FIN 580 Homework 3 - Tejas Dhomne | UIN - 661586178

1. Import pandas_datareader as pdr

In [1]:
```
import pandas as pd
import numpy as np
import pandas_datareader as pdr
```

In [2]:
```
x=['GOOGL','^GSPC']
```

In [3]:
```
df1 = pdr.get_data_yahoo(x, start='2018-01-01',end='2020-12-31')["Adj Close"]
df1
```

Out[3]:

Symbols	GOOGL	^GSPC
Date		
2018-01-02	53.660500	2695.810059
2018-01-03	54.576000	2713.060059
2018-01-04	54.787998	2723.989990
2018-01-05	55.514500	2743.149902
2018-01-08	55.710499	2747.709961
...	...	...
2020-12-24	86.708000	3703.060059
2020-12-28	88.697998	3735.360107
2020-12-29	87.888000	3727.040039
2020-12-30	86.812500	3732.040039
2020-12-31	87.632004	3756.070068

756 rows × 2 columns

1.1 Create two columns in df1 named year and quarter that extract year and quarter information from the Date index column.

In [4]:
```
df1['year']=df1.index.year
df1['quarter']=df1.index.quarter
df1['return']=df1['^GSPC'].pct_change()
df1['return_GOOGL']=df1['GOOGL'].pct_change()
df1.dropna(how="any",inplace=True)
df1
```

Out[4]:

Symbols	GOOGL	^GSPC	year	quarter	return	return_GOOGL
Date						
2018-01-03	54.576000	2713.060059	2018	1	0.006399	0.017061
2018-01-04	54.787998	2723.989990	2018	1	0.004029	0.003884
2018-01-05	55.514500	2743.149902	2018	1	0.007034	0.013260
2018-01-08	55.710499	2747.709961	2018	1	0.001662	0.003531
2018-01-09	55.639500	2751.290039	2018	1	0.001303	-0.001274
...	...	...	...	...	...	...
2020-12-24	86.708000	3703.060059	2020	4	0.003537	0.003431
2020-12-28	88.697998	3735.360107	2020	4	0.008723	0.022951
2020-12-29	87.888000	3727.040039	2020	4	-0.002227	-0.009132
2020-12-30	86.812500	3732.040039	2020	4	0.001342	-0.012237
2020-12-31	87.632004	3756.070068	2020	4	0.006439	0.009440

755 rows × 6 columns

1.2 Create two columns in df1 named year and quarter that extract year and quarter information from the Date index column.

In [5]:
```
df1.loc[(df1["year"]==2018),"GOOGL"][:1]
```

Out[5]:
```
Date
2018-01-03    54.576
Name: GOOGL, dtype: float64
```

In [6]:
```
df1.loc[(df1["year"]==2018),"^GSPC"][:1]
```

Out[6]:
```
Date
2018-01-03    2713.060059
Name: ^GSPC, dtype: float64
```

In [7]:
```
idx_market_price=df1['^GSPC']
idx_google_price=df1['GOOGL']
```

In [8]:
```
df1['nprice_market']=idx_market_price/idx_market_price[0]*100
df1['nprice_GOOGL']=idx_google_price/idx_google_price[0]*100
df1
```

Out[8]:

