R/N

Table-1:   RANBAXY LABORATORIES

Year	Opening share price (P0)	Closing share price (P1)	(P1-P0)	(P1-P0)/ P0*100
2004-2005	1100.10	1251.40	151.30	13.75
2005-2006	1252.00	362.35	-889.65	-71.06
2006-2007	364.40	391.85	27.45	7.53
2007-2008	393.00	349.15	-43.85	11.16
2008-2009	350.00	340.95	-9.05	-2.59
TOTAL RETURN				**-41.21**
AVERAGE RETURN (∑ R/N)		-41.21 / 5		**-8.242**

INTERPRETATION

In the year 2004-05 the returns were 13.75 and in the year 2008-09 the returns were fell down to -2.59. The average return of the Ranbaxy laboratories is -8.242

Table-2:   CIPLA

Year	Opening share price (P0)	Closing share price (P1)	(P1-P0)	(P1-P0)/ P0*100
2004-2005	1339.00	317.25	-1021.75	-76.31
2005-2006	320.00	443.40	123.40	38.56
2006-2007	445.00	250.70	-194.30	-43.66
2007-2008	253.40	239.30	-14.10	-5.56
2008-2009	240.00	218.15	-21.85	-9.10
TOTAL RETURN				**-96.07**
AVERAGE RETURN (∑ R/N)		-96.07 / 5	**-19.20**	

INTERPRETATION

In the year 2004-05 the returns of CIPLA were -76.31 where in the year 2008-009 the returns were -9.10. The average return was -19.20 for the period of 2004 to 2009.

Table-3:   ING VYSYA

Year	Opening share price (P0)	Closing share price (P1)	(P1-P0)	(P1-P0)/ P0*100
2004-2005	560.00	585.75	25.75	4.60
2005-2006	585.00	162.25	-422.75	-72.26
2006-2007	164.50	157.45	-7.05	-4.29
2007-2008	159.00	185.15	26.15	16.45
2008-2009	186.50	227.00	40.5	21.71
TOTAL RETURN				**-33.79**
AVERAGE RETURN (∑ R/N)		-33.79 / 5		**-6.76**

INTERPRETATION

In the year 2004-05 the returns were 4.60 and in the year 2008-09the returns were 21.71. The average return of ING VYSYA is -6.76 for the period 2004-2009.

TABLE-4:   ICICI

Year	Opening share price (P0)	Closing share price (P1)	(P1-P0)	(P1-P0)/ P0*100
2004-2005	299.70	370.75	71.05	23.71
2005-2006	374.85	584.70	209.85	55.98
2006-2007	586.25	890.40	304.15	51.88
2007-2008	889.00	950.25	61.25	6.89
2008-2009	950.20	675.85	-274.35	-28.87
TOTAL RETURN				**109.59**
AVERAGE RETURN (∑ R/N)		109.59 / 5		**21.92**

INTERPRETATION

In the year 2004-05 the returns were 23.71 where as in the year 2008-09 the returns were come down to -28.87. The average return for the period 2004 to 2009 was 21.92.

CALCULATION OF STANDARD DEVIATION
Standard Deviation = $\sqrt{\text{Variance}}$

Variance   = $\frac{1}{n-1} (\sum d^2)$

Table-1:   RANBAXY LABORATORIES

Year	Return (R)	Avg. Return (R¯)	d=(R-R¯)	D²
2004-2005	13.75	-8.24	21.99	483.56
2005-2006	-71.06	-8.24	-62.82	3946.35
2006-2007	7.53	-8.24	15.77	248.69
2007-2008	11.16	-8.24	19.40	376.36
2008-2009	-2.59	-8.24	5.65	31.92
TOTAL				**∑d²=5086.88**

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Variance = 1/n-1 ($\sum d^2$) = 1/5-1 (5086.88) = 1271.72
Standard Deviation = $\sqrt{\text{Variance}}$ = $\sqrt{1271.72}$ = 35.66
INTERPRETATION
The standard deviation i.e. risk of the Ranbaxy is 35.66 and the variance is 1271.72.

