

Understanding Market Dynamics in 2021: General Sentiment and Outlier Behavior

By

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Fei (Adam) Cheng,
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Robert Lanni, and
Matt Pulcini*



Jefferies

Team Profile



Kevin Gu
Incoming Tech Consultant
at Accenture



Adam Cheng
Project Intern at
Khosla Ventures



Matt Pulcini
Incoming Global Financial
Analyst at JPM



Linkin Chen
Incoming Master Student
at Boston University

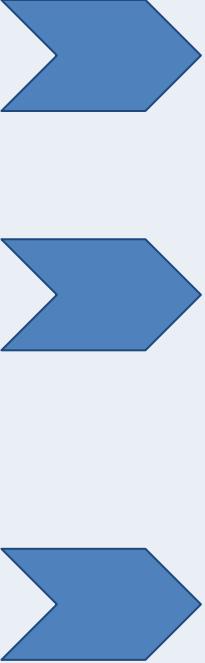
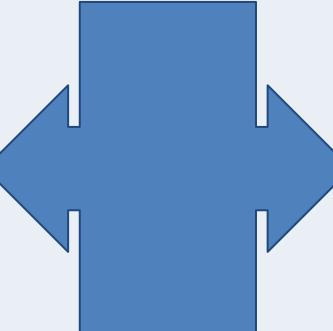


Robby Lanni
Incoming Innovation Strategy and Design
Analyst at DTCC

Meeting Agenda

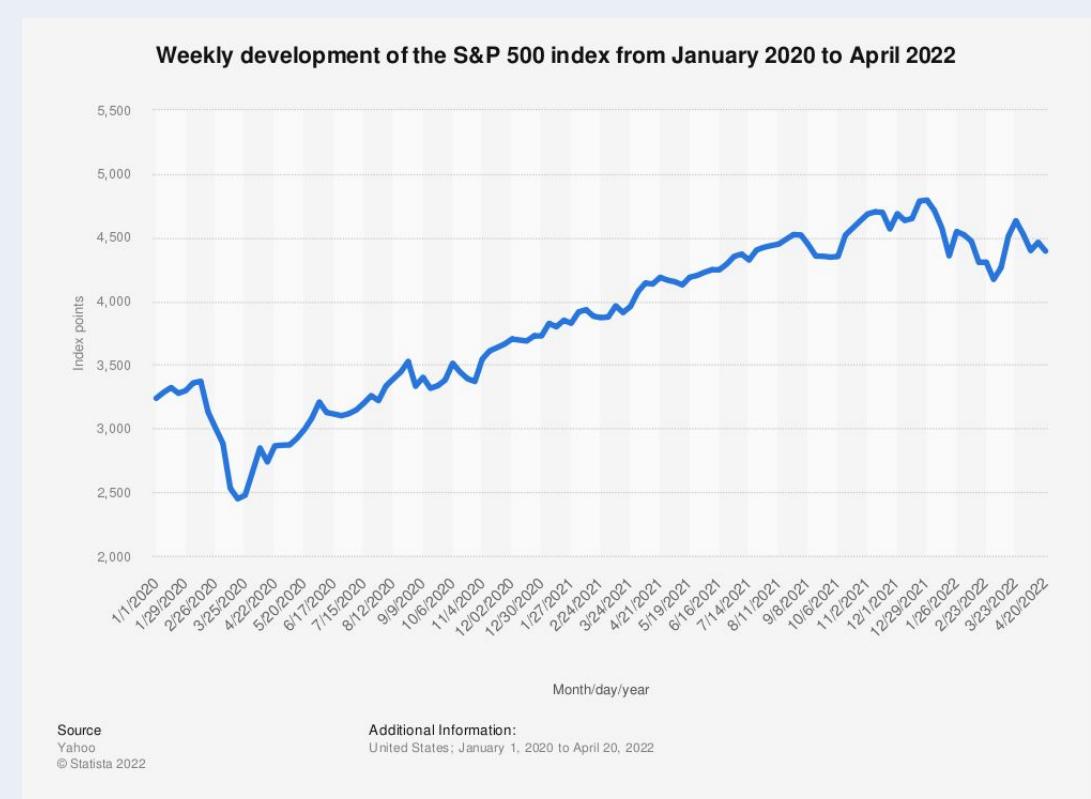
Duration	Session	Speaker
5 minutes	Introduction & Background	Linkin & Matt
5 minutes	Data Generation	Kevin
10 minutes	Outlier Computation	Adam
5 minutes	Results	Robby
15 minutes	Q&A	

Introduction and Hypothesis

Initial Questions	Hypothesis
 <p>Why and how do equities move?</p> <p>What can we do to predict these movements?</p> <p>Can we identify a few companies or sectors that are outliers in price change?</p>	 <p>We can track equities movements based on correlations between market sentiment in related articles and identifying outliers through a combination of price and volume change analysis.</p>

Background - Big Events

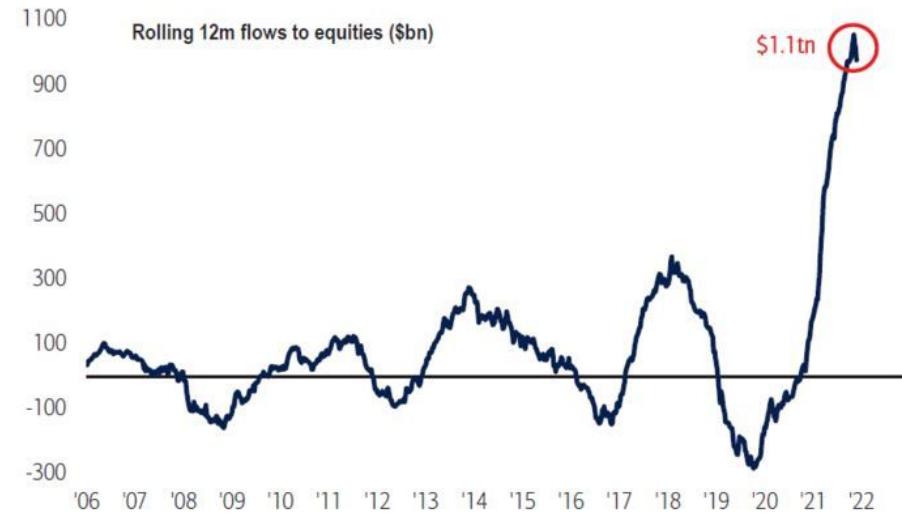
- COVID-19 Pandemic
- Residual COVID-19 affects on the market
 - New Players in Market
 - Retail Traders
 - Rise of Robinhood
 - Influx of Cash
 - PPE funds
 - COVID-19 stimulus
 - Federal Reserve Lending
- End of 2008-2020 Bull Market



Stimulus Cash

- Based on a study by Betterment, 46% of Americans invested part of their stimulus check
 - 70% invested at least half of their stimulus checks
- The stock market took in more cash in 2021 than the past 20 years combined
 - According to Marketwatch and Bloomberg
- BoA estimates \$1.1 trillion total inflow into equities

Chart 6: Inflow to equities exceeds combined inflow of past 19 years
Rolling 12m flows to equities (\$bn)

