Evaluating-Hawkishness-and-Dovishness-of-FOMC -Meeting-Minutes

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1. Introduction

In this report, we explore the sentiment of the Federal Open Market Committee (FOMC) communications over the past 13 years, focusing on Meeting Minutes, Fed speeches, and Press Conference transcripts. By utilizing FinBERT, a sentiment analysis model fine-tuned for financial texts, we assess the tone of these statements, categorizing them into "Hawkishness" and "Dovishness" based on the text in each document. Also, we examine how the identified sentiment correlates with key financial indicators such as bond market yields, the Treasury Yield Curve spread, and other relevant measures.

2. Methodology

2.1 Data

a. **FOMC Statements Collection**
   i. We collected data from the Federal Reserve Board website covering the period from December 30, 2011, to October 10, 2024.
   ii. This dataset includes **FOMC Meeting Minutes, Fed speeches, and FOMC Press Conference** transcripts.
   iii. Initially, three different csv files were created for each of the FOMC Meeting Minutes, Fed speeches, and FOMC Press Conference and later on we combined all the data into one csv file.
   iv. Separate analysis for each dataset as well as combined dataset is carried out.

b. **Financial Indicators**
   i. We retrieved key financial indicators for correlation analysis, including the 10-year Treasury yield (GT 10), 2-year Treasury yield (GT 2), the 2s10s Treasury Yield Spread (2s10s spread), gold prices, the VIX (volatility index), and the S&P 500.
   ii. Dataset for the given financial indicators were provided and they represent key market factors that could be influenced by the sentiment expressed in the FOMC statements.

c. **Data Preprocessing**
   i. To ensure the FOMC statements were ready for analysis, we converted them into readable text format (CSV files).

ii.   Each file was carefully annotated with metadata including the date of the statement, the speaker's name, the title, and the content of the text.

iii. This enables us to carry out sentiment analysis using FinBERT and perform subsequent correlation analyses with the financial data.

2.2 Classification (Hawkishness, Dovishness or Neutral)

To classify the FOMC communications into categories of "Hawkish,"（1） "Dovish,"（-1） or "Neutral,"（0） we employed two distinct methods:

a. **Word list classification**
In this method, we constructed dictionaries for hawkish and dovish terms. The hawkish dictionary contained words and phrases indicative of a preference for tighter monetary policy (e.g., "inflation," "interest rate hike," "economic overheating"), while the dovish dictionary included terms suggesting a more accommodative stance (e.g., "lower rates," "stimulus," "economic growth"). For each document, we calculated the frequency of hawkish and dovish keywords, comparing the two to determine the dominant sentiment in the text.

b. **Factor Similarity Analysis (Finbert)**
In this method, we generate hawkish and dovish phrases that reflect clear partisan characteristics. These phrases served as reference texts embodying the tone and stance of hawkish or dovish sentiment. Using FinBERT, we computed the similarity between each FOMC document and the custom-generated hawkish and dovish phrases, allowing us to classify the documents based on their proximity to these defined tones.

2.3 Correlation Analysis

a. We compared the sentiment scores from the previous step with six market indicators: 10-year Treasury yield (GT 10), 2-year Treasury yield (GT 2), the 2s10s Treasury Yield Spread (2s10s spread), gold prices, the VIX, and the S&P 500. Correlation coefficients were calculated between the sentiment classifications and these market variables.
b. Additionally, analyzed the market data 10 days before and after each meeting. By averaging the changes, we assessed the impact of FOMC communications on financial markets.

3. Results

3.1 Classification
a. By Word list:

Hawkish: 372

Dovish: 350
Neutral: 147

    b. By Finbert:
dovish   379
hawkish   353
neutral   137

    c. Comparison:
Hawkish count where both classifications match: 188
Dovish count where both classifications match: 190

- In word list classification, where if the hawkish term count exceeds the dovish count by 50%, the document is marked as hawkish, and vice versa for dovish. If the difference falls within 50%, the document is classified as neutral. For similarity analysis, the threshold is 20%.
- Comparing both methods, roughly 50% of the documents receive the same classification.

