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A Study On Portfolio Construction Using Sharpe's Single Index Model With Selected Stocks From NSE

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Abstract: The research paper titled "A Study on Portfolio Construction Using Sharpe's Single Index Model with Selected Stocks from NSE" delves into the crucial aspects of portfolio management within the stock market. This endeavor facilitated the understanding of online trading, the dematerialization account market, and practical insights into market operations how the market works practically.

This study uncovers the challenges of selecting and forming the right investment portfolio from the vast array of equities, mutual funds, bonds, and derivatives present on major stock exchanges. Many investors rely on sources like equity brokers, friends, family, newspapers, magazines, and websites for investment guidance etc.

To address this challenge, the study employs the "Single Index Model of Sharpe's " as one of the techniques. The primary aim of the study was to create an optimal portfolio and assess returns under current market conditions.

The study's core focus lies in constructing portfolios from 20 distinct stocks on NSE, organized by sector, to meet investment objectives based on factors such as returns, standard deviation, beta, and risk. Consequently, the research offers valuable insights into evaluating securities and crafting portfolios that minimize risk while maximizing returns.

Key words

- Sharpe's single index model
- Beta, Risk and Return, Portfolio
- Nifty50, Stocks

I. Introduction

Allocating surplus money to assets to generate both short and long-term benefits is known as investing. Investing in stocks or other equity inside the capital market is one prominent strategy to maximize returns among many others. Equity investments are made by both portfolio managers and individual investors to reap the advantages of dividend income and capital growth. Two key elements are considered when making investments: return and risk.

Risk and return are closely linked, with higher-risk investments generally offering greater potential returns, while lower-risk options provide more modest gains. To construct a well-rounded investment portfolio, it's advisable to maintain a balanced mix of high, moderate, and low-risk assets. Risk-averse investors should consider low-risk options like debt funds, tax-saving funds, fixed deposits, bonds, and life insurance policies, avoiding stock market investments. Conversely, those seeking higher returns may explore the equity market, which offers greater potential gains but involves higher risk. Diversification is key to optimizing the risk-return relationship, as it reduces risk without significantly altering expected returns. Sharpe's Single Index Model is an effective tool for constructing an optimal portfolio, and this research aims to create such a portfolio using NSE NIFTY stocks with this methodology.

Need for the Study

In today's unpredictable market, Diversification of investments is crucial if you want to maximize earnings while reducing risk. When choosing assets to enhance their portfolios, many investors are confused and find it challenging to figure out the right allocation for every individual asset. As per empirical study, returns from the financial services sector, especially within the banking industry are sufficient and consistent. However, recent restructuring plans, especially among public sector banks have implemented a great deal of strain on India's banking system.

The objective of this research is to assist investors in creating the best portfolio from a list of twenty banking businesses using Sharpe's Single Index Model. By employing this strategy, investors can choose how best to distribute their capital among the selected group of enterprises, minimizing risk, and maximizing rewards.

Objective of the study

- Analyze the return & risk related to selected securities.
- Make a portfolio utilizing the Sharpe's single-index model.

II. Literature Review

1. **Kapil Sen and CA Disha Fattawat** (2021) investigated the sharpe's single index approach & its use in constructing portfolios. Their research suggests that employing sharpe's single index approach for creating an optimum A portfolio encompasses more straightforward and user-friendly than using Markowitz's Mean-Variance Model. The researchers chose 30 companies from the BSE (Bombay stock Exchange) as samples, and only 8 of these companies showed favourable returns, making them percent of the optimum portfolio.
2. **Dileep and Rao, Kesava** (2018) evaluated the success of a portfolio built using the Sharpes Single Index Model's rate of return and evaluated the model's applicability and efficacy in the Indian setting. For their investigation, the researchers selected a sample of thirty businesses from various industries.
3. **Desai and Surti** (2017) investigated the best portfolio using 50 companies traded on the NSE over a span of three years. They chose 10 companies from this group to form the optimal portfolio. Utilizing Sharpe's Single-Index Model, they determined the allocation of an investment for each security while also assessing the volatility of each security. The research provides valuable insights to investors regarding the implementation of these securities. Through performance analysis and process of creating an ideal portfolio, investors are equipped to make well-informed investment decisions.
4. **Andrade, Pratibha Jenifer** (2018) investigated the creation of an effecient portfolio with stocks from IT industry using the Sharpes single-index model. Six high-achieving IT firms that are listed on the BSE were selected by the researcher. Between 2014 and 2018, daily return information for the market index and these shares were granted from secondary sources. Five companies made up the ideal portfolio, according to the analysis.
5. **Tripathy, Sasikanta** (2021) investigated the Single Index Model to analyze specific stocks of Indian banks. The study presumed a direct correlation between the performance of the banking sector as a whole and individual bank stocks. It examined a selection of fifteen securities from banks traded in the BANKEX index, using secondary information spans from April 1, 2020, to March 31, 2021.