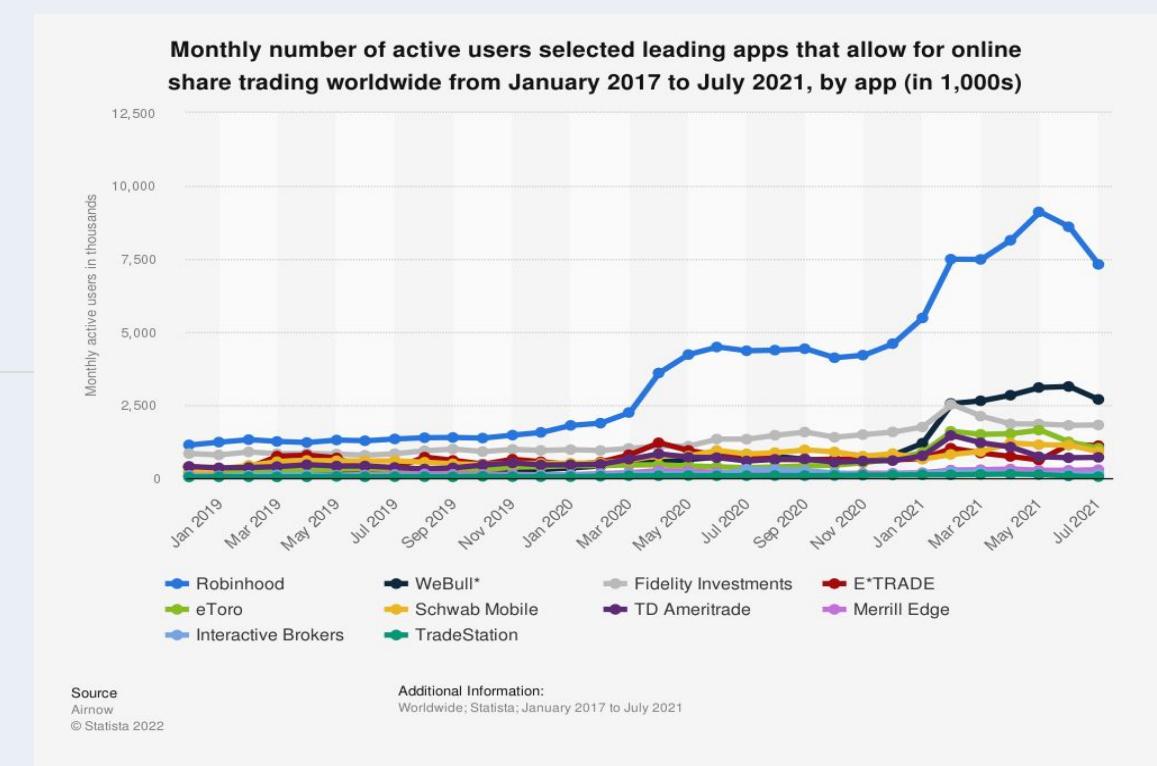


Source: BofA Global Investment Strategy, EPFR

BofA GLOBAL RESEARCH

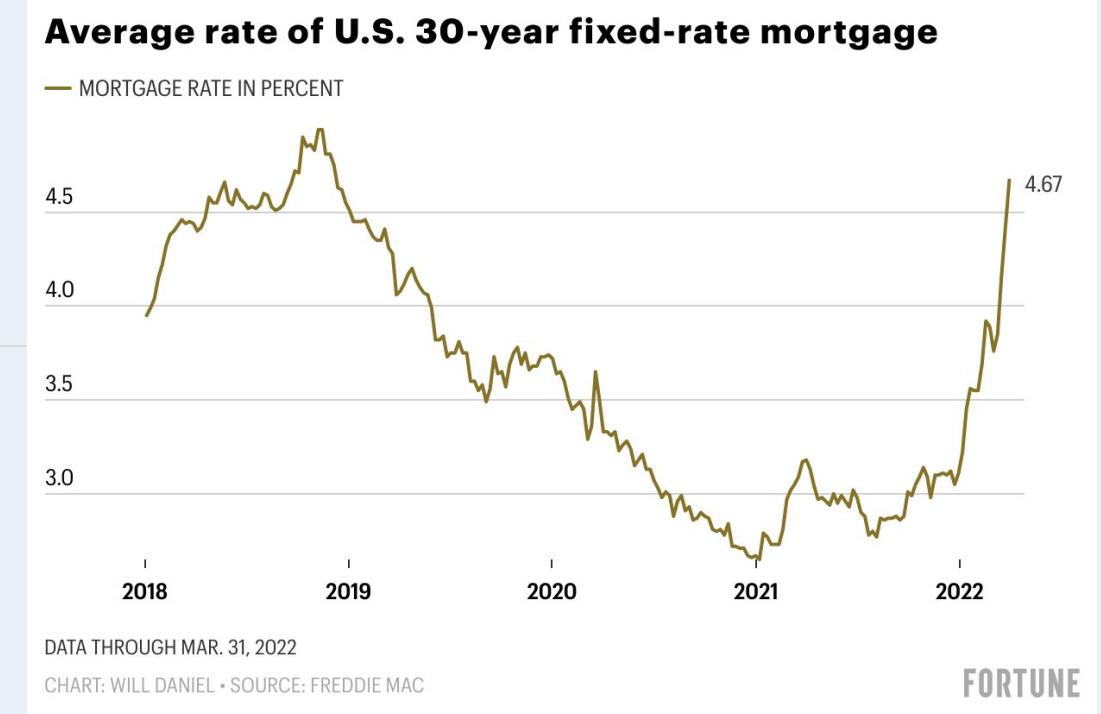
Background - New Players

- The number of online trading investors doubled during 2021
 - Partial stock purchase
 - Commission-free policy
 - No open account deposit
- More individual investors enter the market
- Investors with “gamification” like mindset, lack of sophisticated knowledge
- News plays a more important role in decision making
 - 88% individual investors are making decisions based on what they read online (Maja Pawinska Sims)



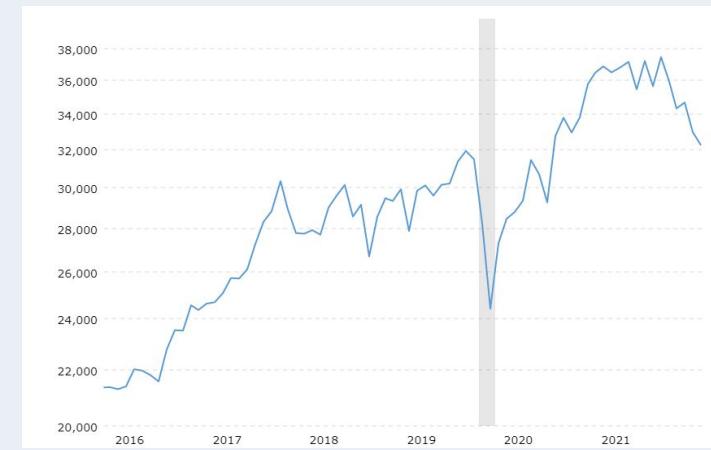
Background - New Cash, More Cash

- Lending rate all history low
 - 2.5% (2021) VS 5.0% (2019)
- Low Rates, high liquidity market allowed for massive inflows of cash
- Lower barrier of entry for trading, stimulus payments, and low-lending rates created the perfect storm



Big Event Analysis- The Inspiration

- “Where is the relationship?
- Unique market conditions peaked our interest
 - All time highs for both S&P and DOW Jones
 - 3,278 (Jan 2020)
 - 2,652 (March 2020)
 - 3,910 (March 2021)
 - 4,573 (Jan 2022)
 - Lending rate fluctuation
 - 3.2% pre-pandemic (Jan 2020)
 - 2.74%(Jan 2021)
 - 4.98% (April 2022)

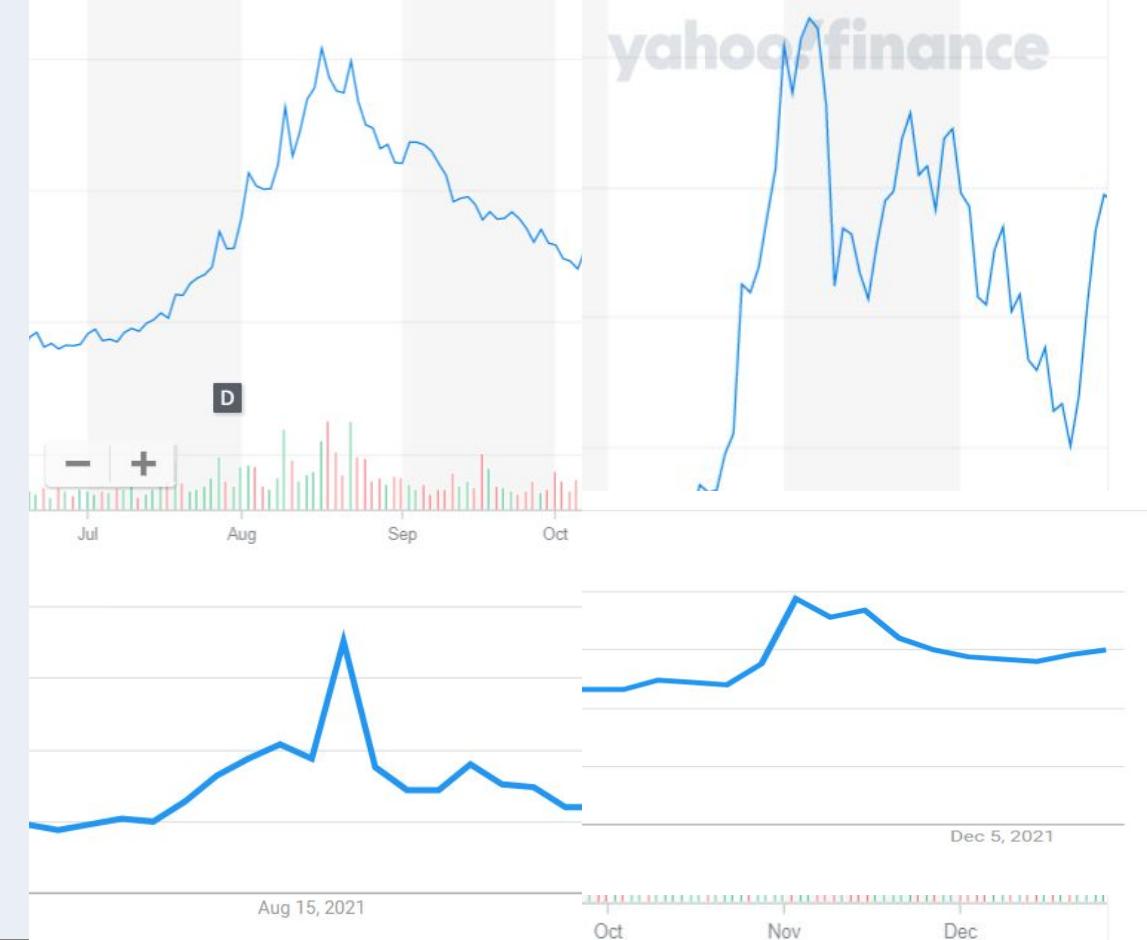


Big Event Analysis- The Inspiration

Stock price & Google tendency

- Pfizer (left graph)
 - mid-August's sharp increase
 - as the tendency people search Pfizer increase, its stock price change
- Tesla (right graph)
 - late-October and early-December's increase
 - as tendency for people to search tesla increase, its price increase too.

