


```
In [1]: # import numpy and pandas
import numpy as np
import pandas as pd

# used for dates
import datetime
from datetime import datetime, date
import math
from math import sqrt, exp
from scipy.stats import norm
import requests_cache
# imports
!pip install requests_cache --upgrade
import numpy as np
import pandas as pd
from pandas_datareader.data import DataReader
import matplotlib.pyplot as plt
import requests_cache

# bring in matplotlib for graphics
import matplotlib.pyplot as plt
%matplotlib inline

#!/usr/bin/env python
#-*- coding:utf-8 -*-
from __future__ import division
import numpy as np
import pandas as pd
import statsmodels.api as sm
import matplotlib.pyplot as plt
from math import sqrt, exp
from scipy.stats import norm
from tqdm import tqdm
```

```

Requirement already up-to-date: requests_cache in /Users/dylan/opt/anaconda3/
lib/python3.8/site-packages (0.8.1)
Requirement already satisfied, skipping upgrade: attrs<22.0,>=21.2 in /Users/
dylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache) (21.2.
0)
Requirement already satisfied, skipping upgrade: url-normalize<2.0,>=1.4 in /
Users/dylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache)
(1.4.3)
Requirement already satisfied, skipping upgrade: appdirs<2.0.0,>=1.4.4 in /Us
ers/dylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache) (1.
4.4)
Requirement already satisfied, skipping upgrade: cattrs<2.0,>=1.8 in /Users/d
ylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache) (1.8.0)
Requirement already satisfied, skipping upgrade: requests<3.0,>=2.22 in /User
s/dylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache) (2.2
6.0)
Requirement already satisfied, skipping upgrade: urllib3<2.0.0,>=1.25.5 in /U
ser/dylan/opt/anaconda3/lib/python3.8/site-packages (from requests_cache)
(1.26.6)
Requirement already satisfied, skipping upgrade: six in /Users/dylan/opt/anac
onda3/lib/python3.8/site-packages (from url-normalize<2.0,>=1.4->requests_cac
he) (1.16.0)
Requirement already satisfied, skipping upgrade: charset-normalizer~=2.0.0; p
ython_version >= "3" in /Users/dylan/opt/anaconda3/lib/python3.8/site-package
s (from requests<3.0,>=2.22->requests_cache) (2.0.6)
Requirement already satisfied, skipping upgrade: certifi>=2017.4.17 in /User
s/dylan/opt/anaconda3/lib/python3.8/site-packages (from requests<3.0,>=2.22->
requests_cache) (2021.5.30)
Requirement already satisfied, skipping upgrade: idna<4,>=2.5; python_version
>= "3" in /Users/dylan/opt/anaconda3/lib/python3.8/site-packages (from reques
ts<3.0,>=2.22->requests_cache) (3.2)

```

Before Subjective Adjustment:

```

best = [('NVDA', 0.08063), ('QCOM', 0.05548), ('NXPI', 0.0), ('MU', 0.0), ('MRVL', 0.05834), ('AMD', 0.07181),
('MCHP', 0.0), ('AVGO', 0.00823), ('XLNX', 0.0), ('LRCX', 0.0), ('ON', 0.0), ('INTC', 0.04661), ('TXN', 0.10892),
('ENPH', 0.1386), ('AMAT', 0.0), ('CRUS', 0.0), ('JBL', 0.05414), ('ADI', 0.01463), ('OLED', 0.0), ('TSM', 0.19765),
('IIVI', 0.0), ('DIOD', 0.01434), ('AEIS', 0.0), ('MTSI', 0.0), ('TTMI', 0.05052), ('FLEX', 0.0), ('MXL', 0.0), ('SMTC',
0.0), ('SYNA', 0.10011), ('AOSL', 0.0)]

```

After Subjective Adjustment:

```

OrderedDict([('NVDA', 0.16027), ('QCOM', 0.0), ('NXPI', 0.0), ('MU', 0.0), ('MRVL', 0.03828), ('AMD', 0.05228),
('MCHP', 0.0), ('AVGO', 0.04696), ('XLNX', 0.0), ('LRCX', 0.0), ('ON', 0.01556), ('INTC', 0.0097), ('TXN', 0.05684),
('ENPH', 0.11506), ('AMAT', 0.0), ('CRUS', 0.01334), ('JBL', 0.09533), ('ADI', 0.03417), ('OLED', 0.0), ('TSM',
0.03025), ('IIVI', 0.0), ('DIOD', 0.0), ('AEIS', 0.0), ('MTSI', 0.0), ('TTMI', 0.14021), ('FLEX', 0.0), ('MXL', 0.0),
('SMTC', 0.0), ('SYNA', 0.19175), ('AOSL', 0.0)])