III. Research Design

Nature of study

The study chooses four companies from each sector entered on the NSE for examination. Its main aim is to offer investment recommendations focused on a particular sector. While diversifying investments across sectors can mitigate losses in one area with gains in another, this research concentrates on advising investments within a single sector. It adopts a descriptive research design, which suits the project's precise goals and aims to provide conclusive recommendations and insights based on available information.

Nature of data

This study is mainly based on secondary data. & the data have been collected from the various journals, articles & web sites and research papers.

Sources of data

This study includes data collected from international journals, articles, research paper and other various websites.

Sampling

The input was taken the period for 1 year from (01-04-2023 to 31-03- 2024). The samples are taken sector wise in NSE Nifty 50.

Research Tools

The study's research methodology is built on the collection of secondary data. Books, journals, and websites serve as supplementary sources for references. Data from April 2023 to March 2024 were utilized for these calculations. The study involved computing risk, average return, Sharpe's single index model, and the cutoff point. Excel was employed for these calculations. A graph was used to enhance the data.

Sharpe's Single Index Model

The following equation is used for the calculation.

$Ri = \alpha i + \beta i Rm + ei$

Where,

Ri = represent return on investment

αi = denotes the traditional approach interrupt.

βi = denotes the beta coefficient's slope.

Rm = Return on the market index.

ei = error word.

Sharpe's single index ideal portfolio

$$\frac{Ri - Rf}{Bi}$$

Where,

Ri= Ri is the stock's anticipated return.

Rf = Rf is Return on Risk-Free Assets

βi = βi represents the mean variation in the stock's rate of return.

Construction, of optimum portfolio

$$Xi = \frac{Zi}{\Sigma Zi}$$

$$Zi = Bi \{Ri - Rf - C^*\}$$

$$\frac{}{\sigma 2ei} \quad \frac{}{Bi}$$

Where,

Xi = The total amount to be invested in stocks

σ2ei = Unsystematic risk

Rf = Rf is the risk-free interest rate.

C* = Rate of cutoff

Limitation

- The research focusses on solely on assessing risk and return for predictive purposes, disregarding additional possible causes that could impact investment outcomes.
- Portfolio construction is limited to stocks within the NIFTY 50 index, it limits the findings generalizability to a wider range of market scenarios.
- Data utilized for analysis is sourced from secondary source, which may have limitations concerning accuracy, completeness, and reliability.