Hypothesis: News sentiment change stock behavior





Data Generation

Data Generation through python

```
# Import packages
import yfinance as yf
import pandas as pd
import xlsxwriter

# Read and print the stock tickers that make up S&P500
tickers = pd.read_html(
    'https://en.wikipedia.org/wiki/List_of_S%26P_500_companies')[0]
print(tickers.head())

# Get the data for this tickers from yahoo finance
data = yf.download(tickers.Symbol.to_list(),'2021-1-1','2022-1-1', auto_adjust=True) ['Low']
# Create a Pandas DataFrame out of a Python dictionary
df = pd.DataFrame.from_dict(data)
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df.to_excel("S&P500.xlsx")
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Excel File Generated

Ticker	Data type	1/4/2021	1/5/2021	1/6/2021	1/7/2021	1/8/2021	1/11/2021	1/12/2021
A	open	118.3000904	117.8425663	118.0514356	123.6610908	125.8094708	125.7696748	127.6395718
A	high	119.4438971	119.6726556	123.2134999	126.7941449	126.9532775	128.6441255	127.6992465
A	low	116.4799342	117.4347685	117.5740074	123.4422807	125.1729071	125.5508724	125.5210266
A	close	118.0017014	118.9664841	122.2288284	125.4812546	126.3763962	127.4605331	126.2868881
A	volume	2030700	2344000	2428500	1775900	1577200	1746800	1826400
AAL	open	15.85000038	14.92000008	15.44999981	15.67000008	15.43000031	14.81999969	15.07999992
AAL	high	15.88000011	15.63000011	15.80000019	15.86999989	15.52999973	15.03999996	15.43000031
AAL	low	15.02999973	14.86999989	15.17000008	15.38000011	15	14.71000004	14.88000011
AAL	close	15.13000011	15.43000031	15.52000046	15.38000011	15.13000011	15	15.38000011
AAL	volume	69732500	53368200	63708000	48187900	55656400	40545300	45742400
AAP	open	155.4686568	153.8243952	154.7893268	163.4045803	165.7183981	165.363937	168.2094141
AAP	high	157.112971	155.7049737	164.2217725	166.2008315	168.4358945	171.1730835	175.1803986
AAP	low	153.5585566	152.9480848	154.7892979	162.0655058	165.511625	164.7731698	168.0715704
AAP	close	154.9172974	154.7499084	163.690094	165.0882263	167.4414368	168.3866577	173.949646
AAP	volume	849100	619500	1584000	993200	864500	1186300	1101000
AAPL	open	133.094712	128.4794547	127.3131821	127.9511473	132.0081585	128.7785059	128.0906925
AAPL	high	133.1844217	131.3203829	130.6325771	131.2107359	132.2075336	129.7553801	129.2769045
AAPL	low	126.3562421	128.0209132	125.9774464	127.4527399	129.8151693	128.0907012	126.455917
AAPL	close	128.4534302	130.0416107	125.6642075	129.9522705	131.0739288	128.0266113	127.8479691
AAPL	volume	143301900	97664900	155088000	109578200	105158200	100384500	91951100

Sentiment Data

- Federal Reserve Bank of San-Francisco Daily Sentiment Index(FRBS)
 - Lexical analysis of economics-related news articles
 - *Lexical: the process of converting a sequence of characters (such as in a computer program or web page) into a sequence of tokens (strings with an assigned and thus identified meaning).*
 - Sentiment scores are constructed from for economics-related news articles from 24 major U.S. newspapers compiled by the news aggregator service Factiva
 - Individual article scores are aggregated into a daily time-series measure of news sentiment, relying on a statistical adjustment that accounts for changes over time in the composition of the sample across newspapers. The index is constructed as a trailing weighted-average of time series, with weights that decline geometrically with the length of time since article publication.
 - The data is regularly updated at a weekly frequency.

Sentiment Data

- FRBS Daily Sentiment

The Data tab contains a news sentiment measure from January 1, 1980, to the latest day available.

The units are the day fixed effects from the following regression, indexed by article.

$$s_a^i = f_{t(a)}^i + f_{p(a),j(a)}^i + \varepsilon_a^i$$

Where

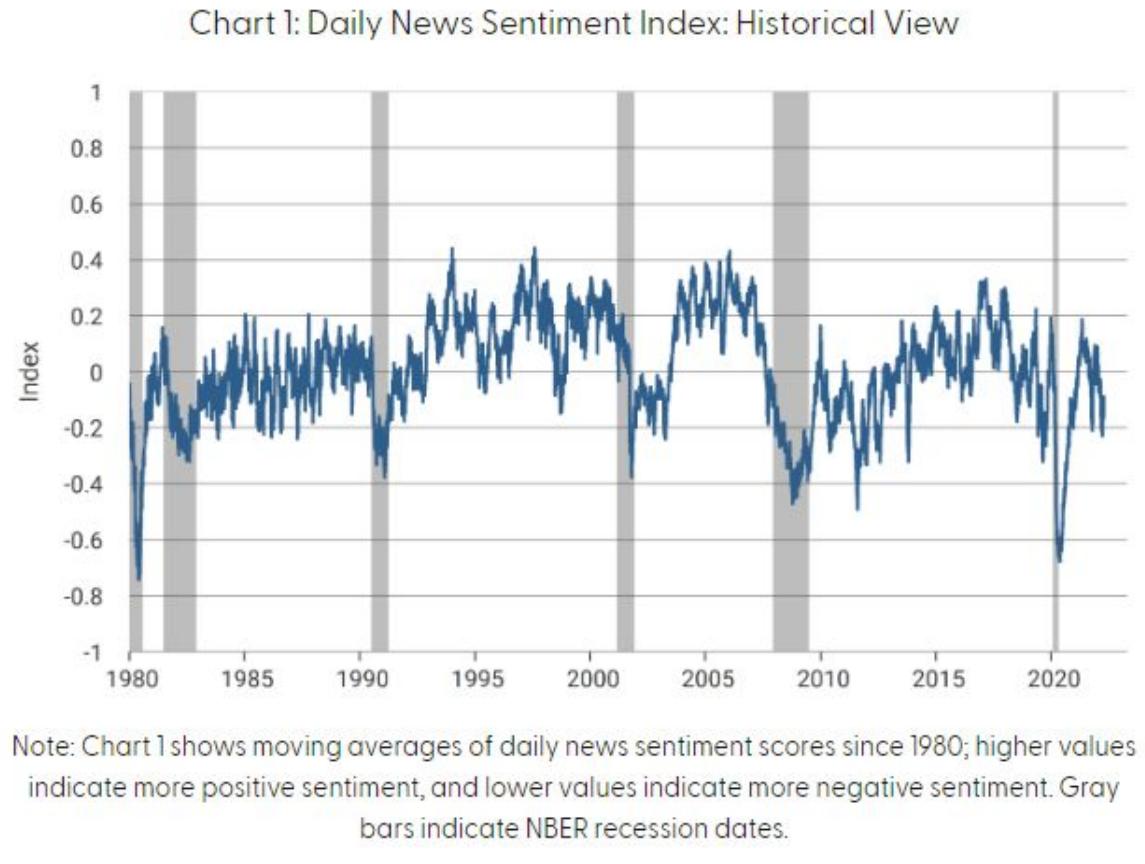
o s_a^i is the positivity score for article

o $f_{t(a)}^i$ is a sample-day (t) fixed effect

o $f_{p(a),j(a)}^i$ is a newspaper*type fixed effect

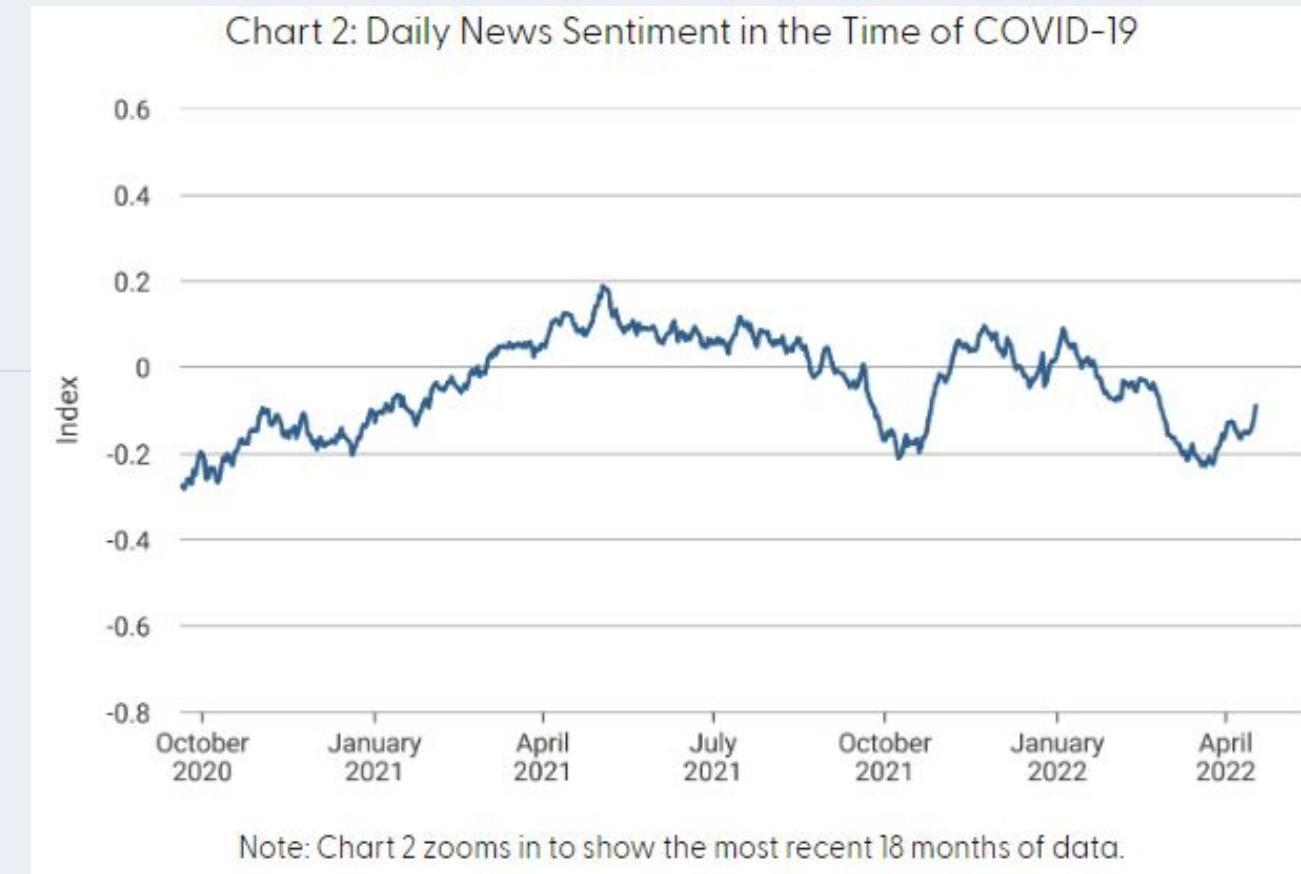
Sentiment Data

- FRBS Daily Sentiment



Sentiment Data

- FRBS Daily Sentiment



Sentiment Data

- FinSentS (Nasdaq) Web News Sentiment
 - Offers daily media sentiment indicators for 49,000+ global equities, calculated by applying sophisticated real-time machine-learning algorithms to the content of thousands of news websites and media sources from around the world
 - Indicators
 - Sentiment Score: a numeric measure of the bullishness / bearishness of news coverage of the stock.
 - Sentiment High / Low: highest and lowest intraday sentiment scores.
 - News Volume: the absolute number of news articles covering the stock.
 - News Buzz: a numeric measure of the change in coverage volume for the stock.

Sentiment Data

- FinSentS (Nasdaq) Web News Sentiment

	ticker	exchange_cd	date	sentiment	sentiment_high	sentiment_low	news_volume	news_buzz	name
1	TWTR	US	2018-06-01	0.858	0.858	-1.5	7	3	TWITTER
2	TWTR	US	2018-06-02	0	0	0	0	2	TWITTER
3	TWTR	US	2018-06-03	1	1	1	2	2	TWITTER
4	TWTR	US	2018-06-04	-2.571	-1	-3.4	7	3	TWITTER
5	TWTR	US	2018-06-05	0.422	4	0.089	57	10	TWITTER
6	TWTR	US	2018-06-06	-2.315	1	-4	19	4	TWITTER
7	TWTR	US	2018-06-07	0.358	2.125	-1.5	14	3	TWITTER
8	TWTR	US	2018-06-08	-1.3	-1.3	-4.5	20	4	TWITTER
9	TWTR	US	2018-06-09	2.715	3	2.5	7	3	TWITTER
10	TWTR	US	2018-06-10	3.6	4	3.6	5	4	TWITTER
11	TWTR	US	2018-06-11	1	3	-1	8	4	TWITTER
12	TWTR	US	2018-06-12	2.292	2.292	-4.666	24	10	TWITTER
13	TWTR	US	2018-06-13	2.362	4	0.572	36	10	TWITTER
14	TWTR	US	2018-06-14	1.697	2.625	-3	33	10	TWITTER
15	TWTR	US	2018-06-15	1.167	3	1	12	4	TWITTER
16	TWTR	US	2018-06-16	-3	-3	-4	3	3	TWITTER
17	TWTR	US	2018-06-17	1.834	2.334	1	6	4	TWITTER

Sentiment Data

- US Index of Consumer Sentiment
 - Measures monthly
 - Tracks consumer sentiment in the US, based on surveys on random samples of US households.
 - The index aids in measuring consumer sentiments in personal finances, business conditions, among other topics.
 - Historically, the index displays pessimism in consumers' confidence during recessionary periods, and increased consumer confidence in expansionary periods.

Sentiment Data

- US Index of Consumer Sentiment

Datemy	MONTHLY DATA	THREE MONTH MOVING AVERAGE
	ICS_ALL_M	ICS_ALL
1/1/2012	75	69.5
2/1/2012	75.3	73.4
3/1/2012	76.2	75.5
4/1/2012	76.4	76
5/1/2012	79.3	77.3
6/1/2012	73.2	76.3
7/1/2012	72.3	74.9
8/1/2012	74.3	73.3
9/1/2012	78.3	75
10/1/2012	82.6	78.4
11/1/2012	82.7	81.2
12/1/2012	72.9	79.4
1/1/2013	73.8	76.5
2/1/2013	77.6	74.8
3/1/2013	78.6	76.7
4/1/2013	76.4	77.5
5/1/2013	84.5	79.8
6/1/2013	84.1	81.7
7/1/2013	85.1	84.6

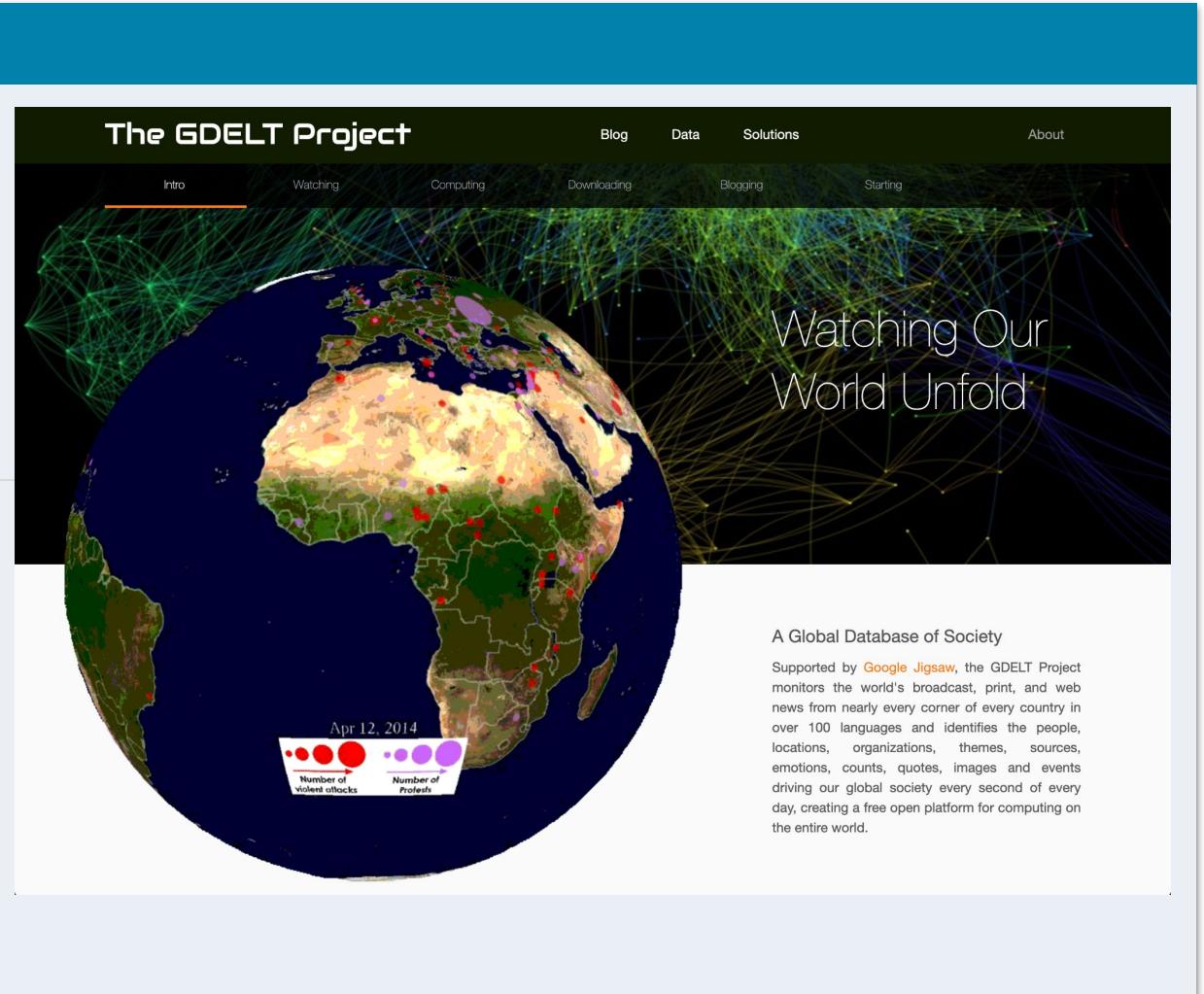
Sentiment Data

- Comparison

Sentiment Data Sources	FRBS	Nasdaq Web News Sentiment	US Index of Consumer Sentiment
Findings	<ul style="list-style-type: none">- Simple to use- Already included a sentiment score	<ul style="list-style-type: none">- Calculate Based on specific company and news sources	<ul style="list-style-type: none">- Monthly Data instead of Daily Data- The source is the survey of US households

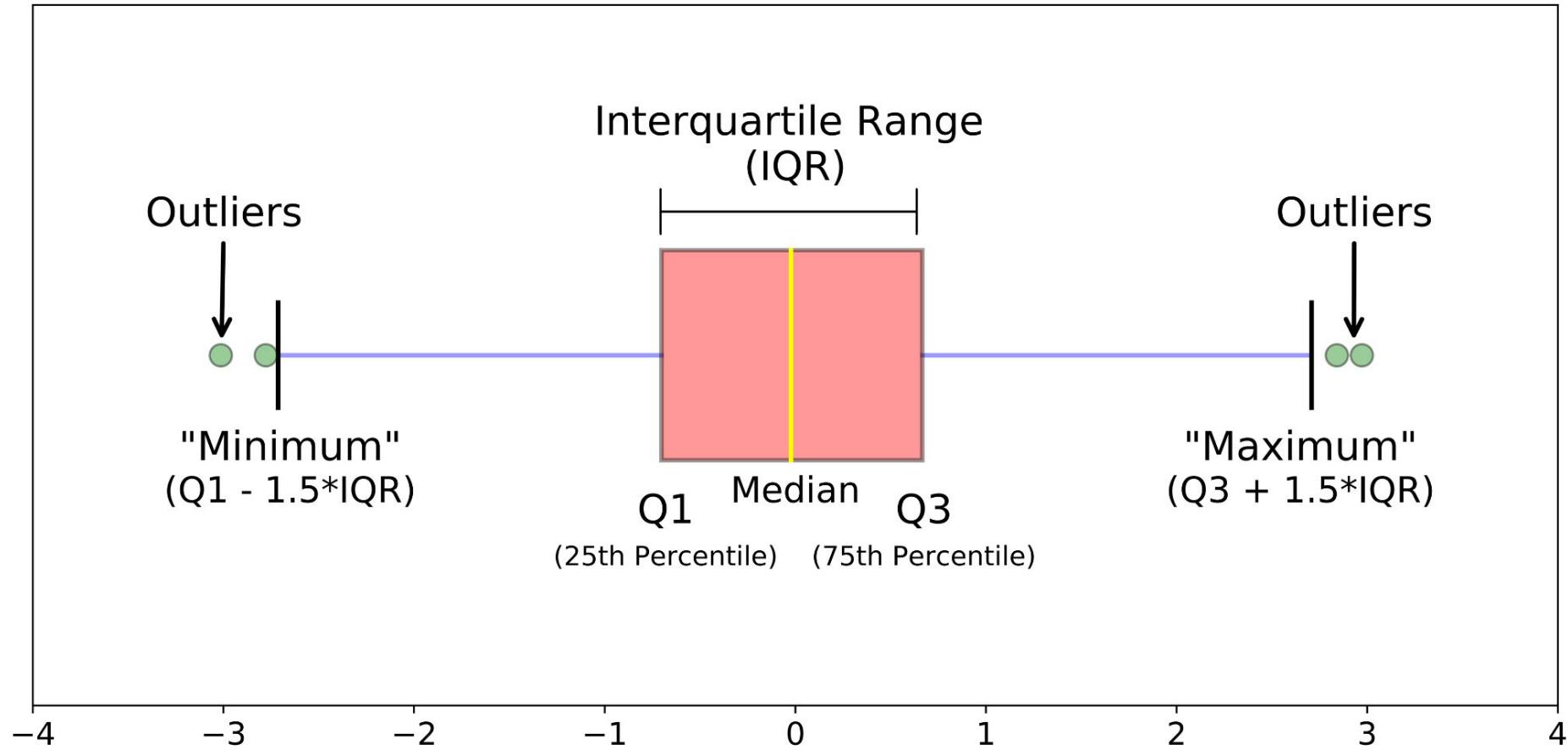
GDELT

- GDEL Global Knowledge Graph (GKG)
