ISSN: P-2455-0515 E- 2394-8450

Educreator Research Journal

OPEN ACCESS

Volume–IX, Issues–I
Jan – Feb 2022

Original Research

A STUDY ON OPTIMAL PORTFOLIO CONSTRUCTION - A STUDY OF NSE

Ms. Gaurav B. Sharma

Student of M.Sc. Finance Part II, KSD' Model College

Abstract :

This study attempts to construct an optimal portfolio by using Sharpe's Single index model. For this purpose NSE, NIFTY and all the 25 stocks have been used as market index for preparing portfolio. The daily data for all the stocks and index for the period of 2015 to December 2021 have been considered. The proposed method formulates a unique cut off point (Cut off rate of return) and selects stocks having excess of their expected return over risk free rate of return surpassing this cut-off point. Percentage of investment in each of selected stocks is then decided on the basis of respective weights assigned to each stock depending on respective beta value, stock movement variance unsystematic risk, return on stock and risk free return vis-a-vis the cut off rate of return. The optimal portfolio consists of four stocks selected out of 25 short listed scripts. Investment in stocks may be made individually or through portfolio managers. This study attempts at selecting an optimal portfolio for investment in Indian equity stocks belonging to specific economic sectors. After reviewing the relevant literature, the objectives and research methodology of the study have been spelt out. This is followed by a coverage of the concepts and definitions which are relevant for this study. A comparison of the different approaches to select an optimum portfolio has been made to get an overview of the relative measures. In this paper, an optimum portfolio of economic sectors in India, in which the investments could be made, has been constructed, using Sharpe's index model and Treynor's index as appropriate. The choice of individual stocks within each the selected sectors could be done by the individuals or portfolio managers based on any subsequent analysis which generally aims at accrual of higher returns, given a risk level.

Introduction :

Investment :

Investment is the commitment of money or capital to purchase financial instruments or other assets in order to gain profitable returns in the form of interest, income, or appreciation of the value of the instrument. No

doubt, investing one's hard-earned money is a risky business. Sure, there are investments that look like they don't carry huge risk of failure, but these won't get huge amounts of dough. The basic rule of Investing applies everywhere-"Huge risk comes with Huge returns" and being aware of the objectives and avenues of investment leads to financial security. If one wants to safe guard one's money against inflation and aim it to grow, one need to select the right financial product for oneself. Investment is an art and a science, key to successful investment is focused and effective investment planning. There are various options in which one can invest. There are many investment options available in the market as Mutual Funds, Fixed Deposit, National Saving Certificate, Public Provident Fund, stock Market, Gold, Silver, & Real estate.

Investment is the employment of funds on assets with the aim of earning income or capital appreciation. Every investment involves a return and risk. The possibility of variation in the actual return is known as investment risk. To make wise decisions in investment, there is a need for knowledge on security analysis and portfolio management. A portfolio is a combination of securities. Any portfolio constructed, either by an individual investor or a fund manager is expected to meet the investor's goals. A rational investor aims at attaining maximum return with minimum risk. It is, therefore, important to construct a portfolio using either of the two popular approaches, namely, traditional and modern. In the traditional approach, investor's needs in terms of income and capital appreciation are evaluated and appropriate securities are selected to meet the needs of the investor. In the modern approach, Markowitz model is used in selection of securities based on to the risk and return analysis. Markowitz laid foundation for quantifying risk and his contribution is popularly known as 'Modern Portfolio Theory'.

Need of the Research :

The equity of an investor is on the performance of a particular company's stock in the stock market. The stronger the company's share, the more profit the investor gets. So, it is necessary to determine, analyze and understand the share of dissimilar firms in order to know its position in the market. Investors can make clever investment with the help of this statistical tools through this project, which the company tries to ensure buy indications and sell indications in which the investment could be made in stock market.

Objectives of the Research :

- To Construct an Optimal Portfolio
- Risk - return analysis of individual securities listed in NSE.
- Allocate investment in different stocks considering risk-return criteria.
- Construct optimal portfolio using Return , Standard Deviation, Excess return to beta ratio, cut-off point, Sharpe single index model.

Limitations of the Research :

The risk and uncertainty in the market tends to change with time. SIM provides optimal portfolio based on a single point of time only without considering the dynamic nature of the market.

In this model it is assumed that prices of stock move together only because of movement with the market. Many researchers have identified that there are other influences beyond these factors which affect the movement of stocks.

