CONSTRUCTION OF OPTIMAL PORTFOLIO USING SHARPE MODEL WITH SPECIAL REFRENCE TO AUTOMOBILE INDUSTRY

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ABSTRACT

The construction of an optimal portfolio using the Sharpe Single Index Model in the Automobile industry involves estimating the risk and return parameters of individual stocks in relation to a market index. Historical data on stock returns and the market index are collected, and excess returns over the risk-free rate are calculated. Regression analysis is then performed to estimate beta coefficients, representing the sensitivity of stock returns to market returns. Expected excess returns are computed using the market index's expected return and beta coefficients. The investor's risk aversion is considered, and optimal portfolio weights are determined, maximizing the investor's utility function. Portfolio performance is evaluated using risk and return metrics like the Sharpe ratio. By applying this model to the Automobile industry, investors can construct portfolios that balance risk and return within the specific industry. The resulting portfolio allocation can guide investment decisions and help optimize returns while considering the unique characteristics of the Automobile sector.

KEY WORDS: Sharpe's index model, Automobile industry

INTRODUCTION:

A portfolio is a group of investments that a person or company holds, such as stocks, bonds, mutual funds, and other types of financial assets. To fulfill a certain investment objective, such as maximizing returns, reducing risk, or producing income, is the main goal of portfolio construction. Several variables, such as the investor's risk tolerance, investment horizon, financial objectives, and market conditions, affect how a portfolio is put together. A highly diversified portfolio often consists of a variety of industries and geographical locations, also a combination of asset types like stocks, bonds, and cash. Investments are chosen, monitored, and rebalanced as ensuring that they correspond with the investor's goals and risk tolerance is a component of managing the portfolio. A disciplined approach to risk management and constant monitoring and evaluation of investment performance are necessary for effective portfolio management.

According to Sharpe's theory, investors should combine a variety of various derivatives with low correlations to when creating a diversified derivative portfolio, consider one another. Options, futures, and swaps on a range of underlying assets, such as stocks, bonds, and commodities, are a few an example of how an investor may employ these instruments. Because of spreading their risk over numerous contracts and underlying assets, investors can reduce the total risk of their portfolio while still obtaining favorable returns.

REVIEW OF LITERATURE

Akther & Pravin (2020) The purpose of this study was every sensible investor needs to be knowledgeable about portfolio management to make wise investing decisions. Every sane investor wants to increase his returns while lowering his risk. The ultimate goal of portfolio creation would be to create a portfolio that offers the highest returns with the lowest risk. An investor must build a portfolio utilizing the fundamental method or the Sharpe's Single Index Model techniques in order to benefit from diversification.

Ayre & Yogesh (2022) The purpose of this study was to develop an effective, ideal stock portfolio. In the current study, an ideal portfolio was built for the Indian Capital Market listed on the NSE using the Sharpe Single Index methodology. 14 stocks were chosen for the study, and data on daily closing prices from January 2020 to January 2022 were gathered. Cut-off rate assisted in identifying the securities and the amount of investment to be made in certain assets.

Bhsleroa & Chavare (2022) Therefore, investing in financial securities is recognized as one of the most risky sectors for investment while simultaneously being one of the appealing areas for saving and investing. Making the best possible portfolio can help to lower risk without lowering returns.

The study of individual securities as well as the theory and application of effectively integrating securities into strong portfolios are all topics covered by portfolio management.

Kan (2022) The assessment is based on the hypothesis of the current portfolio and the impact of the risk on the overall portfolio. It suggests that the main focus should be on reducing risk for the financial experts rather than increasing advantages or returns. The study or paper manages Sharpe's model of capital resource estimation, guiding the financial expert to make investments after identifying them and selecting the best securities with the least amount of risk.

Korn (2022) The purpose of this study systems previously employed to address the problem of determining the perfect portfolio have drawbacks, but together with their peers, they have tentatively and potentially suggested an improved method. A large example distribution on how the portfolio can be ideal is used to calculate the risk and profit disinclined using Sharpe's ratio.

HYPOTHESIS

H0 A: There is no relationship between selected Automobile stocks and Nifty 50.

H1 A: There is a relationship between selected Automobile stocks and Nifty 50.

H0 B: There is no significant impact of Nifty50 on selected Automobile stocks.

H1 B: There is a significant impact of Nifty50 on selected Automobile stocks.

STATEMENT OF PROBLEM

An investor investing in securities has the challenge of selecting from among many securities and allocating funds across a group of assets. The obstacle is that the investor must decide which securities to hold and how much to invest in each of them. They may not have sufficient knowledge and they make not able to find out the risk which can make it difficult for them to make informed investment decisions.