 - GKG tracks data points that have nearly perfect compatibility with the goal of our project
 - GDEL monitors the world's news to quantify and codify events, allowing the platform to generate a real-time global news graph.
 - Downloadable files are too large for our machines to handle
 - Complex compatibility with Google BigQuery



Outlier Computation

Outliers Assumptions



Drafting Output File (first look)

Ticker	price % change IQR	1.5 x IQR(\$)	3 x IQR(\$)	volume % change IQR	1.5 x IQR(vol)	3 x IQR(vol)
A	1.33%	1.99%	3.99%	42.61%	63.91%	127.83%
AAL	3.08%	4.62%	9.24%	45.67%	68.51%	137.01%
AAP	1.99%	2.99%	5.98%	43.77%	65.65%	131.31%
AAPL	1.59%	2.38%	4.77%	28.71%	43.06%	86.12%
ABBV	1.29%	1.94%	3.87%	45.32%	67.98%	135.96%
ABC	1.41%	2.11%	4.23%	44.01%	66.01%	132.03%
ABMD	2.24%	3.35%	6.71%	54.86%	82.29%	164.57%
ABT	1.30%	1.95%	3.90%	43.01%	64.51%	129.02%
ACN	1.06%	1.59%	3.18%	38.57%	57.85%	115.71%
ADBE	1.74%	2.61%	5.22%	37.51%	56.27%	112.54%
ADI	1.80%	2.70%	5.40%	42.73%	64.10%	128.20%

Example using AAPL

- Raw file

Ticker	Data type	1/4/2021	1/5/2021	1/6/2021	1/7/2021	1/8/2021	1/11/2021	1/12/2021	1/13/2021	1/14/2021
AAPL	open	133.094712	128.4794547	127.3131821	127.9511473	132.0081585	128.7785059	128.0906925	128.3498632	130.3833843
AAPL	high	133.1844217	131.3203829	130.6325771	131.2107359	132.2075336	129.7553801	129.2769045	131.0312973	130.5827443
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AAPL	volume	143301900	97664900	155088000	109578200	105158200	100384500	91951100	88636800	90221800

Example using AAPL

- Calculating Price Percentage Change = (Close - Open) / Open

Ticker	1/4	1/5	1/6	1/7	1/8	1/11	1/12	1/13	1/14	1/15
AAPL	-3.49%	1.22%	-1.30%	1.56%	-0.71%	-0.58%	-0.19%	1.23%	-1.86%	-1.69%

- Interquartile Range ($Q_3 - Q_1$)

Ticker	Q1 IQR	Q2 IQR	Q3 IQR	Q4 IQR	Q1 1.5*IQR	Q2 1.5*IQR	Q3 1.5*IQR	Q4 1.5*IQR	Q1 Mean	Q2 Mean	Q3 Mean	Q4 Mean
AAPL	1.91%	1.74%	1.39%	1.52%	2.87%	2.60%	2.09%	2.28%	-0.61%	-0.31%	-0.27%	0.17%

*When Calculating IQRs and Means, we use quarterly data in 2021

Quarterly Interquartile Ranges, Outlier Definition, and Means

`=QUARTILE.INC('Q1'!B2:BJ2,3)-QUARTILE.INC('Q1'!B2:BJ2,1))`

1	Ticker	Q1 IQR	Q2 IQR	Q3 IQR	Q4 IQR	Q1 1.5*IQR	Q2 1.5*IQR	Q3 1.5*IQR	Q4 1.5*IQR	Q1 Mean	Q2 Mean	Q3 Mean	Q4 Mean
2	A	1.80%	1.15%	0.85%	1.42%	2.70%	1.73%	1.27%	2.13%	-0.09%	0.09%	0.04%	-0.11%
3	AAL	3.64%	2.14%	2.89%	2.64%	5.46%	3.20%	4.34%	3.96%	-0.02%	-0.23%	0.02%	-0.22%
4	AAP	2.84%	1.61%	1.76%	1.83%	4.26%	2.42%	2.64%	2.75%	0.21%	-0.06%	0.00%	0.10%
5	AAPL	1.91%	1.74%	1.39%	1.52%	2.87%	2.60%	2.09%	2.28%	-0.61%	-0.31%	-0.27%	0.17%
6	ABBV	1.53%	1.12%	1.05%	1.30%	2.30%	1.68%	1.57%	1.95%	0.11%	0.03%	-0.06%	0.25%
7	ABC	2.08%	1.43%	1.07%	1.21%	3.12%	2.14%	1.60%	1.81%	0.25%	-0.05%	-0.01%	0.08%
8	ABMD	2.08%	2.28%	1.62%	2.89%	3.12%	3.42%	2.43%	4.34%	0.12%	-0.09%	0.03%	0.07%
9	ABT	1.32%	1.25%	1.00%	1.52%	1.98%	1.88%	1.50%	2.28%	0.12%	0.04%	0.04%	0.05%
10	ACN	1.27%	0.72%	1.07%	1.38%	1.91%	1.07%	1.61%	2.07%	0.05%	-0.08%	0.06%	0.12%
11	ADBE	1.73%	1.92%	1.26%	2.06%	2.60%	2.87%	1.88%	3.08%	-0.14%	0.15%	-0.02%	-0.07%
12	ADI	2.35%	1.34%	1.45%	1.54%	3.53%	2.01%	2.18%	2.31%	-1.29%	-1.18%	-1.14%	-0.79%
13	ADM	1.55%	1.24%	1.55%	1.49%	2.33%	1.85%	2.33%	2.24%	0.10%	-0.06%	-0.06%	0.05%
14	ADP	1.87%	1.16%	1.16%	1.31%	2.81%	1.73%	1.74%	1.97%	1.12%	0.97%	0.81%	0.57%
15	ADSK	2.53%	2.02%	1.81%	2.03%	3.80%	3.03%	2.71%	3.05%	-0.15%	0.05%	-0.01%	0.01%
16	AEE	1.87%	1.21%	1.37%	1.11%	2.81%	1.82%	2.06%	1.67%	0.09%	-0.05%	0.02%	0.08%
17	AEP	1.59%	1.01%	1.06%	1.20%	2.39%	1.52%	1.59%	1.80%	0.05%	-0.04%	-0.10%	0.03%
18	AES	2.63%	1.88%	1.54%	1.68%	3.95%	2.82%	2.30%	2.52%	0.16%	-0.09%	-0.30%	0.01%
19	AFL	1.65%	1.02%	1.35%	1.22%	2.48%	1.52%	2.02%	1.82%	0.12%	0.01%	-0.13%	0.09%
20	AIZ	1.73%	1.23%	1.30%	1.15%	2.60%	1.84%	1.95%	1.73%	0.01%	0.09%	-0.01%	-0.13%
21	AJG	1.39%	1.28%	1.07%	1.42%	2.09%	1.91%	1.60%	2.13%	0.10%	0.08%	0.04%	0.07%
22	AKAM	2.11%	1.22%	1.09%	1.42%	3.17%	1.83%	1.63%	2.13%	-0.14%	0.19%	-0.12%	0.08%
23	ALB	3.67%	2.34%	2.78%	2.92%	5.51%	3.50%	4.17%	4.38%	-0.24%	0.12%	0.27%	-0.02%
24	ALGN	3.30%	2.26%	2.13%	2.45%	4.95%	3.39%	3.19%	3.67%	-0.27%	0.03%	0.04%	-0.20%
25	ALK	3.91%	1.88%	2.90%	1.80%	5.87%	2.81%	4.35%	2.70%	0.22%	-0.33%	0.01%	-0.24%

Positive & Negative Price Outliers (Quarterly)

	A	N	O	P	Q	R	S	T	U
1	Ticker	Q1 Neg Out	Q2 Neg Out	Q3 Neg Out	Q4 Neg Out	Q1 Pos Out	Q2 Pos Out	Q3 Pos Out	Q4 Pos Out
2	A	-2.79%	-1.63%	-1.23%	-2.24%	2.61%	1.82%	1.31%	2.02%
3	AAL	-5.48%	-3.43%	-4.32%	-4.18%	5.44%	2.97%	4.35%	3.75%
4	AAP	-4.05%	-2.48%	-2.64%	-2.65%	4.47%	2.35%	2.64%	2.84%
5	AAPL	-3.48%	-2.92%	-2.36%	-2.11%	2.26%	2.29%	1.82%	2.46%
6	ABBV	-2.19%	-1.65%	-1.63%	-1.70%	2.40%	1.71%	1.51%	2.20%
7	ABC	-2.87%	-2.19%	-1.61%	-1.73%	3.37%	2.09%	1.59%	1.90%
8	ABMD	-3.00%	-3.51%	-2.41%	-4.26%	3.24%	3.33%	2.46%	4.41%
9	ABT	-1.86%	-1.84%	-1.45%	-2.23%	2.10%	1.91%	1.54%	2.33%
10	ACN	-1.85%	-1.15%	-1.55%	-1.94%	1.96%	0.99%	1.66%	2.19%
11	ADBE	-2.74%	-2.73%	-1.90%	-3.15%	2.45%	3.02%	1.86%	3.02%
12	ADI	-4.81%	-3.19%	-3.32%	-3.10%	2.24%	0.83%	1.03%	1.52%
13	ADM	-2.22%	-1.91%	-2.39%	-2.18%	2.43%	1.79%	2.27%	2.29%
14	ADP	-1.69%	-0.76%	-0.93%	-1.40%	3.92%	2.71%	2.56%	2.53%
15	ADSK	-3.95%	-2.98%	-2.72%	-3.04%	3.64%	3.08%	2.70%	3.05%
16	AEE	-2.72%	-1.86%	-2.03%	-1.59%	2.89%	1.77%	2.08%	1.75%
17	AEP	-2.34%	-1.56%	-1.69%	-1.78%	2.43%	1.47%	1.50%	1.83%
18	AES	-3.79%	-2.91%	-2.60%	-2.51%	4.10%	2.73%	2.01%	2.53%
19	AFL	-2.36%	-1.51%	-2.15%	-1.74%	2.59%	1.54%	1.89%	1.91%
20	AIIZ	-2.58%	-1.75%	-1.96%	-1.86%	2.61%	1.92%	1.94%	1.60%

Positive outlier:

Stock's quarter's **mean plus**

[1.5 times ($Q_3 - Q_1$)]

Negative outlier:

Stock's quarter's **mean minus**

[1.5 times ($Q_3 - Q_1$)]

Sectors Classification

The 11 GICS stock market sectors



Energy



Materials



Industrials



Utilities



Healthcare



Financials



Consumer
Discretionary



Consumer
Staples



Information
Technology



Communication
Services



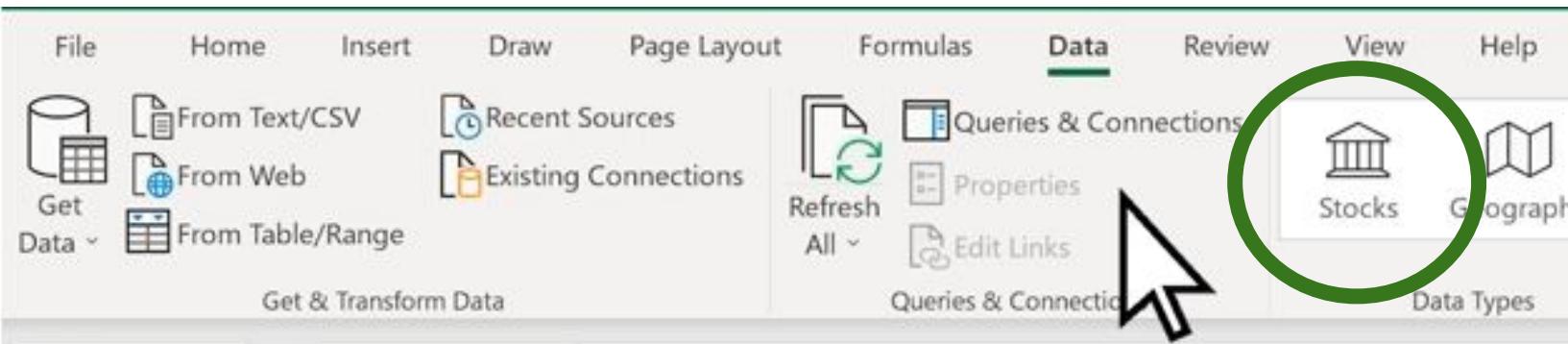
Real Estate



Sectors Classification

Sector (GICS)	Sub-Industries	SUM of Count of Sub				
Information Technology	Software & IT Services	41	Real Estate	Residential & Commercial REIT	27	
	Semiconductors & Semiconductor Equipment	16	Real Estate Total	Real Estate Operations	1	
	Computers, Phones & Household Electronics	6		Real Estate Total	28	
	Electronic Equipment & Parts	5	Utilities	Electrical Utilities & IPPs	17	
Information Technology Total		68		Multiline Utilities	6	
Industrials	Machinery, Equipment & Components	26		Renewable Energy	2	
	Professional & Commercial Services	14	Utilities Total	Natural Gas Utilities	1	
	Aerospace & Defense	10		Utilities Total	26	
	Freight & Logistics Services	9	Materials	Chemicals	13	
	Passenger Transportation Services	5		Containers & Packaging	6	
	Construction & Engineering	2		Metals & Mining	3	
	Office Equipment	1		Construction Materials	2	
Industrials Total		67	Materials Total		24	
Consumer Discretionary	Hotels & Entertainment Services	18	Communication Service	Media & Publishing	12	
	Specialty Retailers	13		Telecommunications Services	5	
	Automobiles & Auto Parts	8		Communications & Networking	5	
	Textiles & Apparel	6	Communication Service Total		22	
	Homebuilding & Construction Supplies	5	Energy	Oil & Gas	14	