Construction of Optimal Portfolio: The 'excess return to beta ratio' (Ri-Rf/β) decides inclusion of any stock in the optimal portfolio. The reason behind the inclusion of any stock in the optimal portfolio is clearly explained by this ratio (Fischer and Jordan, 1995). The stocks are ranked from highest to lowest on the basis of excess return to beta ratio. A unique cut off rate is calculated and all the stocks whose (Ri-Rf/β) is above the cut off rate are accepted for inclusion in the optimal portfolio. This single value explains the desirability why a stock is included in the optimal portfolio (Fischer and Jordan, 1995)

Review of Literature :

1. Dr. S Poornima, Aruna P. Remesh (2015) explored the Single Index Model by studying stocks of Banking and IT sector from BSE SENSEX. In this study 10 Stocks from banking sector and 10 companies from IT Sector were chosen, secondary data were used. Data from January 2010 to December 2015 (60 Months) was collected. Risk-Free rate of 7.75% is used. After analysis of the 20 companies 3 stocks were assigned for optimal portfolio creation, from 3 Stocks 2 stocks were from banking sector and 1 from IT sector.
2. Saurabh Singh & Jayant Gautam (2014) studied stocks from CNX bank Index, 12 bank stock are studied using secondary data, closing price in monthly basis are used for period from January 2009 to December 2013 (60 Months). 7.85% 91-Day treasury bill rate is used for Risk-Free rate of return on asset. After calculation and analysis of selected stocks 2 companies are selected for creation of the optimal portfolio.
3. Mahabub Basha S. & M.S.Ramaratnam(2017) explored the selection of stock from NIFTY Mid-Cap 150, Nifty Mid Cap 150 represents the companies ranked from 101-250 based on full market capitalization from Nifty 500. For this study the secondary data are collected, and these data are monthly closing prices of the Nifty Mid Cap 150 from July 2011 to June 2016(84 months). Here the risk-free rate for the asset was assumed at 7%. After calculation for optimal portfolio 25 companies were selected for portfolio construction out of 150. Study believes that construction of optimal portfolio is a road for fund manager, investors and other institutions for taking right investment decisions. Study concludes by advising that the inclusion of the fundamental analysis of the individual securities would, to a greater extent improve the portfolio performance.

Theoretical Views :

Sharpe's Single Index Model :

The single index model assumes that co-movement between stocks is due to movement in the index. The basic equation underlying the single index model is: $Ri = \alpha i + \beta iRm + ei$ Where Riexpected return on security is i; αi is intercept of the straight line or alpha co-efficient (constant); β is slope of straight line or beta co-efficient ;Rmis the rate of return on ,market index and ei is error term. To analyze return characteristic of the stock, the monthly mean return is calculated the monthly return on each stock is calculate as follows: Rit = Pit –1 – 1 where Rit is the monthly return on stock i at time t ; Pit is the monthly closing price of stock i at time t; and Pit –1 is the monthly closing price of the stock i at time t – 1.

The Jensen Index :

It is an index that uses the capital asset pricing model (CAPM) to determine whether a money manager outperformed a market index. In finance, Jensen's index is used to determine the required (excess) return of a stock, security or portfolio by the capital asset pricing model. Jensen index utilizes the security market line as a benchmark. In 1970's, this measure was first used in the evaluation of mutual fund managers. This model is used to adjust the level of beta risk, so that riskier securities are expected to have higher returns. It allows the investor to statistically test whether portfolio produced an abnormal return relative to the overall capital market.

The Treynor Index :

In 1965, Treynor's was the first researcher who computed measure of the portfolio performance. A measure of a portfolio excess return per unit of risk is equal to the portfolio rate of return minus the risk free rate of return, dividing by the portfolio beta. This is useful for assessing the excess return, evaluating investors to evaluate how the structure of the portfolio to different levels of systematic risk will affect the return.

Statement of the Problem :

The investor ready to invest in securities market always faces the dilemma of choosing the suitable stocks from large number of securities available in the market and when securities is decided it is hard to decide how much an investor allocate funds over collection of different securities. Construction of optimal portfolio is a challenge that investors face and Sharpe's Single Index Model helps to arrive at a conclusion for creation of optimal portfolio.

Research Methodology :

Title of the study :

The present study is titled as 'OPTIMAL PORTFOLIO CONSTRUCTION - A CASE STUDY OF NSE'

Objectives of the study :

To Construct an Optimal Portfolio
Risk - return analysis of individual securities listed in NSE.
Allocate investment in different stocks considering risk-return criteria.
Construct optimal portfolio using Return , Standard Deviation, Excess return to beta ratio, cut-off point, Sharpe single index model.

