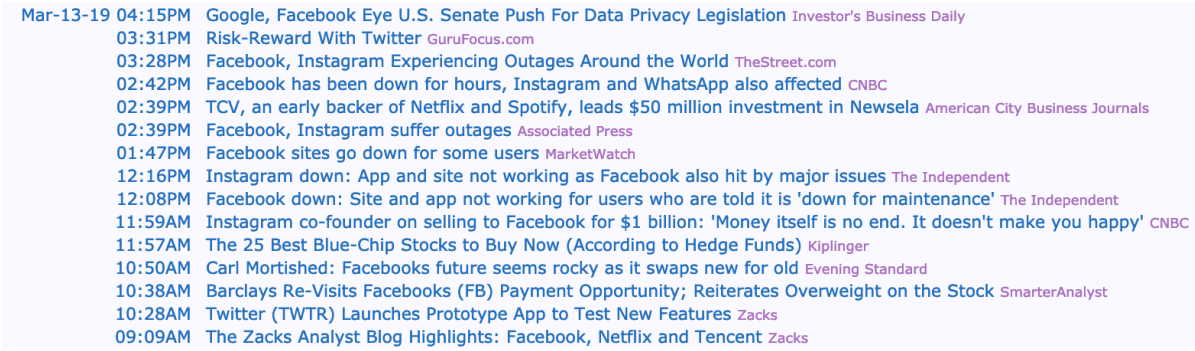
1. Searching for insights inside HTML files

In this notebook, we will generate investing insight by applying sentiment analysis on financial news headlines from FINVIZ.com. Using this natural language processing technique, we can understand the emotion behind the headlines and predict whether the market *feels* good or bad about a stock. It would then be possible to make educated guesses on how certain stocks will perform and trade accordingly. (And hopefully, make money!)



In [1]:
```
# Import libraries
from bs4 import BeautifulSoup
import pandas as pd
import os

html_tables = {}

# For every table in the datasets folder...
for table_name in os.listdir('datasets'):
    #this is the path to the file. Don't touch!
    table_path = "datasets/"+table_name

    # Open as a python file in read-only mode
    table_file = open(table_path, 'r')
    # Read the contents of the file into 'html'
```

```
    html = BeautifulSoup(table_file)

    # Find 'news-table' in the Soup and load it into 'html_table'
    html_table = html.find(id="news-table")

    # Add the table to our dictionary
    html_tables[table_name] = html_table
```

2. Exploring the files

- Explore the headlines table here in this notebook!

In [2]:
```
# Read one single day of headlines
tsla = html_tables['tsla_22sep.html']
# Get all the table rows tagged in HTML with <tr> into 'tesla_tr'
tsla_tr = tsla.findAll('tr')


# For each row...
for i, table_row in enumerate(tsla_tr):
    # Read the text of the element 'a' into 'link_text'
    link_text = table_row.a.get_text()
    # Read the text of the element 'td' into 'data_text'
    data_text = table_row.td.get_text()
    # Print the count
    print(f'{i}:')
    # Print the contents of 'link_text' and 'data_text'
    print(link_text)
    print(data_text)
    # The following exits the loop after three rows to prevent spamming
 the notebook, do not touch
    if i == 3:
        break
```

```
0:
Billionaire investor questions Elon Musk getting 'a pass' after bombshe
ll tweets
```

```
Sep-21-18 09:56PM
1:
Broadcoms Stock Looks Like a Winner
09:30PM
2:
SHAREHOLDER ALERT:Â  Pomerantz Law Firm Reminds Shareholders with Losse
s on their Investment in Tesla, Inc. of Class Action Lawsuit and Upcomi
ng Deadline  TSLA
05:30PM
3:
Tesla's People Problem and the Inscrutable Musk: 2 Things That Make You
Go Hmmm
05:30PM
```

3.Extracting all the news headlines

In [3]:
```
# Hold the parsed news into a list
parsed_news = []
# Iterate through the news
for file_name, news_table in html_tables.items():
    # Iterate through all tr tags in 'news_table'
    for x in news_table.findAll('tr'):
        # Read the text from the tr tag into text
        text = x.get_text()
        headline = x.a.get_text()
        # Split the text in the td tag into a list
        date_scrape = x.td.text.split()
        # If the length of 'date_scrape' is 1, load 'time' as the only
 element
        # If not, load 'date' as the 1st element and 'time' as the seco
nd
        if len(date_scrape) == 1:
            time = date_scrape[0]
        else:
            date = date_scrape[0]
            time = date_scrape[1]
```

```
        # Extract the ticker from the file name, get the string up to t
he 1st '_'
        ticker = file_name.split('_')[0]
        # Append ticker, date, time and headline as a list to the 'pars
ed_news' list
        parsed_news.append([ticker, date, time, headline])
```

4. NLTK think like a financial journalist

Adding some new words and sentiment values to our lexicon.

