Oakland Athletics: A Sentiment Analysis of MLB Performance

In [1]:

```
#Install reqired libraries
!pip install beautifulsoup4 requests
!pip install pandas
!pip install matplotlib
!pip install lxml
!pip install nltk
!pip install wordcloud
!pip install tqdm
```

```
Requirement already satisfied: beautifulsoup4 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (4.12.2)
Requirement already satisfied: requests in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (2.27.1)
Requirement already satisfied: soupsieve>1.2 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from beautifulsoup4) (2.4.1)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from requests) (1.26.8)
Requirement already satisfied: charset-normalizer~=2.0.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from requests) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from requests) (3.3)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from requests) (2021.10.8)
Requirement already satisfied: pandas in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (2.0.2)
Requirement already satisfied: tzdata>=2022.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from pandas) (2023.3)
Requirement already satisfied: pytz>=2020.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from pandas) (2023.3)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from pandas) (2.8.2)
Requirement already satisfied: numpy>=1.20.3 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from pandas) (1.21.5)
Requirement already satisfied: six>=1.5 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from python-dateutil>=2.8.2->pandas) (1.16.0)
Requirement already satisfied: matplotlib in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (3.7.1)
Requirement already satisfied: numpy>=1.20 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (1.21.5)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (1.4.4)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (4.40.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (3.0.4)
Requirement already satisfied: cycler>=0.10 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (0.11.0)
Requirement already satisfied: pillow>=6.2.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (9.5.0)
Requirement already satisfied: importlib-resources>=3.2.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (5.12.0)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (2.8.2)
Requirement already satisfied: packaging>=20.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (21.3)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib) (1.1.0)
Requirement already satisfied: zipp>=3.1.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from importlib-resources>=3.2.0->matplotlib) (3.7.0)
Requirement already satisfied: six>=1.5 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from python-dateutil>=2.7->matplotlib) (1.16.0)
Requirement already satisfied: lxml in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (4.9.2)
Requirement already satisfied: nltk in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (3.8.1)
Requirement already satisfied: joblib in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from nltk) (1.2.0)
Requirement already satisfied: regex>=2021.8.3 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from nltk) (2023.6.3)
Requirement already satisfied: tqdm in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from nltk) (4.65.0)
Requirement already satisfied: click in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from nltk) (8.0.4)
Requirement already satisfied: colorama in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from click->nltk) (0.4.4)
Requirement already satisfied: wordcloud in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (1.9.2)
Requirement already satisfied: pillow in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from wordcloud) (9.5.0)
Requirement already satisfied: numpy>=1.6.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from wordcloud) (1.21.5)
Requirement already satisfied: matplotlib in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from wordcloud) (3.7.1)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (2.8.2)
Requirement already satisfied: cycler>=0.10 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (0.11.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (1.4.4)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (3.0.4)
Requirement already satisfied: importlib-resources>=3.2.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (5.12.0)
Requirement already satisfied: packaging>=20.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (21.3)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (1.1.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from matplotlib->wordcloud) (4.40.0)
Requirement already satisfied: zipp>=3.1.0 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from importlib-resources>=3.2.0->matplotlib->wordcloud) (3.7.0)
Requirement already satisfied: six>=1.5 in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from python-dateutil>=2.7->matplotlib->wordcloud) (1.16.0)
Requirement already satisfied: tqdm in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (4.65.0)
Requirement already satisfied: colorama in c:\users\andre\downloads\new folder\envs\r\lib\site-packages (from tqdm) (0.4.4)
```

In [2]:

```
#Import required libraries
import requests
from bs4 import BeautifulSoup
import pandas as pd
import matplotlib.pyplot as plt
import lxml

import os
import re
import numpy as np
import string
import glob
import nltk
from wordcloud import WordCloud
from collections import Counter, defaultdict
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
from nltk.stem import PorterStemmer
from string import punctuation
from tqdm import tqdm

sw = stopwords.words("english")
```

The first step is to scrape the text from the blog posts from the mlbtraderumors.com website. The posts include text, dates posted, and the authors name, all of which will be scraped before storing into a dataframe to use and start the text analysis.

In [3]:

```
def scrape_website(url, file_path):
    # Send a GET request to the website
    response = requests.get(url)

    # Parse the HTML content using BeautifulSoup
    soup = BeautifulSoup(response.content, "html.parser")

    # Find all the news article elements
    articles = soup.find_all("article")

    # Create lists to store the extracted values
    titles = []
    authors = []
    dates = []
    contents = []

    # Iterate over the articles and extract the text
    with open(file_path, "w", encoding="utf-8") as file:
        for article in articles:
            # Extract the article title
            title_element = article.find("h2")
            title = title_element.text.strip() if title_element else ""
            titles.append(title)

            # Extract the article author
            author_element = article.find("span", class_="entry-author")
            author = author_element.text.strip() if author_element else ""
            authors.append(author)

            # Extract the article date
            date_element = article.find("time", class_="entry-time")
            date = date_element.text.strip() if date_element else ""
            dates.append(date)

            # Extract the article content
            content_element = article.find("div", class_="entry-content")
            content = content_element.text.strip() if content_element else ""
            contents.append(content)

            # Write the title and content to the file
            file.write("Title: " + title + "\n")
            file.write("Author: " + author + "\n")
            file.write("Date: " + date + "\n")
            file.write("Content: " + content + "\n")
            file.write("---\n")

    # Create a DataFrame from the extracted values
    data = {
        "Title": titles,
        "Author": authors,
        "Date": dates,
        "Content": contents
    }

    df = pd.DataFrame(data)

    # Drop rows without content
    df.dropna()

    return df
```

In [4]:

```
# URL of the website to scrape
url = "https://www.mlbtraderumors.com/oakland-athletics?show=all"
file_path = "C:/Users/andre/OneDrive/Project/mlbtraderumors_oakland_athletics_articles1.txt"

# Scrape the website, write the scraped text to a file, and get the head of the DataFrame
df = scrape_website(url, file_path)
df.head()
```

