International Journal of Advanced Research in Management and Social Sciences
ISSN: 2278-6236

A STUDY OF SELECTION OF OPTIMUM PORTFOLIO THROUGH CAPM WITH REFERENCE TO FINANCIAL MODELING

Manika Garg *

Madhvi**

Abstract: *Financial modeling is a process of forecasting performance of a certain asset, using relationships among operating, investing, and financing variables. The central aim of all financial modeling is valuation under uncertainty: how to estimate the value of a security when it's future trajectory, or the trajectory of the other securities or economic variables it depends on, is unknown. Usually, financial modeling requires a great deal of spreadsheet work. Financial modeling is the task of building a model of a financial decision making situation. This is a mathematical model designed to represent (a simplified version of) the performance of a financial asset or portfolio of a business, project, or any other investment. Financial modeling is a general term that means different things to different users; the reference usually relates either to accounting and corporate finance applications, or to quantitative finance applications. The Objectives of the study is to explore application of financial modeling in selection of portfolio with help of CAPM. Next emphasis has been given to check validity of CAPM model. Data has been approached from various sites, research journals, and other references whose link has been given in reference part.*

Keywords: *Financial Modeling, CAPM (Capital Asset Pricing Model), Risk and Return, efficient frontier, security investment.*

*Asst. Professor, S.D Institute of Mgt. and Technology, Jagadhri.

**Asst. Professor, Research Scholar, S.D Institute of Management and Technology, Jagadhri.

INTRODUCTION

Financial modeling is the task of building an abstract representation (a model) of a financial decision making situation. This is a mathematical model designed to represent (a simplified version of) the performance of a financial asset or portfolio of a business, project, or any other investment. Financial modeling is a general term that means different things to different users; the reference usually relates either to accounting and corporate finance applications, or to quantitative finance applications. While there has been some debate in the industry as to the nature of financial modeling - whether it is a tradecraft, such as welding, or a science - the task of financial modeling has been gaining acceptance and rigor over the years. Typically, financial modeling is understood to mean an exercise in either asset pricing or corporate finance, of a quantitative nature. In other words, financial modeling is about translating a set of hypotheses about the behavior of markets or agents into numerical predictions.

For example, a firm's decisions about investments (the firm will invest 20% of assets), or investment returns (returns on "stock A" will, on average, be 10% higher than the market's returns).

Financial modeling is known as the job of creating any abstract representation of a situation of financial decision making. The model is basically a mathematical model, planned such a way to represent the act of any portfolio or financial asset of a project, a business, or any other type of investment. The term financial modeling is generally used to mean different things to different users. The reference of financial modeling commonly relates to corporate finance and accounting applications or to the applications of the quantitative finance. Besides, the overall task of this application is to gain rigor and acceptance over the year.

Additionally, financial modeling is used to translate a complete set of hypothesis about the behavior of the agents or the markets into the numerical predictions like the decisions of the companies about investment, or about the investment returns.

Definition of 'Financial Modeling'

It is a process by which a firm or organization constructs a financial representation of some or all aspects of the firm for the given security. The model is usually characterized by performing calculations, and makes recommendations based on that information. The

model may also summarize particular events for the end user and provide direction regarding possible actions or alternatives.

Capital Asset Pricing Model (CAPM) is one of the most important models in the Finance literature. According to CAPM, the return of a stock has a positive and linear relationship with the stock's systematic risk. This systematic risk is measured with the beta coefficient of the stock and it is assumed to be stable over time.

Capital market plays an important role in the development of an economy and is an integral part of financial system. In the capital market, the manner in which securities are priced is core issue and it has attracted the attention of researchers for long. The risk-return relationship performs a central role in pricing of securities consequently helps in making judicious investment decision making. The capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965) and Mossin (1968) marks the birth of asset pricing theory. In the development of the asset pricing model it is assumed that

(1) All investors are single period risk-averse and prefer maximization of utility of terminal wealth and

(2) They can choose portfolios solely on the basis of mean and variance,

(3) There are no taxes or transactions costs,

(4) All investors have homogeneous views regarding the parameters of the joint Probability distribution of all security returns, and

(5) All investors can borrow and lend at a given risk-less rate of interest. The major result of the model is a statement of the relation between the expected risk premiums on individual assets and their "systematic risk." This relationship says that the expected excess return on any asset is directly proportional to its "systematic risk."

LITERATURE REVIEW

Rationale. Stigler's (1961) seminal paper introduced the concept of returns to information search. According to Stigler's analysis, consumers stop searching for information at the point when the marginal cost of additional searching (including time, effort, and other resources) equals the marginal benefit. Because less-experienced and less-educated consumers will have to work hard to find and assimilate information, this relatively higher marginal cost of searching for Information may result in less searching when all else is equal. Nonetheless, all consumers, regardless of their experience and expertise, will cease searching for

information when the marginal cost equals the marginal benefit, and hiring a technical expert may lower the marginal cost of searching for information relative to searching on one's own. A technical expert can lower the marginal cost of searching for information by acquiring expertise on a relatively esoteric topic and then working with multiple clients, each of whom may only need the information once in a lifetime. **Shapira and Venezia's (2001)** research on financial professionals, which indicates that financial professionals are less likely to fall prey to the disposition effect (holding losing stocks too long in hopes of a rebound and selling profitable stocks too soon) than the general public and cites this fact as evidence that advisors may help consumers avoid making mistakes. In Bluethgen et al.'s model, financial advisors add value by identifying and correcting clients' cognitive errors. Advisors also reduce the costs of information search by exploiting economies of scale, as they serve many clients over time and spread the fixed costs of acquiring information across a pool of clients. **Guiso and Jappelli (2006)** find that financial advice increases investors' risk adjusted returns, but the authors did not adequately control for selection effects **Fischer and Gerhardt (2007)** suggest that financial advisors can be particularly valuable for individuals who lack financial literacy and are prone to cognitive biases. Another study analyzes the effects of financial advice on brain activity. **Bluethgen et al. (2008)** published one of the only papers that provide a detailed economic model of financial advice. Their model is grounded on evidence that consumers often demonstrate significant cognitive errors when making financial decisions. Empirical evidence in terms of take-up, Bluethgen et al.'s (2008) analysis indicates that older individuals, households with higher net worth, and women are more likely to access financial advice. Perhaps unexpectedly, studies on the efficacy of financial advice suggest that advice has no significant or even negative effects on financial outcomes. In the boldly titled paper 'Financial Advisors: A Case of Babysitters?,' **Engelmann et al. (2009)** examine functional MRI images of individuals' brains as they receive financial advice. The MRI scans suggest that financial decisions were less taxing on the brain when participants received advice. **Horn et al. (2009**) utilize a change in German tax withholding laws to test whether investors make investment mistakes by purchasing newly tax-disadvantaged assets. This natural experiment indicates that financial advice helps clients avoid tax mistakes. The authors suggest that this finding may be attributable to the fact that tax consequences are one of financial advisors' core competencies. However,