OBJECTIVE OF THE STUDY

• To examine the Reward-to-Volatility and Reward-to-Variability ratios of the selected automobile industry
• To construct of optimum portfolio using the Sharpe Index Model of selected Automobile Stocks

Proposed methodology:

STEP 1: Selection of Industries

The automobile industry comprises many companies and organizations involved in the design, development, manufacturing, marketing, selling, repairing, and modifying motor vehicles. The automobile industry in India is the fourth largest by production in the world.

STEP 2: Selection of Companies

(The automobile sector can provide opportunities for investors to invest in companies with a strong brand, innovative products, and a competitive advantage. Some investors may be attracted to the sector because of its potential for growth, particularly in areas such as electric and autonomous vehicles.) This company are selected based on their market capital growth Maruti Suzuki, Bajaj Motor ,Mahindra & Mahindra Motor, Tata Motors Ltd, Tvs Motor, Ashok Leyland, Hero Motocorp, Eicher Motor, Mrf, Escorts motor.

STEP 3: Analysis of Risk to Return

$$RI = \frac{P1 - P0}{P0}$$

where,

$P1$ = current day price

$P0$ = previous day price

STEP 4: Analysis Causality

Causality analysis is a process for identifying and addressing the causes and effects of a challenge or problem.

STEP 5: Analysis Sharpe's Ratio

4.1.2:

$$S_e = \frac{R_i - R_f}{\sigma i}$$

where,

Ri=The expected return of   stock

Rf = Risk free rate of return

σi=Standard deviation

STEP 6: Analysis of Performance index rating

4.1.3:

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

This analysis would perform the index ranking of selected automobile companies

STEP 7: Determine Cut off

4.1.4:

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^{N} \frac{(R_i - R_f)}{\sigma_{ei}^2} \times \beta_i}{1 + \sigma_m^2 \sum_{i=1}^{N} \frac{\beta_i^2}{\sigma_{ei}^2}}$$

Where,

σ 2 m = Variance of market index

σ 2ei = Variance of stock movement that is unrelated to the movement of the market index, or the unsystematic risk of equities

The cutoff point, after which the cumulative value of Ci starts to decline, will be chosen. The securities in the optimal portfolio will be those with a value of Ci greater than or equal to the cutoff point.

STEP 8: Determine proportion

For each of the selected securities, this algorithm will be utilized to calculate the percentage

4.1.5:

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} \left[\left(\frac{R_i - R_f}{\beta_i} \right) - C^* \right]$$

where,

Ri=The expected rate of return

Rf = Risk free rate of return

β=beta

c= cut off

4.1.6:

$$X_i = \frac{Z_i}{\sum_{i=1}^{N} Z_i}$$

(X) indicates the weights of securities

STEP 9: Validation of Optimal Portfolio

Investors can analyze the performance of their portfolio by calculating its returns, risk, and other metrics such as the Sharpe ratio.

Comparing the portfolio's performance with a relevant benchmark can help to evaluate its relative performance.

DATA ANALYSIS AND INTERPRETATION

Table Showing the Result of the Regression Analysis

Company Name	R square	F	Significance F	Coefficients	Decision
Tata Motor	0.003	4.8	0.0286**	0.024	Reject H0
Maruti motor	0.005	6.96	0.008***	0.045	Reject H0
Mahindra & Mahindra	0.008	1.02	0.310*	-0.016	Accept H0
Bajaj motor	0.007	0.92	0.324*	-0.02	Accept H0
Ashok leyland	0.023	9.04	0.094**	0.065	Accept H0
Hero motocorp	0.068	0	0.092**	0.016	Accept H0
Eicher motor	0.063	4.95	0.0286**	0.092	Reject H0
Tvs motor	0.004	5.43	0.0198**	0.036	Reject H0
Mrf	0.005	6.64	0.010**	0.03	Reject H0
Escorts motor	0.269	5.8	0.0185**	0.245	Reject H0

Source; Authors own calculation at ***0.001,**0.05, *0.1 level of significance

Interpretation;

The above table indicates that the like Tata motors, Maruti, Eicher motors, Tvs, Mrf, Escorts would accept the Alternative hypothesis i.e., there is no significant impact of nifty 50 on Automobile companies stock and Mahindra & Mahindra, Bajaj motors, Hero Moto Corp, Ashok Leyland would accept the null hypothesis i.e., there is significant impact of nifty 50 on Automobile companies stocks

Table showing the result of the Sharpe's Ratio which are selected automobile companies

Company Name	Ri	Rf	(Ri-Rf)	σ	(Ri-Rf)/ σ
Bajaj	0.065	0.049	0.0153	1.728	0.008
Tvs motor	0.014	0.049	-0.0357	2.218	-0.016
Tata	0.058	0.049	0.0083	3.109	0.002
Escorts	0.041	0.049	-0.0087	2.598	-0.003
Ashok leylend	0.036	0.049	-0.0137	2.885	-0.004
Mrf	-0.015	0.049	-0.0647	3.00	-0.021
Eicher Motor	-0.048	0.049	-0.0977	3.368	-0.029
Mahindra and Mahindra	0.064	0.049	0.0143	2.168	0.006
Maruti	0.04	0.049	-0.0097	2.044	-0.004
Hero Motocorp	0.095	0.049	0.0453	2.002	0.022

Source; Authors own calculation

Analysis:

The above table shows that based on calculation of Sharpe's ratio which give accurate result of investing way where positive resulted value would be profitable to the investor same as negative value would give negative result to investor

Table showing Sharpe's performance index rating of the chosen firms is displayed, along with a stock ranking

SL.NO	COMPANY NAME	Ri	Rf	β	(Ri-Rf)/β	Rank
1	Tata Motor	0.065	0.0497	0.158	0.0968	3
2	Maruti motor	0.014	0.0497	0.125	-0.2856	9
3	Mahindra & Mahindra	0.058	0.0497	-0.051	-0.1627	8
4	Bajaj motor	0.041	0.0497	-0.039	0.223	1
5	Ashok leyland	0.036	0.0497	0.359	-0.0381	5
6	Hero motocorp	0.015	0.0497	0.004	-16.175	10
7	Eicher motor	0.048	0.0497	0.697	-0.1401	7
8	Tvs motor	0.064	0.0497	0.119	0.1201	2
9	Mrf	0.04	0.0497	0.179	-0.0541	6
10	Escorts motor	0.095	0.0497	1.098	0.0412	4

Source; Authors own calculation

Analysis:

The above table shows that the stocks of Tata motor, Maruti Suzuki, Mahindra and Mahindra, Bajaj motor, Ashok Leyland, Hero motocorp, Eicher motor, Tvs motor , Mrf , Escorts motor are sorted from highest to lowest according to the excess returns to beta. Bajaj motor ranked first and Hero MotoCorp ranked last. Here, we will find cut off rate which helps us to find securities for the portfolio

Table showing the percentage of investment in optimal portfolio.

Company Name	$\dfrac{\beta_i}{\sigma_{ei}^2}$	$\dfrac{(R_i - R_f)}{\beta}$	C^*	$\dfrac{(R_i - R_f)}{\beta} - C^*$	$X = \dfrac{Z_i}{\Sigma Z_i}$
Bajaj motor	0.05	0.0968	0.05	0.038	-0.039
Tvs motor	0.02	-0.2856	0.05	-0.343	0.729
Escorts	-0.05	0.2230	0.05	-0.220	-0.226
Tata motor	-0.05	-0.1627	0.05	0.165	0.154
Ashok Leyland	0.04	-0.081	0.05	-0.096	0.118
Mrf	0.04	-0.1755	0.05	-0.233	0.263

Source; Authors own calculation

Analysis:

The above computation implies that investing in every stock is not practical for investors, hence Sharpe's single index model produces the best portfolio. This allows the investor to build the best portfolio possible. we have created an optimum portfolio with top four yielding stocks. i.e.,Tvs motor, Tata motor, , Ashok Leyland, MRF

FINDINGS

➢ Company like Tata motors, Maruti, Eicher motors, TVS, MRF, Escorts motors, would accept the alternative hypothesis i.e., there is no significant impact of nifty 50 on Automobile companies' stock
➢ Mahindra & Mahindra, Bajaj motors, Hero Moto Corp, Ashok Leyland would accept the null hypothesis i.e., there is significant impact of nifty 50 on Automobile companies' stocks
➢ According to Sharpe's Single Index Model, we have created an optimum portfolio with top six yielding stocks. i.e., Bajaj motor, Tvs motor, Tata motor, Escorts motor, Ashok Leyland, MRF. The calculations indicate that this stock is ideal for investing in this vehicle company.

CONCLUSION

The Sharpe index model would provide a suitable company to investors in which would determine the value of company based on their performance in the market. It would suggest company stocks which are positively profitable in the market. The Sharpe single index approach is a methodical, data-driven way to construct an ideal portfolio with the aim of maximizing risk-adjusted returns. Investors can create a portfolio by following a series of steps that aim to achieve the perfect balance between risk and profit. The Sharpe single index model provides investors with a structured framework for choosing investments based on risk-adjusted returns. This approach can assist investors in creating an investment portfolio that is well-balanced, in line with their investing objectives, and suitable for their level of risk tolerance., however it does require extensive study and ongoing maintenance.

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