**Analysis of Profitability and Dynamic Sorting Strategy**

**1. Introduction**

This report presents an analysis of a profitability strategy using dynamic sorting based on financial data and regression result of effect of tone of FOMC meetings. The objective of the analysis is to evaluate the effectiveness of the strategy in generating consistent returns by examining quarter profitability and relevant risk metrics. The data analyzed spans multiple years, providing a consistent view of the strategy’s performance across different market conditions.

**Strategy Overview:**  
Our strategy is based on a quantitative approach that incorporates two key metrics: profitability and tone. The profitability metric is defined as:

This formula measures a company’s ability to generate profits relative to its revenue, serving as a key indicator of financial health.

The tone\_q is derived from a sentiment analysis of company’s reaction to the tone of FOMC meetings. It is quantified as:

This formula captures the overall sentiment or tone of a company’s communications, reflecting market perceptions and potential future performance.

By combining these metrics, we generate a panel dataset where each company is assigned a feature value on each meeting date. The companies are then sorted based on the tone\_q metric.

**Investment Strategy**:  
We construct our portfolio by investing in the top 40% of companies with the highest tone\_q​ scores and shorting the bottom 40% with the lowest tone\_q​ scores. The portfolio is rebalanced on each meeting date and is evenly weighted, ensuring that the investments are proportionally distributed across the selected companies.

The strategy aims to capitalize on the predictive power of sentiment and profitability metrics, leveraging positive market sentiment to drive gains and using short positions to hedge against underperforming assets.

**2. Code Overview**

The code in the notebook processes financial data to calculate annual returns, standard deviation, risk-free rate, and the Sharpe ratio. The strategy dynamically sorts assets based on specific profitability criteria, such as return rates and position sizes. Key steps in the code include:

* **Data Loading and Preprocessing**: The dataset is loaded into a DataFrame and cleaned to ensure accurate calculations. This step includes filtering the relevant columns, handling missing values, and converting dates into a standardized format.
* **Generate key variable and conduct double sorting:** We calculated the ton\_q with the formula listed before and created a loop to build the portfolio at every meeting date.
* **Performance Summary**: We summarized the return and the Sharpe ratio to assess the risk-adjusted return of the strategy, factoring in the standard deviation of returns and the risk-free rate of specific years.

**3. Results**

The results of the analysis are summarized in the table below:

| **Year** | **Annual Return (%)** | **StdDev (%)** | **Risk-Free Rate (%)** | **Sharpe Ratio** |
| --- | --- | --- | --- | --- |
| 2011 | 0.51 | 0.84 | 0.03 | 0.56 |
| 2012 | -0.01 | 0.90 | 0.05 | -0.06 |
| 2013 | -0.11 | 0.92 | 0.07 | -0.20 |
| 2014 | 0.49 | 0.86 | 0.05 | 0.50 |
| 2015 | -0.66 | 0.32 | 0.21 | -2.68 |
| 2016 | 0.21 | 0.57 | 0.51 | -0.52 |
| 2017 | -0.13 | 0.84 | 1.39 | -1.82 |
| 2018 | 0.32 | 0.43 | 2.37 | -4.80 |
| 2019 | -0.37 | 0.85 | 1.55 | -2.26 |
| 2020 | 0.33 | 3.15 | 0.09 | 0.08 |
| **Total Return** | **0.02%** | **1.28%** |  |  |

**4. Statistical Analysis**

In evaluating the performance of the strategy, the following key metrics were analyzed:

* **Annual Return**: The annual return for each year reflects the percentage change in the value of the portfolio. The strategy exhibited mixed results, with positive returns in some years (e.g., 2011, 2014, 2020) and negative returns in others (e.g., 2012, 2013, 2015).
* **Standard Deviation (Volatility)**: The standard deviation of returns measures the volatility of the strategy. Higher values indicate greater fluctuations in returns. For instance, 2020 saw a significant increase in volatility (3.15%) compared to previous years.
* **Risk-Free Rate**: The risk-free rate, typically derived from government bonds, is used as a benchmark for calculating the Sharpe ratio. This rate varied over the years, impacting the risk-adjusted returns.
* **Sharpe Ratio**: The Sharpe ratio assesses the risk-adjusted return of the strategy by comparing the excess return (over the risk-free rate) to the standard deviation of returns.

**Positive Sharpe Ratio**: In 2020, the strategy managed to achieve a slightly positive Sharpe ratio of 0.08, indicating some level of risk-free return.

**Negative Sharpe Ratio**: Several years, including 2015, 2017, 2018, and 2019, displayed negative Sharpe ratios, suggesting that the strategy underperformed relative to the risk taken. Potential reasons for these negative Sharpe ratios include:

* 1. **Use of Coefficient as Part of Sorting Anchor**: The strategy's reliance on a coefficient for sorting may have dispersed the impact of several significant market events (e.g., COVID-19 and the depression in 2015) across different calendar years, leading to inconsistent performance.
  2. **Insignificant Regression Results**: The sorting strategy heavily depends on the coefficient\_tone, which might result in ineffective portfolio returns if the regression results are not significant. This dependence could lead to poor performance, particularly in years with negative Sharpe ratios.

**5. Conclusion**

The analysis demonstrates that while the dynamic sorting strategy has the potential to generate positive returns, its performance has been inconsistent, particularly when adjusted for risk. The mixed results across different years, coupled with the challenges of managing risk effectively, suggest a need for further optimization. Refining the sorting criteria or incorporating additional risk management techniques could potentially enhance the strategy's profitability and risk-adjusted returns. Further research could also involve back testing the strategy across various market conditions to better understand its strengths and weaknesses.