In [4]:
```
# NLTK VADER for sentiment analysis
import nltk

from nltk.sentiment.vader import SentimentIntensityAnalyzer

# New words and values
new_words = {
    'crushes': 10,
    'beats': 5,
    'misses': -5,
    'trouble': -10,
    'falls': -100,
}
# Instantiate the sentiment intensity analyzer with the existing lexico
n
vader = SentimentIntensityAnalyzer()
# Update the lexicon
vader.lexicon.update(new_words)
```

5. BREAKING NEWS: NLTK Crushes Sentiment Estimates

VADER in action

In [5]:
```
# Use these column names
columns = ['ticker', 'date', 'time', 'headline']
# Convert the list of lists into a DataFrame
scored_news = pd.DataFrame(parsed_news, columns=columns)
# Iterate through the headlines and get the polarity scores
scores = [vader.polarity_scores(headline) for headline in scored_news.h
eadline.values]
# Convert the list of dicts into a DataFrame
scores_df = pd.DataFrame(scores)
# Join the DataFrames
scored_news = pd.concat([scored_news, scores_df], axis=1)
# Convert the date column from string to datetime
scored_news['date'] = pd.to_datetime(scored_news.date).dt.date
scored_news.head()
```

Out[5]:

	ticker	date	time	headline	compound	neg	neu	pos
0	fb	2019-01-04	06:22PM	Facebook, Apple, Netflix, Amazon and Alphabet ...	0.4767	0.0	0.631	0.369
1	fb	2019-01-04	05:15PM	Earnings Reports for the Week of Jan. 7-11 (BB...	0.0000	0.0	1.000	0.000
2	fb	2019-01-04	04:55PM	COLUMN-Commentary: 2019 will be the year of mo...	0.0000	0.0	1.000	0.000
3	fb	2019-01-04	04:53PM	3 Tech Trends to Watch in 2019	0.0000	0.0	1.000	0.000
4	fb	2019-01-04	04:30PM	Will Denver's tech growth continue in 2019?	0.3818	0.0	0.698	0.302

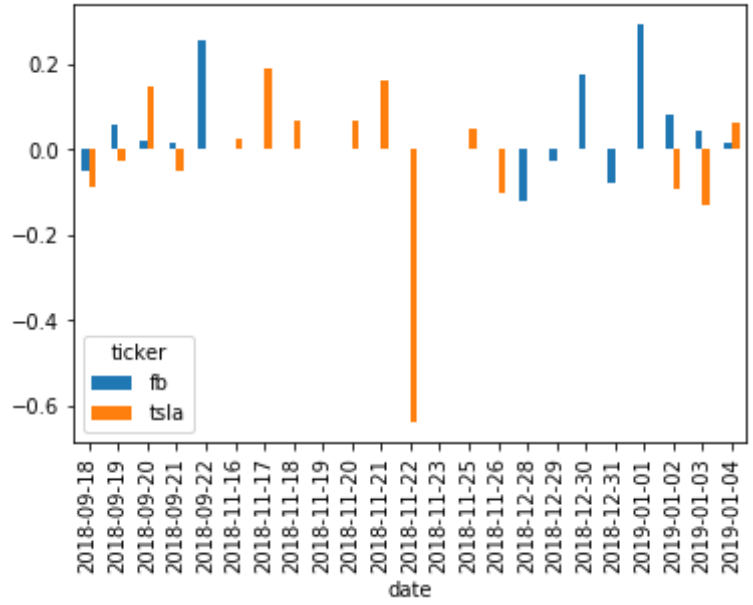
6. Plot all the sentiment in subplots

Plotting the time series for the stocks we have.

In [6]:
```
import matplotlib.pyplot as plt

%matplotlib inline
```

```
# Group by date and ticker columns from scored_news and calculate the m
ean
mean_c = scored_news.groupby(['date', 'ticker']).mean()
# Unstack the column ticker
mean_c = mean_c.unstack(level=1)
# Get the cross-section of compound in the 'columns' axis
mean_c = mean_c.xs('compound', axis=1)
# Plot a bar chart with pandas
mean_c.plot.bar();
```



7. Cleaning the duplicates

Cleaning duplicates

In [7]:
```
# Count the number of headlines in scored_news (store as integer)
num_news_before = scored_news.headline.count()
# Drop duplicates based on ticker and headline
scored_news_clean = scored_news.drop_duplicates(['ticker', 'headline'])
```

```
# Count number of headlines after dropping duplicates
num_news_after = scored_news_clean.headline.count()
# Compare before and after
print(num_news_before)
print(num_news_after)
```

```
500
476
```