	Diversified Retail	4		Oil & Gas Related Equipment and Services	6	
	Consumer Goods Conglomerates	3	Energy Total		20	
	Leisure Products	3		Grand Total	466	
Consumer Discretionary Total		63				
Health Care	Healthcare Equipment & Supplies	29				
	Healthcare Providers & Services	12				
	Pharmaceuticals	10				
	Biotechnology & Medical Research	6				
Health Care Total		57				
Financials	Banking Services	22				
	Insurance	18				
	Investment Banking & Investment Services	15				
	Financial Technology (Fintech) & Infrastructure	1				
Financials Total		56				
Consumer Staples	Food & Tobacco	16				
	Food & Drug Retailing	6				
	Personal & Household Products & Services	5				
	Beverages	5				
	Household Goods	3				
Consumer Staples Total		35				

Getting Industry & Sector Info



The Global Industry Classification Standard (GICS®)

Explore the GICS structure by clicking below on the Interactive tool:



Select Stocks



TFC	Banking Services	Financials
USB	Banking Services	Financials
WFC	Banking Services	Financials
ZION	Banking Services	Financials
INTU	Financial Technology (Fintech) & Ir	Financials
AFL	Insurance	Financials
AIZ	Insurance	Financials
AJG	Insurance	Financials
ALL	Insurance	Financials

- 40101010 Diversified Banks
- 40101015 Regional Banks
- 401020 Thrifts & Mortgage Finance**
- 40102010 Thrifts & Mortgage Finance
- 4020 Diversified Financials**
- 402010 Diversified Financial Services**
- 40201020 Other Diversified Financial Services
- 40201030 Multi-Sector Holdings
- 40201040 Specialized Finance
- 402020 Consumer Finance**
- 40202010 Consumer Finance
- 402030 Capital Markets**
- 40203010 Asset Management & Custody Banks
- 40203020 Investment Banking & Brokerage
- 40203030 Diversified Capital Markets
- 40203040 Financial Exchanges & Data
- 402040 Mortgage Real Estate Investment Trusts (REITs)**
- 40204010 Mortgage REITs
- 4030 Insurance**
- 403010 Insurance**
- 40301010 Insurance Brokers
- 40301020 Life & Health Insurance
- 40301030 Multi-line Insurance
- 40301040 Property & Casualty Insurance
- 40301050 Reinsurance

Outlier Visualization

AR154 | fx | =ARRAY_CONSTRAIN(ARRAYFORMULA(IF(S('Q2'!AN121>='1.5xIQR'!\$S121,"1.5xIQR", 'Q2'!AN121<='1.5xIQR'!\$O121,"-1.5xIQR"))), 1, 1)

	A	B	C	D	E	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AI	AJ	AK		
▲ 1	Ticker	Full Name	Industry	Sector	Dumm	4/28	4/29	4/30	5/3	5/4	5/5	5/6	5/7	5/10	5/11	5/12	5/13	5/14	5/17	
129	CTRA	Coterra Energy Inc. (XNYS:COTR)	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
130	CVX	CHEVRON CORPORATION	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
131	DVN	DEVON ENERGY CORPORA	Oil & Gas	Energy	0	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
132	EOG	EOG RESOURCES, INC. (XN	Oil & Gas	Energy	0	1.5xIQR	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A		
133	FANG	DIAMONDBACK ENERGY, II	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
134	HES	HESS CORPORATION (XNY	Oil & Gas	Energy	0	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
135	MPC	MARATHON PETROLEUM	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
136	MRO	MARATHON OIL CORPORA	Oil & Gas	Energy	0	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
137	OXY	Occidental Petroleum	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
138	PSX	PHILLIPS 66 (XNYS:PSX)	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
139	PXD	PIONEER NATURAL RESOU	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
140	VLO	VALERO ENERGY CORPORAT	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
141	XOM	EXXON MOBIL CORPORAT	Oil & Gas	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
142	BKR	BAKER HUGHES COMPAN	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	1.5xIQR	#N/A	-1.5xIQR	#N/A	#N/A	1.5xIQR	#N/A		
143	HAL	HALLIBURTON COMPANY	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
144	KMI	KINDER MORGAN, INC. (X	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A		
145	OKE	ONEOK, INC. (XNYS:OKE)	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
146	SLB	Schlumberger N.V. (XNYS:	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
147	WMB	THE WILLIAMS COMPANIE	Oil & Gas Related Equipment a	Energy	0	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
148	AXP	AMERICAN EXPRESS COM	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	-1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	
149	BAC	BANK OF AMERICA CORP	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	
150	C	CITIGROUP INC. (XNYS:C)	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
151	CFG	CITIZENS FINANCIAL GROU	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	
152	CMA	COMERICA INCORPORATE	Banking Services	Financials	1	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	
153	COF	CAPITAL ONE FINANCIAL C	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	
154	DFS	DISCOVER FINANCIAL SERV	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
155	FITB	FIFTH THIRD BANCORP (X	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	#N/A	
156	FRC	FIRST REPUBLIC BANK (XN	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	
157	HBAN	HUNTINGTON BANCSHARE	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	
158	JPM	JPMORGAN CHASE & CO.	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
159	KEY	KEYCORP (XNYS:KEY)	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	#N/A	
160	MTB	M&T BANK CORPORATION	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	#N/A	
161	PNC	THE PNC FINANCIAL SERV	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	
162	RF	REGIONS FINANCIAL CORP	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A
163	SBNY	Signature Bank (XNAS:SBN	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
164	SIVB	SVB FINANCIAL GROUP (X	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A
165	SYF	SYNCHRONY FINANCIAL (X	Banking Services	Financials	1	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
166	TFC	Truist Financial Corporati	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
167	USB	U.S. BANCORP (XNYS:USB)	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A	
168	WFC	WELLS FARGO & COMPAN	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	#N/A	#N/A	-1.5xIQR	1.5xIQR	#N/A	#N/A
169	ZION	ZIONS BANCORPORATION	Banking Services	Financials	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.5xIQR	#N/A	#N/A	#N/A	1.5xIQR	#N/A	1.5xIQR	#N/A	#N/A



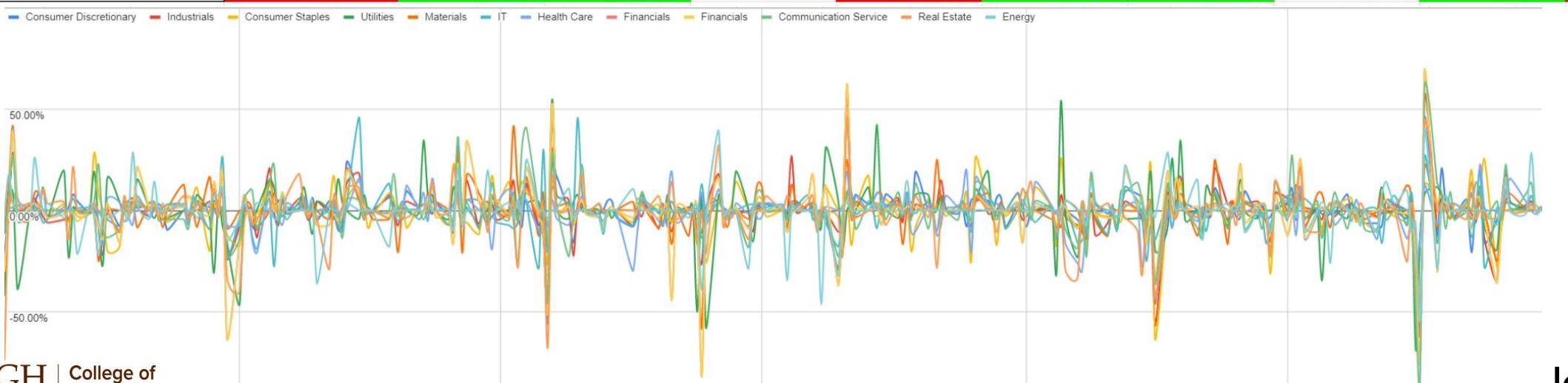
↓

Percentage of Outliers in a range

fx | =COUNTIF('OUTLIERS'!F25:F87,"1.5xIQR")/(COUNTIF('OUTLIERS'!F25:F87,"1.5xIQR")+COUNTIF('OUTLIERS'!F25:F87,"#N/A"))

On a given day within a sector, the percentage of stocks that have positive outliers **minus** the percentage of stocks that have negative outliers

Combined Outliers Percentage	1/4	1/5	1/6	1/7	1/8	1/11	1/12	1/13	1/14	1/15
Consumer Discretionary	-22.22%	1.59%	28.57%	0.00%	-1.59%	3.17%	7.94%	0.00%	-3.17%	0.00%
Industrials	-34.33%	0.00%	28.18%	1.49%	2.99%	5.97%	1.49%	-2.99%	-5.97%	-4.48%
Consumer Staples	-11.43%	0.00%	8.54%	2.85%	2.86%	-2.84%	2.86%	0.00%	-2.86%	2.86%
Utilities	-42.31%	0.00%	7.69%	-38.46%	0.00%	0.00%	-3.85%	11.54%	-3.85%	19.00%
Materials	-8.33%	12.50%	41.67%	0.00%	-4.35%	8.33%	8.33%	0.00%	0.00%	0.00%