```

In [2]: total_portfolio_value = 270105461.50778675

FELAX Return: (Best)

```
In [3]: session = requests_cache.CachedSession(cache_name='cache', backend='sqlite')
session.headers = { 'User-Agent': 'Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:89.0) Gecko/20100101 Firefox/89.0', 'Accept': 'application/json; charset=utf-8' }

def get_data_for_multiple_stocks(tickers,start_date='2021-01-04',end_date= '2021-10-31'):

    stocks = dict()
    stocks_log_returns = pd.DataFrame()
    stocks_adj_close= pd.DataFrame()
    # Loop through all the tickers
    for ticker in tickers:

        # get the data for the specific ticker
        s = DataReader(ticker, 'yahoo', start_date, end_date, session = session)

        s.insert(0, "Ticker", ticker) # insert ticker column

        s['Prev Adj Close'] = s['Adj Close'].shift(1)
        s['log_return'] = np.log(s['Adj Close']/s['Prev Adj Close'])
        stocks[ticker] = s
        stocks_log_returns[ticker] = s['log_return']
        stocks_adj_close[ticker] = s['Adj Close']

    return stocks, stocks_log_returns, stocks_adj_close

# Top 30 stocks in best portfolio
tickers = ['FELAX']

stocks_data = get_data_for_multiple_stocks(tickers)[0]
stocks_log_returns = get_data_for_multiple_stocks(tickers)[1]
stocks_adj_close = get_data_for_multiple_stocks(tickers)[2]
```

```
In [4]: #number of felax in our portfolio
total_portfolio_value/37.82
```

Out[4]: 7141868.363505731

```
In [5]: #felax std
np.std(stocks_adj_close['FELAX'] * 7141868.363505731)
```

Out[5]: 23296553.864891145

```
In [6]: #felax returns
start = stocks_adj_close['FELAX'][0] * 7141868.363505731
end = stocks_adj_close['FELAX'][-1] * 7141868.363505731

returns = ((end-start)/start)*100
end-start
```

Out[6]: 93772739.24116868

```
In [7]: returns
```

Out[7]: 34.717084013916896

```
In [8]: #october returns
start = stocks_adj_close['FELAX'][188] * 7141868.363505731
end = stocks_adj_close['FELAX'][-1] * 7141868.363505731

end-start
```

Out[8]: 31781319.666413665

```
In [ ]:
```

BFOCX Return (Worst):

```
In [9]: session = requests_cache.CachedSession(cache_name='cache', backend='sqlite')
session.headers = { 'User-Agent': 'Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:89.0) Gecko/20100101 Firefox/89.0', 'Accept': 'application/json; charset=utf-8' }

def get_data_for_multiple_stocks(tickers,start_date='2021-01-04',end_date= '2021-10-31'):

    stocks = dict()
    stocks_log_returns = pd.DataFrame()
    stocks_adj_close= pd.DataFrame()
    # Loop through all the tickers
    for ticker in tickers:

        # get the data for the specific ticker
        s = DataReader(ticker, 'yahoo', start_date, end_date, session = session)

        s.insert(0, "Ticker", ticker) # insert ticker column

        s['Prev Adj Close'] = s['Adj Close'].shift(1)
        s['log_return'] = np.log(s['Adj Close']/s['Prev Adj Close'])
        stocks[ticker] = s
        stocks_log_returns[ticker] = s['log_return']
        stocks_adj_close[ticker] = s['Adj Close']

    return stocks, stocks_log_returns, stocks_adj_close

# Top 30 stocks in best portfolio
tickers = ['BFOCX']

stocks_data = get_data_for_multiple_stocks(tickers)[0]
stocks_log_returns = get_data_for_multiple_stocks(tickers)[1]
stocks_adj_close = get_data_for_multiple_stocks(tickers)[2]
```

```
In [10]: #number of BFOCX
total_portfolio_value/43.02
```

Out[10]: 6278602.080608711

```
In [11]: #bfocx std
np.std(stocks_adj_close['BFOCX'] * 6278602.080608711)
```

