

```
In [383... # Provides ways to work with large multidimensional arrays
import numpy as np
# Allows for further data manipulation and analysis
import pandas as pd
pd.set_option('display.min_rows', 1200)
from pandas_datareader import data as web # Reads stock data
import matplotlib.pyplot as plt # Plotting
import matplotlib.dates as mdates # Styling dates
import seaborn as sns
%matplotlib inline

import datetime as dt # For defining dates
import mplfinance as mpf # Matplotlib finance
```

```
In [384... # Reading tickers name of 5000 stocks

df = pd.read_csv('D:\Python Class\Python4finance\wilshire_5000_stocks', index_col = False)
```

```
In [385... # Converting stocks name into list

wilshire_ticker = df.Ticker.values.tolist()
```

```
In [386... wilshire_ticker
```

```
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...]
```

Scrapping Stocks Data From Yahoo

Note: This step take few hours to download the data.

In [387...

```
# start = dt.datetime(2017, 1, 1)
# end = dt.datetime(2021, 12, 31)

# wilshire_1 = pd.DataFrame()

# for x in wilshire_ticker[1:1200]:
#     try:
#         print('working on:', x)
#         wilshire_1[x] = web.DataReader(x, 'yahoo', start, end)['Adj Close']
#     except:pass
```

In [388...

```
# start = dt.datetime(2017, 1, 1)
# end = dt.datetime(2021, 12, 31)

# wilshire_2 = pd.DataFrame()
```



```
# for x in wilshire_ticker[1200:2400]:
#     try:
#         print('working on:', x)
#         wilshire_2[x] = web.DataReader(x, 'yahoo', start, end)['Adj Close']
#     except:pass
```

In [389...

```
# start = dt.datetime(2017, 1, 1)
# end = dt.datetime(2021, 12, 31)

# wilshire_3 = pd.DataFrame()

# for x in wilshire_ticker[2400:]:
#     try:
#         print('working on:', x)
#         wilshire_3[x] = web.DataReader(x, 'yahoo', start, end)['Adj Close']
#     except:pass
```

Saving Data To Local Drive

In [390...

```
# Saving extracted data to our local drive

wilshire_1.to_csv("D:\Python Class\Python4finance\wilshire_1.csv")
wilshire_2.to_csv("D:\Python Class\Python4finance\wilshire_2.csv")
wilshire_3.to_csv("D:\Python Class\Python4finance\wilshire_3.csv")
```

In [391...

```
# Reading stocks data from our local drive

group_1 = pd.read_csv("D:\Python Class\Python4finance\wilshire_1.csv")
group_2 = pd.read_csv("D:\Python Class\Python4finance\wilshire_2.csv")
group_c = pd.read_csv("D:\Python Class\Python4finance\wilshire_3.csv")
group_1.tail()
```

Out[391...

	Date	AA	AAL	AAME	AAN	AAOI	AAON	AAP	AAPL	AAT	...	DVAJ
1254	2021-12-27	59.830002	18.170000	3.06	24.820000	5.59	79.809998	236.500000	180.330002	36.730000	...	14.35
1255	2021-12-28	59.189999	18.540001	3.13	24.760000	5.48	79.349998	238.130005	179.289993	36.580002	...	14.20
1256	2021-12-29	59.630001	18.049999	2.88	24.790001	5.30	79.709999	241.029999	179.380005	36.759998	...	15.00
1257	2021-12-30	59.209999	18.070000	2.78	24.440001	5.35	79.169998	237.520004	178.199997	37.500000	...	14.20
1258	2021-12-31	59.580002	17.959999	2.45	24.650000	5.14	79.430000	239.880005	177.570007	37.529999	...	14.00

5 rows × 836 columns

In [392...

```
# concatinating all stocks

all_wilshire = pd.concat([group_1,group_2,group_c], axis= 1)
```