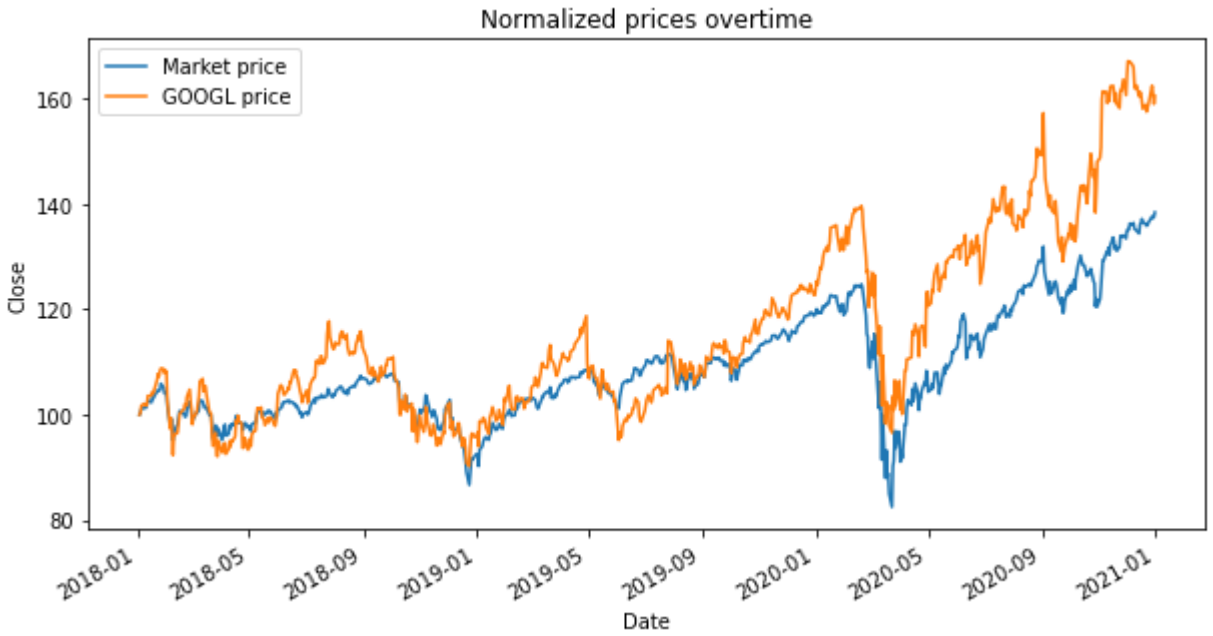
Symbols Date	GOOGL	^GSPC	year	quarter	return	return_GOOGL	nprice_market	nprice_
2018-01-03	54.576000	2713.060059	2018	1	0.006399	0.017061	100.000000	100
2018-01-04	54.787998	2723.989990	2018	1	0.004029	0.003884	100.402864	100
2018-01-05	55.514500	2743.149902	2018	1	0.007034	0.013260	101.109074	101
2018-01-08	55.710499	2747.709961	2018	1	0.001662	0.003531	101.277152	102
2018-01-09	55.639500	2751.290039	2018	1	0.001303	-0.001274	101.409109	101
...	...	...	...	...	...	...	...	
2020-12-24	86.708000	3703.060059	2020	4	0.003537	0.003431	136.490162	158
2020-12-28	88.697998	3735.360107	2020	4	0.008723	0.022951	137.680701	162
2020-12-29	87.888000	3727.040039	2020	4	-0.002227	-0.009132	137.374034	161
2020-12-30	86.812500	3732.040039	2020	4	0.001342	-0.012237	137.558327	159
2020-12-31	87.632004	3756.070068	2020	4	0.006439	0.009440	138.444044	160

755 rows × 8 columns

1.3 Import matplotlib.pyplot as plt. Use pandas visualization to create the following line plot of the normalized prices.

In [9]:
```
import matplotlib.pyplot as plt
```

In [10]:
```
df1[['nprice_market','nprice_GOOGL']].plot(figsize = (10,5))
plt.xlabel("Date")
plt.ylabel("Close")
plt.title("Normalized prices overtime")
plt.legend(["Market price","GOOGL price"]);
```



1.4 Import matplotlib.pyplot as plt. Use pandas visualization to create the following line plot of the normalized prices.

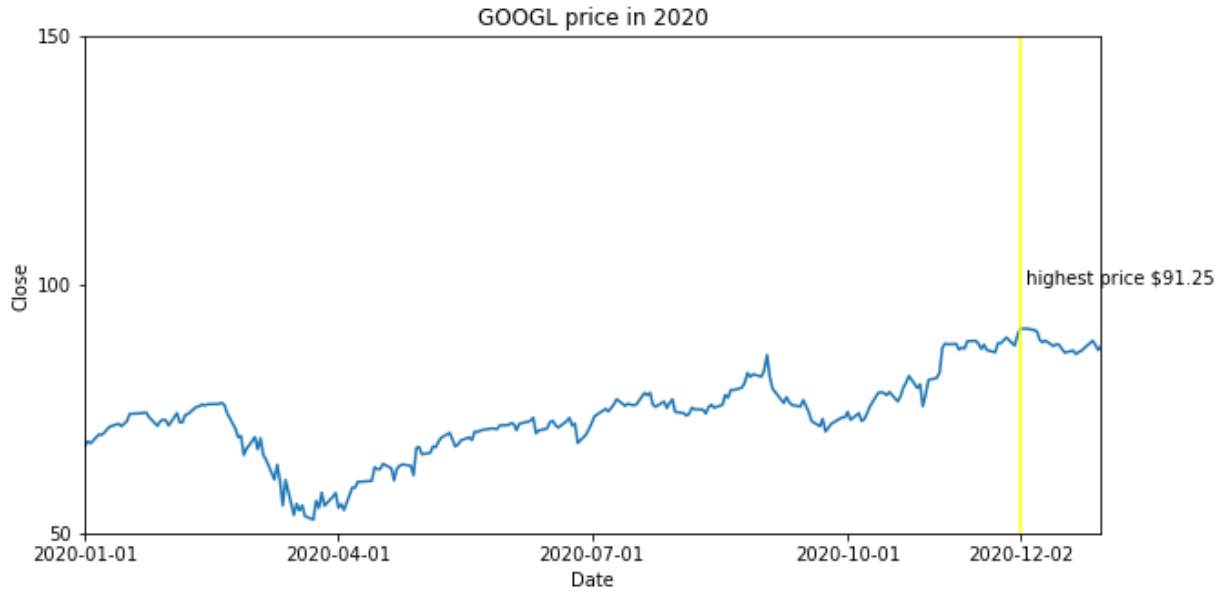
In [11]:
```
df1.loc[df1["year"]==2020,"GOOGL"].max()
```