TABLE-2: CIPLA

Year	Return (R)	Avg. Return (R⁻)	d=(R-R⁻)	D²
2004-2005	-76.31	-19.21	-57.1	3260.41
2005-2006	38.56	-19.21	57.77	3337.37
2006-2007	-43.66	-19.21	-24.45	597.80
2007-2008	-5.56	-19.21	13.65	186.32
2008-2009	-9.10	-19.21	10.11	102.21
TOTAL				$\sum d^2$=7484.11

Variance = 1/n-1 ($\sum d^2$) = 1/5-1 (7484.11) = 1871.03
Standard Deviation = $\sqrt{\text{Variance}}$ = $\sqrt{1871.03}$ = 43.26
INTERPRETATION
The standard deviation of the CIPLA is 43.26 and its variance is 1871.03

Table-3: ING VYSYA

Year	Return (R)	Avg. Return (R⁻)	d=(R-R⁻)	D²
2004-2005	4.60	-6.76	11.36	129.05
2005-2006	-72.26	-6.76	65.5	4290.25
2006-2007	-4.29	-6.376	2.47	6.1009
2007-2008	16.45	-6.76	23.21	538.70
2008-2009	21.71	-6.76	28.47	810.54
-6.76 TOTAL				$\sum d^2$=5774.64

Variance = 1/n-1 ($\sum d^2$) = 1/5-1 (5774.64) = 1443.66

Standard Deviation = $\sqrt{\text{Variance}}$ = $\sqrt{1443.66}$ = 37.99
INTERPRETATION
The standard deviation of ING VYSYA is 37.99 with a variance of 1443.66.

Table-4: ICICI

Year	Return (R)	Avg. Return (R⁻)	d=(R-R⁻)	d²
2004-2005	23.71	21.92	1.79	3.2041
2005-2006	55.98	21.92	34.06	1160.08
2006-2007	51.88	21.92	29.96	897.60
2007-2008	6.89	21.92	-15.03	225.90
2008-2009	-28.87	21.92	-50.79	2579.62
TOTAL				$\sum d^2$=4866.40

Variance = 1/n-1 ($\sum d^2$) = 1/5-1 (4866.40) = 1216.6
Standard Deviation = $\sqrt{\text{Variance}}$ = $\sqrt{1216.6}$ = 34.87
INTERPRETATION
The standard deviation of the ICICI is 34.87 and the variance is 1216.6.
CALCULATION OF CORRELATION BETWEEN TWO COMPANIES
Covariance (COVab) = 1/(n-1) ($\sum$dx.dy)
Correlation of coefficient = COVab / σ_a* σ_b

TABLE-1: RANBAXY & CIPLA

YEAR	Dev. Of RANBAXY (dx)	Dev. Of CIPLA (dy)	Product of dev. (dx)(dy)
2004-2005	21.99	-57.1	-1255.629
2005-2006	-62.82	57.77	-3629.11
2006-2007	15.77	-24.45	-385.57
2007-2008	19.40	13.65	264.81
2008-2009	5.65	10.11	57.12
TOTAL			$\sum$dx. dy = -4948.37

COVab =1/(5-1)(-4948.37) = -1237.09
Correlation of coefficient = -1237.09/(35.66)(43.26) = -0.80
INTERPRETATION

It is founded that the correlation of the RANBAXY & CIPLA is -0.80.

TABLE-2: ING VYSYA & ICICI

YEAR	Dev. Of ING VYSYA (dx)	Dev. Of ICICI (dy)	Product of dev. (dx)(dy)
2004-2005	11.36	1.79	20.3344
2005-2006	65.5	34.06	2230.93
2006-2007	2.47	29.96	74.0012
2007-2008	23.21	-15.03	-348.84
2008-2009	28.47	-50.79	-1445.99
TOTAL			$\sum$dx. dy = 530.44

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COVab =1/(5-1)(530.44) =132.61

Correlation of coefficient = 132.61/(37.99)(34.87) = 0.10

INTERPRETATION

The correlation of the ING VYSYA and ICICI is 0.10.

CALCULATION OF PORTFOLIO WEIGHTS

Deriving the minimum risk portfolio, the following formula is used:

$$WA = \frac{(\sigma b)^2 - rab\,(\sigma a)\,(\sigma b)}{(\sigma a)^2 + (\sigma b)^2 - 2rab\,(\sigma a)\,(\sigma b)}$$

Where,

Xa   is the proportion of security A

Xb   is the proportion of security B

σa = standard deviation of security A

σb = standard deviation of security B

rab = correlation co-efficient between A&B

RANBAXY & CIPLA

$$Xa = \frac{(43.26)^2 - (-0.80)(35.66)(43.26)}{(35.66)^2 + (43.26)^2 - 2(-0.80)(35.66)(43.26)}$$

= 0.55

Xb = 1-Xa

= 1-0.55

= 0.45

ING VYSYA & ICICI

$$Xa = \frac{(34.87)^2 - (0.10)(37.99)(34.87)}{(37.99)^2 + (34.87)^2 - 2(0.10)(37.99)(34.87)}$$

= 0.45

Xb = 1 − Xa

= 1 − 0.45

= 0.55

CALCULATION OF PORTFOLIO RISK

For two securities

$$\sigma_P = \sqrt{\sigma a^2 * (Xa)^2 + \sigma b^2 * (Xb)^2 + 2rab * \sigma a * \sigma b * Xa * Xb}$$