Horn et al. (2009) failed to incorporate selection processes into their analysis, so the possibility of endogeneity between using an advisor andal ready being less prone to making tax mistakes cannot be ruled out **Haslem (2010)** assesses the relationship between financial advisors and investors in light of the current financial crisis, concluding that advisors can help clients avoid panicking and acting irrationally. This literature suggests that technical advisors play several roles: defusing biases that lead to common mistakes, facilitating cognition by easing access to information, overcoming affective issues by reducing anxiety, and mediating joint decision making by couples. The latter roles of advising are less well defined and not yet empirically tested. **Hackethal et al. (2010)** carefully examine the role of investment advisors. This study controls for selection effects, as individuals who use advisors likely differ from individuals who do not use advisors in ways that also affect financial outcomes. Clients who used financial advisors had lower average returns and were more likely to incur substantial losses on their investments. Furthermore, working with a financial advisor was not associated with better market timing or diversification strategies, and financial advising was linked to more trading, higher turnover, and higher trading costs. Thus, the results provide no evidence that financial advising is worth its added expense. **Haslem (2010)** matched advisor accounts to non advisor accounts, concluding that fee-only advisors who recommend index funds may in fact add value to investors' portfolios that exceed the fees they charge. **Hung and Yoong (2010)** compare imposed, unsolicited advice to advice that is offered to and then voluntarily selected by participants. The study's experimental design allows the authors to estimate the causal effects of both the intent to treat and the treatment on the treated, which is a standard experimental technique used to address selection bias. The authors find that imposed, unsolicited advice does not affect behavior. On the other hand, voluntarily selected advice was linked to improvements in client outcomes. The authors conclude that selection effects are negative such that individuals with the lowest financial capacity are more likely to take-up advice. This is a unique finding, given that almost all studies about selection effects in the financial capacity-building field conclude that clients with the greatest financial capacity are the most likely to participate. **Hung and Yoong (2010)** contend that compulsory financial advice is unlikely to be effective, but wider access to optional advice might be useful. **Bhattacharya et al. (2010)** conducted an experiment with a European brokerage bank. The bank randomly selected

about 8,000 customers out of several hundred thousand active customers for participation in a new no-cost advice service. About 380 customers opted to participate. Customers who accepted the free advice offer were more likely to be male, older, and wealthier. Participants also tended to have longer relationships with the bank and to make more trades per month than the control group. The authors concluded that customers who signed up to receive advice were among the bank's most financially sophisticated customers. The authors measured customer returns after participating customers received advice, finding returns for customers in the advice program were only slightly higher than returns for customers who did not participate in the program. However, many advisees did not utilize the advice they received. The authors also found that although returns did not improve for the average advisee, they did improve for the average advisee who followed the investment advice. Furthermore, the advice appeared to be most beneficial for investors with the least financial sophistication. The authors conclude that investors who could benefit substantially from financial advice are less likely to seek advice.

OBJECTIVES OF THE STUDY

- To study financial modeling concept with its linkage to CAPM
- To select the optimum portfolio through efficient frontier along with risk and return relationship.
- To analyze validity of CAPM in practical market and pricing of security.

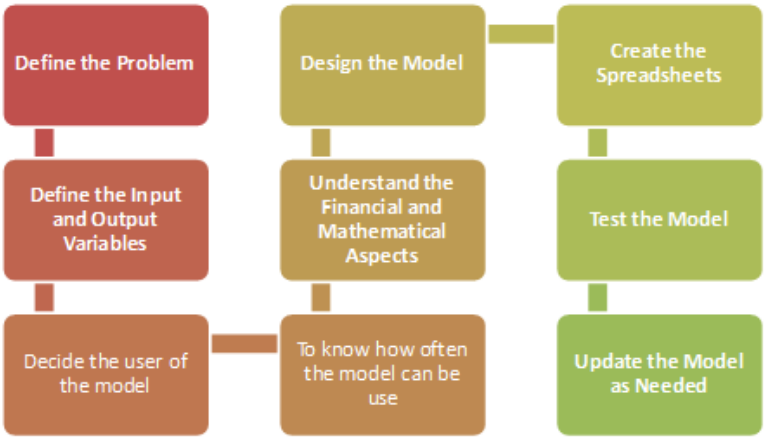
RESEARCH METHODOLOGY

This research is a descriptive study in nature. The data needed for the study is collected from both primary and secondary sources. The secondary data is collected from published and unpublished reports and records of different institutions.

DATA ANALYSIS & INTERPRETATION:

Objective: 1. To analyze the concept of financial modeling with its linkage to CAPM.

Diagram: 1.1



Step 1: **Define and Structure the Problem:**

The first step in creating a model is to define and structure the problem i.e. why the model is needed and what decisions, will be made based on its output—that is, what questions the model is supposed to answer. Then establish how accurate or realistic the outputs need to be.

Step 2: **Define the Input and Output Variables of the Model:**

After defining and structured the problem the next step is to define the input and output variables of the model i.e. what things will be needed and decide who will provide them or where they will come from. Thus for this Make a list of the tabular, graphical, and other outputs the model needs to create.

Step 3: **Decide Who Will Use the Model and how Often** :

Here the next step is to decide who will use the model i.e whether the model is created for oneself or for the use of others when you create models for others' use, it involves much more work. You have to make sure that the people cannot enter data that do not make sense, they cannot accidentally damage parts of the model, and they can get the necessary outputs automatically. How frequently a model will be used is another important issue. If a model is going to be used only once in a while, then it does not matter if it takes a long time to run or if it takes some extra work every time to create the outputs. A model that will be used frequently, however, should be designed differently.

Step 4: **Understand the Financial and Mathematical Aspects of the Model:**

Understanding the Financial and Mathematical Aspects of the Model is the important step, because without understanding these aspects one cannot create or use the model. it is so because the computer cannot do any thinking; you have to tell it exactly how all the calculations in the model will have to be done.

Step 5: **Design the Model:**

Here the next step is to design the model according to the need, it should be in such a way that it will bitterly help in achieving the objects for which the model is created and it also help in solving the problems.

Step 6: **Create the Spreadsheets:**

After the designing of model the next main step is to creation of the spreadsheets.

Step 7: **Test the Model:**

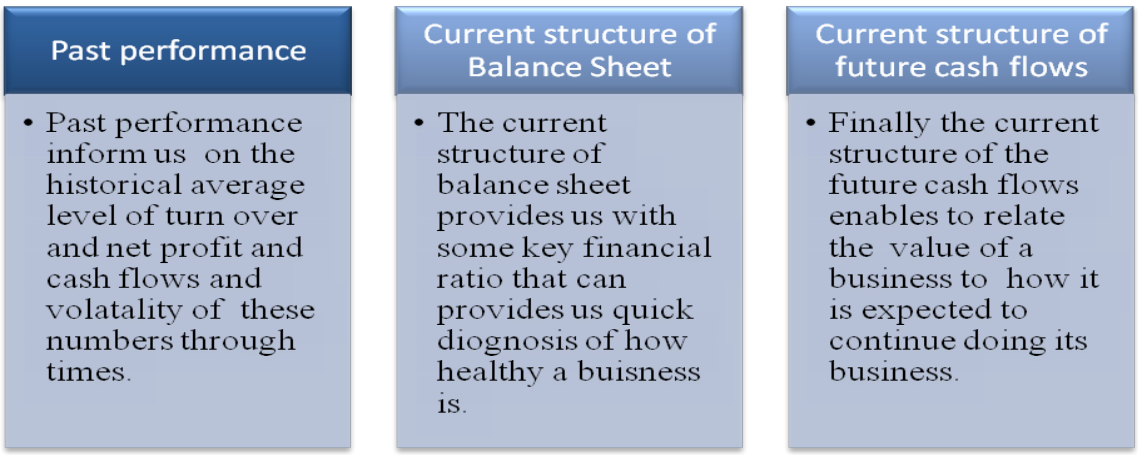
Now the most important step is to test the model as no model works correctly the first time it is used; you have to find the problems and fix them. After finding and solving the problem one have to test a model extensively with a wide range of input variables. Now if the model works properly then one can easily use it without any problem or interruption.

Step 8: Update the Model as Necessary:

As we work in a dynamic environment which goes on changing from time to time, so the model which we are using also needs an up gradation. Depending upon the need of up gradation one have to make the possible changes in the same.

Diagram: 1.2

INTEGRATED FINANCIAL MODEL



RELATION OF CAPM AND PRACTICAL MARKET:

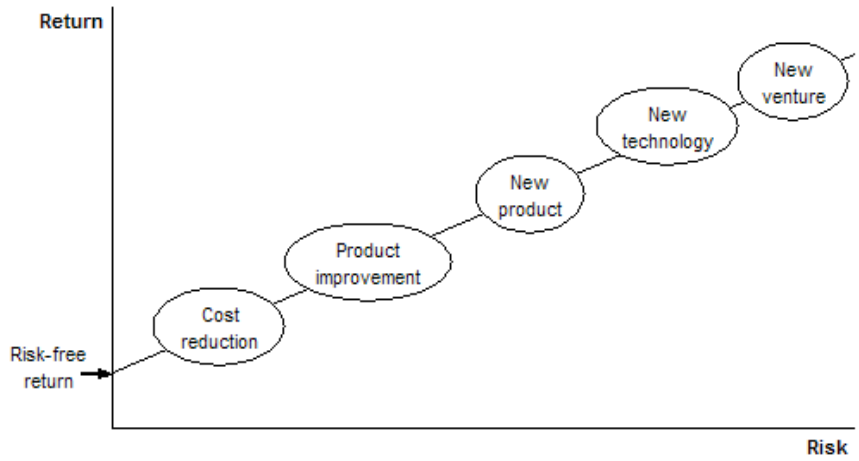
A financial model is a quantitative representation of financial information, from, e.g., a business, organization or branch of a government. A financial model is used by the financial analyst and may be constructed for many purposes, including: valuation of a security, forecasting future raw materials needs for a corporation, or determining the benefits of a hostile takeover or merger. The focus here will be on financial modeling as it relates to Wall Street jobs and, more generally, careers in the finance industry. However, financial modeling with other applications has many of the same characteristics as financial modeling for Wall Street.

$$E[R_{it} - R_{ft}] = \beta_i E[R_{mt} - R_{ft}]$$

or

$$\alpha_i = 0 \quad \text{for all securities } i$$

Diagram: 1.3



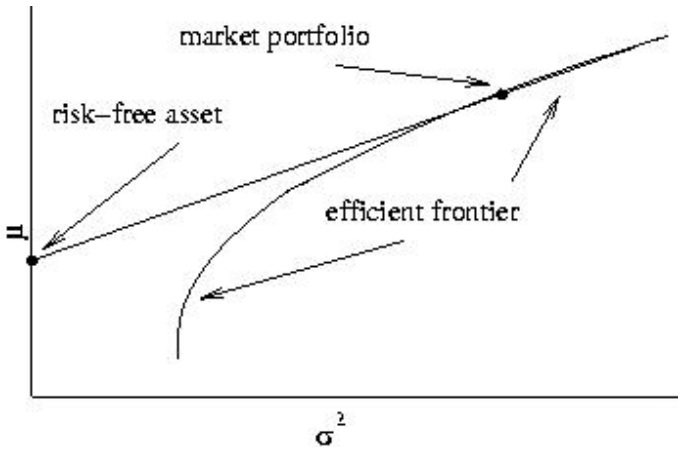
There are many kinds of financial models used on Wall Street. While most financial models focus on valuation, some are meant to quantify and predict risk, portfolio performance, or general economic trends within and industry or region. There are several different methods employed for valuation in financial modeling. Discounted cash flow models (DCF models) and capital asset pricing models (CAPM) are used to assess the value of a security. However, while the discounted cash flow model is used by financial analysts to estimate the fair price of a security with respect to identifying undervalued securities, the the capital asset pricing model focuses on valuation of a security within the context of its volatility, or risk.

An important task of the corporate financial manager is measurement of the company's cost of equity capital. But estimating the cost of equity causes a lot of head scratching; often the result is subjective and therefore open to question as a reliable benchmark. This article describes a method for arriving at that figure, a method spawned in the rarefied atmosphere of financial theory. The capital asset pricing model (CAPM) is an idealized portrayal of how financial markets price securities and thereby determine expected returns on capital investments. The model provides a methodology for quantifying risk and translating that risk into estimates of expected return on equity.

A principal advantage of CAPM is the objective nature of the estimated costs of equity that the model can yield. CAPM cannot be used in isolation because it necessarily simplifies the world of financial markets. But financial managers can use it to supplement other techniques and their own judgment in their attempts to develop realistic and useful cost of equity calculations.

Although CAPM's assumptions are obviously unrealistic, such simplification of reality is often necessary to develop useful models. The true test of a model lies not just in the reasonableness of its underlying assumptions but also in the validity and usefulness of the model's prescription. Tolerance of CAPM's assumptions, however fanciful, allows the derivation of a concrete, though idealized, model of the manner in which financial markets measure risk and transform it into expected return.

Diagram: 1.4



Objective: 2. To select the optimum portfolio through efficient frontier along with risk and return relationship.

The Capital Asset Pricing Model (CAPM) provided the first coherent framework for answering this question. The CAPM was developed in the early 1960s by William Sharpe (1964), Jack Treynor (1962), John Lintner (1965a, b) and Jan Mossin (1966). The CAPM is based on the idea that not all risks should affect asset prices. In particular, a risk that can be diversified away when held along with other investments in a portfolio is, in a very real way, not a risk at all. The CAPM gives us insights about what kind of risk is related to return.

To analyze the risk and return of portfolio CAPM model is used**.**

The Capital Asset Pricing Model

- The capital asset pricing model is the oldest and still the most widely used model for risk in the investment world.
- It is derived in four steps:

1. Uses variance as a measure of risk
2. Specifies that a portion of variance can be diversified away, and that is only the non-diversifiable portion that is rewarded.
3. Measures the non-diversifiable risk with beta, which is standardizing around one.
4. Translates beta into expected return -

Expected Return = Risk free rate + Beta * Risk Premium

Cost of Equity = Rf + Equity Beta * (E(Rm) - Rf)

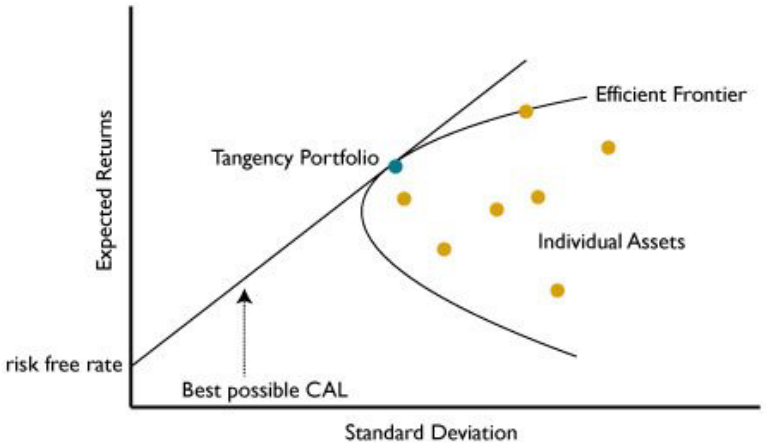
Where,

Rf = Risk free rate

E(Rm) = Expected Return on the Market Index.

In the current study a hypothetical portfolio have been made whose risk and return relationship is analyzed.

Diagram: 1.5



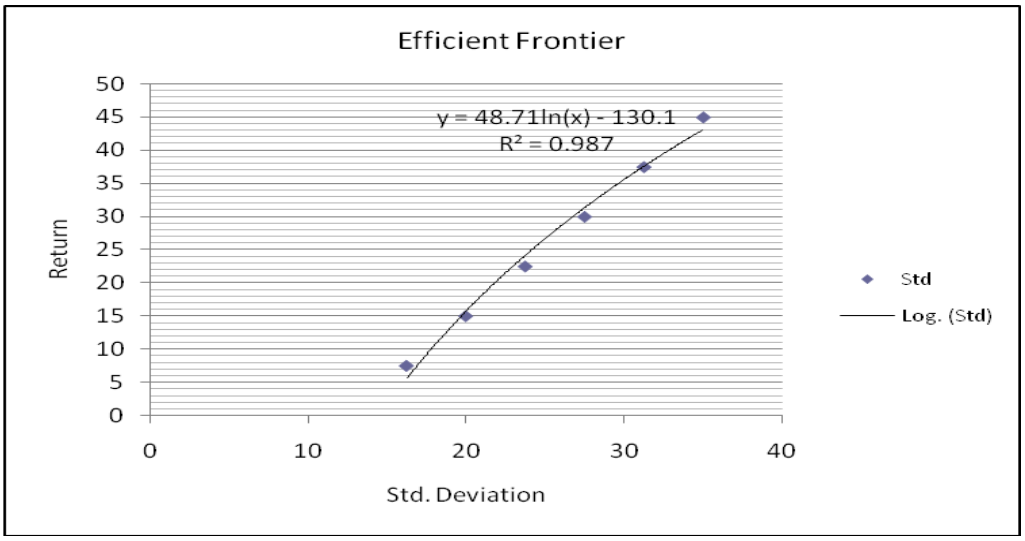
Explanation: A hypothetical example has been taken to analyze the risk return statement of the portfolio.

Table 1.1

Portfolio	Amt. Invested	Risk Free Ret.	Portfolio Return	Std. Dev	Risk Premium
	500000	12.5	16.25	7.5	4
B	500000	10	20	15	10
C	500000	8	23.75	22.5	5.75
C	500000	9	27.5	30	18.5
D	500000	13	31.25	37.5	18.25
E	500000	12.7	35	45	22.3
F	500000	6	38.5	52.5	32.5
G	500000	11	42	60	31
H	500000	9	45.5	67.5	36.5
I	500000	12	49	75	37
J	500000	8	52.5	82.5	44.5
K	500000	12	56	90	40

Where Expected Return: RA = RF + B (RM – RF)

Graph 1.1



RESULTS:

In the above example investor is assumed to invest Rs. 500000 in given set of portfolios. Range of available portfolio is from A-K. Risk Free rate of return is assumed for concerned

portfolios whose risk premium along with standard deviation is being calculated. After plotting related graph, Graph 1.1 is resulted which

Explained in above given portfolios risk and return explanation.

Objective: **3. To analyze validity of CAPM in practical market and pricing of security.**

Below is given few statements which prove that CAPM in practical life is suffering from some problems which raise question mark on validity of CAPM:

- If we have consider stock of A-K we will get different combination of risk and return for each set of portfolio with its relation to SML and CML, in given situation assumptions is not practical applicable.
- Any investor interested in knowing optimum portfolio he also have to consider mean, variance measures.
- In CAPM weightage(**E (rp) =Σwi*E(ri)** to every portfolio with regard to market portfolio has to be given which does not always true indication and measure of SML relationship.
- Actual risk premium **(Rp-Rf)** is calculated for the portfolio but there are some residual factors which are not always entertained.
- Once the mean variance is calculated and optimum portfolio is selected but portfolio set (combination of security) is a dynamic equation which needs to be changed timely.
- Expected return **(E(rP) = rf + β P [E(rM) – rf])** is all a analysis game which is based on market situation which definitely not a static term.

FINDINGS

In the given study a hypothetical statement for the portfolio has been in which investor is supposed to invest Rs. 500000. A different set of combination portfolio range from A-K is given. That available set of portfolio is then plotted on the way to efficient set and feasible set in excel spreadsheet. Risk premium, standard deviation is calculated which gave optimum portfolio to the investor, which helps him to invest in given market. Data has been approached from various sites, research journals, and other references. it can be concluded that beta is not sufficient to determine the expected returns on securities/portfolios. The study is conducted to investigate whether the CAPM perfectly captures all-pervasive

aspects of actual market by including the on expected variance of securities direct that the unexpected risk has no effect on the expected return on given set of portfolios.

CONCLUSION

The CAPM model is very prominent contribution to understand the risk return relationship of security along with selection of the portfolio. It tells us analyzed the pricing of diversified portfolio. That helps to know the relation between expected return and actual return of the invested security. Capital Asset Pricing Model was developed at a time when the theoretical foundations of decision making under uncertainty were relatively new and when basic empirical facts about risk and return in the capital markets were not yet known.Whereas financial modeling is the task of building a model of a financial decision making situation. This is a mathematical model designed to represent (a simplified version of) the performance of a financial asset or portfolio of a business, project, or any other investment. Financial modeling is a general term that means different things to different users; the reference usually relates either to accounting and corporate finance applications, or to quantitative finance applications. In this study relation between risk and return along with selection of portfolio has been analyzed.

REFERENCES

1. Feltham. A. Gerald and Ohlson. A. James, “Valuation and Clean Surplus Accounting for operating and financial activities” Journal of banking & Finance, Vol 17, issue 2-3, April 1993, Pg 221-49.
2. Sharpe’F. William, “capital asset prices: a theory of market equilibrium under conditions of risk” The Journal of Finance, Volume 19, Issue 3, September 1964, Pg 425–442.
3. Li. W. C, “On a double-threshold autoregressive heteroscedastic time series model”, Journal of Applied Econometrics, Volume 11, Issue 3, May 1996, Pg 253–274.
4. Roll. Richard, “A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory”, Volume 4, Issue 2, March 1977, P Pg.129–176.
5. Boyle. Phelim and Broadie. Mark, “Monte Carlo methods for security pricing” Journal of Economic Dynamics and Control, Volume 21, Issues 8–9, 29 June 1997, Pg. 1267–1321.

6. Berger. N. Allen and Humphrey. B. David, "Efficiency of financial institutions: International survey and directions for future research" European Journal of Operational Research, Volume 98, Issue 2, Pg. 175–212,16 April 1997.
7. Clare. Andrew and Brien. O. Raymond, "Macroeconomic shocks and the CAPM: evidence from the UK stock market" International Journal of Finance & Economics, Volume 3, Issue 2, , April 1998, Pg.111–126.
8. A.Craig MacKinlay, "On multivariate tests of the CAPM", Journal of Financial economics, Vol. 18, issue2, june 1987, pg 341-371.
9. Jonathan B. Berk[†], "Necessary Conditions for the CAPM" Journal of economic theory, vol. 73, issue 1, March 1997, pg 245-257.
10. Hamao. Yasushi, "An empirical examination of the Arbitrage Pricing Theory: Using Japanese data", Japan and the world economy, vol. 1, issue.1, 1988, pg 45-61.
11. Cashin. Paul and C. John McDermott , "Testing the consumption-CAPM in developing equity markets" International Journal of Finance and economics, April 1998, Volume 3, Issue 2, Pg. 127–141.
12. Brown.Philip and tarry. Walter, "The CAPM: Theoretical Validity, Empirical Intractability and Practical Applications" Abacus, Volume 49, Issue Supplement S1 January 2013, Pg. 44–50,
13. Groenewold, N. and Fraser, P. (1997), "Share Prices and Macroeconomic Factors", Journal of
14. Business Finance and Accounting, Vol. 24, Iss2ue 9 & 10, Pg 1367-1383.
15. He, J. and Ng, L.K. (1994), "Economic Forces, Fundamental Variables and Equity returns, Journal of Business, Vol. 67, No. 4, Pg 599-639.
16. Jagannathan, R and Wang, Z. (1996), "The Conditional CAPM and the Cross-section of Expected returns", Journal of Finance, Vol. 51, Issue 1, Pg 3-53.