Out[11]: 17206881.93038579

```
In [12]: #BFOCX returns
start = stocks_adj_close['BFOCX'][0] * 6278602.080608711
end = stocks_adj_close['BFOCX'][-1] * 6278602.080608711

returns = ((end-start)/start)*100
end-start
```

```
Out[12]: 33904436.86470729
```

```
In [13]: start
```

```
Out[13]: 270105464.3819027
```

```
In [14]: returns
```

```
Out[14]: 12.552295801305869
```

```
In [15]: stocks_adj_close['BFOCX'][188]
stocks_adj_close['BFOCX'][0]
```

```
Out[15]: 43.02000045776367
```

```
In [16]: #october returns
start = stocks_adj_close['BFOCX'][188] * 6278602.080608711
end = stocks_adj_close['BFOCX'][-1] * 6278602.080608711

end-start
```

```
Out[16]: 38111112.71321756
```

```
In [17]: start
```

```
Out[17]: 265898788.53339243
```

Find performance for optimal and adjusted optimal

```
In [18]: price_per_stock = {'NVDA': 59.833770751953125,
 'QCOM': 85.23181915283203,
 'NXPI': 125.79685974121094,
 'MU': 55.31268310546875,
 'MRVL': 27.127023696899414,
 'AMD': 49.099998474121094,
 'MCHP': 105.23179626464844,
 'AVGO': 301.33160400390625,
 'XLNX': 100.11534881591797,
 'LRCX': 291.0453186035156,
 'ON': 25.059999465942383,
 'INTC': 58.26591491699219,
 'TXN': 123.73091125488281,
 'ENPH': 29.34000015258789,
 'AMAT': 61.03724670410156,
 'CRUS': 85.0,
 'JBL': 41.377220153808594,
 'ADI': 116.50666809082031,
 'OLED': 211.5386962890625,
 'TSM': 57.80479431152344,
 'IIVI': 35.31999969482422,
 'DIOD': 57.29999923706055,
 'AEIS': 71.49348449707031,
 'MTSI': 26.299999237060547,
 'TTMI': 15.15999984741211,
 'FLEX': 12.779999732971191,
 'MXL': 21.549999237060547,
 'SMT': 53.86000061035156,
 'SYNA': 66.26000213623047,
 'AOSL': 13.680000305175781}
```

```
In [ ]:
```

```
In [19]: weights = [('NVDA', 0.08063), ('QCOM', 0.05548), ('NXPI', 0.0), ('MU', 0.0),
 ('MRVL', 0.05834), ('AMD', 0.07181), ('MCHP', 0.0), ('AVGO', 0.00823), ('XLN
 X', 0.0), ('LRCX', 0.0), ('ON', 0.0), ('INTC', 0.04661), ('TXN', 0.10892), ('E
 NPH', 0.1386), ('AMAT', 0.0), ('CRUS', 0.0), ('JBL', 0.05414), ('ADI', 0.0146
 3), ('OLED', 0.0), ('TSM', 0.19765), ('IIVI', 0.0), ('DIOD', 0.01434), ('AEI
 S', 0.0), ('MTSI', 0.0), ('TTMI', 0.05052), ('FLEX', 0.0), ('MXL', 0.0), ('SMT
 C', 0.0), ('SYNA', 0.10011), ('AOSL', 0.0)]
```

```
In [20]: no_of_stocks = {}

for stock in weights:
    no_of_stocks[stock[0]] = total_portfolio_value * stock[1] /price_per_stock
[stock[0]]
```

```
In [21]: no_of_stocks
```

```
Out[21]: {'NVDA': 363985.1389553605,  
          'QCOM': 175819.91272040192,  
          'NXPI': 0.0,  
          'MU': 0.0,  
          'MRVL': 580895.0071498406,  
          'AMD': 395036.12614361424,  
          'MCHP': 0.0,  
          'AVGO': 7377.148359719574,  
          'XLNX': 0.0,  
          'LRCX': 0.0,  
          'ON': 0.0,  
          'INTC': 216071.70468040498,  
          'TXN': 237773.1366321537,  
          'ENPH': 1275958.3084622857,  
          'AMAT': 0.0,  
          'CRUS': 0.0,  
          'JBL': 353419.33633222926,  
          'ADI': 33917.740217053506,  
          'OLED': 0.0,  
          'TSM': 923562.5712860886,  
          'IIVI': 0.0,  
          'DIOD': 67597.07451298668,  
          'AEIS': 0.0,  
          'MTSI': 0.0,  
          'TTMI': 900113.9876464301,  
          'FLEX': 0.0,  
          'MXL': 0.0,  
          'SMTA': 0.0,  
          'SYNA': 408093.22184973373,  
          'AOSL': 0.0}
```

```
In [22]: session = requests_cache.CachedSession(cache_name='cache', backend='sqlite')
session.headers = {      'User-Agent': 'Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:89.0) Gecko/20100101 Firefox/89.0',      'Accept': 'application/json; charset=utf-8'    }

def get_data_for_multiple_stocks(tickers,start_date='2021-01-04',end_date= '2021-10-31'):

    stocks = dict()
    stocks_log_returns = pd.DataFrame()
    stocks_adj_close= pd.DataFrame()
    # Loop through all the tickers
    for ticker in tickers:

        # get the data for the specific ticker
        s = DataReader(ticker, 'yahoo', start_date, end_date, session = session)

        s.insert(0, "Ticker", ticker) # insert ticker column

        s['Prev Adj Close'] = s['Adj Close'].shift(1)
        s['log_return'] = np.log(s['Adj Close']/s['Prev Adj Close'])
        stocks[ticker] = s
        stocks_log_returns[ticker] = s['log_return']
        stocks_adj_close[ticker] = s['Adj Close']

    return stocks, stocks_log_returns, stocks_adj_close

# Top 30 stocks in best portfolio
tickers = ['NVDA','QCOM','MRVL','AMD','AVGO','INTC','TXN','ENPH','JBL','ADI','TSM','DIOD','TTMI','SYNA']
```