3.2 Correlation Analysis

    (a) Analysis done on separate datasets

Correlation Matrix: Press Conferences Polarity and Bond Market Yields
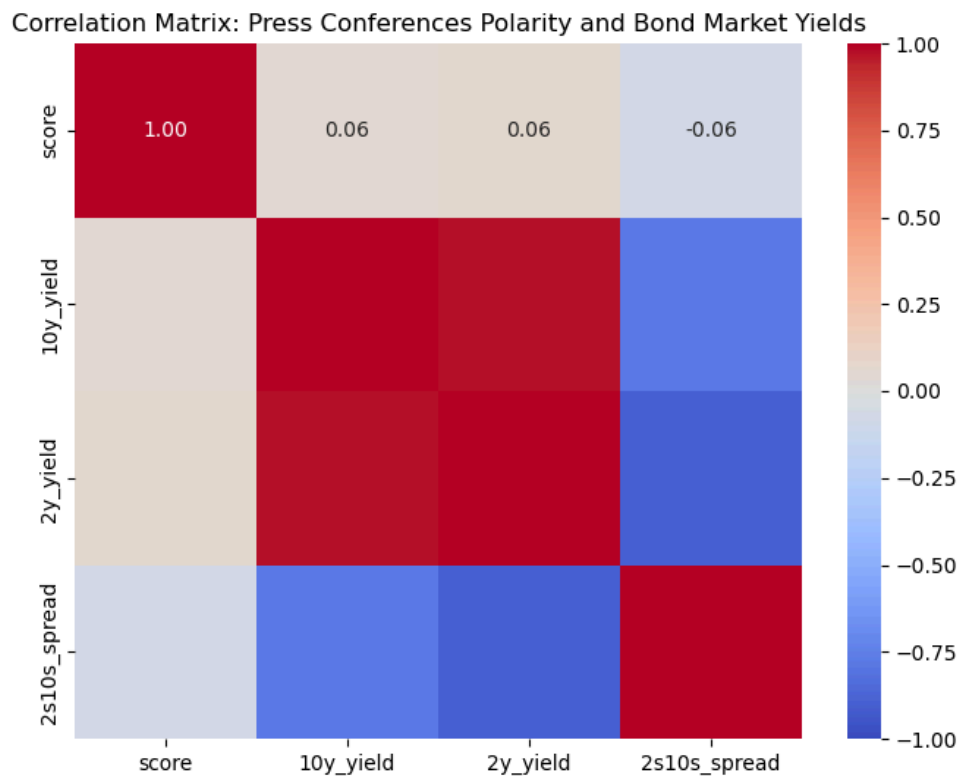
(i)
- This correlation matrix compares the polarity scores from press conferences with bond market yields, including the 10-year yield, 2-year yield, and the 2s10s spread.

- The matrix shows a weak positive correlation between the polarity scores and both the 10-year and 2-year yields (0.06), suggesting a minimal relationship between press conference sentiment and these yields.

Correlation Matrix: Speeches Polarity and Bond Market Yields

(ii)
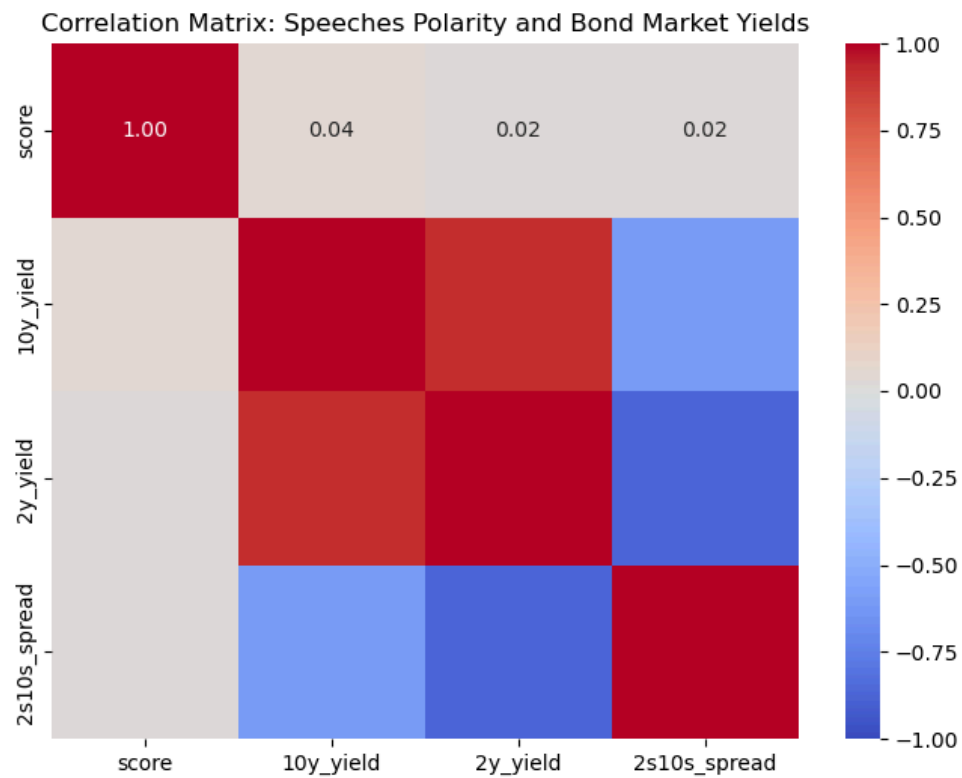
- The polarity scores from Fed speeches exhibit very weak correlations with all bond market yields, with 0.04 for the 10-year yield and even lower correlations for the 2-year yield (0.02) and 2s10s spread (0.02).
- This indicates that speeches, in contrast to meeting minutes or press conferences, have little correlation with movements in bond yields, suggesting less direct market impact.

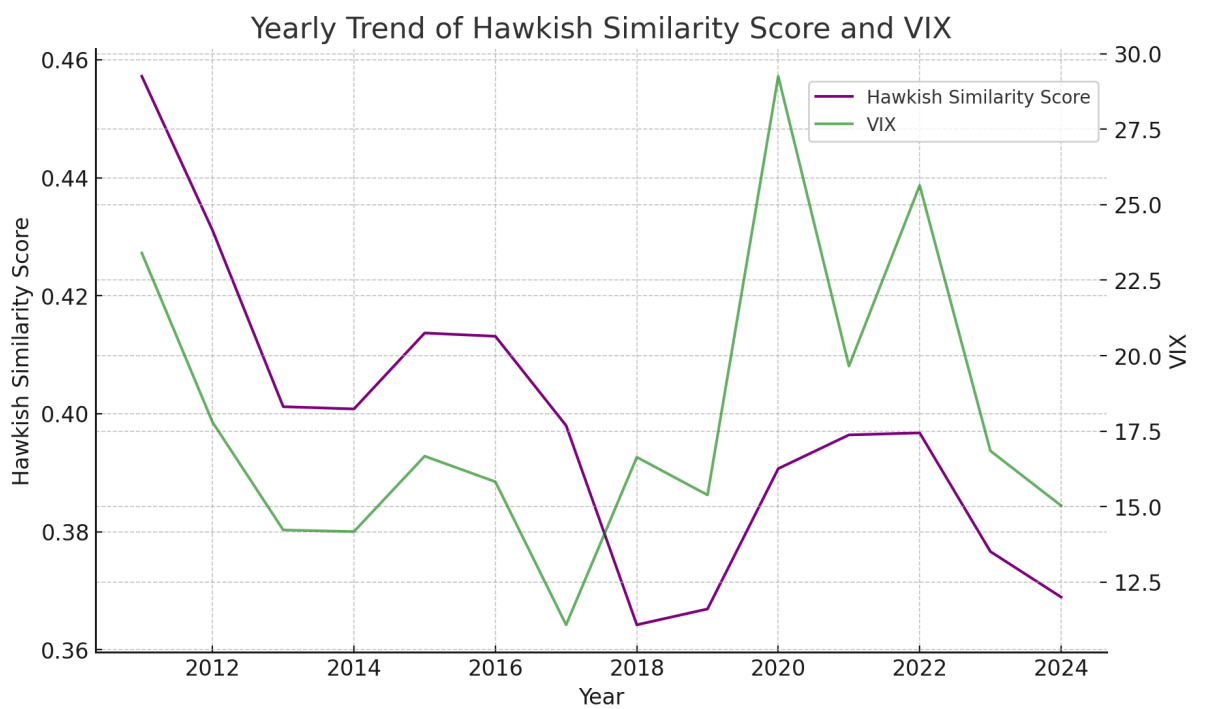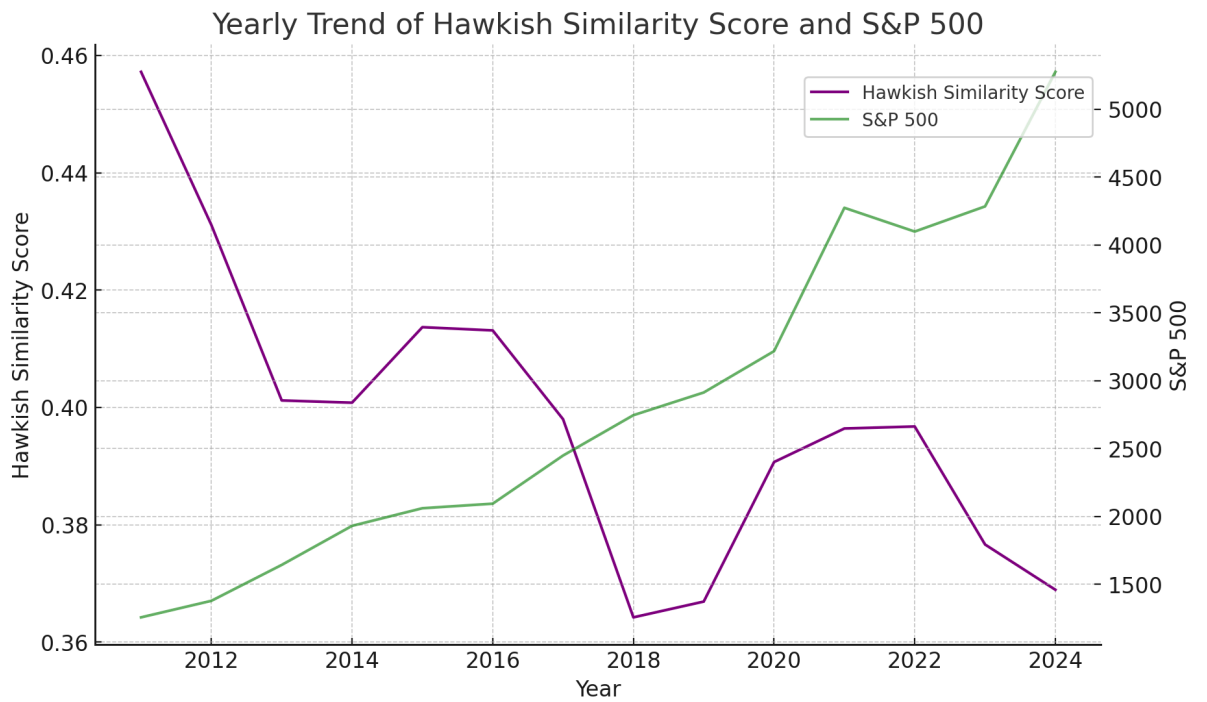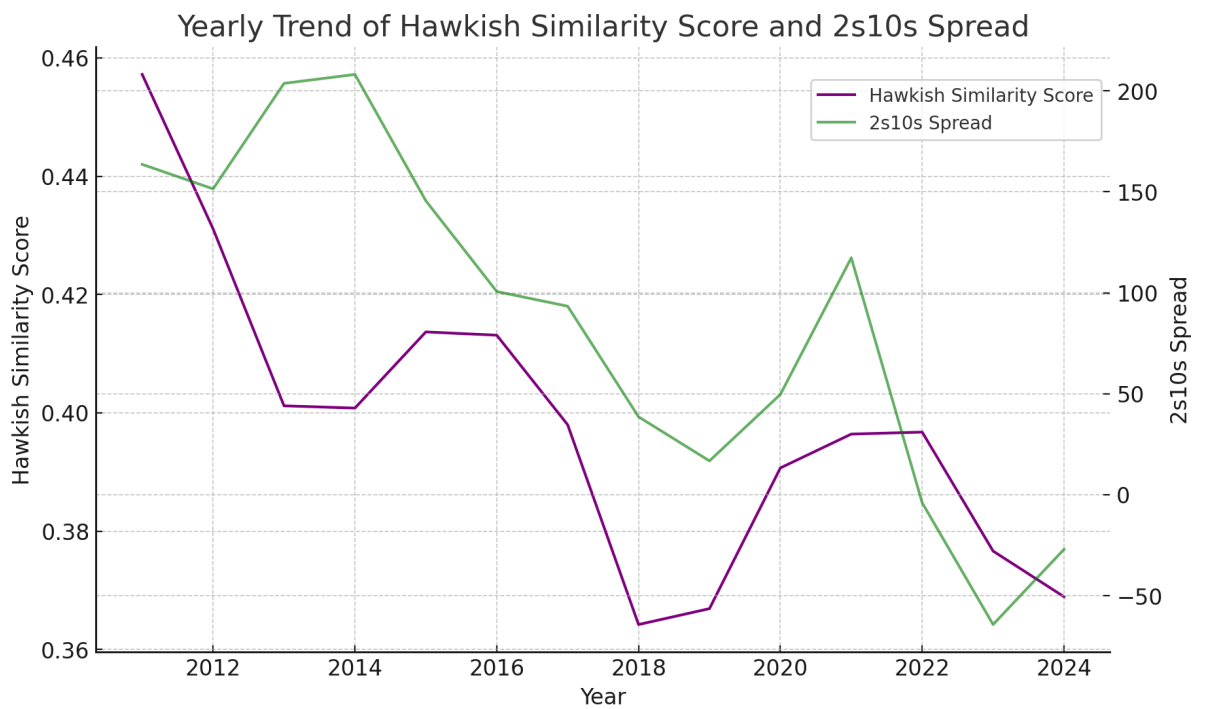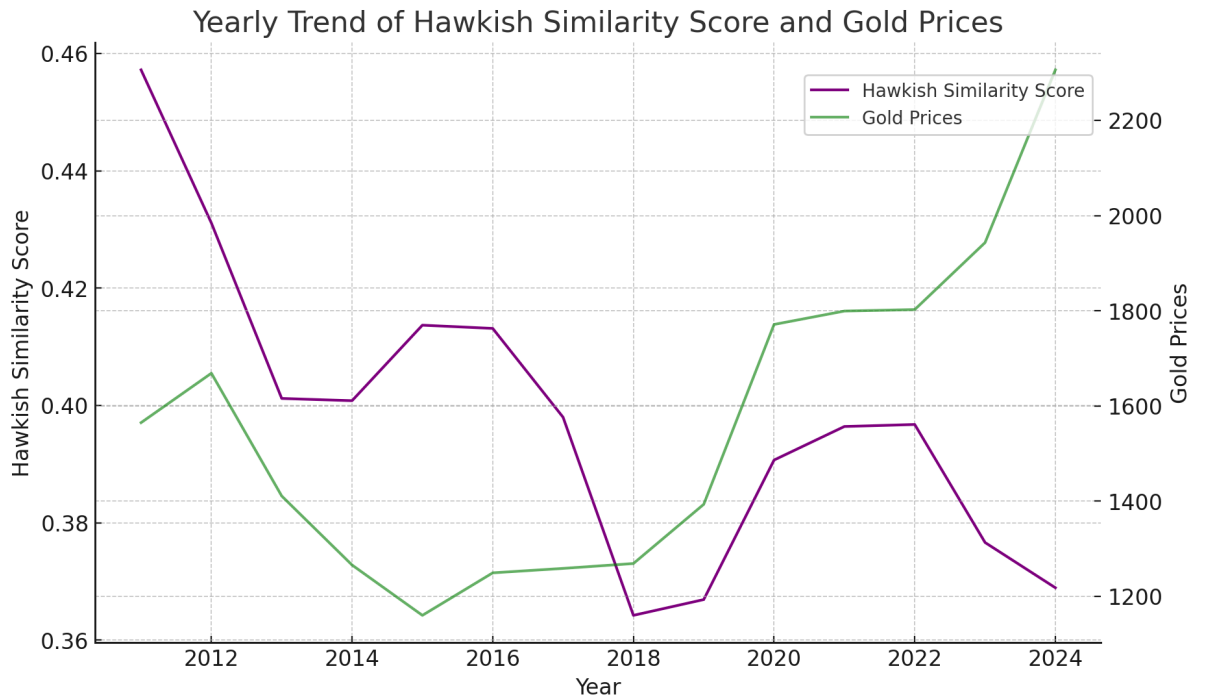Correlation Matrix: Minutes Polarity and Bond Market Yields
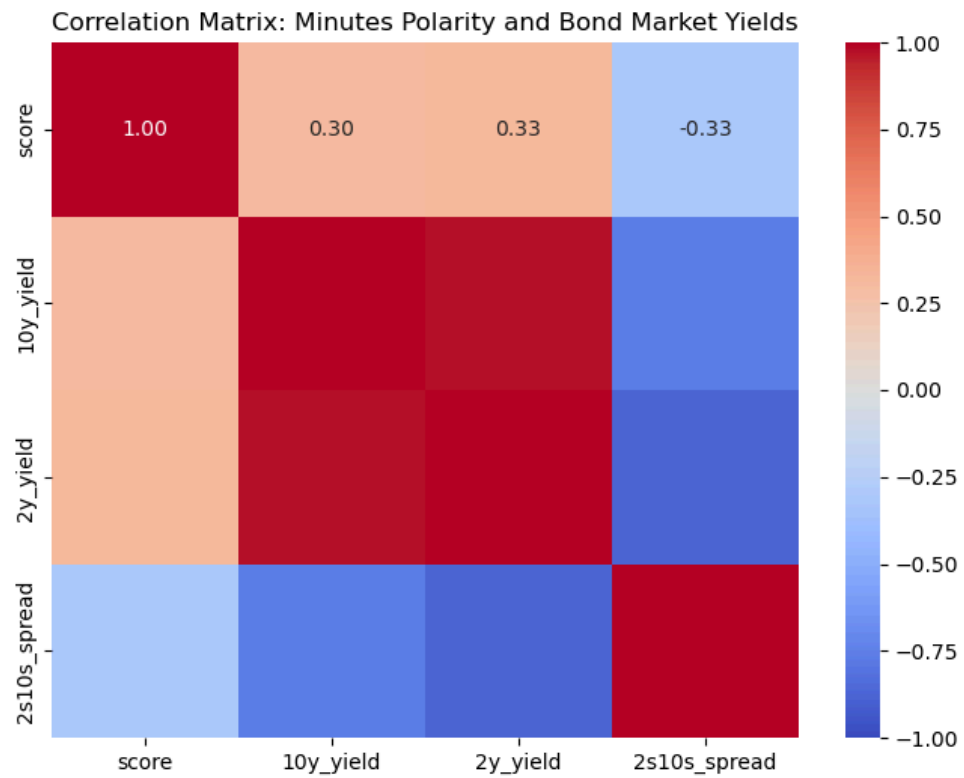
(iii)

- The polarity scores from Fed meeting minutes show moderate positive correlations with both the 10-year yield (0.30) and the 2-year yield (0.33), indicating that more hawkish or dovish sentiments in the minutes moderately align with bond yield movements.
- There is a moderate negative correlation (-0.33) with the 2s10s spread, suggesting that a higher polarity score (more hawkish sentiment) tends to be associated with a flattening yield curve.
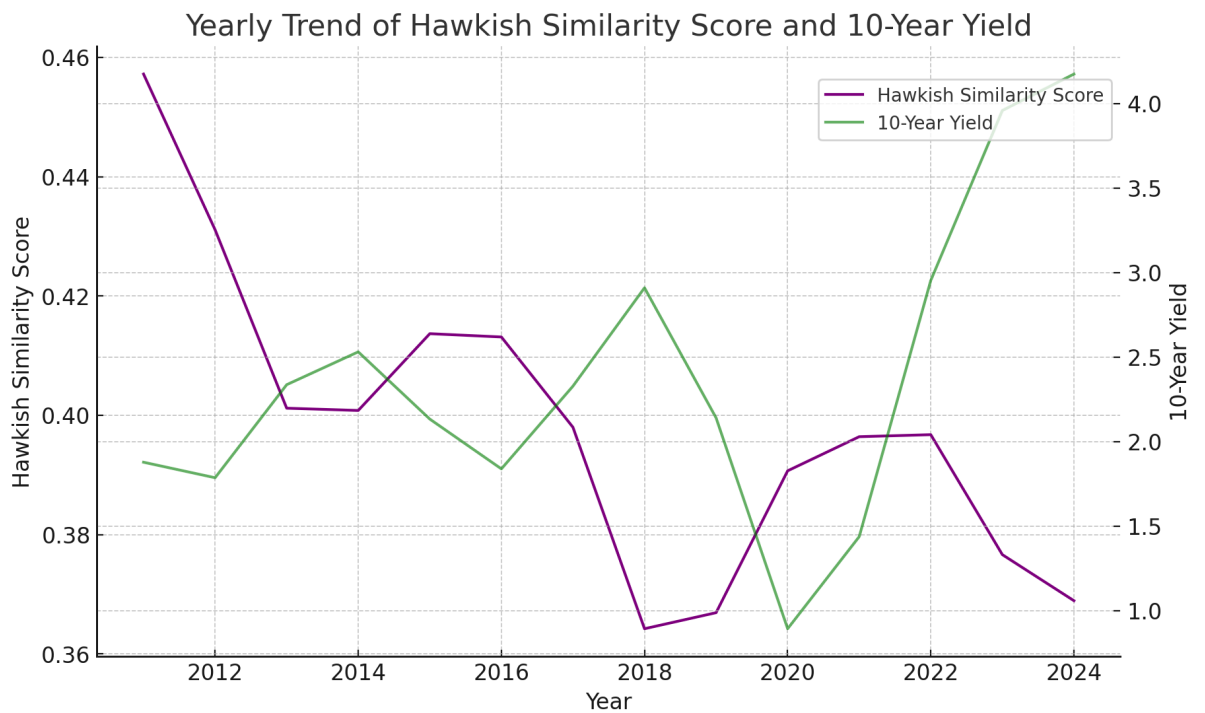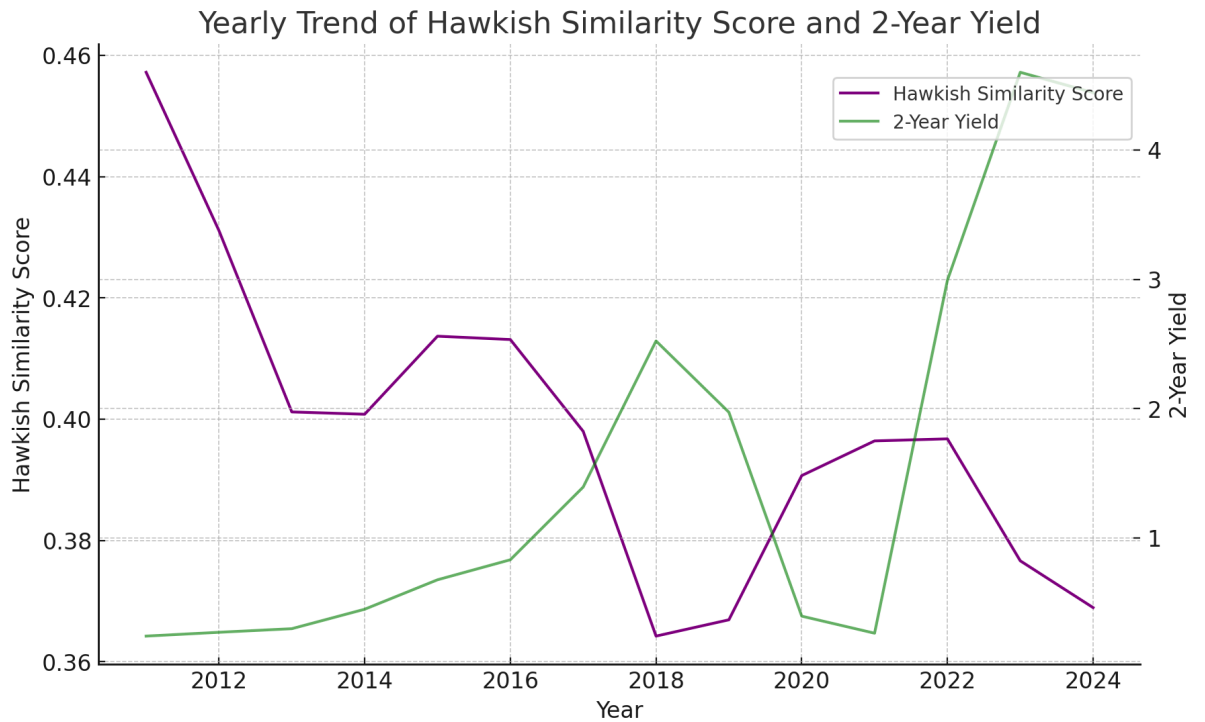
(b) Analysis done on combined dataset:

Correlation Heatmap

- This figure illustrates the correlation between sentiment and various market data. For each market indicator, we used the rate of change over the ten days before and after each FOMC meeting to assess how sentiment influences these financial variables.
- The correlation analysis results were not particularly strong, which may be due to the simplified classification approach where hawkish sentiment is represented as 1, dovish as -1, and neutral as 0.
- This straightforward representation might not fully capture the nuanced relationship between sentiment and market data. To address this, I plan to incorporate similarity scores into the analysis, offering a more refined perspective on the connection between sentiment and financial indicators.

Yearly Trend of Hawkish Similarity Score and S&P 500

Yearly Trend of Hawkish Similarity Score and VIX

Yearly Trend of Hawkish Similarity Score and Gold Prices

Yearly Trend of Hawkish Similarity Score and 2s10s Spread

Yearly Trend of Hawkish Similarity Score and 2-Year Yield

Yearly Trend of Hawkish Similarity Score and 10-Year Yield

- Overall, the hawkish similarity score shows significant fluctuations over the years, but it does not exhibit a clear or consistent correlation with the financial metrics like the S&P 500, VIX, gold prices, or bond yields.
- The financial metrics, particularly the stock market and bond yields, generally trend upward, while the hawkish sentiment remains volatile.
- This suggests that other external factors likely have a more significant impact on these financial metrics than the sentiment alone.

4. Conclusion

1. Analysis on individual datasets(when only finbert model is used for each dataset):

    - **Meeting minutes** show a moderate correlation with bond market yields, particularly with a positive correlation to both the 10-year and 2-year yields. This suggests that hawkish or dovish sentiments within the minutes have a moderate influence on market expectations of interest rates.
    - **Press conferences** and **Fed speeches** exhibit much weaker correlations, with minimal impact on bond yields. This indicates that while these forms of communication are important, they may not be as directly tied to immediate market movements compared to the detailed meeting minutes.
    - Overall, FOMC communications, especially the **meeting minutes, appear to have a more substantial effect on bond markets,** particularly on the shape of the yield curve, with more hawkish minutes associated with a flattening curve.

2. Analysis on combined dataset(when both wordlist and finbert model is used):

    - The overall sentiment analysis, combining Fed speeches, meeting minutes, and press conferences, using FinBERT and a predefined wordlist, does not show a strong or consistent relationship with key financial metrics like the S&P 500, VIX, gold prices, and bond yields.
    - The lack of correlation may be attributed to the limitations of the wordlist, as it may not encompass all relevant terms and nuances within the dataset that influence financial sentiment and market reactions.
    - Future work should focus on developing a more comprehensive and robust dictionary for sentiment analysis, which includes a wider range of financial terms and contextual meanings to improve the accuracy of sentiment-to-market relationship predictions.