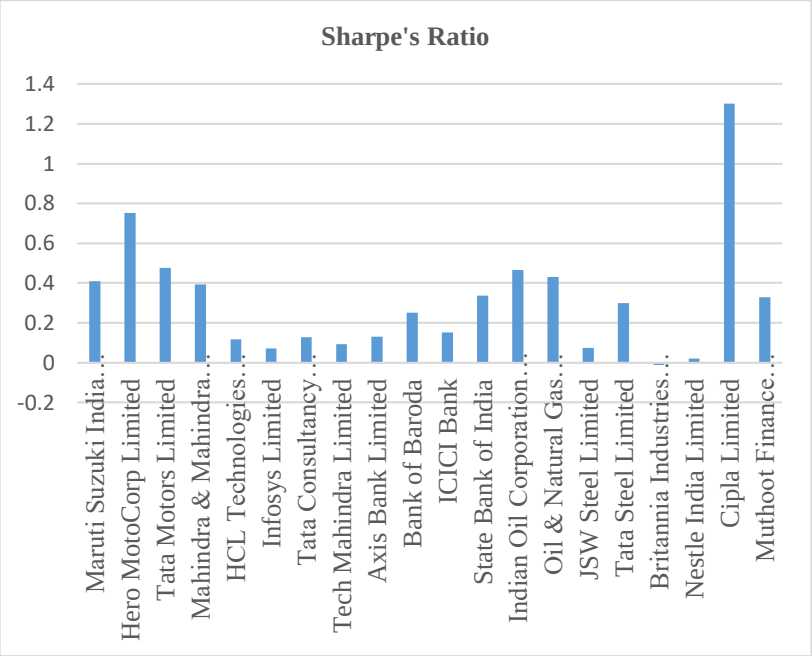
IV. Data Analysis' and Interpretation

Construction of Portfolio before Ranks.

The current risk-free rate is 7.365%.

Name of the company	Ri	Rf	β	Sharpe's Ratio (Ri-Rf)/β	Rank
Maruti Suzuki India Limited	0.3102	0.07635	0.57	0.41030	6
Hero Motocorp Limited	0.6920	0.07635	0.82	0.75087	2
Tata Motors Limited	0.5422	0.07635	0.98	0.47539	3
Mahindra & Mahindra Limited	0.5274	0.07635	1.15	0.39225	7
HCL Technologies Limited	0.1729	0.07635	0.82	0.11774	15
Infosys Limited	0.1512	0.07635	1.06	0.07061	18
Tata Consultancy Service Limited (TCS)	0.1771	0.07635	0.79	0.12760	14
Tech Mahindra Limited	0.1787	0.07635	1.09	0.09393	16
Axis Bank Limited	0.2146	0.07635	1.05	0.13170	13
Bank of Baroda	0.4018	0.07635	1.30	0.25037	11
ICICI Bank	0.2141	0.07635	0.91	0.15143	12
SBI (State Bank of India)	0.4470	0.07635	1.10	0.33698	8
IOC (Indian Oil Corporation Limited)	0.7194	0.07635	1.38	0.46601	4
ONGC (Oil and Natural Gas Corporation)	0.6286	0.07635	1.28	0.43151	5
JSW Steel Limited	0.1773	0.07635	1.34	0.07540	17
Tata Steel Limited	0.5140	0.07635	1.46	0.29981	10
Britannia Industries Limited	0.0692	0.07635	0.60	-0.01188	20
Nestle India Limited	0.0872	0.07635	0.56	0.01953	19
Cipla Limited	0.4408	0.07635	0.28	1.30173	1
Muthoot Finance Limited	0.4170	0.07635	1.04	0.32760	9

Analysis: The stocks are listed in descending order, with Britannia Industries Ltd. having the lowest ratio (-0.0118) and Cipla Ltd. having the highest ratio (1.3017). Given the level of risk involved, this implies that these assets may be able to produce returns higher than the risk-free rate.



Interpretation:

The Sharpe Ratio chart indicates that, Cipla Limited (1.3017) offers the highest return adjusted for risk among the listed companies, followed by Hero MotoCorp Limited, Tata Motors Limited, and IOC (Indian Oil Corporation Limited). Conversely, companies such as Britannia Industries ltd (-0.0118) and Nestle India ltd show some of the lowest risk-adjusted returns, indicating they may be less appealing to investors seeking greater rewards in proportion to the risk taken.

