FED Talks & Stocks

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Paper: When the Fed Speaks: Arguments, Emotions, and the Microfoundations of Institutions

Key findings regarding the relationship between FED speech and market volatility:

- The more a Fed's speech explicitly reaffirms the backing (i.e. assumptions) underlying the monetary policy framework, the more market uncertainty will increase.
- The positive tone of a speech will suppress the market uncertainty created by the Fed explicitly reaffirming the backing underlying the monetary policy framework.
- The fear expressed in the business media at the time of a speech will amplify the market uncertainty created by the Fed chair explicitly reaffirming the backing underlying the monetary policy framework.

Identified a directly proportional relationship between "Backing ratio" to change in VIX (volatility index)

- Backing ratio = (number of paragraphs that make the backing explicit / total number of paragraphs)

Motivation

- Use FED communications (i.e. documents/speeches) to predict direction and magnitude of change in stock market volatility (measured by VIX)
- By predicting future change in VIX, investors could hedge their portfolios
- Speculators can potentially profit by making better informed trades on the VIX (via ETFs like VXX)
- Help identify FED’s sentiment on key economic indicators (like inflation, unemployment, pricing stability).
- Help identify impact of FED’s monetary policy on different asset classes like commodities, stocks, bonds, etc.

Original Methodology

Scrape FOMC (Federal Open Market Committee) statements from FED's website using a custom scraper that we build using beautifulsoup4

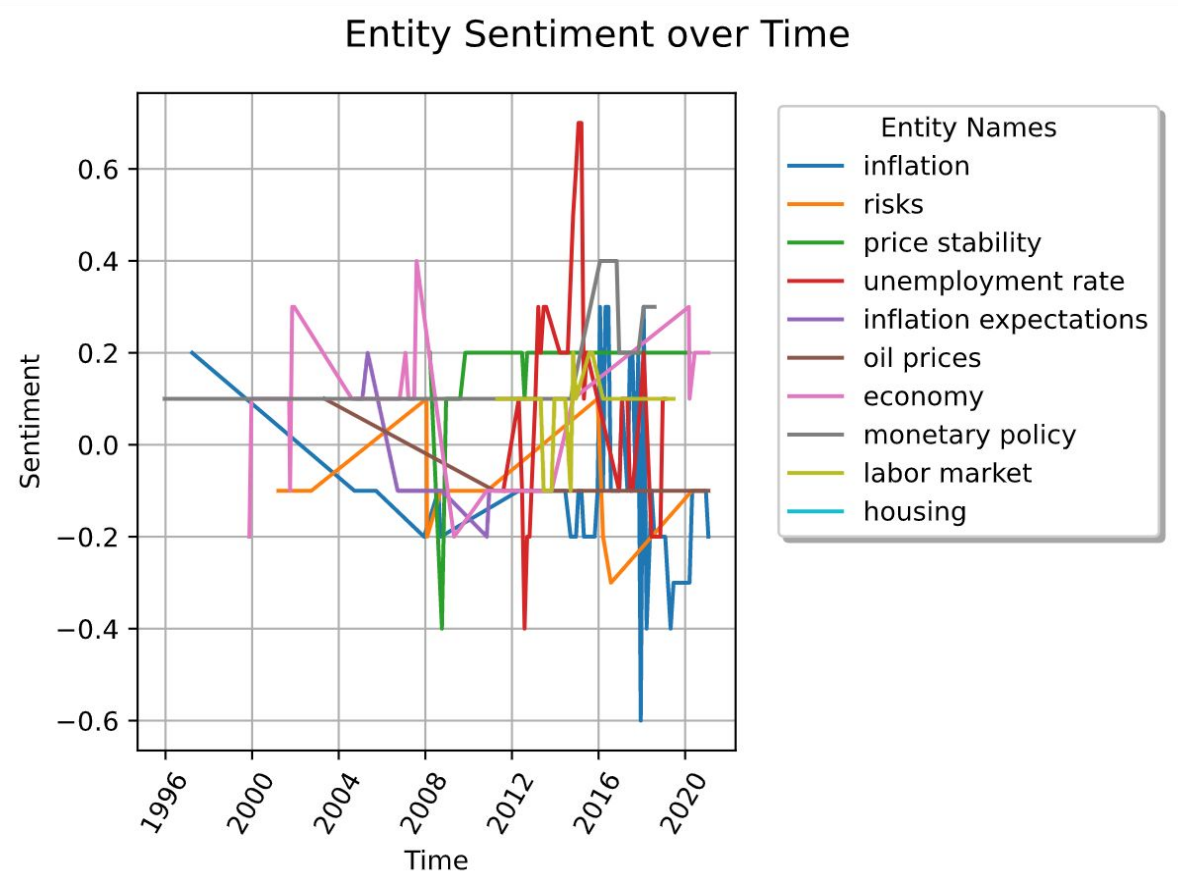
Conduct Entity-Sentiment analysis of FOMC statements using Google's NLP API