In [23]: stocks_adj_close

Out[23]:

	NVDA	QCOM	MRVL	AMD	AVGO	INTC	TXN	EE
Date								
2021-01-04	131.036606	146.363647	46.162373	92.300003	415.599091	48.414623	158.491653	172.240
2021-01-05	133.946915	150.237122	47.458229	92.769997	418.413940	49.330872	159.654312	181.479
2021-01-06	126.050354	149.014954	46.361732	90.330002	415.833679	49.808475	160.445694	203.380
2021-01-07	133.339874	153.460068	48.863735	95.160004	433.358002	50.870930	164.080185	213.759
2021-01-08	132.667877	154.386551	48.923542	94.580002	435.557129	50.344585	167.226181	207.410
...
2021-10-25	231.660004	131.929993	67.669998	122.360001	522.070007	49.068768	198.974518	179.429
2021-10-26	247.169998	131.940002	67.730003	122.930000	533.869995	47.946571	195.774231	173.460
2021-10-27	244.509995	131.199997	67.699997	122.279999	523.109985	47.559265	185.954712	216.220
2021-10-28	249.410004	133.690002	68.480003	121.160004	529.570007	47.747955	186.719986	224.460
2021-10-29	255.669998	133.039993	68.500000	120.230003	531.669983	48.661598	187.479996	231.630

209 rows × 14 columns

In [24]: nstocks = [363985.1389553605,
175819.91272040192,

580895.0071498406,
395036.12614361424,

7377.148359719574,

216071.70468040498,
237773.1366321537,
1275958.3084622857,

353419.33633222926,
33917.740217053506,

923562.5712860886,

67597.07451298668,
900113.9876464301,
408093.22184973373]

```
In [25]: first = list(stocks_adj_close.iloc[0])
```

```
In [26]: #calculate the adj close at first date
first_price = []
for i in range(len(nstocks)):
    first_price.append(nstocks[i]* first[i])
```

```
In [27]: adj_close_at_day_1 = sum(first_price)
adj_close_at_day_1
```

```
Out[27]: 586316802.0362402
```

```
In [28]: last = list(stocks_adj_close.iloc[-1])
```

```
In [29]: #calculate the adj close at first date
last_price = []
for i in range(len(nstocks)):
    last_price.append(nstocks[i]* last[i])
```

```
In [30]: last_price
```

```
Out[30]: [93060079.81024033,
23391080.007890727,
39791307.98976408,
47495194.772356786,
3922208.342337793,
10514394.47674967,
44577706.639919735,
295550229.21938443,
21191023.0829154,
5884388.9365723245,
105009061.53673898,
6495402.64240501,
11917508.990418993,
79402701.16426672]
```

```
In [31]: adj_close_at_last_day = sum(last_price)
adj_close_at_last_day
```

```
Out[31]: 788202287.611961
```

```
In [32]: last
```

```
Out[32]: [255.6699981689453,  
 133.0399932861328,  
 68.5,  
 120.2300033569336,  
 531.6699829101562,  
 48.661598205566406,  
 187.47999572753906,  
 231.6300048828125,  
 59.959999084472656,  
 173.49000549316406,  
 113.69999694824219,  
 96.08999633789062,  
 13.239999771118164,  
 194.57000732421875]
```

```
In [33]: adj_close_at_last_day - adj_close_at_day_1
```

```
Out[33]: 201885485.5757208
```

```
In [34]: returns = ((788202287 - 586316802) / 586316802)*100  
returns
```

```
Out[34]: 34.43283295163013
```

```
In [35]: total = []
for index, row in stocks_adj_close.iterrows():
    row_total = 0
    for i in range (len(row)):
        print(row[i])
        row_total += (nstocks[i]* row[i])

    total.append(row_total)
```

