# A SIMPLIFIED PERSPECTIVE OF THE MARKOWITZ PORTFOLIO THEORY

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**ABSTRACT** Risk and return are the two sides of an investment. Every investor wants maximum return from his investment for the given level of risk or lowest risk to a given level of return. Harry Markowitz framed a model in 1952 to assist the investors. The model contributes in the selection of the most efficient portfolio by analyzing various possible portfolios of the given securities. He gave a hypothesis of Modern Portfolio Theory, which helps to construct an optimum portfolio by comparing various portfolios. Markowitz model is a theoretical framework for analysis of risk and return and their inter-relationships. It has been proved that "Portfolio helps in the reduction of risk". The main purpose of this paper is to shed the light on the contributions made by the Harry Markowitz in the area of security analysis.

Keywords: Markowitz model, Portfolio, Security analysis

## 1. Introduction

Harry Max Markowitz a noble prize winner made various contributions in the field of security analysis. Harry M. Markowitz is credited with introducing new concepts of risk measurement and their application to the selection of portfolios.He started with the idea of risk aversion of average investors and their desire to maximize the expected return with the least risk.He used the statistical analysis for measurement of risk and mathematical programming for selection of assets in a portfolio in an efficient manner.His framework led to the concept of efficient portfolios. An efficient portfolio is expected to yield the highest return for a given level of risk or lowest risk for a given level of return. To choose the best portfolio from a number of possible portfolios, each with different return and risk, two separate decisions are to be made:

I. Determination a set of efficient portfolios.

II. Selection of best portfolio out of the efficient set

What is Portfolio....

Any collection of financial assets such as stocks, bonds, and cash.

Portfolios may be held by individual investors and/or managed by financial professionals, hedge funds, banks and other financial institutions. A portfolio is designed according to the investor's risk tolerance, time frame and investment objectives.

#### 2. Literature review

According to the Markowitz, Risk and Reward are two aspects of investment considered by investors. The expected return may vary depending on the assumptions. If the investor wants a higher return, he has to take higher risk. Modern portfolio theory is the contribution of Harry Markowitz, which assists the investors how to diversify the risk. Essentially, MPT is an investment framework for the selection and construction of investment portfolios based on the maximization of expected returns of the portfolio and the simultaneous minimization of investment risk (Fabozzi, Gupta, & Markowitz, 2002). Markowitz H. (1952 and 1959) affirmed the major assumption of the Markowitz"s approach to portfolio analysis is that investors are basically risk-averse. This means that investors must be given higher returns in order to accept higher risk. Markowitz then developed a model of portfolio analysis. Markowitz (1952) and Tobin (1958) showed that it was possible to identify the composition of an optimal portfolio of risky securities, given forecasts of future returns and an appropriate covariance matrix of share returns. William Sharpe (1964) has given model known as Sharpe Single Index Model (SIM) which laid down some steps that are required for construction of optimal portfolios. Konno and Yamazaki (1991) proposed a new model using mean absolute deviation (MAD) as risk measure to overcome the weaknesses of the mean-variance model proposed by Markowitz. One of the most significant reasons problems being the computational difficulty associated with solving a large scale quadratic problem associated with a dense covariance matrix.

# 3. Objective of the study:-

To study how Markowitz model helps to reduce the risk of an investor.

# 4. Markowitz Portfolio Theory

According to Harry Markowitz, Combining stocks into portfolios can reduce standard deviation, below the level obtained from a simple weighted average calculation. The various weighted combinations of stocks that create the standard deviations constitute the set of efficient portfolios.

As per the Modern Portfolio Theory, expected returns, the variance of these returns and covariance of the returns of the securities within the portfolio are to be considered for the choice of a portfolio. A portfolio is said to be efficient, if it is expected to yield the highest return possible for the lowest risk or a given level of risk.

A set of efficient portfolios can be generated by using the above process of combining various securities whose combined risk is lowest for a given level of return for the same amount of investment, that the investor is capable of.

The Modern Portfolio Theory of Markowitz is based on the following assumptions:

I. Investors are rational and behave in a manner as to maximize their utility with a given level of income or money.

II. Investors have free access to fair and correct information on the returns and risk.

III. The markets are efficient and absorb the information quickly and perfectly.

IV. Investors are risk averse and try to minimize the risk and maximize return.

## **Efficient Frontier**

Each half egg shell represents the possible weighted combinations for two stocks. The composite of all stock sets constitutes the efficient frontier.



Standard Deviation

#### 5. Expected Return of a Portfolio

The Expected Return on a Portfolio is simply the weighted average of the returns of the individual assets that make up the portfolio:

$$ER_p = \sum_{i=1}^{n} (w_i \times ER_i)$$

The portfolio weight of a particular security is the percentage of the portfolio's total value that is invested in that security.

#### For Example,

Portfolio value = \$2,000 + \$5,000 = \$7,000  $r_A = 14\%, r_B = 6\%,$   $w_A = weight of security A = $2,000 / $7,000 = 28.6\%$  $w_B = weight of security B = $5,000 / $7,000 = (1-28.6\%) = 71.4\%$ 

$$ER_p = \sum_{i=1}^{n} (w_i \times ER_i) = (.286 \times 14\%) + (.714 \times 6\%)$$
$$= 4.004\% + 4.284\% = 8.288\%$$

# Standard Deviation of a Two-Asset Portfolio using Covariance



## 6. How Diversification works?

Let's prove by an example:-									
A. Correlation Coefficient = .4									
Stocks S.D	. 0	6 of Portfolio	Average Return						
ABC Corp=	28	60%	15%						
Big Corp=	42	40%	21%						
Standard Deviation = weighted avg = 33.6									
Standard Deviation = Portfolio = 28.1									
Return = weighted avg = Portfolio = 17.4%									
B. Correla	ation Coefficien	t = .4							
Stocks S.D. % of Portfolio Avg Return									
ABC Corp	28	60%	15%						
Big Corp	42	40%	21%						
Standard Deviation = weighted average = 33.6									
Standard Deviation = Portfolio = 28.1									
Return = weighted average = Portfolio = 17.4%									
Let's Add stock New Corp to the portfolio									
C. Correlation Coefficient = .3									
Stocks S.D	). % of Poi	rtfolio Ave	<u>erage Return</u>						
Portfolio	28.1	50%	17.4%						
New Corp	30	50%	19%						
NEW Standard Deviation = weighted average = 31.80									
NEW Stand	lard Deviation	a = Portfolio = 23.	43						
NEW Return = weighted average = Portfolio = 18.20%									
NOTE: Higher return & Lower risk									
How did we do that? <u>DIVERSIFICATION</u>									

### 7. Relationship between risk and return

1			Portfolio risk with correlation of			
	Weight in asset 1(%)	Portfolio return	1	0.5	0.2	-1
	o	15	25	25	25	25
	10	14.2	23.7	23.1	22.8	21.3
	20	13.4	22.4	21.3	20.6	17.6
	30	12.6	21.1	19.6	18.6	13.9
2	40	11.8	19.8	17.9	16.6	10.2
	50	11	18.5	16.3	14.9	6.5
	60	10.2	17.2	15	13.4	2.8
	70	9.4	15.9	13.8	12.3	0.9
	80	8.6	14.6	12.9	11.7	4.6
	90	7.8	13.3	12.2	11.6	8.3
	100	7	12	12	12	12



# 8. Findings of the study

- The lower the correlation between assets, the greater the reduction in risk that can be derived.
- Modern Portfolio Theory was first developed with individual securities in mind but can also be applied to combinations of asset classes.
- Consider the situation in which an investor has an exposure to just one asset class, such as to Indian Equities. The fortunes of this investor will rise and fall completely with that for Indian Equities.
- But if this investor diversifies to also hold Gilt funds, some of the risks embedded in this portfolio can be removed without necessarily impacting on returns.
- As one asset class performs strongly, the other may not.

# 9. Conclusion

The Markowitz model was a brilliant innovation in the science of portfolio selection.Portfolio provides a useful guideline for the reduction of risk: to diversify as much as possible amongst uncorrelated assets. Markowitz theory suggests that investors are concerned with both returns and risks and these two should be measured for the portfolio as a whole. By taking variance as a measure of risk, he proposed a method of selecting an optimal portfolio which provides maximum returns for a given level of risk or ensures minimum risk for a given level of returns.

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