- Identify entities of economic importance
- Determine FED's sentiment on the identified entities

Deep Neural Network (DNN) as binary classifier

- Determine if the VIX (VXX ETF) went up or down given extracted features from a given speech

Entity Sentiment



Most Common Entities with sentiment found by GCP NLP API across 201 Policy statements from 1994-2021

	A	B
1	Entity Name	Apperance Coun
2	committee	90
3	employment	75
4	price stability	75
5	mandate	75
6	inflation	61
7	investment	61
8	growth	55
9	household spending	48
10	stance	47
11	business	43
12	information	40
13	monetary policy	39
14	job gains	39
15	housing sector	38
16	activity	34
17	labor market conditions	34
18	pace	33
19	outlook	31
20	labor market	31
21	unemployment rate	31
22	markets	29
23	economy	26
24	energy	26
25	objective	26
26	recovery	25
27	improvement	25

28	return	23
29	energy prices	22
30	food	21
31	rate	20
32	prices	20
33	declines	19
34	basis	19
35	items	19
36	conditions	17
37	businesses	15
38	strains	15
39	downside risks	15
40	average	15
41	support	14
42	exports	14
43	tools	14
44	action	13
45	strength	13
46	risks	13
47	federal reserve	13
48	range	13
49	level	13
50	structures	13
51	software	13
52	imports	13
53	increase	12
54	imbalances	12
55	balance	12

56	labor market indicators	11
57	output	11
58	credit	11
59	equipment	11
60	signs	10
61	uncertainty	10
62	u.s.	10
63	inflation expectations	10
64	unemployment	10
65	strengthening	10
66	demand	9
67	prospects	9
68	sales	9
69	production	9
70	business spending	9
71	households	9
72	crisis	9
73	extent	8
74	employers	8
75	accommodation	8
76	hardship	8
77	price stability goals	8
78	district	7
79	light	7
80	productivity	7
81	developments	7
82	events	7
83	part	7

Feature set for FOMC statements


```
{
    "fomc_doc": {
        "meeting_date": "2014-06-18",
        "paragraphs": [
        "doc_type": "St"
    },
    "entity_sentiments": {
        "Committee": {
        "Inflation": {
        "investment": {
        "price stability": {
        "recovery": {
        "mandate": {
        "business": {
        "housing sector": {
        "advance": {
        "Household spending": {
        "extent": {
        "restraint": {
        "Labor market indicators": {
        "growth": {
        "improvement": {
        "objective": {
        "strength": {
        "labor market": {
        "information": {
        "monetary policy": {
        "stance": {
            "score": 0.10000000149011612,
            "magnitude": 0.10000000149011612,
            "salience": 0.0007396299624815583
        }
    },
    "change_in_vix": -5.307047922287806,
    "change_in_s_n_p_500": 0.7260961504165412
}
```


- Number of paragraphs
- Number of words
- N-Gram (i.e. uni, bi and tri) counts
- POS tagging (i.e. num. of nouns, adjectives, etc.)

Roadblock and Change Of Plan

- Only a limited number of FOMC statements issued by FED (about 201) which are too few for training a DNN classifier
- For our DNN binary classifier, we were only able to find true class labels (i.e. VIX going down or up) for some FOMC statements (about 100 out of 201 speeches)
- Changing our true class label from change in VIX (94 out 201) to change in S&P 500 (143 out of 201) index as our true label for the binary classifier.

Naive Bayes model

POS tagging

Still in the works...

- We are still working on merging feature extraction code written by different teammates
  - The feature extraction code is done but on different branches, it just needs to be merged into one branch (i.e. main branch)
- We are still working on the binary classifier
  - Instead of using a Deep Neural Network, we may use a Naive Bayes classifier given the limited number of training data that we have got

Future extensions

- For the binary classifier, include more useful features like Wall Street sentiment score, current unemployment %, etc. which can help the classifier be potentially more accurate at predicting change in markets

- Train the binary classifier with different kinds of FED statements like FED minutes, FED Greenbooks, Memoranda of Discussion, etc.

- Create binary classifiers for all possible assets like commodities (gold, crude oil), bonds, individual stocks (GameStop, Apple, AMC), etc.

Questions?