Table displaying rank wise calculation of cut-off value

Company Name	(Ri-Rf)* β / σ²ei	βi² / σ²ei	Σ(Ri-Rf)* β / σ²ei	Σ βi²/ σei²	CUTOFF
Cipla Limited	0.4494	0.3452	0.4494	0.3452	0.00542
Hero MotoCorp	1.5512	2.0659	2.0006	2.4111	0.02354
Tata Motors	1.9323	4.0646	3.9329	6.4757	0.04417
Indian Oil Corporation Limited	2.7850	5.9763	6.7179	12.4520	0.07070
Oil & Natural gas corporation ltd	2.7117	6.2843	9.4296	18.7364	0.09308
Maruti Suzuki India	0.7855	1.9146	10.2152	20.6509	0.09896
Mahindra & Mahindra Limited	2.0407	5.2025	12.2559	25.8535	0.11304
SBI (State Bank of India)	1.4636	4.3431	13.7194	30.1966	0.12166
Muthoot Finance ltd	1.1996	3.6619	14.9191	33.8585	0.12814
Tata steel ltd	3.2121	10.7137	18.1311	44.5721	0.14261
Bank of Baroda	1.4329	5.7229	19.5640	50.2950	0.14725
ICICI Bank	0.9266	6.1191	20.4906	56.4141	0.14743
Axis Bank	0.7732	5.8711	21.2638	62.2851	0.14679
TCS (Tata Consultancy Service ltd)	0.4976	3.9000	21.7615	66.1852	0.14629
HCL technologies	0.3363	2.8561	22.0977	69.0413	0.14575
Tech Mahindra	0.6609	7.0363	22.7587	76.0776	0.14345
JSW Steel	0.6758	8.9622	23.4344	85.0398	0.13982
Infosys	0.3871	5.4820	23.8215	90.5218	0.13762
Nestle India	0.0367	1.8809	23.8583	92.4027	0.13635
Britannia Industries	-0.0195	1.6442	23.8387	94.0469	0.13497

Analysis

In this portfolio, the critical point C* is 0.14743. According to Sharpe's optimal portfolio theory, securities will cease to be added to the portfolio when their inclusion begins to decrease overall income. The maximum return of stocks in the portfolio serves as the cutoff point for ascertaining which ones to include. In this case, 12 stocks are recognised as beneficial for maximizing portfolio returns.

Table displaying Value of Zi

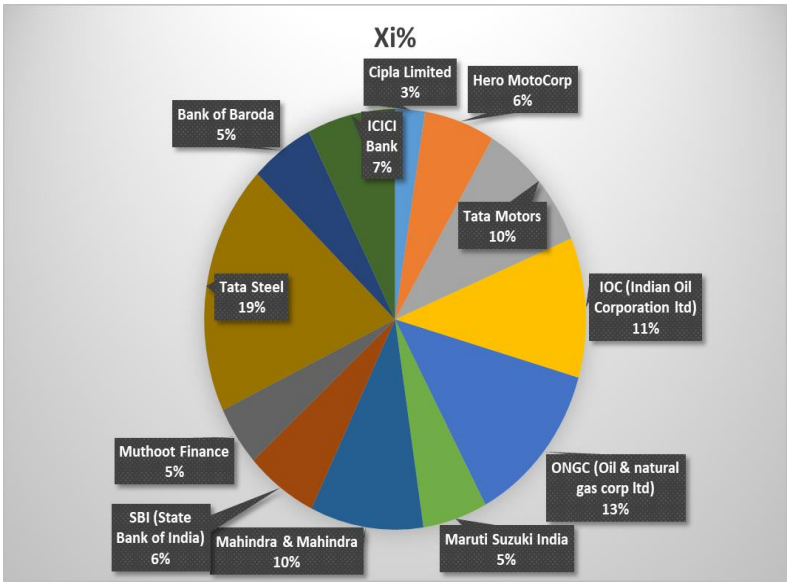
Sl No	Company Name	Zi
1.	Cipla Limited	1.9719
2.	Hero MotoCorp	4.7067
3.	Tata Motors ltd	7.9946
4.	IOC (Indian Oil Corporation ltd)	8.4337
5.	ONGC (Oil & natural gas corp ltd)	9.9443
6.	Maruti Suzuki India	4.2966
7.	Mahindra & Mahindra	7.5164
8.	SBI (State Bank of India)	4.7729
9.	Muthoot Finance	3.6103
10.	Tata Steel	15.0978
11.	Bank of Baroda	4.2039
12.	ICICI Bank	5.8556

Interpretation

According to this table, investing in up to 12 out of the 20 stocks can yield high returns for the investor. However, including more than 12 equity shares in the portfolio would decrease the overall portfolio return.

Table displaying Value of Xi

Sl. No	Company	Zi	Xi%
1.	Cipla Limited	1.9719	2.51%
2.	Hero MotoCorp	4.7067	6.00%
3.	Tata Motors	7.9946	10.20%
4.	IOC (Indian Oil Corporation ltd)	8.4337	10.76%
5.	ONGC (Oil & natural gas corp ltd)	9.9443	12.68%
6.	Maruti Suzuki India	4.2966	5.48%
7.	Mahindra & Mahindra	7.5164	9.59%
8.	SBI (State Bank of India)	4.7729	6.09%
9.	Muthoot Finance	3.6103	4.60%
10.	Tata Steel	15.0978	19.26%
11.	Bank of Baroda	4.2039	5.36%
12.	ICICI Bank	5.8556	7.47%
	Σzi	78.4046	100%



Interpretation:

The above pie chart shows the allocation of percentages for investments across various companies. Utilizing the sharpes single-index model for portfolio construction, Tata Steel and ONGC (Oil & natural gas corp ltd) are recommended for the largest allocations, while Cipla Limited receives the smallest allocation based on their corresponding weights.

In the Sharpe's Single Index Model, ICICI Bank holds the highest cutoff point at 0.14743, followed by Bank of Baroda, Tata Steel Limited, and Muthoot Finance Limited in that order. These 12 companies, denoted as Zi, are recognised as effective performers in the stock market, offering promising returns. The Zi values underscore that these primary companies are succeeding and providing substantial returns to shareholders.

V. Findings

The process of selecting the optimal combination of companies for investment involves calculating the cutoff rate, which is used to achieve the desired Xi. This helps in determining the most effective way to allocate funds across various securities, ensuring maximum profitability, as represented by Zi. The portfolio's absolute percentage is instrumental in calculating its relative proportion, which guides decisions on the appropriate weight and allocation for each security. From the NIFTY 50 index, 12 ideal stocks were selected for portfolio development using Criterion 12, with certain stocks excluded. The largest investment allocation, amounting to 19.26%, is directed towards Tata Steel Ltd. Additionally, Indian Oil Corporation Limited, JSW Steel Limited, and Tata Steel Limited exhibit high beta values, indicating greater volatility compared to other companies.

Suggestion

The study emphasizes the importance of using various metrics, such as the Treynor ratio, Jensen measure, and Sharpe ratio, when making informed decisions about constructing investment portfolios. It strongly recommends that investors design their portfolios using diverse techniques and performance evaluations to optimize outcomes. Before making any investments, potential investors should take necessary precautions and thoroughly review offering documents to mitigate both systematic and unsystematic risks. For those aiming to maximize returns while minimizing risks, a well-constructed portfolio is the optimal choice, offering opportunities in stocks that align with this approach. Risk-neutral investors may prefer equities that closely follow market trends, while risk-averse investors might include higher-risk stocks in their portfolios. On the other hand, traders often prioritize quick, high gains over the associated risks when engaging in stock trading.

Conclusion

In financial decision-making, the interplay of risk and returns is vital, necessitating that investors continuously monitor the market and adjust their portfolios accordingly. This analysis utilizes Sharpe's Single Index Model (SIM) to determine the relative weights of equities by calculating Ci/C, offering precise guidance on the optimal allocation of investment securities. The model identifies stocks that deliver the best returns with minimal risk, thereby optimizing investment allocation. Additionally, Sharpe's Index Model promotes diversification, enhancing portfolio returns while mitigating risks. By assessing the risk associated with each security, SIM facilitates the construction of an ideal investment portfolio.

This method was applied to a diverse sample of 20 organizations from various industries to ensure reliable outcomes. The study significantly contributes to investment finance by demonstrating the model's effectiveness in achieving balanced, low-risk portfolios. Moreover, it highlights the crucial role each industry plays in the growth of the Indian economy, emphasizing the positive impacts on profitability, asset quality, and overall economic expansion. Consequently, to maximize returns while minimizing risks, investors should carefully evaluate all investment options, considering the unique contributions of different industries.

References

1. Nisani, Doron. "Portfolio selection using the Riskiness Index." Studies in Economics and Finance 35, no. 2 (June 4, 2018)
2. Fiala, Petr. "New trends in project portfolio management." Trendy v podnikání 10, no. 3 (2021)
3. **https://www.moneycontrol.com/portfolio-management/portfolio-investmentsignup.php?classic=true**
4. **https://www.nseindia.com/**