131.03660583496094
146.3636474609375
46.16237258911133
92.30000305175781
415.5990905761719
48.41462326049805
158.4916534423828
172.24000549316406
41.97174835205078
144.17581176757812
110.4020004272461
71.23999786376953
13.75
97.4000015258789
133.94691467285156
150.23712158203125
47.458229064941406
92.7699966430664
418.4139404296875
49.33087158203125
159.65431213378906
181.47999572753906
42.857566833496094
146.75283813476562
111.45957946777344
74.0199966430664
14.020000457763672
98.5
126.05035400390625
149.01495361328125
46.361732482910156
90.33000183105469
415.83367919921875
49.808475494384766
160.44569396972656
203.3800048828125
43.78319549560547
147.41436767578125
114.2665786743164
77.36000061035156
14.34000015258789
101.2699966430664
133.33987426757812
153.46006774902344
48.86373519897461
95.16000366210938
433.3580017089844
50.87092971801758
164.08018493652344
213.75999450683594
44.69887161254883
153.6446990966797
120.01895141601562
79.08999633789062
14.279999732971191
102.63999938964844
132.66787719726562

154.3865509033203
48.92354202270508
94.58000183105469
435.55712890625
50.34458541870117
167.22618103027344
207.41000366210938
44.25098419189453
154.76040649414062
117.310791015625
77.04000091552734
14.1899995803833
104.25
136.11279296875
153.86416625976562
50.0798454284668
97.25
435.6744079589844
50.237361907958984
167.3727264404297
201.67999267578125
44.430137634277344
156.3007049560547
121.17534637451172
77.51000213623047
14.180000305175781
105.33000183105469
134.74632263183594
152.22805786132812
50.47856903076172
95.36000061035156
439.22222900390625
51.89439392089844
168.3399658203125
206.49000549316406
44.62919998168945
157.08071899414062
121.57070922851562
78.47000122070312
14.180000305175781
106.66000366210938
135.21597290039062
155.15530395507812
50.0798454284668
91.77999877929688
441.0010681152344
55.5106315612793
167.47042846679688
203.69000244140625
44.370426177978516
156.47842407226562
117.84451293945312
78.52999877929688
14.130000114440918
102.19999694824219
131.90345764160156
158.53599548339844

51.14643859863281
90.79000091552734
441.84161376953125
57.75249481201172
167.76353454589844
208.8300018310547
45.26618576049805
157.44606018066406
124.98060607910156
79.1500015258789
14.220000267028809
101.9000015258789
128.49850463867188
154.83006286621094
50.608154296875
88.20999908447266
435.7623291015625
56.12470626831055
165.30145263671875
190.58999633789062
44.390323638916016
155.75765991210938
123.77478790283203
76.94000244140625
14.100000381469727
100.95999908447266
130.15476989746094
161.4139862060547
53.638465881347656
89.44999694824219
448.8786926269531
56.52434539794922
170.1865234375
201.27999877929688
44.92778778076172
158.5124053955078
129.7742462158203
79.5199966430664
14.15999984741211
103.51000213623047
133.55722045898438
162.23202514648438
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147.41000366210938
61.040000915527344
165.3699951171875
109.26000213623047
88.80000305175781
12.84000015258789
177.5
207.0
128.05999755859375
63.69000244140625
103.63999938964844
488.7799987792969

53.60720443725586
193.20008850097656
153.5800018310547
61.279998779296875
166.0500030517578
109.33999633789062
87.5199966430664
12.9399995803833
178.17999267578125
210.75
127.83999633789062
65.1500015258789
106.44999694824219
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166.97999572753906
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88.66000366210938
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126.55000305175781
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105.05999755859375
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154.36000061035156
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168.6199951171875
110.04000091552734
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124.94000244140625
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161.25999450683594
63.33000183105469
167.89999389648438
110.26000213623047
87.0
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122.94999694824219
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114.86000061035156
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67.16999816894531
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503.3599853515625
54.09382247924805
193.71690368652344

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62.130001068115234
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115.33999633789062
88.44000244140625
13.449999809265137
175.10000610351562
222.89999389648438
132.5
67.8499984741211
116.33000183105469
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54.82870864868164
197.01657104492188
187.05999755859375
61.77000045776367
176.6300048828125
116.95999908447266
89.08999633789062
13.529999732971191
176.1999969482422
221.02999877929688
132.16000366210938
67.19000244140625
116.38999938964844
509.3900146484375
54.987606048583984
198.1595458984375
180.10000610351562
60.939998626708984
176.9199981689453
115.58999633789062
90.47000122070312
13.470000267028809
175.8000030517578
226.9199981689453
133.0500030517578
67.06999969482422
119.33000183105469
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55.61325454711914
200.05784606933594
179.8000030517578
62.630001068115234
178.80999755859375
116.29000091552734
93.30000305175781
13.529999732971191
178.94000244140625
227.25999450683594
131.6199951171875
66.30999755859375
119.81999969482422
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49.1184196472168
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176.6999969482422

61.619998931884766
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13.4399995803833
177.74000549316406
231.66000366210938
131.92999267578125
67.66999816894531
122.36000061035156
522.0700073242188
49.06876754760742
198.97451782226562
179.42999267578125
62.220001220703125
180.52000427246094
113.63999938964844
94.08999633789062
13.5600004196167
179.39999389648438
247.1699981689453
131.94000244140625
67.7300033569336
122.93000030517578
533.8699951171875
47.946571350097656
195.77423095703125
173.4600067138672
61.529998779296875
179.8800048828125
114.18000030517578
93.88999938964844
13.6899995803833
178.75999450683594
244.50999450683594
131.1999969482422
67.69999694824219
122.27999877929688
523.1099853515625
47.55926513671875
185.9547119140625
216.22000122070312
60.5
170.4600067138672
113.75
93.54000091552734
13.600000381469727
181.42999267578125
249.41000366210938
133.69000244140625
68.4800033569336
121.16000366210938
529.5700073242188
47.747955322265625
186.71998596191406
224.4600067138672
60.02000045776367

```
172.4600067138672
116.01000213623047
96.05000305175781
13.029999732971191
190.6199951171875
255.6699981689453
133.0399932861328
68.5
120.2300033569336
531.6699829101562
48.661598205566406
187.47999572753906
231.6300048828125
59.959999084472656
173.49000549316406
113.69999694824219
96.08999633789062
13.239999771118164
194.57000732421875
```

In [36]: np.std(total)

Out[36]: 49646132.25268391

In [37]: *#monthly return for october only*
#188 is october first
total[208] - total[188]

Out[37]: 133928670.76257491

In []:

Subjectively adjusted portfolio

In []:

```
In [38]: weights = [('NVDA', 0.16027),  
                 ('QCOM', 0.0),  
                 ('NXPI', 0.0),  
                 ('MU', 0.0),  
                 ('MRVL', 0.03828),  
                 ('AMD', 0.05228),  
                 ('MCHP', 0.0),  
                 ('AVGO', 0.04696),  
                 ('XLNX', 0.0),  
                 ('LRCX', 0.0),  
                 ('ON', 0.01556),  
                 ('INTC', 0.0097),  
                 ('TXN', 0.05684),  
                 ('ENPH', 0.11506),  
                 ('AMAT', 0.0),  
                 ('CRUS', 0.01334),  
                 ('JBL', 0.09533),  
                 ('ADI', 0.03417),  
                 ('OLED', 0.0),  
                 ('TSM', 0.03025),  
                 ('IIVI', 0.0),  
                 ('DIOD', 0.0),  
                 ('AEIS', 0.0),  
                 ('MTSI', 0.0),  
                 ('TTMI', 0.14021),  
                 ('FLEX', 0.0),  
                 ('MXL', 0.0),  
                 ('SMTC', 0.0),  
                 ('SYNA', 0.19175),  
                 ('AOSL', 0.0)]
```

```
In [39]: no_of_stocks = {}  
  
for stock in weights:  
    no_of_stocks[stock[0]] = total_portfolio_value * stock[1] / price_per_stock  
    [stock[0]]
```

