

# FOMC sentiment analysis

*NLP in Investment Management (FRE-GY-7871)*



**Pranay Matalia (pjm533)**  
**Devansh Joshi (dj2436)**  
**Aaryav Sharma (as18794)**

10.12.2024

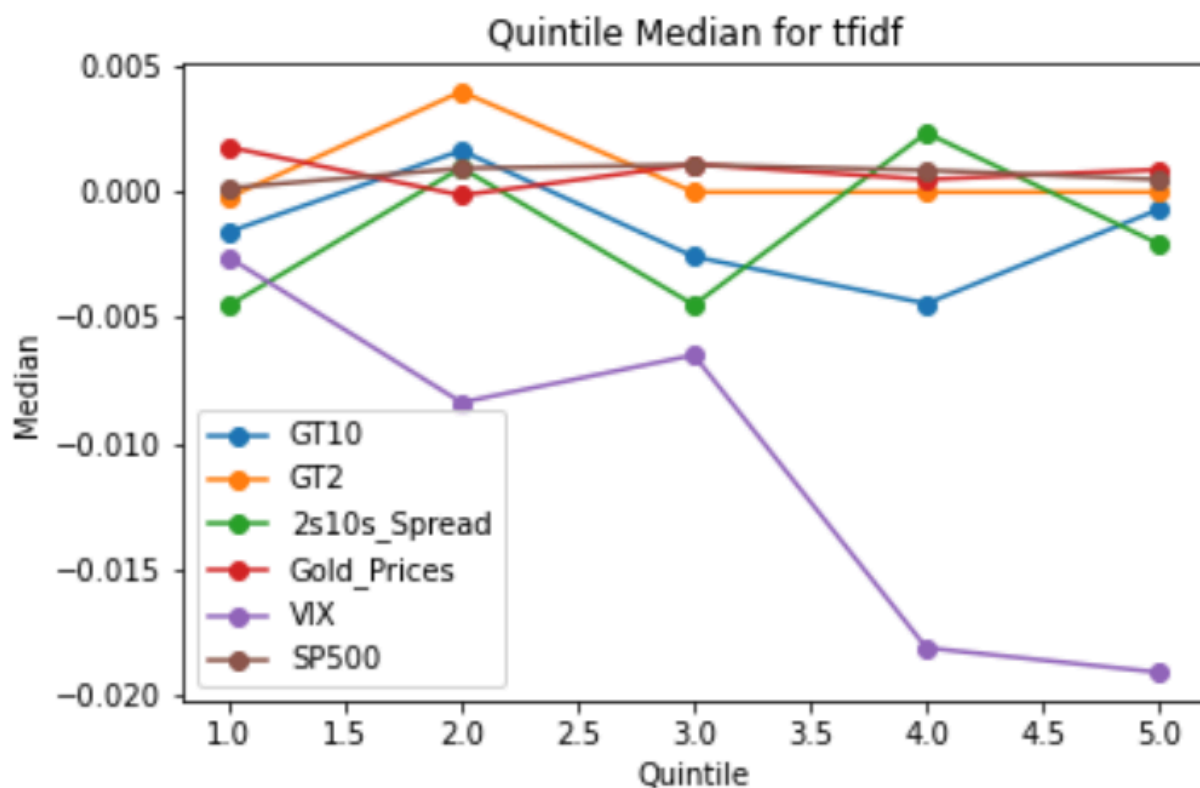
## RESULTS

Following the sentiment analysis and the calculation of 1-day returns for each asset class, we segment the results into **five quantiles** based on the sentiment scores. This allows us to evaluate the impact of shifts in **hawkish or dovish sentiment** on financial market indicators, providing deeper insights into how varying tones of Fed communications influence market behavior.

### Word dictionary

For the word dictionary approach we use loughran-mcdonald's negative words dictionary and have calculated the tf-idf score based on it.

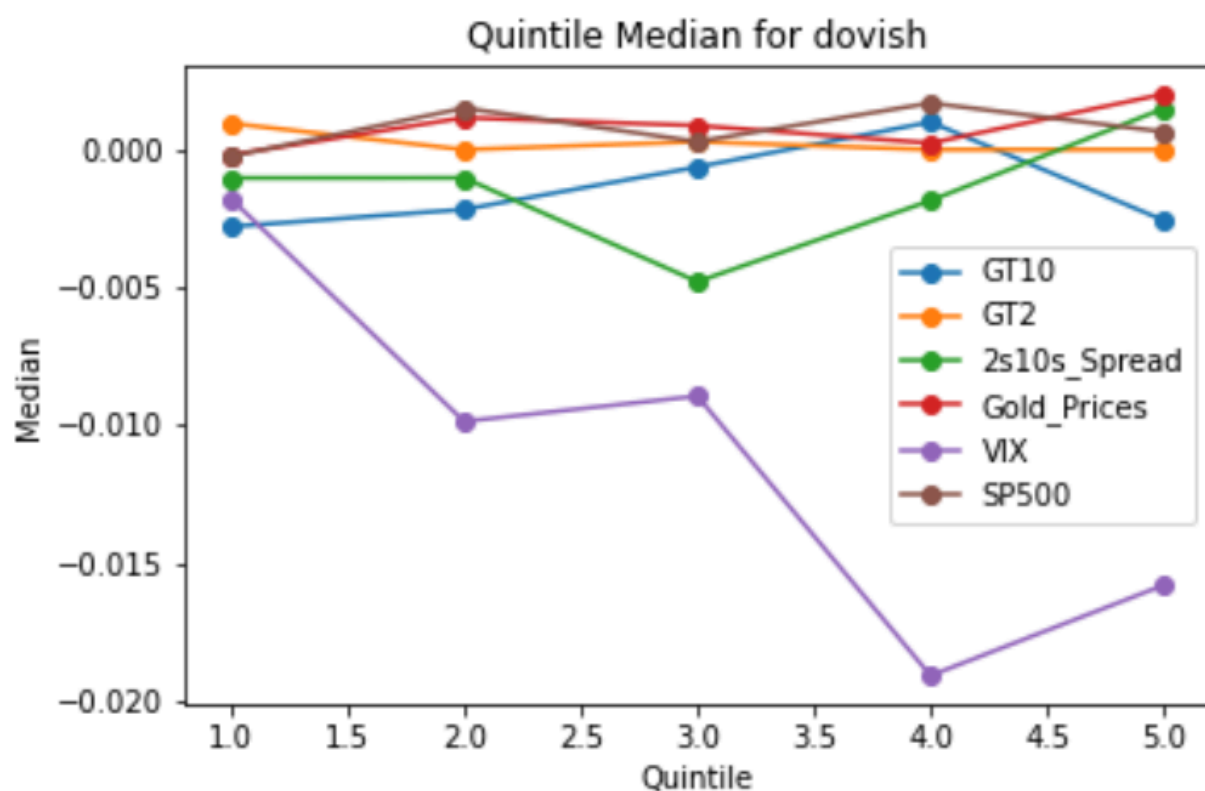
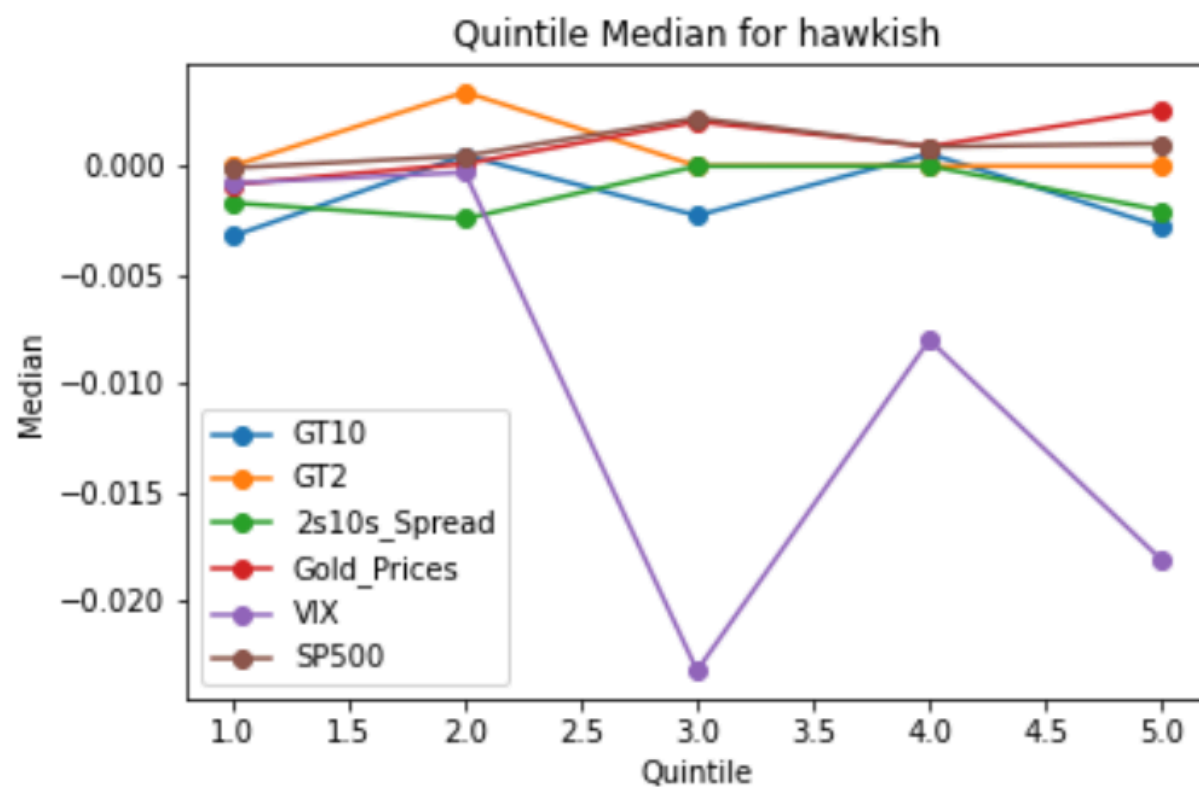
The chart below illustrates the relationship between TF-IDF scores and the median of various economic indicators across quintiles. The most noticeable pattern is the sharp decline in the VIX (purple line) after the second quintile, suggesting a significant drop in market volatility as TF-IDF scores increase. Other indicators, including GT10, GT2, 2s10s\_Spread, Gold Prices, and the SP500, show only minor fluctuations across quintiles. GT2 exhibits a slight peak in the second quintile, while the others remain relatively stable. Overall, the chart suggests that while TF-IDF scores (a proxy for textual sentiment or importance) are correlated with changes in volatility, they have limited influence on interest rates, asset prices, or the equity market.



### Factor similarity

For the factor similarity approach we have constructed 10 extremely hawkish and 10 extremely dovish statements and used these as the targets to compute cosine similarity with each document.

Running a similar analysis on the results from Factor similarity analysis. The two plots below illustrate the **quintile means for hawkish and dovish sentiment**.



In the hawkish sentiment plot one can see that hawkish sentiment primarily affects market volatility (as measured by the VIX), with a sharp dip in the third quintile and a subsequent rise, indicating a volatile relationship between hawkishness and market sentiment. In contrast, other key economic indicators like bond yields (GT10, GT2), the yield curve spread (2s10s\_Spread), gold prices, and the SP500 remain relatively stable across all quintiles. This suggests that while hawkish sentiment leads to significant fluctuations in market volatility, it has a more muted effect on interest rates, asset prices, and the broader equity market. The VIX's sharp movement contrasts with the steadiness of the other variables, highlighting a specific sensitivity in market volatility to hawkish policy stances.

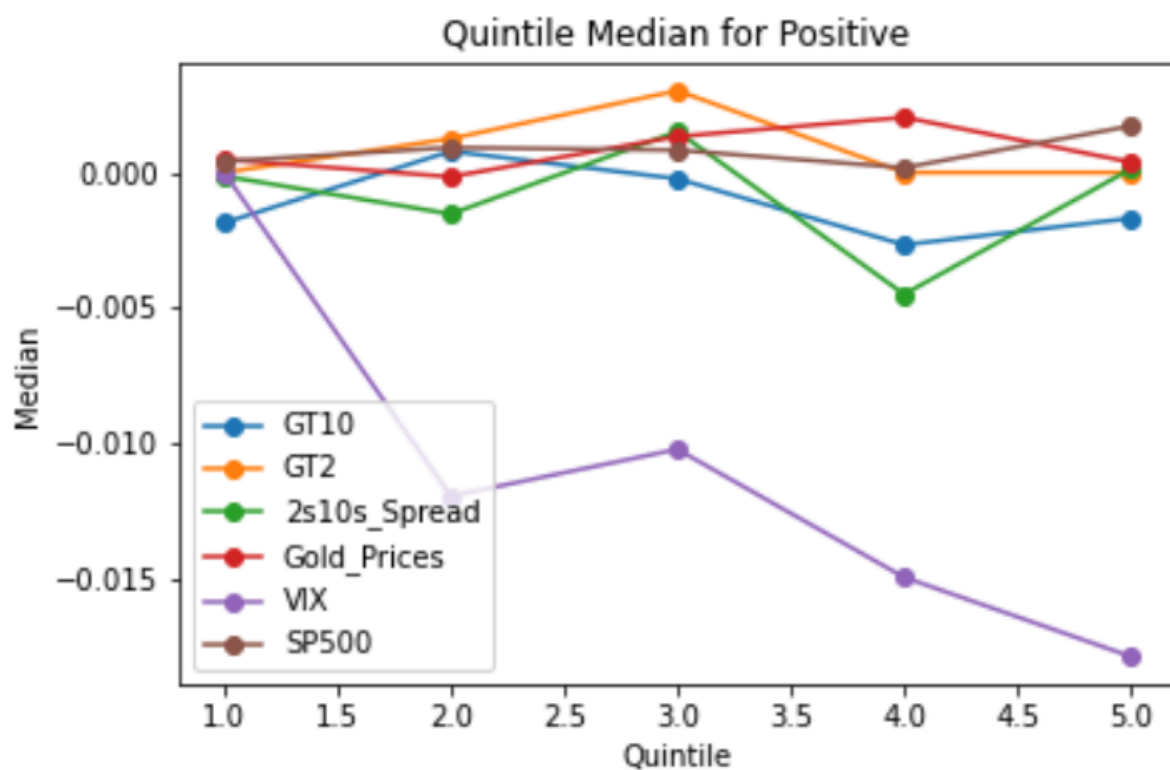
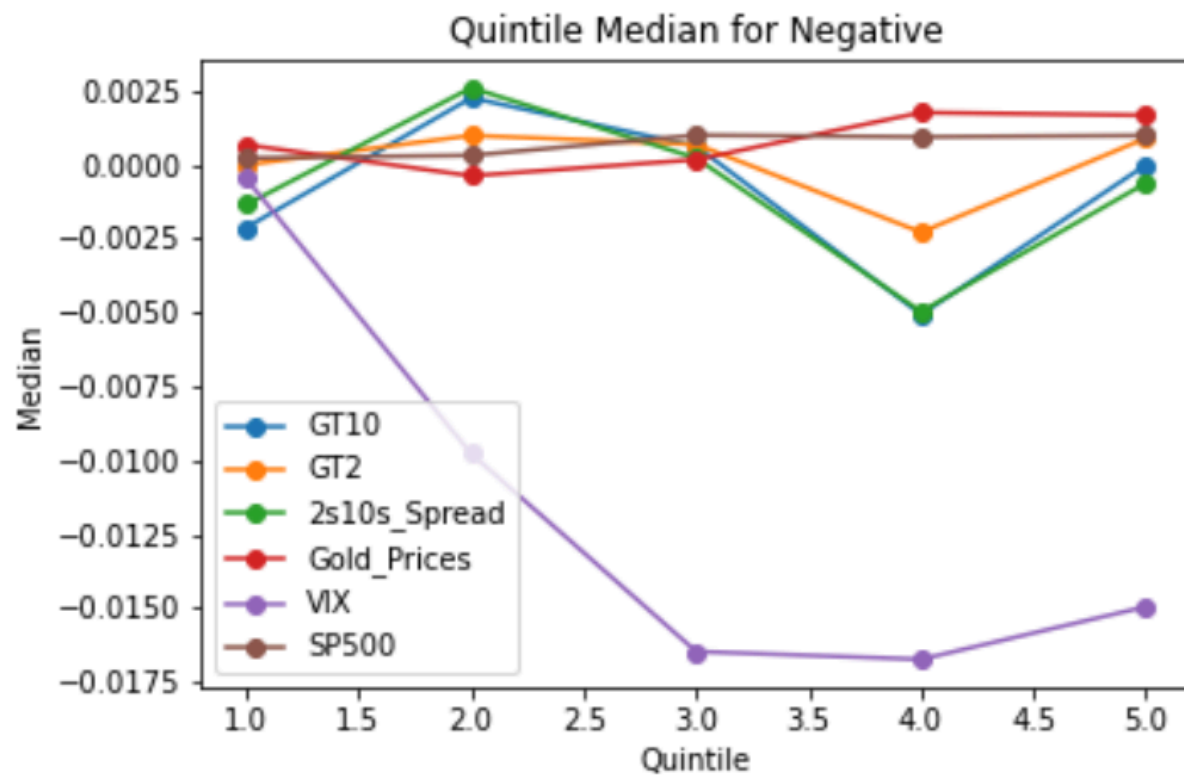
In the dovish sentiment plot as dovish sentiment increases, market volatility (as measured by the VIX) tends to decrease, reaching its lowest point around the fourth quintile, which could indicate that more dovish monetary policies are associated with calmer market conditions. Other indicators, such as GT10, GT2, and the 2s10s spread, show minimal variation across the quintiles, suggesting that dovish sentiment does not heavily influence bond yields or the yield curve spread in this dataset. Additionally, the stable behavior of Gold Prices and the SP500 across the quintiles indicates that these asset prices are less sensitive to changes in dovish sentiment compared to market volatility. Overall, the key takeaway is that increased dovishness appears to have a stronger relationship with reduced market volatility than with interest rates or asset prices.