Data and Methodology :

This study aims at constructing an optimal portfolio by using Sharpe's single -index model.
For this purpose monthly closing price of share and monthly closing index value of the benchmark market index (Nifty) have been used for the period from, January 2015 to December 2021.
They were collected from website of NSE. This study takes 25 companies listed in NATIONAL STOCK EXCHANGE (NSE) out of 50 companies because of unavailability of data. The study has used secondary data because it pertains to historical analysis of reported financial data. Auction of 91 days Treasury bill has been used as proxy for risk-free rate. The collected data were consolidated as per study requirement. Various statistical tools have been used to analyze data through Microsoft excel software.

Data Analysis and Interpretation :

Steps :

1 . Calculate the mean return, beta, variance and residual variance of each stock and Benchmark Index

$$\beta_p = \frac{\mathrm{Cov}(r_p, r_b)}{\mathrm{Var}(r_b)}$$

2. Calculate the excess return to beta ratio and cut-off point:
Excess return to beta ratio = (Ri-Rf)/ βi, Where Ri is the expected return on stock I (Collected by using Prowess). Rf = Risk free rate of return.

3. Calculate the cut off rate : Cut-off Rate $Ci = \dfrac{\sigma m^2 \sum_{t=1}^{J} \frac{(Ri - Rf)\beta i}{\sigma ci}}{1 + \sigma m^2 \sum_{t=1}^{J} \frac{\beta i^2}{\sigma ci^2}}$

Given Stock - Piramal,
Price as of 2015: 941-944
Price as of 2021: 2617-2668
Calculated Mean & Beta Values of Selected Stocks are Given below -

Calculated value of mean return and beta values of sample companies stocks :

Sr. No.	Company Name	Mean Return (Ri in %)	Beta
1.	Piramal	12.368	0.515
2.	Canara	17.07	1.2467
3.	BF Utili	13.31	1.195
4.	Shah alloys	12.21	1.0183
5.	Green	11.98	1.16
6.	Sms pharma	9.834	0.68
7.	BOI	12.466	1.425
8.	Sanofi	8.202	0.36
9.	SIB	10.806	1.1478
10.	Shahsun	11.696	1.425
11.	Oil Ind	8.05	0.4825
12.	Dena	10.54	1.4267
13.	UBI	9.694	1.206
14.	Andhra	9.386	1.3097
15.	ONGC	7.366	0.87
16.	JSW	7.496	1.6433
17.	Allahabad	7.292	1.228
18.	RPG	7.222	1.015
19.	Kalyani	6.904	1.6583
20.	BOB	6.782	1.1033

21.	Paneca	6.498	0.945
22.	Oriental	5.996	0.97
23.	Indo Wind	5.35	1.398
24.	JSW energy	4.402	1.8525
25.	SBI	4.642	1.2417

Ci of sample companies stocks :

Company Name	$\frac{(R_i - R_f)\beta_i}{\sigma_{ei}2}$	$\sum_{i=1}^{N}\frac{(R_i - R_f)\beta_i}{\sigma_{ei}2}$	$\sigma_m 2\times\sum_{i=1}^{N}\frac{(R_i - R_f)\beta_i}{\sigma_{ei}2}$	$\frac{\beta_i^2}{\sigma_{ei}^2}$	$\sum_{i=1}^{N}\frac{\beta_i^2}{\sigma_{ei}^2}$	$1 + \sigma l\ \pi$	C_i $\sum_{i=1}^{N}\frac{\beta_i^2}{\sigma_{ei}^2}$
Piramel	0.029	0.029	0.391	0.003	0.003	1.034	0.378
Canara	0.131	0.160	2.166	0.016	0.018	1.244	1.742
BF Utili	0.151	0.312	4.210	0.027	0.045	1.602	2.627
Shah	0.025	0.337	4.547	0.004	0.049	1.662	2.735
Green	0.023	0.360	4.860	0.005	0.054	1.729	2.811
Sms	0.014	0.374	5.044	0.003	0.057	1.766	2.856
BOI	0.049	0.423	5.705	0.012	0.068	1.924	2.965
Sanofi	0.022	0.444	5.999	0.005	0.073	1.986	3.020
SIB	0.128	0.573	7.728	0.034	0.107	2.447	3.158
Shasun	0.059	0.632	8.529	0.016	0.123	2.667	3.198=C*
OilInd	0.020	0.789	10.651	0.006	0.179	3.418	3.116
Dena	0.097	0.729	9.843	0.034	0.158	3.131	3.144
UBI	0.040	0.769	10.386	0.015	0.173	3.336	3.113
Andhra	0.050	0.839	11.322	0.023	0.202	3.723	3.041
ONGC	0.018	0.857	11.564	0.018	0.220	3.966	2.916
JSW	0.022	0.878	11.855	0.036	0.255	4.447	2.666
Allahabad	0.010	0.888	11.987	0.015	0.271	4.651	2.577
RPG	0.007	0.895	12.085	0.010	0.281	4.788	2.524
Kalyani	0.007	0.902	12.175	0.027	0.308	5.159	2.360
BOB	0.003	0.905	12.216	0.012	0.320	5.321	2.296
Paneca	0.000	0.905	12.216	0.006	0.326	5.402	2.262
Oriental	-0.003	0.902	12.171	0.006	0.332	5.488	2.218
Indo wind	-0.012	0.890	12.007	0.015	0.347	5.688	2.111

Findings :

The above table shows the Excess return to beta ratio and the cut-off values of all companies included in the optimal portfolio construction. Only those stocks with Excess return to beta ratio are to be selected in the optimal portfolio. It can be observed that only 11 stocks qualify to be included in the optimal portfolio on this

criterion. They are Piramel Enterprises ltd, Canara Bank ,BF Utilities limited, Shah Alloys limited, Green Earth Resources and projects limited, SMS Pharmaceuticals limited, Bank of India, Sanofi India Limited, South Indian Bank, Shasun Pharmaceuticals limited and Oil India limited.

Conclusion :

- Portfolio can be considered as basket of securities; it is generally accepted fact that investment in individual stock is considered as risky investment and portfolio allows diversification of securities also and with that risk is also diversified. Construction of portfolio is a massive procedure that is produced after various consideration from investors side that includes various factors like investing goals, risk tolerance, timeframe and many more. Investors from past to now strive to create an optimal portfolio, with goal of achieving maximum return will having minimum risk. For an investor construction of optimal portfolio is a difficult procedure, construction of optimal portfolio not only include individuals own factors but also many calculations of historical data and its understanding.
- Sharpe single Index Model is considered to effective method for creation of optimal portfolio as it is considered relatively simple to some other model like Markowitz Model which requires a lot of inputs. The goal of William Sharpe while creating Sharpe single Index Model was simplification of existing model for portfolio creation, it considered that securities not only have individual relationship but also is connected through something common that is benchmark index. Framework of this model is such that it is less time consuming and less complex compared to Markowitz Model.

Reference :

1. Dr. S Poornima, Aruna P. Remesh (2015). http://dx.doi.org/10.1016/0148-2963(85)90017-7.
2. Mahabub Basha S. & M.S.Ramaratnam(2017). http://dx.doi.org/10.3905/jpm.2020.1.155
3. Bruno, Salvatore, Ludwig B. Chincarini, and Frank Ohara. "Portfolio construction and crowding." Journal of Empirical Finance 47 (June 2018): 190-206. http://dx.doi.org/10.1016/j.jempfin.2018.02.003.
4. Kangari, R., and L. S. Riggs. "Portfolio management in construction." Construction Management and Economics 6, no. 2 (June 1988): 161-69. http://dx.doi.org/10.1080/01446198800000014.
5. Brunel, Jean L. P. "Tax-Aware Portfolio Construction." AIMR Conference Proceedings 1999, no. 2 (August 1999): 42-50. http://dx.doi.org/10.2469/cp.v1999.n2.7.
6. Sherwood, Matthew W. "Targeted Return Portfolio Construction." Journal of Investing 28, no. 5 (July 2019): 102-21. http://dx.doi.org/10.3905/joi.2019.28.5.102.
7. Elton, Edwin J., and Martin J. Gruber. "Optimum Centralized Portfolio Construction with Decentralized Portfolio Management." Journal of Financial and Quantitative Analysis 39, no. 3 (September 2004): 481-94. http://dx.doi.org/10.1017/s0022109000003999

Cite This Article:
Ms. Gaurav B. Sharma, (2022). *A study of optimal protfolio construction - A study of NSE. Educreator Research Journal IX Feb 2022. 34-40*