Information Technology	-11.76%	0.00%	1.47%	2.94%	-2.94%	1.47%	0.00%	-5.88%	-4.41%	0.00%
Health Care	-1.75%	1.75%	40.35%	7.02%	1.75%	3.51%	-3.51%	10.50%	-3.51%	1.75%
Financials	-30.36%	1.79%	39.29%	0.00%	1.79%	3.57%	1.79%	0.00%	-3.57%	-1.79%
Communication Service	-9.09%	4.55%	27.27%	-4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Real Estate	-75.00%	0.00%	3.57%	0.00%	3.57%	-3.57%	0.00%	10.71%	3.57%	3.57%
Energy	-3.57%	17.86%	3.57%	0.00%	-3.70%	25.93%	10.71%	0.00%	3.57%	-3.70%



Dates with most outliers

=I3*(68/466)+E3*(67/466)+D3*(63/466)+J3*(57/466)+K3*(56/466)+F3*(35/466)+M3*(28/466)+G3*(26/466)+H3*(24/466)+L3*(22/466)+N3*(20/466)

average outlier:	-0.03%	-0.31%	0.15%	-0.48%	0.12%	-0.55%	-0.30%	-0.65%	0.11%	-0.97%	-0.05%	TOTAL outlier	Date
Date	Consumer C	Industrials	Consumer S	Utilities	Materials	IT	Health Care	Financials	Communications	Real Estate	Energy		Date
12/2/2021	44.44%	55.22%	11.43%	7.69%	20.83%	26.32%	12.28%	67.86%	59.09%	42.86%	39.29%	36.86%	12/2/2021
7/20/2021	44.44%	58.21%	8.29%	0.00%	25.00%	7.34%	19.21%	62.50%	9.02%	46.43%	3.57%	30.59%	7/20/2021
5/12/2021	20.63%	44.78%	54.29%	53.85%	29.17%	10.27%	5.23%	51.79%	27.27%	14.29%	0.00%	28.32%	5/12/2021
1/6/2021	28.57%	28.18%	8.54%	7.69%	41.67%	1.47%	40.35%	39.29%	27.27%	3.57%	3.57%	22.66%	1/6/2021
4/20/2021	31.75%	26.87%	8.57%	3.83%	29.17%	14.66%	8.77%	23.21%	36.36%	3.57%	21.43%	19.37%	4/20/2021
3/26/2021	4.76%	17.91%	14.29%	-3.85%	4.17%	45.59%	15.79%	7.14%	4.47%	10.71%	0.00%	14.59%	3/26/2021
5/6/2021	12.70%	13.43%	8.57%	3.85%	16.67%	4.41%	5.26%	21.43%	40.91%	10.71%	25.00%	12.87%	5/6/2021
12/21/2021	20.63%	17.91%	0.00%	3.85%	4.17%	10.29%	8.73%	16.07%	22.73%	14.17%	14.81%	12.86%	12/21/2021
6/18/2021	4.76%	17.91%	5.71%	7.69%	4.17%	4.41%	10.53%	16.07%	4.55%	32.14%	39.29%	11.99%	6/18/2021
2/24/2021	7.92%	19.40%	0.00%	-7.69%	16.67%	26.32%	1.75%	17.86%	0.00%	10.71%	10.71%	11.59%	2/24/2021
11/3/2021	9.52%	5.94%	25.71%	3.85%	8.33%	2.94%	11.97%	24.83%	4.55%	21.16%	3.70%	11.24%	11/3/2021
3/25/2021	23.81%	13.43%	5.71%	0.00%	20.83%	2.94%	0.00%	19.55%	4.55%	10.71%	3.57%	10.44%	3/25/2021

Date	Consumer C	Industrials	Consumer S	Utilities	Materials	IT	Health Care	Financials	Communications	Real Estate	Energy		Date
12/1/2021	-60.32%	-71.64%	-40.00%	-11.54%	-58.33%	-45.59%	-12.24%	-73.21%	-81.82%	-53.57%	-53.57%	-51.44%	12/1/2021
9/30/2021	-42.86%	-56.72%	-62.86%	-19.23%	-45.83%	-14.71%	-43.86%	-33.93%	-36.36%	-42.86%	-3.57%	-38.14%	9/30/2021
5/11/2021	-55.56%	-47.76%	-22.86%	-50.00%	-45.83%	-20.50%	-6.99%	-50.00%	-45.45%	-67.86%	-3.57%	-37.48%	5/11/2021
11/30/2021	-15.87%	-41.79%	-54.29%	-69.23%	-45.83%	-19.04%	-28.07%	-25.00%	-50.00%	-14.29%	-7.14%	-31.20%	11/30/2021
2/25/2021	-23.81%	-20.90%	-11.43%	-15.38%	-8.33%	-20.59%	-7.02%	-62.50%	-22.73%	-32.14%	-14.29%	-23.36%	2/25/2021
1/4/2021	-22.22%	-34.33%	-11.43%	-42.31%	-8.33%	-11.76%	-1.75%	-30.36%	-9.09%	-75.00%	-3.57%	-22.26%	1/4/2021
6/16/2021	-11.09%	-26.51%	0.00%	7.69%	-58.33%	13.10%	8.75%	-82.14%	-13.64%	0.00%	-39.29%	-17.10%	6/16/2021
7/16/2021	-28.57%	-10.43%	0.00%	3.85%	-29.17%	-17.65%	0.00%	-37.06%	-22.73%	-3.57%	-32.14%	-16.34%	7/16/2021
12/17/2021	-4.65%	-34.33%	-28.19%	-19.23%	-25.00%	1.47%	0.00%	-35.71%	4.52%	-3.57%	-7.14%	-14.43%	12/17/2021
10/27/2021	-3.16%	-14.93%	-31.43%	0.00%	-20.53%	-7.31%	-10.53%	-23.21%	-22.32%	-21.43%	-10.71%	-13.94%	10/27/2021
9/10/2021	-4.76%	-7.46%	-8.57%	-23.08%	0.00%	-16.18%	-26.32%	-8.93%	-18.18%	-32.14%	0.00%	-13.09%	9/10/2021
9/28/2021	-12.70%	-10.45%	-11.43%	-3.85%	-8.28%	-25.00%	-14.04%	-16.07%	-9.09%	0.00%	-3.57%	-12.60%	9/28/2021
1/27/2021	-22.11%	-13.30%	0.00%	-26.92%	-8.33%	-4.38%	-17.47%	-14.24%	-9.02%	0.00%	0.00%	-11.74%	1/27/2021
2/26/2021	-3.17%	-7.46%	-17.14%	-46.15%	0.00%	-4.41%	-7.02%	-14.29%	-13.64%	-39.29%	-3.57%	-11.74%	2/26/2021
9/14/2021	-3.17%	-13.43%	-11.43%	-11.54%	-16.67%	-10.29%	-3.50%	-19.64%	-22.73%	-3.57%	-7.14%	-10.61%	9/14/2021
9/7/2021	-7.92%	-14.93%	-17.14%	-30.77%	0.00%	-13.24%	-1.75%	-7.14%	-9.09%	-10.71%	0.00%	-10.30%	9/7/2021
3/4/2021	-9.52%	-13.43%	-5.71%	0.00%	-8.33%	-19.12%	-21.05%	-1.79%	-9.09%	-3.57%	3.70%	-10.14%	3/4/2021
12/3/2021	-12.66%	-8.92%	2.85%	11.45%	-8.33%	-16.18%	-7.01%	-30.36%	13.49%	0.00%	-28.57%	-10.02%	12/3/2021

Correlation

=CORREL(CombinedOutliersbySector!D3:D254 , CombinedOutliersbySector!E3:E254)

	Consumer Discretionary	Industrials	onsumer Staple	Utilities	Materials	IT	Health Care	Financials	Communication Ser	Real Estate
Consumer Discretionary										
Industrials	82.53%									
Consumer Staples	42.08%	58.59%								
Utilities	31.30%	42.61%	55.57%							
Materials	67.01%	76.45%	46.41%	29.44%						
IT	54.61%	54.62%	29.18%	17.05%	34.76%					
Health Care	41.42%	46.33%	46.67%	29.28%	33.66%	37.63%				
Financials	74.71%	80.38%	46.60%	30.77%	72.79%	41.63%	32.22%			
Communication Service	68.87%	68.24%	56.33%	36.38%	59.08%	43.44%	38.36%	63.88%		
Real Estate	56.40%	62.70%	48.31%	46.71%	38.45%	39.97%	41.38%	54.34%	55.62%	
Energy	44.60%	42.71%	17.38%	6.20%	46.40%	27.64%	12.24%	55.54%	43.24%	25.06%

AVERAGE Correlation among all sectors: 46.72% (2021)

Results and Explanation

Results - Description

- Correlation by sector between price outliers and FRBS sentiment scores
- **First two columns:** correlation between daily stock price outliers for a given sector and the FRBS Daily Sentiment Score
- **Third and fourth column:** correlation between daily stock price outliers and the day to day change in FRBS Daily Sentiment Score (e.g. Day 2 minus Day 1)
- **Last column:** offset price outlier data two days behind the change in FRBS sentiment data to account for a two-day lag between sentiment and price outlier results
- Calculations “w 0” include all of the values of zero in the data set, whereas “w/o 0” removes the values of zero

Sector (GICS)	=	CORREL w 0	CORREL w/o 0	FRBS difference w 0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service		5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary		5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples		8.74%	10.14%	6.62%	8.60%	-2.13%
Energy		-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials		0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care		9.10%	10.45%	9.86%	11.36%	15.13%
Industrials		6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology		5.92%	5.92%	4.24%	4.22%	5.39%
Materials		5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate		7.56%	9.48%	12.61%	16.19%	7.75%
Utilities		0.73%	0.49%	0.87%	1.08%	2.56%

Results - Daily Stock Price Outliers and FRBS Sentiment Score

- Healthcare and Consumer Staples are the likeliest to have stocks with price outliers resulting from dramatic news coverage
- Energy sector had a “negative correlation” with the FRBS data
 - Experienced heavy losses in 2021, which resulted in many negative price outliers in our data set. As news coverage and sentiment increased, stock prices in the energy sector generally decreased.
 - Magnitude of -9.22% rivals the top movers in terms of the percent change movement

Sector (GICS)	CORREL w/0	CORREL w/o 0	FRBS difference w/0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service	5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary	5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples	8.74%	10.14%	6.62%	8.60%	-2.13%