In [393...

```
# saving all wilshire stocks data
all_wilshire.to_csv("D:\Python Class\Python4finance\wilshire_4.csv", index = False)
```

```
In [394... # Reading all wilshire stocks data from local drive
all_wilshire_stocks = pd.read_csv("D:\Python Class\Python4finance\wilshire_4.csv", index_c

In [395... # Removing Duplicate Columns that showup while concatinating

# all_wilshire_stocks.dtypes != 'float64'
all_wilshire_stocks = all_wilshire_stocks.drop(columns = ['Date.1', 'Date.2'])
```

Return Calculations

```
In [396... all_wilshire_percentage = (all_wilshire_stocks / all_wilshire_stocks.iloc[0]) * 100

In [402... # Calculating mean price, standard deviation, coefficient of variation.

stocks_return = []

for ticker in wilshire_ticker:
    try:
        stocks_return.append((ticker, ((all_wilshire_percentage[ticker][1258] - all_wilshire_percentage[ticker].iloc[0]) /
        all_wilshire_stocks[ticker].iloc[1258], \
        all_wilshire_stocks[ticker].iloc[0], \
        all_wilshire_stocks[ticker].mean(), all_wilshire_stocks[ticker].std(),
        (all_wilshire_stocks[ticker].std() / all_wilshire_stocks[ticker].mean())

    except:pass

# 1258 represent 2021-12-31 and 0 represent 2017-01-03

In [407... wilshire_5000_return = pd.DataFrame(stocks_return, columns = ['Symbols', 'Percentage Return',
        'Standard Deviation', 'COV'])

In [408... wilshire_5000_return.to_csv("D:\Python Class\Python4finance\wilshire_5000_return.csv")

In [409... high_return = wilshire_5000_return.sort_values(by = 'Percentage Return', ascending = False)
high_return.head(1200)
```

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
201	APPS	8612.857531	60.990002	0.700000	19.156878	26.950907	1.406853
235	ARWR	3846.428876	66.300003	1.680000	32.152800	26.575186	0.826528
1505	MRTX	2720.961689	146.690002	5.200000	87.350882	65.051623	0.744716
522	CELH	2611.636353	74.570000	2.750000	19.574448	26.716838	1.364883
1715	OPRX	2455.967033	62.110001	2.430000	20.305083	21.421914	1.055003
256	ATLC	2393.706375	71.320000	2.860000	13.617371	17.717524	1.301097
1197	JYNT	2378.867927	65.690002	2.650000	22.660075	25.948067	1.145101
1832	PLUG	2233.057740	28.230000	1.210000	10.477387	14.425612	1.376833
389	BLFS	2200.617305	37.270000	1.620000	18.942256	13.950321	0.736466

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
509	CDNA	1877.391325	45.480000	2.300000	30.723796	25.348081	0.825031
744	CYRX	1766.561412	59.169998	3.170000	25.280064	21.732513	0.859670
672	CROX	1744.892155	128.220001	6.950000	41.991390	42.183990	1.004587
508	CDMO	1742.119481	29.180000	1.584045	8.433317	7.735092	0.917206
1086	IIPR	1544.532872	262.910004	15.986911	88.203960	72.514870	0.822127
160	AMRC	1341.415948	81.440002	5.650000	25.382327	21.843392	0.860575
1038	HUBS	1277.534055	659.150024	47.849998	238.723928	198.320682	0.830753
1446	MIC	1205.162895	3.650000	0.279659	0.369300	0.755206	2.044970
147	AMD	1158.967542	143.899994	11.430000	45.331112	36.212167	0.798837
440	BXC	1143.636422	95.760002	7.700000	25.925226	17.127445	0.660648
241	ASPN	1071.529433	49.790001	4.250000	11.330068	13.028465	1.149902
1640	NVDA	1068.459999	294.109985	25.170736	86.482395	65.749554	0.760265
461	CALX	952.236871	79.970001	7.600000	17.088618	17.086058	0.999850
1351	LSCC	949.863705	77.059998	7.340000	22.691620	20.191984	0.889843
62	AEHR	915.966351	24.180000	2.380000	3.479388	4.110302	1.181329
1748	PAR	859.454554	52.770000	5.500000	30.188459	21.670151	0.717829
406	BOOT	835.741495	123.050003	13.150000	35.139349	27.489567	0.782302
831	DXCM	821.802596	536.950012	58.250000	225.890866	161.840794	0.716456
1110	INS	817.257661	38.799999	4.230000	24.749963	16.013502	0.647011
1752	PAYC	793.458127	415.190002	46.470001	224.166560	134.486608	0.599941
1053	IAC	789.650198	130.710007	14.692292	64.550680	44.913345	0.695784
1629	NTLA	777.151349	118.239998	13.480000	36.926283	38.788339	1.050426
1897	PW	776.463082	68.889999	7.860000	16.947292	15.700137	0.926410
1607	NOW	757.930153	649.109985	75.660004	303.904638	177.215997	0.583130
1667	OAS	739.114618	125.989998	15.014635	22.804970	33.810504	1.482594
889	GNRC	739.103541	351.920013	41.939999	135.949047	128.186336	0.942900
1510	MSCI	719.489996	612.690002	74.764793	268.199783	162.080601	0.604328
1606	NOVT	718.236696	176.330002	21.549999	85.433598	38.372498	0.449150
1123	INVE	703.999983	28.139999	3.500000	7.171676	5.043932	0.703313
1518	MTCH	701.806094	132.250000	16.494013	75.360283	47.185982	0.626139
169	AMTX	698.701331	12.300000	1.540000	3.762781	5.652270	1.502152
1631	NTRA	685.449930	93.389999	11.890000	42.831553	37.474790	0.874934
1768	PCTY	684.845472	236.160004	30.090000	112.878241	68.430992	0.606237
387	BLD	656.954727	275.910004	36.450001	111.011882	64.388694	0.580016
388	BLDR	636.340177	85.709999	11.640000	25.668626	14.972785	0.583311
510	CDNS	635.398599	186.350006	25.340000	77.163511	43.219927	0.560108

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
1863	PRFT	630.451908	129.289993	17.700001	41.587879	29.529462	0.710050
1348	LRCX	626.599510	719.150024	98.974747	287.945316	174.684536	0.606659
881	GME	619.231408	148.389999	20.631746	43.189734	68.506163	1.586168
1849	PODD	612.369527	266.070007	37.349998	150.148745	85.946061	0.572406
1236	KNSL	611.128540	237.889999	33.452461	103.628146	62.051798	0.598793
282	AVID	603.455700	32.570000	4.630000	10.743916	9.113996	0.848294
1102	INFU	595.102055	17.030001	2.450000	8.043979	6.283202	0.781106
515	CDXS	594.888899	31.270000	4.500000	15.150929	7.284140	0.480772
119	ALGN	577.784652	657.179993	96.959999	325.360151	168.416417	0.517631
736	CWST	572.598421	85.419998	12.700000	41.144392	19.928487	0.484355
1294	LEU	557.575742	49.910000	7.590000	10.953384	13.246643	1.209365
1506	MRVL	553.996293	87.489998	13.377751	30.121364	16.582118	0.550510
419	BRKS	550.538066	103.110001	15.849957	45.734854	26.676096	0.583277
7	AAPL	549.666935	177.570007	27.332468	73.547618	41.158475	0.559617
1909	QDEL	546.503884	134.990005	20.879999	93.341009	64.259204	0.688435
643	COUP	541.957748	158.050003	24.620001	139.461632	99.694382	0.714852
1051	HZNP	538.010693	107.760002	16.889999	42.073828	32.814572	0.779928
769	DECK	536.950110	366.309998	57.509998	178.137212	108.209681	0.607451
226	ARNA	532.244923	92.940002	14.700000	47.673034	18.483153	0.387707
1677	ODFL	531.129127	358.380005	56.783943	141.007635	78.061402	0.553597
1492	MPWR	515.896736	493.329987	80.099464	203.933172	126.684656	0.621207
1873	PRPH	512.139837	7.170000	1.171301	3.102272	2.483326	0.800486
1424	MEDP	506.070733	217.639999	35.910000	85.917287	54.928134	0.639314
43	ACY	503.908252	59.700001	9.885608	12.033032	10.200549	0.847712
1225	KLAC	501.558332	430.109985	71.499298	167.459646	94.060308	0.561689
654	CPRX	499.115045	6.770000	1.130000	3.811597	1.343285	0.352420
1482	MOH	493.543545	318.079987	53.590000	146.959365	70.339373	0.478631
176	ANET	492.417077	143.750000	24.264999	62.982069	20.513799	0.325709
1622	NSSC	491.479298	49.980000	8.450000	21.939174	10.845726	0.494354
305	AXSM	485.736433	37.779999	6.450000	32.282295	31.041437	0.961562
1362	LULU	485.564729	391.450012	66.849998	204.066585	120.144688	0.588752
1120	INTU	483.173302	643.219971	110.296539	274.150772	133.426618	0.486691
1512	MSFT	478.013235	336.320007	58.185520	151.584954	76.981229	0.507842
1423	MED	471.557415	209.429993	36.641987	129.364374	70.765313	0.547023
1215	KEYS	469.211691	206.509995	36.279999	89.719595	43.548499	0.485384
1850	POOL	467.138543	566.000000	99.799248	230.884851	126.822136	0.549287

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
1639	NVAX	463.267754	143.070007	25.400000	66.799539	72.792311	1.089713
1077	IDXX	459.914992	658.460022	117.599998	309.250437	161.125941	0.521021
676	CRVL	457.640762	208.000000	37.299999	79.931454	37.758650	0.472388
219	ARES	456.442000	81.269997	14.605295	31.935717	19.009786	0.595252
464	CAR	453.429379	207.369995	37.470001	48.512629	45.854738	0.945212
748	CZR	448.563067	93.529999	17.049999	50.060258	26.720351	0.533764
1363	LUNA	448.051934	8.440000	1.540000	5.455242	3.216600	0.589635
44	ADBE	447.989930	567.059998	103.480003	327.277324	153.858292	0.470116
653	CPRT	444.221076	151.619995	27.860001	77.073654	36.566014	0.474429
1298	LGIH	436.575168	154.479996	28.790001	82.173376	40.105256	0.488057
1705	ON	435.224590	67.919998	12.690000	24.860929	11.144862	0.448288
1417	MDGL	430.952366	84.739998	15.960000	102.537760	58.505909	0.570579
32	ACLS	426.925792	74.559998	14.150000	26.666148	11.180622	0.419281
199	APPF	426.347815	121.059998	23.000000	92.543419	45.336613	0.489896
1892	PTSI	426.000016	71.010002	13.500000	24.012990	11.865332	0.494121
143	AMAT	425.097171	157.360001	29.967787	64.664352	35.397126	0.547398
1700	OMCL	424.534868	180.440002	34.400002	80.940334	38.333485	0.473602
1224	KKR	424.241909	74.500000	14.210997	30.964635	15.954452	0.515248
702	CTRN	417.130747	94.750000	18.322252	33.161094	25.022374	0.754570
...
1385	MARA	14.734641	32.860001	28.639999	11.479952	14.373059	1.252014
1138	IRBT	14.414719	65.879997	57.580002	80.802430	20.304856	0.251290
1170	JAZZ	14.301097	127.400002	111.459999	143.571859	18.791868	0.130888
166	AMSF	14.235287	53.830002	47.122044	53.162383	6.393854	0.120270
1755	PBCT	14.091959	17.820000	15.618979	14.685519	2.133886	0.145305
1754	PB	13.966652	72.300003	63.439613	63.507755	6.636561	0.104500
448	C	13.964304	60.389999	52.990276	60.401766	8.845487	0.146444
56	ADTN	13.798049	22.830000	20.061855	14.974541	4.151011	0.277205
1413	MCY	13.587474	53.060001	46.712898	46.391922	6.917367	0.149107
497	CCNE	13.572372	26.500000	23.333139	23.458760	3.817785	0.162745
973	HFC	13.486968	32.779999	28.884373	38.218684	12.942567	0.338645
178	ANGI	13.284132	9.210000	8.130000	12.416187	3.793268	0.305510
225	ARMK	13.062834	36.849998	32.592495	35.017975	5.615231	0.160353
438	BWFG	13.011653	32.840000	29.058950	26.234885	5.388871	0.205409
1777	PDM	12.895774	18.379999	16.280502	16.721669	1.765928	0.105607
1616	NRZ	12.480513	10.710000	9.521649	10.761385	2.257922	0.209817

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
1517	MTB	12.258405	153.580002	136.809357	141.315582	19.996789	0.141504
417	BRKL	12.008927	16.190001	14.454206	13.655898	2.079177	0.152255
1332	LOCO	11.732282	14.190000	12.700000	13.730627	2.877130	0.209541
1361	LUB	11.620615	2.860000	2.562251	1.531614	0.627139	0.409463
1842	PNBK	11.421130	15.550000	13.956060	13.540132	4.492243	0.331772
480	CBFV	11.223972	24.070000	21.641018	23.171109	3.098200	0.133710
1400	MBWM	10.915924	35.029999	31.582479	28.823468	3.992461	0.138514
220	ARGO	10.619613	58.110001	52.531372	52.507804	10.170500	0.193695
1157	ITI	10.497241	4.000000	3.620000	5.283487	0.953174	0.180406
1545	NAII	10.480348	12.650000	11.450000	10.730000	2.663256	0.248207
751	DAIO	10.287089	4.610000	4.180000	5.733805	2.285054	0.398523
402	BOH	10.250871	83.760002	75.972191	73.581928	9.453487	0.128476
1011	HQY	10.077142	44.240002	40.189999	63.480576	13.726973	0.216239
1100	INFN	9.977063	9.590000	8.720000	7.671811	2.322193	0.302692
1749	PARR	9.933332	16.490000	15.000000	16.424742	4.227341	0.257376
1317	LL	9.916291	17.070000	15.530000	19.202637	8.273968	0.430877
1681	OFC	9.899893	27.969999	25.450434	25.268290	2.308563	0.091362
16	ABM	9.877612	40.849998	37.177727	36.970878	6.102469	0.165062
764	DD	9.725521	80.779999	73.620064	73.575466	14.256910	0.193773
1904	PZN	9.701134	9.470000	8.632545	8.000453	1.759780	0.219960
1798	PFMT	9.545456	2.410000	2.200000	1.890048	0.949831	0.502544
1848	PNW	9.363798	70.589996	64.546036	75.910458	7.007179	0.092308
1330	LOAN	9.258016	5.500000	5.033956	4.982229	0.843709	0.169344
229	AROW	9.113605	35.230000	32.287449	30.563527	3.306637	0.108189
1867	PRIM	9.082484	23.980000	21.983364	23.289282	4.594282	0.197270
974	HFWA	8.960129	24.440001	22.430223	25.079485	3.754694	0.149712
1159	ITRI	8.934809	68.519997	62.900002	70.247673	13.192821	0.187804
827	DVN	8.645945	44.049999	40.544540	25.596769	9.386840	0.366720
514	CDXC	8.405796	3.740000	3.450000	4.792550	1.874917	0.391215
1042	HURN	8.242957	49.900002	46.099998	48.030429	8.399201	0.174872
1474	MNRO	8.240899	58.270000	53.833626	59.770401	11.628954	0.194560
943	HAIN	7.982771	42.610001	39.459999	32.294106	8.069620	0.249879
1646	NVRO	7.848878	81.070000	75.169998	98.858872	36.733478	0.371575
1858	PPIH	7.826088	8.680000	8.050000	7.972685	1.268893	0.159155
982	HII	7.794575	186.740005	173.236923	198.334325	25.521860	0.128681
362	BHB	7.741605	28.930000	26.851280	24.043352	3.305658	0.137487

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
453	CADE	7.519799	29.790001	27.706526	26.762324	3.264204	0.121970
1025	HSTM	7.516532	26.360001	24.517160	25.055911	2.845040	0.113548
1350	LSBK	7.445889	14.900000	13.867445	13.849225	1.152747	0.083235
984	HIW	7.420782	44.590000	41.509659	40.172742	3.898841	0.097052
716	CVBF	7.315644	21.410000	19.950493	19.810974	1.386710	0.069997
132	ALOT	7.276267	13.500000	12.584331	14.651127	4.628391	0.315907
368	BIG	7.257529	45.049999	42.001713	39.743008	12.619125	0.317518
679	CRY	7.105265	20.350000	19.000000	23.869079	4.826392	0.202203
647	CPF	7.043678	28.170000	26.316360	23.824120	4.302388	0.180590
1216	KFFB	6.798232	7.530000	7.050679	6.782427	0.608975	0.089787
949	HAYN	6.749805	40.330002	37.779930	30.218583	6.075243	0.201043
1407	MCHX	6.504993	2.480000	2.328529	2.864867	0.813751	0.284045
442	BXP	6.493581	115.180000	108.156754	107.315143	13.180297	0.122819
1591	NKTR	6.461786	13.510000	12.690000	30.938157	21.048243	0.680333
350	BEN	6.303852	33.490002	31.504034	28.075844	5.177583	0.184414
236	ASB	6.228756	22.590000	21.265429	19.556716	3.372718	0.172458
687	CSTR	6.073438	21.030001	19.825888	16.359436	3.292363	0.201252
770	DEI	5.968396	33.500000	31.613199	33.259693	3.803697	0.114364
246	ASTE	5.615612	69.269997	65.586891	50.014656	12.568148	0.251289
342	BDN	5.294675	13.420000	12.745184	12.604676	1.494748	0.118587
299	AXGN	5.280902	9.370000	8.900000	20.121509	10.295107	0.511647
1900	PXD	5.236361	181.880005	172.830002	138.591255	29.676372	0.214129
416	BRID	5.212853	12.110000	11.510000	17.807085	6.128042	0.344135
1058	IBM	5.178139	133.660004	127.079643	118.053881	9.978371	0.084524
1799	PFS	5.026350	24.219999	23.060879	20.481667	3.615553	0.176526
1204	KAR	4.974106	15.620000	14.879860	18.034825	3.114979	0.172720
892	GNW	4.651171	4.050000	3.870000	3.766775	0.589404	0.156474
264	ATRA	4.543950	15.760000	15.075000	21.436656	10.965750	0.511542
1198	K	4.542716	64.419998	61.620743	59.050022	4.314710	0.073069
888	GNL	4.533987	15.280000	14.617255	14.968723	1.667876	0.111424
762	DCOM	4.490729	35.160000	33.648918	28.650651	4.847455	0.169192
1284	LCNB	4.434082	19.530001	18.700792	16.292703	1.733834	0.106418
1247	KRC	4.192254	66.459999	63.785931	64.727710	6.437459	0.099454
993	HMN	4.162785	38.700001	37.153385	37.567569	3.124085	0.083159
1556	NBTB	4.077699	38.520000	37.010811	34.158793	3.012338	0.088186
433	BUSE	4.036901	27.120001	26.067675	23.710504	3.510023	0.148037

	Symbols	Percentage Return	Price Dec 2021	Price Jan 2017	Mean Price	Standard Deviation	COV
1582	NHC	4.017308	67.940002	65.316055	66.538149	7.480575	0.112425
80	AGLE	3.938727	4.750000	4.570000	7.200920	1.723922	0.239403
1546	NATH	3.932103	58.389999	56.180908	64.697882	9.555422	0.147693
1024	HST	3.850811	17.389999	16.745174	16.221301	2.371379	0.146189
847	GCO	3.667200	64.169998	61.900002	40.695647	13.250115	0.325590
1663	NYCB	3.341201	12.210000	11.815229	10.039048	1.306623	0.130154
1493	MPX	3.296745	12.500000	12.101059	13.870669	2.596346	0.187182
1625	NTCT	3.213737	33.080002	32.049999	27.915870	3.957752	0.141774
1583	NHI	3.176862	57.470001	55.700474	60.781081	7.024719	0.115574
313	B	2.979505	46.590000	45.242012	51.806277	8.267437	0.159584
397	BMRN	2.924047	88.349998	85.839996	87.117149	10.462217	0.120094
109	AKTS	2.769228	6.680000	6.500000	7.855452	2.245872	0.285900

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