

Detailed Report for Portfolio Analysis of Indian Stocks

This report provides a detailed analysis of a portfolio consisting of 10 Indian stocks.

The analysis includes calculating stock returns, correlations, descriptive statistics, and the creation of a combined index. Additionally, the report discusses the Markowitz Efficient Frontier, Capital Market Line (CML), and Security Market Line (SML) for optimizing portfolio returns and risk. The combined index return and risk are also calculated.

1. Importing Libraries

The following libraries are imported to perform data analysis and visualization:

- yfinance: To download financial data for the selected assets.
- pandas: To handle and manipulate the data.
- numpy: To perform numerical calculations.
- matplotlib and seaborn: For creating visualizations.
- scipy: Used for optimization tasks (although not explicitly used in this report).

2. Defining the Assets and Downloading Data

We have selected 10 Indian stocks to analyze. Their adjusted closing price data for the past three years (from January 1, 2021, to January 1, 2024) is downloaded using the yfinance library.

3. Calculating Daily Returns

Daily returns are calculated using the percentage change in the adjusted closing price

using the pandas function `pct_change()`. The first row is dropped using `dropna()` to handle missing values.

4. Plotting Asset Data (Time Series and Histogram)

We define a function that plots the time series of asset prices and the histogram of daily returns for each asset. The time series shows how the price evolves over time, while the histogram helps visualize the distribution of daily returns.

5. Calculating Descriptive Statistics

Descriptive statistics are calculated for each asset using pandas `describe()`.

The statistics include mean, standard deviation, skewness, and kurtosis, which give insights into the distribution of returns.

6. Correlation Analysis

The correlation matrix of asset returns is calculated to understand how assets move relative to each other.

A heatmap is generated to visualize the correlations between the assets.

7. Creating a Combined Index

A combined index is created by calculating the weighted average of the daily returns of all selected assets.

The cumulative returns of this weighted index are calculated, which represents the performance of the combined portfolio.

8. Markowitz Efficient Frontier, CML, and SML

The Markowitz Efficient Frontier is calculated by generating random portfolios and plotting their return and risk.

The portfolio with the maximum Sharpe ratio is identified as the Market Portfolio.

The Capital Market Line (CML) is plotted to show the optimal risk-return trade-off, and the Security Market Line (SML) is plotted for a selected asset (RELIANCE.NS).

9. Combined Index Return and Risk

The return and risk (volatility) of the combined index are calculated and annualized.

These values provide an overview of the overall performance of the portfolio.

Conclusion

This report successfully analyzes the portfolio consisting of 10 Indian stocks.

It includes the calculation of returns, risks, correlations, and descriptive statistics.

By using the Markowitz Efficient Frontier, Capital Market Line, and Security Market Line, we can determine the optimal portfolio and expected return for a selected asset.