In [40]: no_of_stocks

Out[40]: {'NVDA': 723501.1561500141,
'QCOM': 0.0,
'NXPI': 0.0,
'MU': 0.0,
'MRVL': 381156.339967362,
'AMD': 287599.0624535323,
'MCHP': 0.0,
'AVGO': 42093.66791888593,
'XLNX': 0.0,
'LRCX': 0.0,
'ON': 167711.13609850642,
'INTC': 44966.64954730591,
'TXN': 124082.12528618818,
'ENPH': 1059247.9290885322,
'AMAT': 0.0,
'CRUS': 42390.66890016323,
'JBL': 622302.6474427672,
'ADI': 79218.6728104387,
'OLED': 0.0,
'TSM': 141349.69785683876,
'IIVI': 0.0,
'DIOD': 0.0,
'AEIS': 0.0,
'MTSI': 0.0,
'TTMI': 2498119.2044320265,
'FLEX': 0.0,
'MXL': 0.0,
'SMTA': 0.0,
'SYNA': 781658.9280759809,
'AOSL': 0.0}

```
In [41]: session = requests_cache.CachedSession(cache_name='cache', backend='sqlite')
session.headers = { 'User-Agent': 'Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:89.0) Gecko/20100101 Firefox/89.0', 'Accept': 'application/json; charset=utf-8' }

def get_data_for_multiple_stocks(tickers,start_date='2021-01-04',end_date= '2021-10-31'):

    stocks = dict()
    stocks_log_returns = pd.DataFrame()
    stocks_adj_close= pd.DataFrame()
    # Loop through all the tickers
    for ticker in tickers:

        # get the data for the specific ticker
        s = DataReader(ticker, 'yahoo', start_date, end_date, session = session)

        s.insert(0, "Ticker", ticker) # insert ticker column

        s['Prev Adj Close'] = s['Adj Close'].shift(1)
        s['log_return'] = np.log(s['Adj Close']/s['Prev Adj Close'])
        stocks[ticker] = s
        stocks_log_returns[ticker] = s['log_return']
        stocks_adj_close[ticker] = s['Adj Close']

    return stocks, stocks_log_returns, stocks_adj_close

# Top 30 stocks in best portfolio
tickers = ['NVDA', 'QCOM', 'MRVL', 'AMD', 'AVGO', 'INTC', 'TXN', 'ENPH', 'JBL', 'ADI', 'TSM', 'DIOD', 'TTMI', 'SYNA']
```

```
In [42]: nstocks = [723501.1561500141,
381156.339967362,
287599.0624535323,
42093.66791888593,
167711.13609850642,
44966.64954730591,
124082.12528618818,
1059247.9290885322,
42390.66890016323,
622302.6474427672,
79218.6728104387,
141349.69785683876,
2498119.2044320265,
781658.9280759809]
```

```
In [43]: first = list(stocks_adj_close.iloc[0])
first
```

```
Out[43]: [131.03660583496094,
146.3636474609375,
46.16237258911133,
92.30000305175781,
415.5990905761719,
48.41462326049805,
158.4916534423828,
172.24000549316406,
41.97174835205078,
144.17581176757812,
110.4020004272461,
71.23999786376953,
13.75,
97.4000015258789]
```

```
In [44]: #calculate the adj close at first date
first_price = []
for i in range(len(nstocks)):
    first_price.append(nstocks[i]* first[i])
```

```
In [45]: adj_close_at_day_1 = sum(first_price)
adj_close_at_day_1
```

```
Out[45]: 662541129.926738
```

```
In [46]: last = list(stocks_adj_close.iloc[-1])
```

```
In [47]: #calculate the adj close at first date
last_price = []
for i in range(len(nstocks)):
    last_price.append(nstocks[i]* last[i])
```

```
In [48]: adj_close_at_last_day = sum(last_price)
adj_close_at_last_day

#####
#adj_close_at_last_day - adj_close_at_day_1
```

```
Out[48]: 276135519.12011945
```

```
In [49]: returns = ((adj_close_at_last_day - adj_close_at_day_1)/adj_close_at_day_1)*10
0
```

```
In [50]: returns
```

```
Out[50]: 41.67824556803798
```

```
In [51]: #stocks_adj_close['sum'] = stocks_adj_close.sum(axis = 1)
```

In [52]: `#np.std(stocks_adj_close['sum'])`

In [53]: `stocks_adj_close`

Out[53]:

	NVDA	QCOM	MRVL	AMD	AVGO	INTC	TXN	EI
Date								
2021-01-04	131.036606	146.363647	46.162373	92.300003	415.599091	48.414623	158.491653	172.240
2021-01-05	133.946915	150.237122	47.458229	92.769997	418.413940	49.330872	159.654312	181.479
2021-01-06	126.050354	149.014954	46.361732	90.330002	415.833679	49.808475	160.445694	203.380
2021-01-07	133.339874	153.460068	48.863735	95.160004	433.358002	50.870930	164.080185	213.759
2021-01-08	132.667877	154.386551	48.923542	94.580002	435.557129	50.344585	167.226181	207.410
...
2021-10-25	231.660004	131.929993	67.669998	122.360001	522.070007	49.068768	198.974518	179.429
2021-10-26	247.169998	131.940002	67.730003	122.930000	533.869995	47.946571	195.774231	173.460
2021-10-27	244.509995	131.199997	67.699997	122.279999	523.109985	47.559265	185.954712	216.220
2021-10-28	249.410004	133.690002	68.480003	121.160004	529.570007	47.747955	186.719986	224.460
2021-10-29	255.669998	133.039993	68.500000	120.230003	531.669983	48.661598	187.479996	231.630

209 rows × 14 columns



```
In [54]: total = []
for index, row in stocks_adj_close.iterrows():
    row_total = 0
    for i in range (len(row)):

        row_total += (nstocks[i]* row[i])

    total.append(row_total)

total
```

Out[54]: [662541129.926738,
680612889.5035375,
701010270.2261125,
728871357.2948893,
723945043.5134928,
722804723.9602373,
728812583.7334814,
723106302.9419152,
729269446.1640134,
701880793.2038939,
725379699.429451,
726468240.2034138,
746325191.584089,
740514556.3353213,
729823127.0026712,
710268056.7181345,
680496638.1884726,
700531145.0627038,
683464826.824859,
703765773.3219942,
718530885.006865,
713484392.914297,
713726218.4127529,
717313156.1571523,
739016190.6489305,
738363870.5603166,
743277595.3654925,
753125700.4070883,
766521043.7478006,
759167030.5644994,
746875113.1038417,
734111035.0488257,
753694572.9300709,
714712338.7640224,
711202831.3804376,
737318126.8592846,
694015758.815338,
713889410.9934015,
737333413.9352272,
710045061.3558881,
683163170.7103473,
652447728.147796,
655829562.224705,
621515714.767704,
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693708295.7895111,
689660545.8744466,
708099100.792883,
706504219.9326146,
708588511.7462904,
674032794.4277554,
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708697629.4291724,
711843375.4193367,
705364183.1655533,
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690526163.1895125,
687448314.1068653,
707257423.8866761,
703175000.5054042,
723280811.9478261,
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688453122.7504622,
679443722.1509888,
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662866557.2174481,
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665302336.7149329,
637202481.6356028,
642587084.846103,
618394544.9466879,
620438580.0424758,
640113790.8551421,
635072513.3575995,
633568749.0828025,
651109079.3133031,
677307070.1501778,
676881474.4045141,
689130586.7443548,
687511726.7643304,
693409571.1216446,
693436043.5304797,
701769356.8284562,
696620691.5344938,
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712194097.7070236,
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762511359.0735661,
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787605965.0508842,
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808038062.7611192,
801349932.8220465,
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808031063.24583,
821202624.8127258,
825680995.4062158,
821616498.6694026,
818500460.626098,
816157871.3984722,
816646205.1254611,
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788337140.7294028,
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786577833.5919111,
800865280.8401537,
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822798842.2089494,
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827889701.2026343,
841422694.7975981,
851504709.335215,
843028499.533416,
843067334.4711593,
845475569.4508187,
845955675.3744332,
836118553.1674492,

```
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822958376.3221942,  
826420322.2834604,  
825839175.6477566,  
825383270.9771763,  
826324792.5689957,  
819268762.402968,  
796496717.2603676,  
800526728.5318335,  
819472679.2687861,  
828614029.2531248,  
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787205078.384249,  
795978728.4381554,  
765711138.7237849,  
779320444.9896734,  
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794499125.9437225,  
797752219.3314768,  
800166644.7385463,  
804985116.6428511,  
822851280.5743301,  
825927551.1349792,  
838716318.617895,  
852756577.3364108,  
843464921.4980588,  
853206581.7262436,  
847291640.1919345,  
858399815.1337467,  
864285592.3148432,  
900168958.3641042,  
922273052.5143628,  
938676649.0468575]
```

In [55]: np.std(total)

Out[55]: 63440847.1808211

In [56]: total[208] - total[188]

Out[56]: 142697920.60870206

In [57]: total

Out[57]: [662541129.926738,
680612889.5035375,
701010270.2261125,
728871357.2948893,
723945043.5134928,
722804723.9602373,
728812583.7334814,
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700531145.0627038,
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739016190.6489305,
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759167030.5644994,
746875113.1038417,
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October Only

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