8. Sentiment on one single trading day and stock

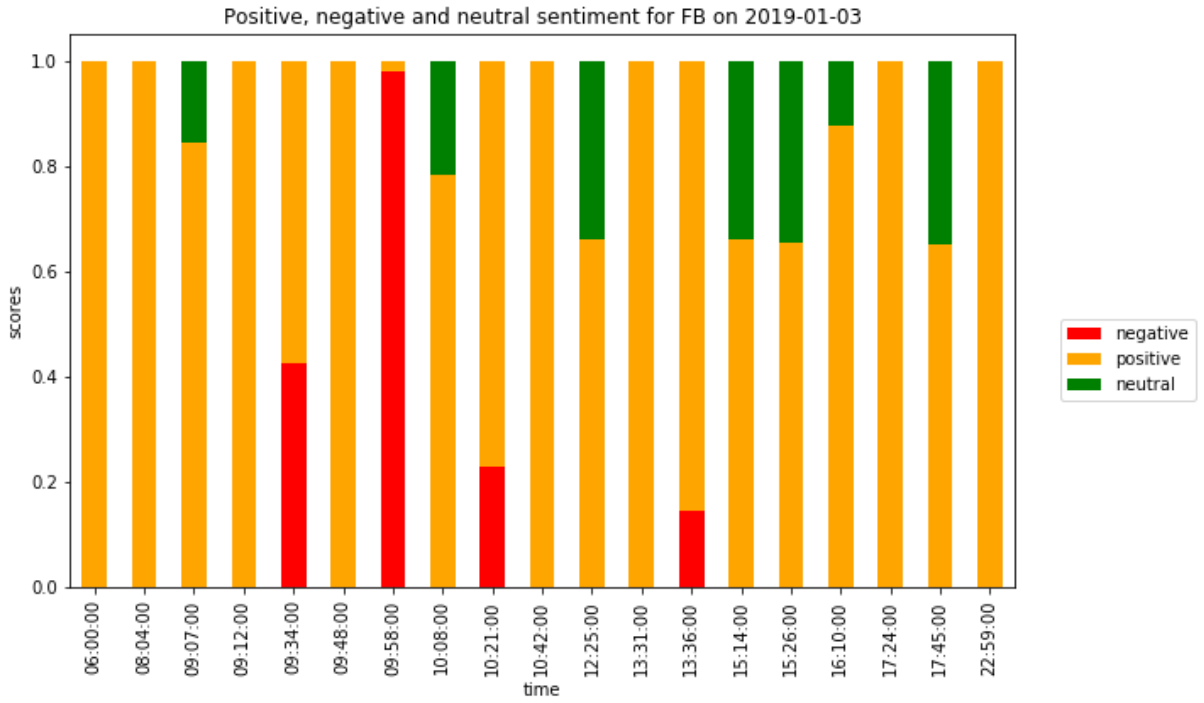
In [10]:
```
# Set the index to ticker and date
single_day = scored_news_clean.set_index(['ticker', 'date'])
#print(single_day)
# Cross-section the fb row
single_day = single_day.loc['fb']
#print(single_day)
# Select the 3rd of January of 2019
single_day = single_day.loc['2019-01-03']
#print(single_day)
# Convert the datetime string to just the time
single_day['time'] = pd.to_datetime(single_day['time'])
single_day['time'] = single_day.time.dt.time
#print(single_day)
#print(single_day.shape)
# Set the index to time and sort by it
single_day.set_index('time', inplace=True)
single_day=single_day.sort_index(ascending=True)
single_day
```

Out[10]:
```
time
06:00:00    Why Internet Censorship Doesnt Work and Never ...
08:04:00    3 Big Stock Charts for Thursday: Medtronic, Fa...
09:07:00    The Zacks Analyst Blog Highlights: Facebook, W...
09:12:00    Why The FAANGs Are Crucial To A 2019 Market Rally
09:34:00    Apple warning stoking fears of slowdown in Chi...
09:48:00                  Stock Market News For Jan 3, 2019
09:58:00                                 Facebook Falls 3%
```

```
10:08:00    Mark Zuckerberg Halts Stock Sales as Facebook ...
10:21:00    Facebook Under Fire for Collecting Data From A...
10:42:00    Why Netflix Stock Will Rise Back Above $300 In...
12:25:00    3 Great Reasons You Should Be Bullish on Twili...
13:31:00             Take the Money And Run From Twilio Stock
13:36:00    What's Next For Apple (AAPL) After It Slashed ...
15:14:00    Zuckerberg Paused His Selling of Facebook Shar...
15:26:00        Is Facebook Stock the Best FANG Stock to Buy?
16:10:00    Google Stock Upgraded, Viewed As 'Most Defensi...
17:24:00    Facebook (FB) Reportedly Testing Dark Mode on ...
17:45:00    Investors Are Focused Too Closely on Facebook ...
22:59:00    [$$] Facebook Begins New Year in Fixer-Upper Mode
Name: headline, dtype: object
```

9. Visualize the single day

In [9]:
```
TITLE = "Positive, negative and neutral sentiment for FB on 2019-01-03"
COLORS = ["red", "orange", "green"]
# Drop the columns that aren't useful for the plot
plot_day = single_day.drop(['headline', 'compound'], axis=1)
# Change the column names to 'negative', 'positive', and 'neutral'
plot_day.columns = ['negative', 'positive', 'neutral']
# Plot a stacked bar chart
plot_day.plot.bar(stacked = True,
                  figsize=(10, 6),
                  title = TITLE,
                  color = COLORS)
plt.legend(bbox_to_anchor=(1.2, 0.5))
plt.ylabel("scores");
```



In [ ]: