**QF603 (Quantitative Analysis in Finance) - Group 15**

**Project Title: Constructing an Employee Satisfaction-Based Index for Stock Return Prediction and Portfolio Optimization**

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**1. Project Background**

Employee satisfaction significantly impacts company performance, influencing long-term profitability. However, traditional financial models overlook this key factor. This project aims to create a stock index based on employee satisfaction, hypothesizing that companies with higher satisfaction scores will yield superior risk-adjusted returns. We will integrate satisfaction data into a portfolio optimization framework to construct a unique index.

**2. Project Objective**

**a. Improved Risk-Adjusted Returns:**

Many existing models overlook the impact of intangible corporate factors, such as employee satisfaction, on financial performance. This project seeks to develop a new index and ETF strategy that incorporates employee satisfaction to achieve more stable and higher risk-adjusted returns than traditional benchmarks like the Nifty 50 or S&P 500.

**b. Real-World Applicability:**

This model could offer significant benefits to asset managers, hedge funds, and institutional investors by providing a novel index that taps into the growing importance of social governance metrics in financial decision-making. It aims to appeal to both performance-driven and socially conscious investors.

**3. Data Collection**

Data for the project will be drawn from various sources that provide both financial and employee satisfaction metrics, ensuring comprehensive coverage across companies. Key data sources include:

* **Glassdoor, Indeed** : Employee satisfaction scores for publicly traded companies.
* **Wharton Research Data Services (WRDS)**, **Yahoo! Finance**, and **Bloomberg**: Historical stock prices (open, high, low, close), volumes, and financial ratios.

This diverse dataset ensures a robust and scalable approach to incorporating employee satisfaction into stock return predictions.

**4. Methodology**

This project will focus on building an employee satisfaction-based index, using modern portfolio optimization techniques and time series forecasting models for performance evaluation.

**a. Stock Selection and Index Construction**

1. **Employee Satisfaction Screening**: Stocks will be selected from companies with readily available employee satisfaction scores (e.g., through platforms like Glassdoor or Indeed). Companies with higher employee satisfaction will be assigned greater weighting.
2. **Index Formation**: We will construct an index using a weighted approach, where the weight of each stock is determined by both historical performance and employee satisfaction. Companies with higher satisfaction scores will have higher expected returns, and this will be factored into the portfolio weight.

**b. Portfolio Optimization**

1. **Mean-Variance Optimization (Markowitz Model)**:  
   The portfolio will be optimized using a mean-variance framework, with employee satisfaction incorporated as a factor that influences expected returns. By balancing expected return and risk (variance), the model will aim to construct a portfolio that maximizes return for a given level of risk.
2. **Constraints and Adjustments**:  
   Portfolio constraints, such as maximum or minimum weights for individual stocks, will be introduced to ensure diversification while favoring companies with higher employee satisfaction scores.

**c. Time Series Models for Performance Forecasting**

1. **ARIMA (AutoRegressive Integrated Moving Average)**:  
   ARIMA models will be used to forecast the performance of the employee satisfaction-based index. Historical returns of the index, alongside external factors like macroeconomic variables and employee satisfaction trends, will be included as inputs to predict future index performance.
2. **LSTM (Long Short-Term Memory)**:  
   Deep learning models like LSTM will be applied to capture complex relationships and dependencies between stock returns and employee satisfaction over time. LSTM is particularly suited for time-series data and will help in forecasting future returns with greater accuracy.

**d. Portfolio Construction**

The final portfolio will be constructed using the **TopK** selection strategy, where stocks with the highest expected returns (influenced by employee satisfaction) are chosen. Unequal weighting will be applied to reflect the optimization process, rather than simple equal weighting.

**5. Benchmark**

The primary benchmark for evaluating the performance of the employee satisfaction-based index will be the **Nifty 50.** This project aims to either replicate or outperform these traditional indices by incorporating employee satisfaction as a key stock selection criterion. Comparisons will be made based on risk-adjusted returns, using factors such as the **Sharpe Ratio** and **Alpha**.

**6. Performance Evaluation**

The performance of the employee satisfaction-based index will be evaluated using several key financial metrics:

1. **Sharpe Ratio (SR)**:  
   Measures the portfolio’s risk-adjusted return relative to the benchmark (Nifty 50). A higher Sharpe Ratio indicates better risk-adjusted performance.
2. **Alpha**:  
   A measure of excess return over the benchmark index. This will help determine whether the employee satisfaction-based index is outperforming the market.