Out[4]:

	Title	Author	Date	Content
0	Dick Hall Passes Away	Darragh McDonald	June 19, 2023	The Orioles have announced that former major l...
1	A's Acquire Yacksel Rios	Nick Deeds	June 18, 2023	6:56 PM: As noted by Justin Toscano of the Atl...
2	Report: Red Sox Interested In Aledmys Diaz	Mark Polishuk	June 18, 2023	The Red Sox are looking to acquire an infielde...
3	A's To Stay In Oakland Through 2024 Season	Nick Deeds	June 17, 2023	While the Athletics seem more likely than ever...
4	A's Select Tyler Wade, Place Kevin Smith On 10...	Mark Polishuk	June 17, 2023	The Athletics placed infielder Kevin Smith on ...

In [5]:

```
# Change the Data column to a datetime object:
df['Date'] = pd.to_datetime(df['Date'], format="%B %d, %Y", errors= 'coerce')
```

In [6]:

```
df.dtypes
```

Out[6]:

```
Title               object
Author              object
Date        datetime64[ns]
Content             object
dtype: object
```

In [7]:

```
# Check for missing values
df.isna().sum()
```

Out[7]:

```
Title       0
Author      0
Date       30
Content     0
dtype: int64
```

In [8]:

```
len(df)
```

Out[8]:

```
1030
```

In [9]:

```
df = df.dropna()
df
```

Out[9]:

	Title	Author	Date	Content
0	Dick Hall Passes Away	Darragh McDonald	2023-06-19	The Orioles have announced that former major l...
1	A's Acquire Yacksel Rios	Nick Deeds	2023-06-18	6:56 PM: As noted by Justin Toscano of the Atl...
2	Report: Red Sox Interested In Aledmys Diaz	Mark Polishuk	2023-06-18	The Red Sox are looking to acquire an infielde...
3	A's To Stay In Oakland Through 2024 Season	Nick Deeds	2023-06-17	While the Athletics seem more likely than ever...
4	A's Select Tyler Wade, Place Kevin Smith On 10...	Mark Polishuk	2023-06-17	The Athletics placed infielder Kevin Smith on ...
...	...	...	...	...
995	How Jonathan Lucroy Has Helped The A's	Mark Polishuk	2018-10-03	Jonathan Lucroy didn't contribute much at the ...
996	A's To Start Liam Hendriks In Wild-Card Game	Connor Byrne	2018-10-02	The Yankees and Athletics have named their sta...
997	Andrew Triggs Undergoes Thoracic Outlet Surgery	Jeff Todd	2018-09-28	Sept. 28: The A's announced tonight that Trigg...
998	Athletics Plan To Discuss Bob Melvin Extension...	Steve Adams	2018-09-28	The Athletics have been baseball's most unexpe...
999	Beane: Laureano Viewed As Long-Term Center Fie...	Steve Adams	2018-09-28	Ramon Laureano's brilliant play with the Athle...

1000 rows × 4 columns

Cleaning the Data

In [10]:

```
#Identify any noise in the data
RE_SUSPICIOUS = re.compile(r'[&#<>{}\[\]\\]')

def impurity(text, min_len=10):
    """returns the share of suspicious characters in a text"""
    if text == None or len(text) < min_len:
        return 0
    else:
        return len(RE_SUSPICIOUS.findall(text))/len(text)
```

In [11]:

```
df['Content'].apply
```

Out[11]:

```
<bound method Series.apply of 0      The Orioles have announced that former major l...
1      6:56 PM: As noted by Justin Toscano of the Atl...
2      The Red Sox are looking to acquire an infielde...
3      While the Athletics seem more likely than ever...
4      The Athletics placed infielder Kevin Smith on ...
                             ...
995    Jonathan Lucroy didn't contribute much at the ...
996    The Yankees and Athletics have named their sta...
997    Sept. 28: The A's announced tonight that Trigg...
998    The Athletics have been baseball's most unexpe...
999    Ramon Laureano's brilliant play with the Athle...
Name: Content, Length: 1000, dtype: object>
```

In [12]:

```
pd.options.display.max_colwidth = 100 ###
# Add new column to data frame
df['impurity'] = df['Content'].apply(impurity, min_len=10)

# Acquire the top 3 records
df[['Content', 'impurity']].sort_values(by='impurity', ascending=False).head(3)
```

Out[12]:

	Content	impurity
111	Major League Baseball's international signing period for 2023 has officially opened up today, wi...	0.005563
944	Left-handed pitching prospect Jesus Luzardo is drawing raves from both inside and outside the At...	0.004474
531	Kingston fit the mold of many of the Angels' candidates — well-regarded younger executives who w...	0.003306

The steps above displays the highest impurity levels for the Athletics' data set. The impurity levels above are extremely low, being below 1% of all characters in each blog post appear suspicious.

Character Normalization & Tokenization

In [13]:

```
# Example function to normalize the text in the "Contents" column
def normalize_text(text):
    # Lowercase the text
    text = text.lower()

    # Remove punctuation
    text = text.translate(str.maketrans("", "", string.punctuation))

    # Remove special characters and digits
    text = re.sub(r"[^a-zA-Z]", " ", text)

    # Tokenize the text
    tokens = word_tokenize(text)

    # Remove stopwords
    stop_words = set(stopwords.words("english"))
    tokens = [token for token in tokens if token not in stop_words]

    # Perform stemming
    stemmer = PorterStemmer()
    tokens = [stemmer.stem(token) for token in tokens]

    return tokens

# Apply normalization to the "Contents" column
df["Contents_Normalized"] = df["Content"].apply(normalize_text)

# Print the head of the DataFrame with the normalized contents
df[["Content", "Contents_Normalized"]].head()
```

