Project Report on

EFFICIENT PORTFOLIO AND HEDGE RATIO

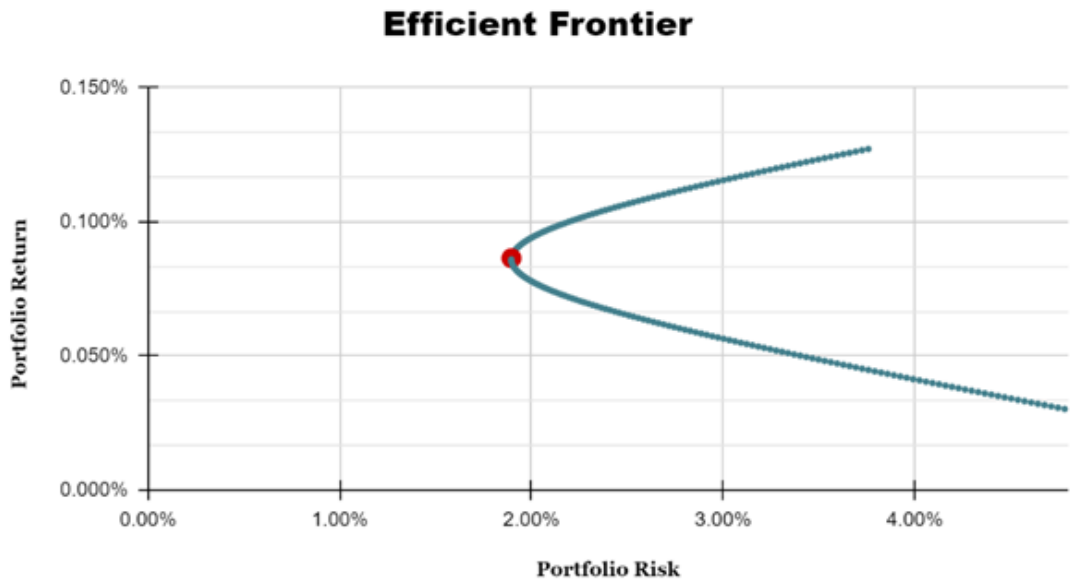
Submitted under the guidance of Mr. Vaibhav Puri

Sri Guru Gobind Singh College of Commerce, University of Delhi

Project - 1

Efficient Portfolio

For creating an efficient portfolio, the stocks of two companies, **Fortis** and **Jindal Steel** are analyzed. The information on the closing prices of these two stocks is collected from the NSE website for 3 complete financial years **(April 2018 - March 2021)**. The percentage change in these closing prices from the previous trading day is measured. Then the mean return(average) and standard deviation of these Daily Return percentages for the three years are calculated for both stocks. The **mean return** and **standard deviation** for *Fortis* come out to be 0.079% and 1.98% whereas the values *for Jindal Steel* are 0.127% and 3.758% respectively. The *correlation* between these two Daily Returns comes out to be 0.23309. For creating an efficient portfolio, weights for the first stock are taken as 0, 0.01, 0.02….2, and simultaneously weights for the second stock are taken by deducting the first from 1. The **portfolio risk** (portfolio standard deviation) is calculated for all sets of weights by taking into account the mean return, standard deviation, correlation, and weights of the two stocks. Similarly, the **mean return on the portfolio** is calculated by taking into account the set of weights and mean returns on the two stocks. For plotting the efficient frontier, the portfolio return and risk are taken on the y-axis and x-axis respectively. The **minimum variance point** (highlighted with red color) i.e., where the portfolio risk is minimum comes out to be 1.90% and the portfolio return here is 0.086%. The upper portion of the minimum variance set is the **efficient frontier**. The portfolio return and weights for the second stock are plotted on another graph to depict the expected portfolio return at different points. Two Buttons are created to change the correlation value by 0.1(green for addition and red for subtraction) between the mean returns of the two stocks, this change is depicted in the diagrams in terms of the created portfolio. The following diagram shows the minimum variance set of the portfolio and the efficient frontier.



Project - 2

Hedging

For the second project, to compute the hedge ratio and verify using regression, our team decided to cross-hedge two assets namely Silver and Crude Oil.

The reason for choosing the aforementioned commodities is that silver has been used for thousands of years for ornaments and utensils, trade, and as the basis for many monetary systems. Risk management through hedging enables the hedger to mitigate the risks arising from uncertainty and volatility in Silver prices and focus on their core business activity thus, Hedging is critical for stabilizing the incomes of corporations and individuals. Similarly, Crude oil is one of the world's most economically mature commodity markets. Since oil and coal are global commodities that are shipped all over the world, global supply and demand determine prices for these energy sources. And like silver, risk management through hedging enables the hedger to mitigate the risks arising from uncertainty and volatility in crude oil prices and focus on their core business activity.

For our project, the time period taken for the analysis is from January 2018 to December 2021. The historical data on Spot Prices of Silver and Futures of Crude Oil has been taken from the *MCX website*. The data has been averaged for simpler calculations and better understanding. After obtaining the data, change in S and change in F were computed which play a crucial role in our analysis. After this, further calculations have been made for (S'), (S-S'), [(S-S')^2], (F'), (F-F'), [(F-F')^2], and [(S-S')*(F-F')]. Through the obtained calculations, we obtain the hedge ratio using the formula: **Hedge Ratio = (Correlation between Change in S and Change in F) * [(Standard Deviation of Change in S) / (Standard Deviation of Change in F)].** The hedge ratio comes out to be **0.1362495209**.

Now, to verify our hedging, we conduct a linear regression analysis. In the Google Sheets, using the *Add-On "XLMiner Analysis ToolPack"*, linear regression is easy to compute. For the regression analysis, our X variable becomes the Change in F and the Y variable becomes the Change in S.

After obtaining the results of the regression equation, we notice the beta coefficient of Change in F to be **0.1362495209** which is the same as the hedge ratio. (For further analysis, a *line fit plot* has been constructed to get the results clearer diagrammatically.) *Now, since the beta coefficient is equal to the hedge ratio, we can confirm the success of the hedging procedure.*

Here is the link for the excel sheet:
https://docs.google.com/spreadsheets/d/1bJPhYGim0LZ2CEW-hmyz4Xn2eDA7iqn8GE_6MwO-gNc/edit?usp=sharing

Group Details: Idhika Minocha (203041); Gautam Arora (203001)