Energy	-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials	0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care	9.10%	10.45%	9.86%	11.36%	15.13%
Industrials	6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology	5.92%	5.92%	4.24%	4.22%	5.39%
Materials	5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate	7.56%	9.48%	12.61%	16.19%	7.75%
Utilities	0.73%	0.49%	0.87%	1.08%	2.56%

Results - Price Outliers and Daily Change in FRBS Daily Sentiment Score

- Yielded more positive correlation results
- Why?
 1. News is something that is reacted to, which means that there is likely to be an element of time or lag involved
 2. Day-to-day change shows the direction the news is heading in, as opposed to the static measure of daily sentiment

Sector (GICS)	=	CORREL w/0	CORREL w/o 0	FRBS difference w/0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service		5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary		5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples		8.74%	10.14%	6.62%	8.60%	-2.13%
Energy		-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials		0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care		9.10%	10.45%	9.86%	11.36%	15.13%
Industrials		6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology		5.92%	5.92%	4.24%	4.22%	5.39%
Materials		5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate		7.56%	9.48%	12.61%	16.19%	7.75%
Utilities		0.73%	0.49%	0.87%	1.08%	2.56%

Results - Price Outlier Data Two Days Behind Daily Change in FRBS Scores

- Mixed bag
- Correlation was highest for healthcare and utilities
- Correlation was lowest for consumer staples, financials, and industrials.
- These results indicate that some sectors experience more news-related lag than others
- Investors and trading algorithms could certainly use this analysis to their advantage and attempt to implement better timing into their trades

Sector (GICS)	=	CORREL w/0	CORREL w/o 0	FRBS difference w/0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service		5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary		5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples		8.74%	10.14%	6.62%	8.60%	-2.13%
Energy		-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials		0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care		9.10%	10.45%	9.86%	11.36%	15.13%
Industrials		6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology		5.92%	5.92%	4.24%	4.22%	5.39%
Materials		5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate		7.56%	9.48%	12.61%	16.19%	7.75%
Utilities		0.73%	0.49%	0.87%	1.08%	2.56%

Results - Best Measure: Price Outliers and Daily Change in FRBS Scores

- As mentioned earlier, news is something that is reacted to, and day-to-day change shows the unfolding activity in response to news rather than the static measure of daily sentiment
- Price movement responds to news from the trading day prior, after hours news such as earnings reports and politics, and news from the current trading day
- Thus, a single daily sentiment score is incomplete

Sector (GICS)	=	CORREL w/0	CORREL w/o 0	FRBS difference w/0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service		5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary		5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples		8.74%	10.14%	6.62%	8.60%	-2.13%
Energy		-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials		0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care		9.10%	10.45%	9.86%	11.36%	15.13%
Industrials		6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology		5.92%	5.92%	4.24%	4.22%	5.39%
Materials		5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate		7.56%	9.48%	12.61%	16.19%	7.75%
Utilities		0.73%	0.49%	0.87%	1.08%	2.56%

Results - Sector-Specific Insights

- **High correlation:** Consumer Discretionary. When consumers are feeling positive sentiment towards the market and economy, then they are more willing to spend their disposable income on discretionary goods.
- A similar principle can be applied to the Materials sector. The materials sector primarily consists of items that are used in construction, building, and renovation, all of which tends to increase during times of high market sentiment.

Sector (GICS)	= CORREL w/o 0	CORREL w/o 0	FRBS difference w/o 0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service	5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary	5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples	8.74%	10.14%	6.62%	8.60%	-2.13%
Energy	-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials	0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care	9.10%	10.45%	9.86%	11.36%	15.13%
Industrials	6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology	5.92%	5.92%	4.24%	4.22%	5.39%
Materials	5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate	7.56%	9.48%	12.61%	16.19%	7.75%
Utilities	0.73%	0.49%	0.87%	1.08%	2.56%

Results - Sector-Specific Insights

- **Low correlation:** Utilities. Individuals need basic utilities such as electricity, gas, water, etc. for daily life and will pay those expenses regardless of their sentiment towards the market.
- A similar principle can be applied to Energy, which has the second lowest correlation to consumer sentiment. The need for energy, power, and gas is independent of market performance and sentiment.

Sector (GICS)	=	CORREL w/o 0	CORREL w/o 0	FRBS difference w/o 0	FRBS difference w/o 0	diff 2 days Prior w/o 0
Communication Service		5.85%	7.68%	12.02%	13.19%	-5.69%
Consumer Discretionary		5.67%	2.22%	13.93%	15.30%	12.08%
Consumer Staples		8.74%	10.14%	6.62%	8.60%	-2.13%
Energy		-6.36%	-9.22%	2.40%	3.35%	-8.03%
Financials		0.46%	0.18%	8.05%	9.31%	-0.80%
Health Care		9.10%	10.45%	9.86%	11.36%	15.13%
Industrials		6.49%	6.49%	12.42%	9.61%	2.95%
Information Technology		5.92%	5.92%	4.24%	4.22%	5.39%
Materials		5.11%	6.58%	19.53%	27.99%	5.66%
Real Estate		7.56%	9.48%	12.61%	16.19%	7.75%
Utilities		0.73%	0.49%	0.87%	1.08%	2.56%

Conclusive Insights

- Healthcare and Consumer Staples are the likeliest to have stocks with positive price outliers resulting from dramatic news coverage, with Energy being likeliest to have negative price outliers
- Daily sentiment scores are not necessarily the best measure. Rather, day-to-day change in sentiment is better since it incorporates news from the trading day prior, after hours news such as earnings reports and politics, and news from the current trading day
- Investors and trading algorithms could use the lag analysis to understand when major price movements are likely to occur for a given sector
- The sector-level correlation can allow comparable analysis that determines which sectors respond more or less to news sentiment
- There are a number of sector-specific insights that connect the conceptual drivers of price movements for stocks in a given sector and the correlation results



Q & A Session

Q&A Session



Kevin Gu
Data Generation



Adam Cheng
Outliers
Computation



Matt Pulcini
Introduction & Background



Linkin Chen
Introduction & Background



Robby Lanni
Results

Appendix

Initial Natural Language Processing

```
#Resources from https://analyticsindiamag.com/how-to-scrape-summarize-convert-news-articles-into-text-files/
from newspaper import Article
import nltk
#install library for Nature Language processing
nltk.download('punkt')
#url link
url= 'https://economictimes.indiatimes.com/markets/stocks/news/jefferies-sees-87-bull-case-upside-in-shares-o
#Set the language of the article which is to be scraped and summarized. Define an object for further use.
article = Article(url, language="en") # en for English
article.download()
article.parse()
article.nlp()
#print information
print("Article Title:")
print(article.title) #prints the title of the article
print("\n")
print("Article Text:")
print(article.text) #prints the entire text of the article
print("\n")
print("Article Summary:")
print(article.summary) #prints the summary of the article
print("\n")
print("Article Keywords:")
print(article.keywords) #prints the keywords of the article
```

Initial Natural Language Processing

```
print("Article Title:")
print(article.title) #prints the title of the article
print("\n")
print("Article Text:")
print(article.text) #prints the entire text of the article
print("\n")
print("Article Summary:")
print(article.summary) #prints the summary of the article
print("\n")
print("Article Keywords:")
print(article.keywords) #prints the keywords of the article
file1=open("NewsFile.txt", "w+")
file1.write("Title:\n")
file1.write(article.title)
file1.write("\n\nArticle Text:\n")
file1.write(article.text)
file1.write("\n\nArticle Summary:\n")
file1.write(article.summary)
file1.write("\n\nArticle Keywords:\n")
keywords='\n'.join(article.keywords)
file1.write(keywords)
file1.close()
```

Initial Natural Language Processing

Article Title:

Jefferies sees 87% bull case upside in shares of this electricals company

Article Text:

Higher spend on capex, housing and infra development in India

Faster ramp-up in FMEG, resulting in better margins

Subdued traction in capex, housing and infra development in India

Lower offtake in FMEG

Excess volatility in commodities impacting margins

Sharp volatility in commodities, RM procurement

Slowdown in capex/housing and

Rising competition impacting pricing

Initial Natural Language Processing

Article Summary:

It sees a 37 per cent upside potential in base case while 87 per cent in bull case.

In bear case, it sees a 38 per cent potential downside."Our conviction is underpinned by robust prospects (revival in capex, infra, housing), its market leadership (21 per cent organized share), a ramp-up in B2C FMEG (37 per cent sales CAGR in 5 years) and benefits accruing from strategic initiatives.

The company currently trades at a 25-40 per cent P/E discount to Havells and Whirlpool ."She has a base case target of Rs 3,300 on the counter.

Polycab's focus on in-house manufacturing and deeper penetration could drive +18 per cent sales CAGR over FY22-25."Over FY22-25e, we estimate Polycab's consolidated sales/PAT to post +14 per cent/30 per cent CAGR – despite factoring rising input costs.

Copper volatility is typically a pass-through in the Cables and Wires industry," she said.For the bull case scenario, Jefferies says two things need to happen:Conversely, bear case scenario may kick in, if there isAmong key risks to the Jefferies call are

Initial Natural Language Processing

```
Article Keywords:
```

```
['case', 'electricals', 'cagr', 'housing', 'sees', 'bull', 'rs', '87', 'capex', 'volatility', 'infra', 'upside', 'cent',  
 'sales', 'shares', 'jefferies', 'company']
```

Initial Natural Language Processing

Article Keywords:

```
['case', 'electricals', 'cagr', 'housing', 'sees', 'bull', 'rs', '87', 'capex', 'volatility', 'infra', 'upside', 'cent',  
 'sales', 'shares', 'jefferies', 'company']
```