Out[13]:

	Content	Contents_Normalized
0	The Orioles have announced that former major leaguer Dick Hall has passed away. He was 92 years ...	[oriol, announc, former, major, leaguer, dick, hall, pass, away, year, old, hall, underw, mani, ...
1	6:56 PM: As noted by Justin Toscano of the Atlanta Journal-Constitution, a clause in Rios's pact...	[pm, note, justin, toscano, atlanta, journalconstitut, claus, rio, pact, brave, requir, club, ad...
2	The Red Sox are looking to acquire an infielder who can play multiple positions, MassLive.com's ...	[red, sox, look, acquir, infield, play, multipl, posit, masslivecom, sean, mcadam, write, focu, ...
3	While the Athletics seem more likely than ever to relocate to Las Vegas after Nevada's governor ...	[athlet, seem, like, ever, reloc, la, vega, nevada, governor, sign, bill, provid, mm, public, fu...
4	The Athletics placed infielder Kevin Smith on the 10-day injured list due to a back strain, with...	[athlet, place, infield, kevin, smith, day, injur, list, due, back, strain, placement, retroact,...

In [14]:

```
df['length'] = df['Contents_Normalized'].str.len()
df.head()
```

Out[14]:

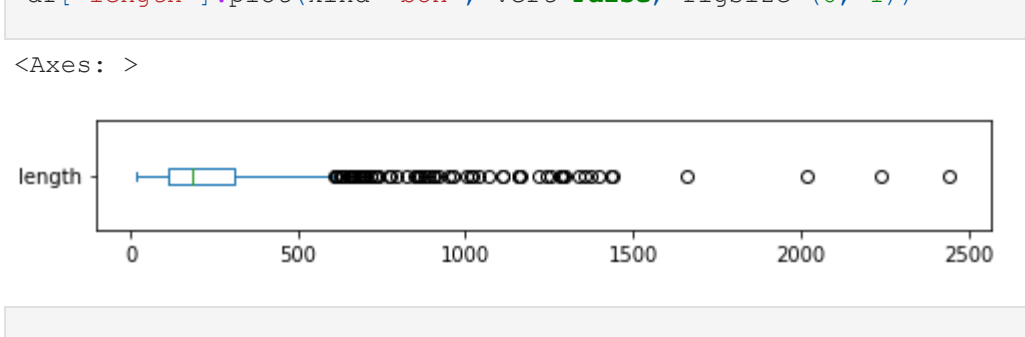
	Title	Author	Date	Content	impurity	Contents_Normalized	length
0	Dick Hall Passes Away	Darragh McDonald	2023-06-19	The Orioles have announced that former major leaguer Dick Hall has passed away. He was 92 years ...	0.0	[oriol, announc, former, major, leaguer, dick, hall, pass, away, year, old, hall, underw, mani, ...	173
1	A's Acquire Yacksel Rios	Nick Deeds	2023-06-18	6:56 PM: As noted by Justin Toscano of the Atlanta Journal-Constitution, a clause in Rios's pact...	0.0	[pm, note, justin, toscano, atlanta, journalconstitut, claus, rio, pact, brave, requir, club, ad...	206
2	Report: Red Sox Interested In Aledmys Diaz	Mark Polishuk	2023-06-18	The Red Sox are looking to acquire an infielder who can play multiple positions, MassLive.com's ...	0.0	[red, sox, look, acquir, infield, play, multipl, posit, masslivecom, sean, mcadam, write, focu, ...	84
3	A's To Stay In Oakland Through 2024 Season	Nick Deeds	2023-06-17	While the Athletics seem more likely than ever to relocate to Las Vegas after Nevada's governor ...	0.0	[athlet, seem, like, ever, reloc, la, vega, nevada, governor, sign, bill, provid, mm, public, fu...	102
4	A's Select Tyler Wade, Place Kevin Smith On 10-Day IL	Mark Polishuk	2023-06-17	The Athletics placed infielder Kevin Smith on the 10-day injured list due to a back strain, with...	0.0	[athlet, place, infield, kevin, smith, day, injur, list, due, back, strain, placement, retroact,...	127

In [15]:

```
df['length'].plot(kind='box', vert=False, figsize=(8, 1))
```

Out[15]:

```
<Axes: >
```

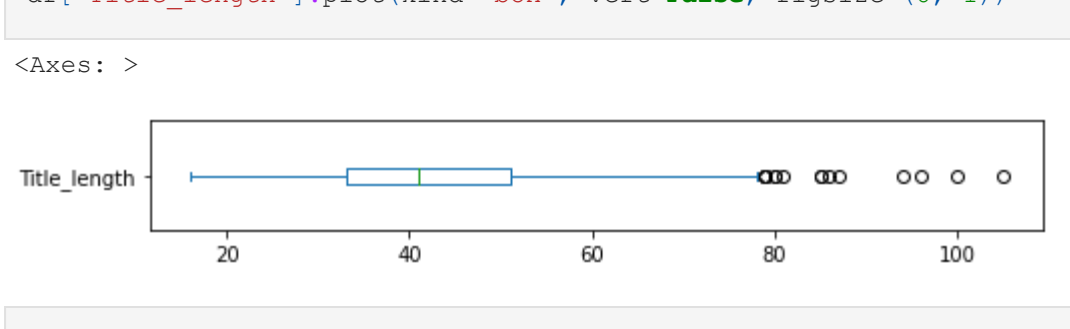


In [16]:

```
df['Title_length'] = df['Title'].str.len()
df['Title_length'].plot(kind='box', vert=False, figsize=(8, 1))
```

Out[16]:

```
<Axes: >
```

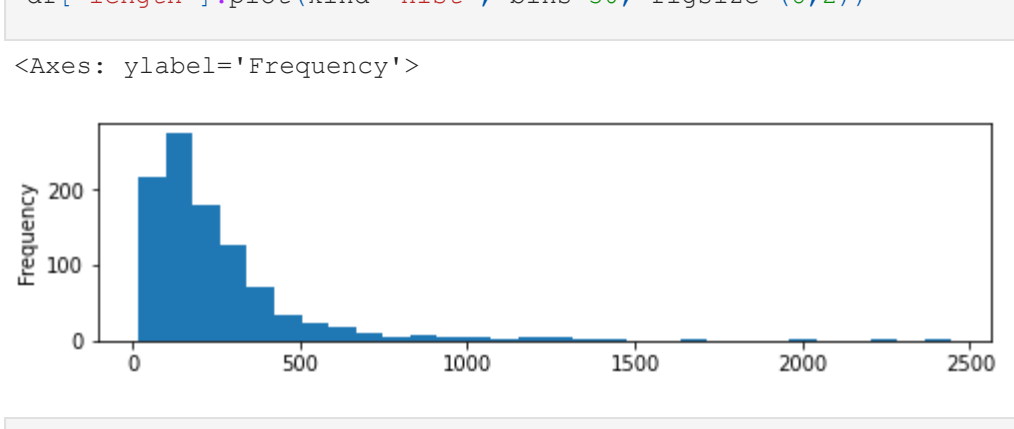


In [17]:

```
df['length'].plot(kind='hist', bins=30, figsize=(8,2))
```

Out[17]:

```
<Axes: ylabel='Frequency'>
```



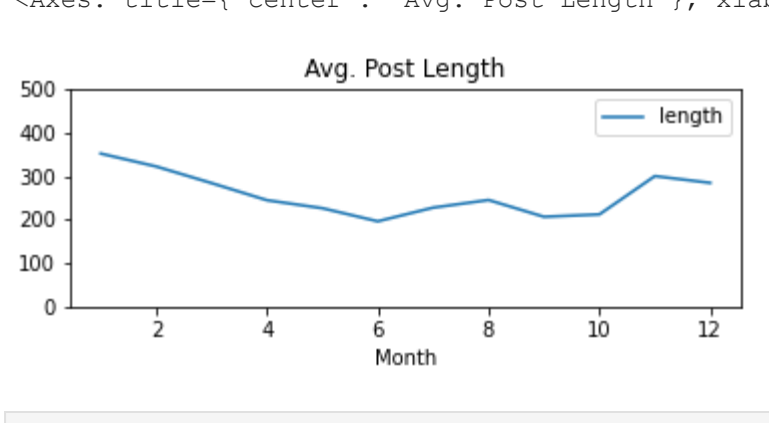
In [18]:

```
# Extract the month from the date and create a new column
df['Month'] = df['Date'].dt.month

# Plot the average post length
df.groupby('Month').agg({'length': 'mean'}) \
  .plot(title="Avg. Post Length", ylim=(0,500), figsize=(6,2))
```

Out[18]:

```
<Axes: title={'center': 'Avg. Post Length'}, xlabel='Month'>
```



In [19]:

```
def count_words(df, column='Contents_Normalized', preprocess=None, min_freq=2):

    # process tokens and update counter
    def update(doc):
        tokens = doc if preprocess is None else preprocess(doc)
        counter.update(tokens)

    # create counter and run through all data
    counter = Counter()
    tqdm.pandas() #initialize tqdm for progress bar
    df[column].apply(update)

    # transform counter into data frame
    freq_df = pd.DataFrame.from_dict(counter, orient='index', columns=['freq'])
    freq_df = freq_df.query('freq >= @min_freq')
    freq_df.index.name = 'token'

    return freq_df.sort_values('freq', ascending=False)
```

In [20]:

```
freq_df = count_words(df)
freq_df.head(5)
```

Out[20]:

token	freq
season	3189
year	2288
leagu	1834
mm	1595
oakland	1573

In [21]:

```
#How many tokens are in the df?
len(freq_df)
```

Out[21]:

```
6657
```

In [22]:

```
# top words with 10+ characters
count_words(df, column='Content',
            preprocess=lambda Content: re.findall(r"\w{10,}", Content)).head(5)
```

Out[22]:

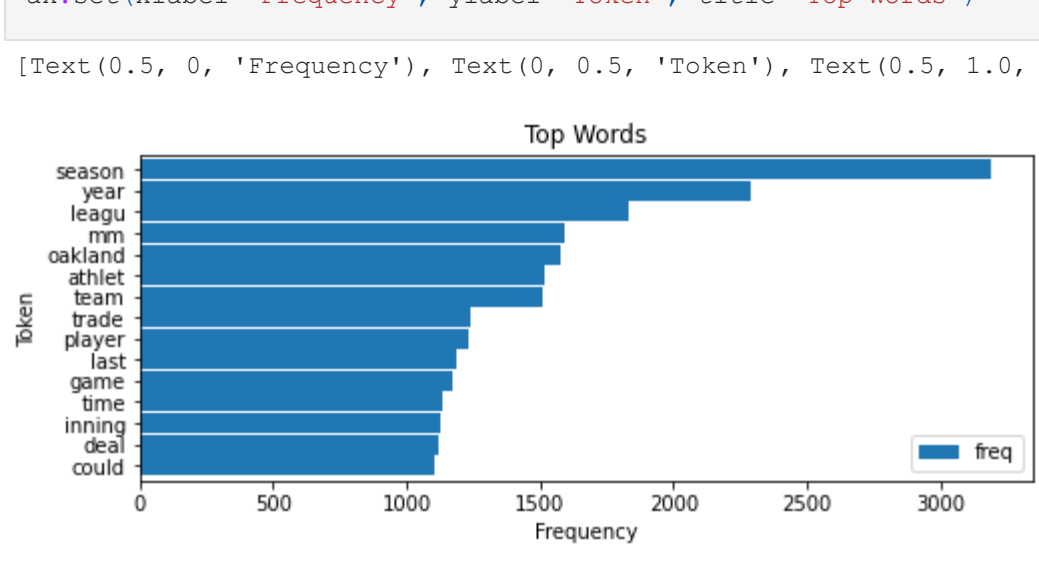
token	freq
appearances	734
organization	375
arbitration	367
outfielder	316
assignment	272

In [23]:

```
ax = freq_df.head(15).plot(kind='barh', width=0.95, figsize=(8,3))
ax.invert_yaxis()
ax.set(xlabel='Frequency', ylabel='Token', title='Top Words')
```

Out[23]:

```
[Text(0.5, 0, 'Frequency'), Text(0, 0.5, 'Token'), Text(0.5, 1.0, 'Top Words')]
```



Import data on the Oakland Athletics from baseball-reference.com.

https://www.baseball-reference.com/teams/OAK/attend.shtml

In [24]:

```
# URL of the webpage to scrape
url = "https://www.baseball-reference.com/teams/OAK/attend.shtml"

# Read the HTML table into a list of DataFrames
tables = pd.read_html(url)

# Select the table of interest (index 0 in this case)
table = tables[0]

# Save the DataFrame as a CSV file
file_path = "C:/Users/andre/OneDrive/Project/MLB_data/athletics_statistics.csv"
table.to_csv(file_path, index=False, header=True)

print("Data saved to", file_path)
```

```
Data saved to C:/Users/andre/OneDrive/Project/MLB_data/athletics_statistics.csv
```

In [25]:

```
path = "C:/Users/andre/OneDrive/Project/MLB_data/"

athletics_df = pd.DataFrame(pd.read_csv(path + 'athletics_statistics.csv'))
athletics_df.head()
```

Out[25]:

	Year	Tm	Lg	W	L	Finish	Playoffs	Attendance	Attend/G	Rank	Est. Payroll	PPF	BPF	Stadium
0	2023	Oakland Athletics	AL West	19	55	5	NaN	368146.0	9688.0	15th of 15	$51,230,000	94	92	RingCentral Coliseum
1	2022	Oakland Athletics	AL West	60	102	5	NaN	787902.0	9849.0	15th of 15	$50,248,334	95	93	RingCentral Coliseum
2	2021	Oakland Athletics	AL West	86	76	3	NaN	701430.0	8660.0	15th of 15	$94,555,834	95	95	RingCentral Coliseum
3	2020	Oakland Athletics	AL West	36	24	1	Lost ALDS (3-1)	NaN	NaN	11th of 15	$85,683,333	94	96	Oakland-Alameda County Coliseum
4	2019	Oakland Athletics	AL West	97	65	2	Lost ALWC (1-0)	1670734.0	20626.0	10th of 15	$102,935,833	93	94	Oakland-Alameda County Coliseum

In [26]:

```
athletics_df= athletics_df[athletics_df['Year'] > 2004]
athletics_df
```

Out[26]:

	Year	Tm	Lg	W	L	Finish	Playoffs	Attendance	Attend/G	Rank	Est. Payroll	PPF	BPF	Stadium
0	2023	Oakland Athletics	AL West	19	55	5	NaN	368146.0	9688.0	15th of 15	$51,230,000	94	92	RingCentral Coliseum
1	2022	Oakland Athletics	AL West	60	102	5	NaN	787902.0	9849.0	15th of 15	$50,248,334	95	93	RingCentral Coliseum
2	2021	Oakland Athletics	AL West	86	76	3	NaN	701430.0	8660.0	15th of 15	$94,555,834	95	95	RingCentral Coliseum
3	2020	Oakland Athletics	AL West	36	24	1	Lost ALDS (3-1)	NaN	NaN	11th of 15	$85,683,333	94	96	Oakland-Alameda County Coliseum
4	2019	Oakland Athletics	AL West	97	65	2	Lost ALWC (1-0)	1670734.0	20626.0	10th of 15	$102,935,833	93	94	Oakland-Alameda County Coliseum
5	2018	Oakland Athletics	AL West	97	65	2	Lost ALWC (1-0)	1573616.0	19427.0	13th of 15	$69,883,333	97	97	Oakland-Alameda County Coliseum
6	2017	Oakland Athletics	AL West	75	87	5	NaN	1475721.0	18219.0	14th of 15	$51,560,000	95	95	Oakland-Alameda County Coliseum
7	2016	Oakland Athletics	AL West	69	93	5	NaN	1521506.0	18784.0	14th of 15	$54,969,067	97	96	Oakland-Alameda County Coliseum
8	2015	Oakland Athletics	AL West	68	94	5	NaN	1768175.0	21829.0	12th of 15	$64,016,001	97	97	O.co Coliseum
9	2014	Oakland Athletics	AL West	88	74	2	Lost ALWC (1-0)	2003628.0	24736.0	10th of 15	$89,160,900	97	98	O.co Coliseum
10	2013	Oakland Athletics	AL West	96	66	1	Lost ALDS (3-2)	1809302.0	22337.0	9th of 15	$69,440,000	97	98	O.co Coliseum
11	2012	Oakland Athletics	AL West	94	68	1	Lost ALDS (3-2)	1679013.0	20729.0	12th of 14	$61,202,500	95	95	O.co Coliseum
12	2011	Oakland Athletics	AL West	74	88	3	NaN	1476791.0	18232.0	14th of 14	$67,094,000	98	98	O.co Coliseum
13	2010	Oakland Athletics	AL West	81	81	2	NaN	1418391.0	17511.0	13th of 14	$57,904,900	99	99	Oakland-Alameda County Coliseum
14	2009	Oakland Athletics	AL West	75	87	4	NaN	1408783.0	17392.0	14th of 14	$65,945,000	98	98	Oakland-Alameda County Coliseum
15	2008	Oakland Athletics	AL West	75	86	3	NaN	1665256.0	20559.0	13th of 14	$47,967,126	94	94	McAfee Coliseum, Tokyo Dome
16	2007	Oakland Athletics	AL West	76	86	3	NaN	1921844.0	23726.0	12th of 14	$79,366,940	94	94	McAfee Coliseum
17	2006	Oakland Athletics	AL West	93	69	1	Lost ALCS (4-0)	1976625.0	24403.0	12th of 14	$64,843,079	97	97	McAfee Coliseum
18	2005	Oakland Athletics	AL West	88	74	2	NaN	2109118.0	26038.0	8th of 14	$55,425,762	100	100	McAfee Coliseum

In [27]:

```
# Remove the dollar and comma signs from the following columns:
athletics_df['Est. Payroll'] = athletics_df['Est. Payroll'].replace({'\$':''}, regex = True)
athletics_df['Est. Payroll'] = athletics_df['Est. Payroll'].replace({'\,':''}, regex = True)
athletics_df['Attendance'] = athletics_df['Attendance'].replace({'\,':''}, regex = True)
athletics_df['Attend/G'] = athletics_df['Attend/G'].replace({'\,':''}, regex = True)
athletics_df['Stadium'] = athletics_df['Stadium'].replace({'\,':''}, regex = True)
athletics_df.head()
```

Out[27]:

	Year	Tm	Lg	W	L	Finish	Playoffs	Attendance	Attend/G	Rank	Est. Payroll	PPF	BPF	Stadium
0	2023	Oakland Athletics	AL West	19	55	5	NaN	368146.0	9688.0	15th of 15	51230000	94	92	RingCentral Coliseum
1	2022	Oakland Athletics	AL West	60	102	5	NaN	787902.0	9849.0	15th of 15	50248334	95	93	RingCentral Coliseum
2	2021	Oakland Athletics	AL West	86	76	3	NaN	701430.0	8660.0	15th of 15	94555834	95	95	RingCentral Coliseum
3	2020	Oakland Athletics	AL West	36	24	1	Lost ALDS (3-1)	NaN	NaN	11th of 15	85683333	94	96	Oakland-Alameda County Coliseum
4	2019	Oakland Athletics	AL West	97	65	2	Lost ALWC (1-0)	1670734.0	20626.0	10th of 15	102935833	93	94	Oakland-Alameda County Coliseum

In [28]:

```
athletics_df['Est. Payroll'] = athletics_df['Est. Payroll'].astype(float)
athletics_df.dtypes
```

Out[28]:

```
Year              int64
Tm               object
Lg               object
W                 int64
L                 int64
Finish            int64
Playoffs         object
Attendance      float64
Attend/G        float64
Rank             object
Est. Payroll    float64
PPF               int64
BPF               int64
Stadium          object
dtype: object
```

In [29]:

```
athletics_df.describe()
```

Out[29]:

	Year	W	L	Finish	Attendance	Attend/G	Est. Payroll	PPF	BPF
count	19.000000	19.000000	19.000000	19.000000	1.800000e+01	18.000000	1.900000e+01	19.000000	19.000000
mean	2014.000000	76.157895	75.789474	2.894737	1.518666e+06	19041.388889	6.754905e+07	96.105263	96.105263
std	5.627314	20.456629	17.491518	1.523692	4.682565e+05	5114.775012	1.597226e+07	1.940640	2.157538
min	2005.000000	19.000000	24.000000	1.000000	3.681460e+05	8660.000000	4.796713e+07	93.000000	92.000000
25%	2009.500000	71.500000	67.000000	2.000000	1.432724e+06	17688.000000	5.519741e+07	94.500000	94.500000
50%	2014.000000	76.000000	76.000000	3.000000	1.619436e+06	19993.000000	6.484308e+07	97.000000	96.000000
75%	2018.500000	90.500000	87.000000	4.500000	1.799020e+06	22210.000000	7.462514e+07	97.000000	98.000000
max	2023.000000	97.000000	102.000000	5.000000	2.109118e+06	26038.000000	1.029358e+08	100.000000	100.000000

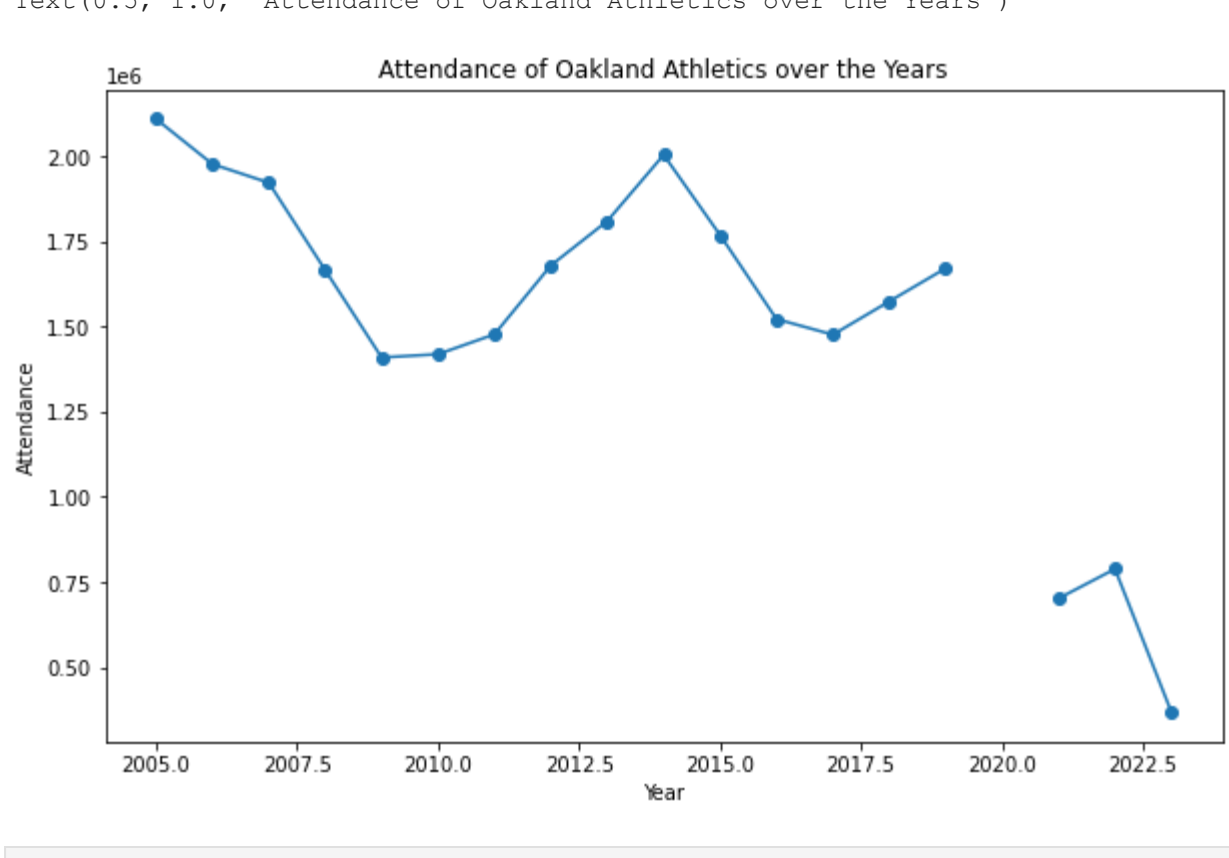
In [31]:

```
# Plotting the data
plt.figure(figsize=(10, 6))

# Plotting Attendance over the years
plt.plot(athletics_df['Year'], athletics_df['Attendance'], marker='o')
plt.xlabel('Year')
plt.ylabel('Attendance')
plt.title('Attendance of Oakland Athletics over the Years')
```

Out[31]:

```
Text(0.5, 1.0, 'Attendance of Oakland Athletics over the Years')
```

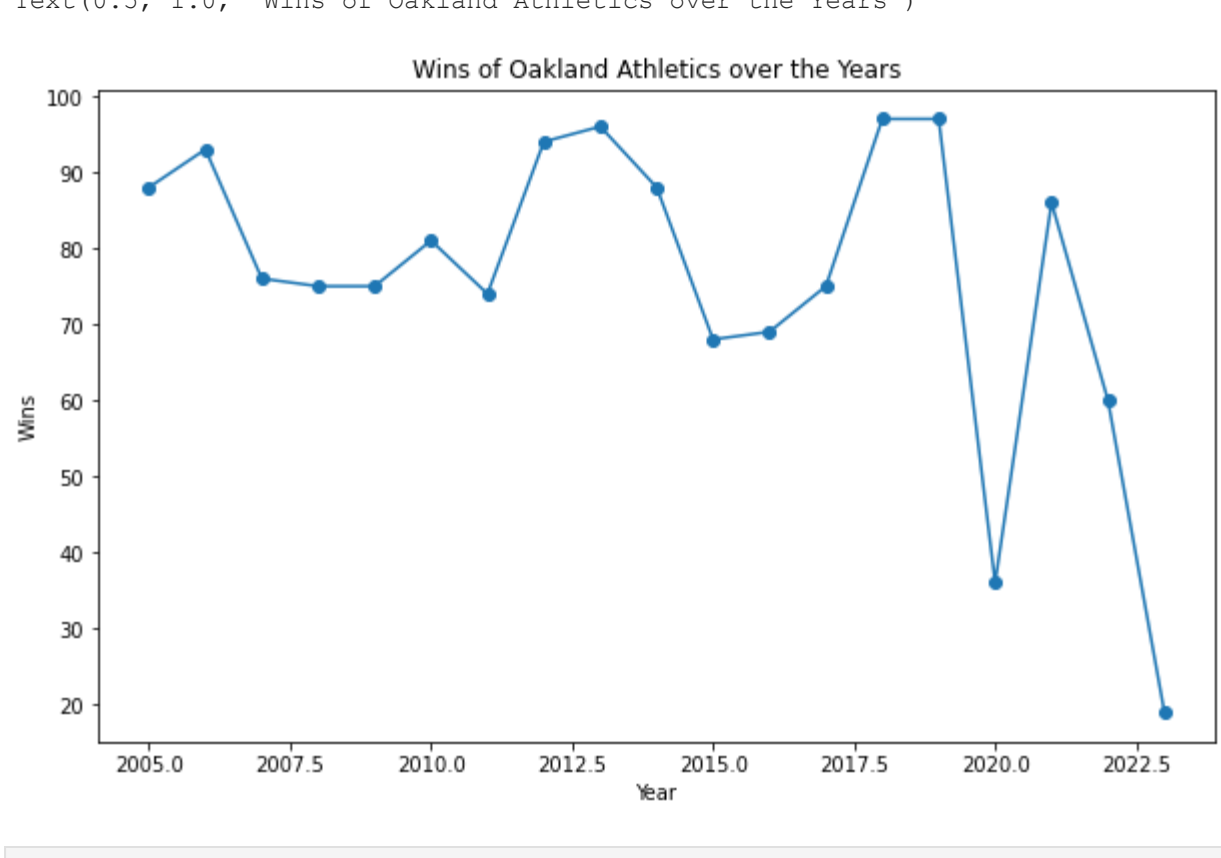


In [32]:

```
# Plotting Wins over the years
plt.figure(figsize=(10, 6))
plt.plot(athletics_df['Year'], athletics_df['W'], marker='o')
plt.xlabel('Year')
plt.ylabel('Wins')
plt.title('Wins of Oakland Athletics over the Years')
```

Out[32]:

```
Text(0.5, 1.0, 'Wins of Oakland Athletics over the Years')
```

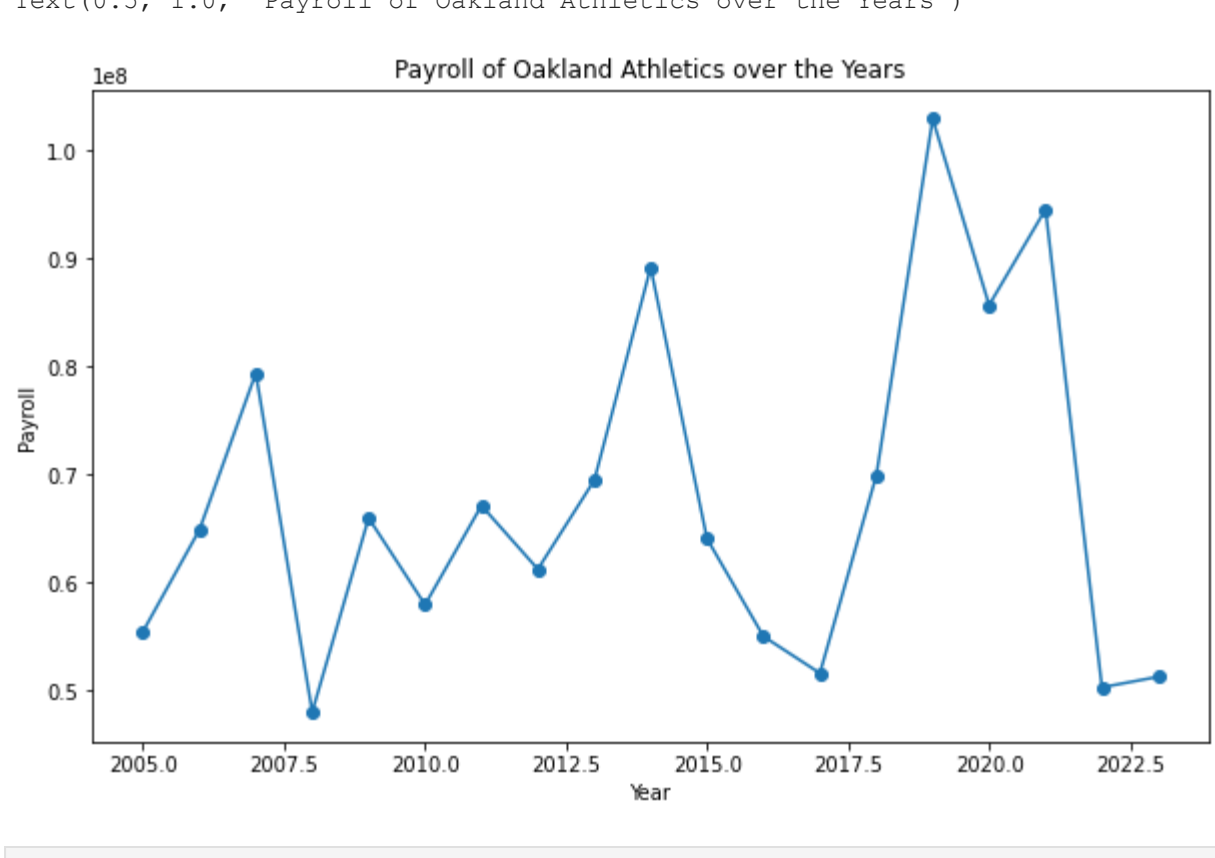


In [33]:

```
# Plotting Payroll over the years
plt.figure(figsize=(10, 6))
plt.plot(athletics_df['Year'], athletics_df['Est. Payroll'], marker='o')
plt.xlabel('Year')
plt.ylabel('Payroll')
plt.title('Payroll of Oakland Athletics over the Years')
```

Out[33]:

```
Text(0.5, 1.0, 'Payroll of Oakland Athletics over the Years')
```



In [14]:

```
# Correlation matrix
correlation = athletics_df.corr()
print(correlation)

# Heatmap of correlation matrix
plt.figure(figsize=(10, 8))
plt.imshow(correlation, cmap='coolwarm', interpolation='none')
plt.colorbar()
plt.xticks(range(len(correlation)), correlation.columns, rotation=90)
plt.yticks(range(len(correlation)), correlation.columns)
plt.title('Correlation Matrix')
```

```
                  Year         W         L    Finish  Attendance  Attend/G  \
Year          1.000000 -0.461594 -0.272585  0.356362   -0.739316 -0.740579
W            -0.461594  1.000000  0.292504 -0.498125    0.702923  0.602977
L            -0.272585  0.292504  1.000000  0.565745    0.085816 -0.029819
Finish        0.356362 -0.498125  0.565745  1.000000   -0.541928 -0.535614
Attendance   -0.739316  0.702923  0.085816 -0.541928    1.000000  0.983150
Attend/G     -0.740579  0.602977 -0.029819 -0.535614    0.983150  1.000000
Est. Payroll  0.214157  0.281505 -0.380622 -0.439569    0.160458  0.123188
PPF          -0.479714  0.252063  0.252121 -0.070948    0.289479  0.288072
BPF          -0.516398  0.396448  0.056171 -0.359041    0.512159  0.487661

              Est. Payroll       PPF       BPF
Year              0.214157 -0.479714 -0.516398
W                 0.281505  0.252063  0.396448
L                -0.380622  0.252121  0.056171
Finish           -0.439569 -0.070948 -0.359041
Attendance        0.160458  0.289479  0.512159
Attend/G          0.123188  0.288072  0.487661
Est. Payroll      1.000000 -0.316857 -0.025893
PPF              -0.316857  1.000000  0.905660
BPF              -0.025893  0.905660  1.000000
```

Out[14]:

```
Text(0.5, 1.0, 'Correlation Matrix')
```