These plots highlight that market behavior aligns with conventional expectations: **hawkish sentiment** tends to increase yields and volatility, while **dovish sentiment** supports equities and gold.

### **FOMC-RoBERTa sentiment**

For this approach we have used GTech's pretrained model on FOMC data to classify files into their percentage positive, negative and neutral sentiment.

The two plots below illustrate the **quintile means for negative (hawkish)** and **positive (dovish)** sentiment using the FOMC-RoBERTa model, with the x-axis representing sentiment **quintiles** (higher quintiles indicating stronger sentiment) and the y-axis showing the **1-day median changes**.



The **negative quintile median plot** shows the quintile median for various economic indicators based on the "Negative" column. The most significant observation is the sharp decline in the VIX (purple) from the first to the third quintile, reaching its lowest point in the third quintile before stabilizing. This suggests that as negative sentiment increases, market volatility initially drops and then remains low. Other indicators, including GT10, GT2, 2s10s\_Spread, Gold Prices, and the SP500, show only minor fluctuations across quintiles, with the 2s10s spread (green) and GT2 (orange) dipping slightly in the middle quintiles but returning to stability by the fifth quintile. Overall, negative sentiment has a pronounced effect on market volatility but minimal impact on bond yields, asset prices, and equity markets.

The **positive sentiment plot** displays that the quintile median for various economic indicators based on the "Positive" column, reveals that market volatility (VIX) consistently declines as positive sentiment increases, with the VIX showing a sharp downward trend from the first to the fifth quintile. Meanwhile, other indicators such as GT10, GT2, the 2s10s spread, Gold Prices, and the SP500 exhibit minor fluctuations, with no significant upward or downward trends across the quintiles. GT2 (orange) peaks slightly in the second quintile, while the 2s10s spread (green) dips in the third quintile. Overall, positive sentiment seems to correlate with a steady decrease in market volatility, while its impact on bond yields, asset prices, and equity markets remains minimal.

These plots confirm that **hawkish sentiment** corresponds with higher yields and market volatility, while **dovish sentiment** supports equities and gold, aligning with typical market behavior in response to changes in monetary policy expectations.

### **Regression results**

After obtaining the sentiment scores, we conducted an **Ordinary Least Squares (OLS) regression** analysis, using the market indicators as the dependent variables and the sentiment labels as the independent variables. The following equation provides a representative example

$$\Delta y = \alpha_1 + \alpha_2 \times x$$

where  $\Delta y$  is change in the dependent variable and  $x$  is the independent variable at 95% significance level indicating extreme values for that particular variable so that the analysis eliminates noisy data points.

The results from the regression analysis ( $R^2$  values )are as follows:

	<b>hawkish</b>	<b>dovish</b>	<b>tfidf</b>	<b>Positive</b>	<b>Negative</b>
<b>GT10</b>	0.475869	1.975653	0.334636	0.001123	0.432224
<b>GT2</b>	0.065445	3.897818	0.060404	0.72549	0.009653
<b>2s10s_Spread</b>	3.255899	1.130968	0.146273	4.753694	0.001897
<b>Gold_Prices</b>	0.082743	0.002872	1.771619	0.134738	1.918018
<b>VIX</b>	1.123259	0.012606	1.075799	2.566851	17.41261
<b>SP500</b>	0.038921	0.165994	0.996451	2.345252	17.532986

It is clear from the above table that FOMC-Roberta's model is the best since it achieves the highest  $R^2$  values, especially with 17%  $R^2$  for VIX and SP500 for Negative sentiment. Tf-idf based approach is the worst with the least  $R^2$  scores on average followed by the vector similarity based approach.

## CONCLUSION

Overall, as can be observed from the plots and the regression analysis, the FOMC-RoBERTa sentiment analysis using Georgia Tech's BERT is the most in line with expectations and produces the best results in terms of predictive power. The sentiment analysis that it performs seems to edge out the word dictionary and the vector similarity based approach. The quintile plots produced by using FOMC-RoBERTa sentiment analyser are most in line with expectations and make the most sense out of all the plots. Moreover, as can be seen from the regression analysis it achieves the highest  $R^2$  values, especially with **17%  $R^2$**  for VIX and SP500 for Negative sentiment. Tf-idf based approach is the worst with the least  $R^2$  scores on aggregate followed by the vector similarity based approach.



## REFERENCES

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