Where,

σP = portfolio risk

Xa = proportion of investment in security A

Xb = proportion of investment in security B

R_{12} = correlation co-efficient between security 1 & 2

σa = standard deviation of security 1

σb = standard deviation of security 2

FOR THREE SECURITIES

$$\sigma p = \sqrt{(\sigma a)^2(Xa)^2 + (\sigma b)^2(Xb)^2 + (\sigma c)^2(Xc)^2 + 2(Xa)(Xb)(rab)(\sigma a)(\sigma b) + 2(Xa)(Xc)(rac)(\sigma a)(\sigma c) + 2(Xb)(Xc)(rbc)(\sigma b)(\sigma c)}$$

RANBAXY & CIPLA

$$\sigma p = \sqrt{(0.55)^2 * (35.66)^2 + (0.45)^2 * (43.26)^2 + 2(-0.80)(35.66)(43.26)(0.55)(0.45)}$$

= √152.74

= 12.36

ING VYSYA & ICICI

$$\sigma p = \sqrt{(0.45)^2 * (37.99)^2 + (0.55)^2 * (34.87)^2 + 2(0.10)(37.99)(34.87)(0.45)(0.55)}$$

= √725.6381

= 26.94

CALCULATION OF PORTFOLIO RETURN

$Rp = W_1R_1 + W_2R_2$ (for two securities)

$Rp = W_1R_1 + W_2R_2 + W_3R_3$ (for three securities)

Where,

W1, W2, W3 are the weights of the securities

R1, R2, R3 are the Expected returns

RANBAXY & CIPLA

Rp = (0.55)(-8.24) + (0.45)(-19.21)

= -13.1765

ING VYSYA & ICICI

Rp = (0.45)(-6.76) + (0.55)(21.92)

= 9.014

FINDINGS

PHARMACEUTICAL INDUSTRY

The expected returns of RANBAXY and CIPLA are -8.242 and -19.21 respectively and their standard deviations are 35.66 and 43.26 respectively. In this combination both RANBAXY & CIPLA are yielding negative returns but the risk of the CIPLA is 7.6 more than RANBAXY.

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BANKING INDUSTRY

The expected returns of ING VYSYA and ICICI are -6.76 and 21.92 respectively. And their standard deviations are 37.99 and 34.87. In this combination the risk of both companies nearly same but the ICICI is yielding more returns i.e. 21.92 than ING VYSYA.

PHARMACEUTICAL INDUSTRY

The combination of RANBAXY and CIPLA is yielding a negative return of -13.17% with a standard deviation of 12.36%. This combination is having lowest risk.

BANKING INDUSTRY

The combination of the ING VYSYA and ICICI are yielding a return of 9.014% with a standard deviation of 26.94%. This combination yields the 2nd highest returns in the portfolio and having the highest risk in the portfolio.

PHARMACEUTICAL INDUSTRY

The combination of the RANBAXY and CIPLA are having a correlation of -0.80.

BANKING INDUSTRY

The combination of ING VYSYA and ICICI are having a correlation of 0.10.

SUGGESTIONS

1. Select your investments on economic grounds.Public knowledge is no advantage.
2. Buy stocks in companies with potential for surprises.
3. Take advantage of volatility before reaching a new equilibrium.
4. Listen to rumors and tips, check for yourself.
5. Don't put your trust in only one investment. It is like "putting all the eggs in one basket ". This will help lesson the risk in the long term.
6. The investor must select the right advisory body which is has sound knowledge about the product which they are offering.
7. Professionalized advisory is the most important feature to the investors. Professionalized research, analysis which will be helpful for reducing any kind of risk to overcome.

CONCLUSIONS FOR PORTFOLIO RISK, RETURN & INVESTMENTS

When we form the optimum of two securities by using minimum variance equation, then the return of the portfolio may decrease in order to reduce the portfolio risk.

RANBAXY & CIPLA

As per the calculations RANBAXY bears a proportion of 0.55 whereas CIPLA bears a proportion of 0.45. The standard deviations of the companies are 35.66 for RANBAXY and 43.26 for CIPLA. This combination yields a return of −13.1765 and a risk of 12.36 respectively. The investors shall not invest in this combination as there is negative return and there is not much difference in their standard deviation.

ING VYSYA & ICICI

In this situation optimum weights of ING VYSYA and ICICI are 0.45 and 0.55 respectively. The portfolio risk is 26.94, which is lesser than the individual risks of two companies and this combination is yielding a return of 9.014. Hence, it is recommended to invest the major proportion of the funds in ICICI, in order to reduce the portfolio risk.

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