Project 1: Technical Analysis

(Submission Deadline – 24 Jan, Evaluation – 25 Jan)

1. Choose any one asset from the market. This could be stock, bond, ETF, or any other investable asset with readily available price data.
2. Gather the closing prices for your chosen assets over the last 3 years
3. Pick at least 4 technical indicators of your choice out of various popular indicators like (Moving Average(MA), Relative Strength Index (RSI), Bollinger Bands, MACD (Moving Average Convergence Divergence etc.) and calculate them for the given data.
4. Perform Correlation analysis of the indicators which you pick.
5. Come up with a combined indicator which is the weighted average of all the picked indicators (Weights should be in accordance with the correlations which you get)
6. Finally, using the combined indicator come up with a methodology to predict bullish and bearish positions on each time-stamp.
7. Report the accuracy of prediction.

Submission Guidelines

You can complete the task using Excel, Python or R. Anyone of the group members can submit the deliverables on behalf of the group.

The report should include:

1. Submit a csv with data and an additional column for prediction with value ‘L’ for long and ’S’ for short.
2. Submit your code files with proper README and comments
3. ppt

Project 2: Markowitz portfolio optimization

(Submission Deadline – 05 Feb, Evaluation – 06 Feb)

1. Choose any 10 risky assets from the market. These could be stocks, bonds, ETFs, or any other investable assets with readily available price data.

2. Gather the closing prices for your chosen assets over the past 3 months.

3. Calculate the simple/log returns for each asset over the chosen period.

4. Apply Markowitz's mean-variance optimization to construct the efficient frontier.

5. Choose two points on the efficient frontier representing two different risk tolerance levels. For each point, calculate the corresponding weights for each asset to construct a portfolio that maximizes expected return for that given level of risk.

Submission guidelines:

You can complete the task using Excel, Python or R. Anyone of the group members can submit the deliverables on behalf of the group.

The report should include:

1. A brief description of your chosen assets

2. The calculated returns and risk measures for each asset.

3. A graph showing the Markowitz efficient frontier and the two chosen points.

4. The optimal portfolio weights for each chosen point on the efficient frontier.

5. A brief discussion of the trade-off between risk and return in your portfolio choices.

6. Discussion of the limitations of Markowitz optimization and its real-world applications.

The submission should include:

1. ppt

2. Data Used by your group

3. The .Py or .R file if you have done the analysis using python or R respectively. If you have done the analysis using excel then share the excel sheet.

Project 3: Capital Asset Pricing Model

(Submission Deadline – 20 Feb, Evaluation – 22 Feb)

1. Choose a risk-free asset, such as a government bond, and note its current yield.

2. Choose any 10 risky assets from the market (stocks, bonds, etc). You can keep the same assets you used for the previous project or choose new assets.

3. Use the CAPM formula to calculate the expected return for each of your 10 risky assets.

4.Calculate the Capital market line (CML) equation using CAPM model. Plot the efficient frontier and CML.

5. Identify the tangency point on efficient frontier where CML touches it. Discuss what this point represents and its significance.

6. Choose 3 of your risky assets and calculate individual security market lines.

7. Calculate relevant performance measures (e.g., Sharpe Ratio, Treynor Ratio) for each of your optimized portfolios and compare them to individual assets. Discuss the implications of these measures in evaluating portfolio performance.

BONUS: Compare and contrast the portfolios constructed using Markowitz and CAPM approaches. What are the key insights gained from each method?

Submission guidelines:

You can complete the task using Excel, Python or R. Anyone of the group members can submit the deliverables on behalf of the group.

The submission should include:

1. ppt

2. Data Used by your group

3. The .py or .R file if you have done the analysis using python or R respectively. If you have done the analysis using excel then share the excel sheet.

Project 4: Multi factor model (Fama and French)

(TBD)

Comparison of CAPM, 3-factor model and 5-factor model

Project 5: Option Pricing

(TBD)

1. Pick a stock of your choice which is being traded in the derivative market.

2. Look at the stock's and option's history on YAHOO Finance.

3. Use past one-year data to estimate the annual volatility.

4. Use 10 years' US treasury rate as the rate of interest.

5. Now fix the strike price and time of maturity to evaluate the call/ put option price by using one step Binomial model

6. Evaluate the option price by using Black Scholes Formula

7. Increase the number of steps in Binomial model to verify that the price converges to 6.

8. Draw the graph to show 7.

9. How do you create a delta neutral portfolio?

10. Use numerical methods to get implied volatility? You can use Excel, Python and R for coding.

Project 6: Option Greeks

(TBD)

1. Utilize any 10 companies historical stock data.

2. Implement the Black-Scholes model for European and American options.

3. Calculate and interpret Option Greeks for a given option contract.

4. Visualize the impact of changes in underlying price, volatility, and time to expiration on Option Greeks.

5. Present the findings and analysis in a concise report, emphasizing the practical implications for options traders.