Out[11]:
```
91.24849700927734
```

In [12]:
```
df1.loc[df1["year"]==2020,"GOOGL"].idxmax()
```

Out[12]:
```
Timestamp('2020-12-02 00:00:00')
```

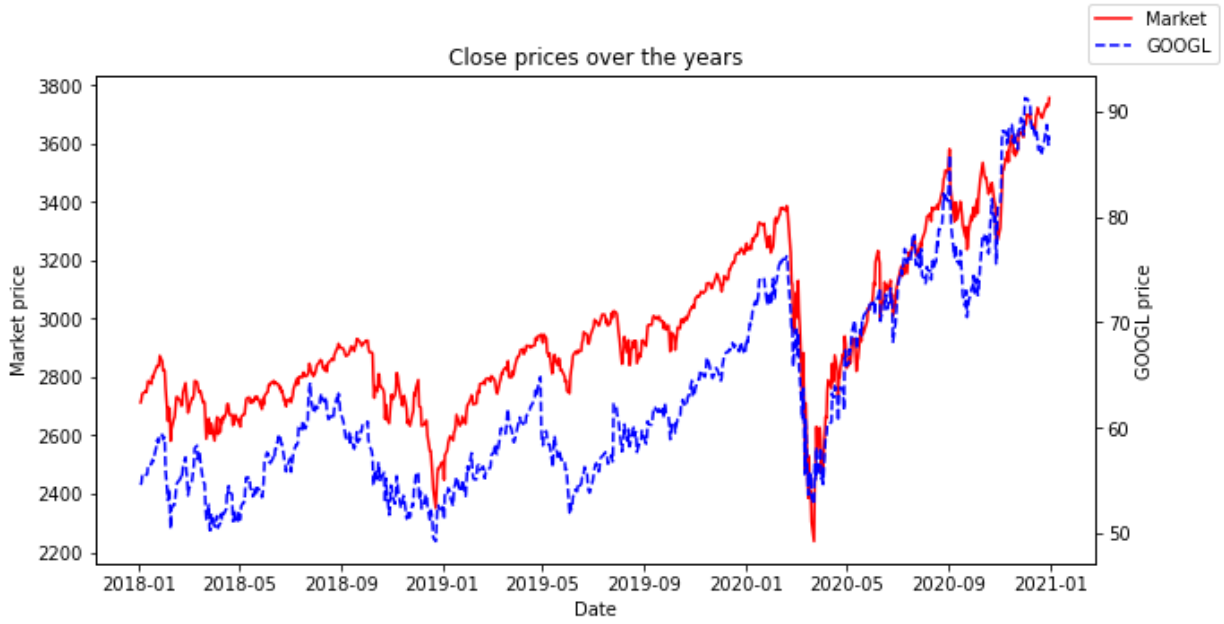
In [13]:
```
plt.figure(figsize = (10, 5))
plt.plot(df1['GOOGL'])
plt.xlabel("Date")
plt.ylabel("Close")
plt.title("GOOGL price in 2020")
plt.xlim(pd.to_datetime("2020-01-01"),pd.to_datetime("2020-12-31"))
plt.ylim(50,150)
plt.xticks([pd.to_datetime("2020-01-01"),pd.to_datetime("2020-04-01"),pd.to_datet
plt.yticks([50,100,150])
plt.axvline(pd.to_datetime("2020-12-02"), color='yellow')
plt.text(pd.to_datetime("2020-12-02"),100," highest price $91.25");
```



1.5 Use the matplotlib object-oriented interface to create the following line plot of the market price and the price of GOOGL with difference y-axis scales.

In [14]:
```
fig, ax1 = plt.subplots(figsize=(10,5))
ax1.plot(df1["^GSPC"],color="red",linestyle="-",label="Market")
ax1.set_ylabel("Market price")
ax1.set_xlabel("Date")

ax2 = ax1.twinx()
ax2.plot(df1["GOOGL"],color="blue", linestyle="--",label="GOOGL")
ax2.set_ylabel("GOOGL price")
ax2.set_title('Close prices over the years')
fig.legend(["Market", "GOOGL"]);
```



1.6 Use groupby(), mean(), unstack(), and mul() to group df1 by the quarter and year columns, calculate the average value of GOOGL's return in the return_GOOGL column for each group, unstack the second index level, and multiply the numbers by 100. Save the result in a DataFrame named df2.

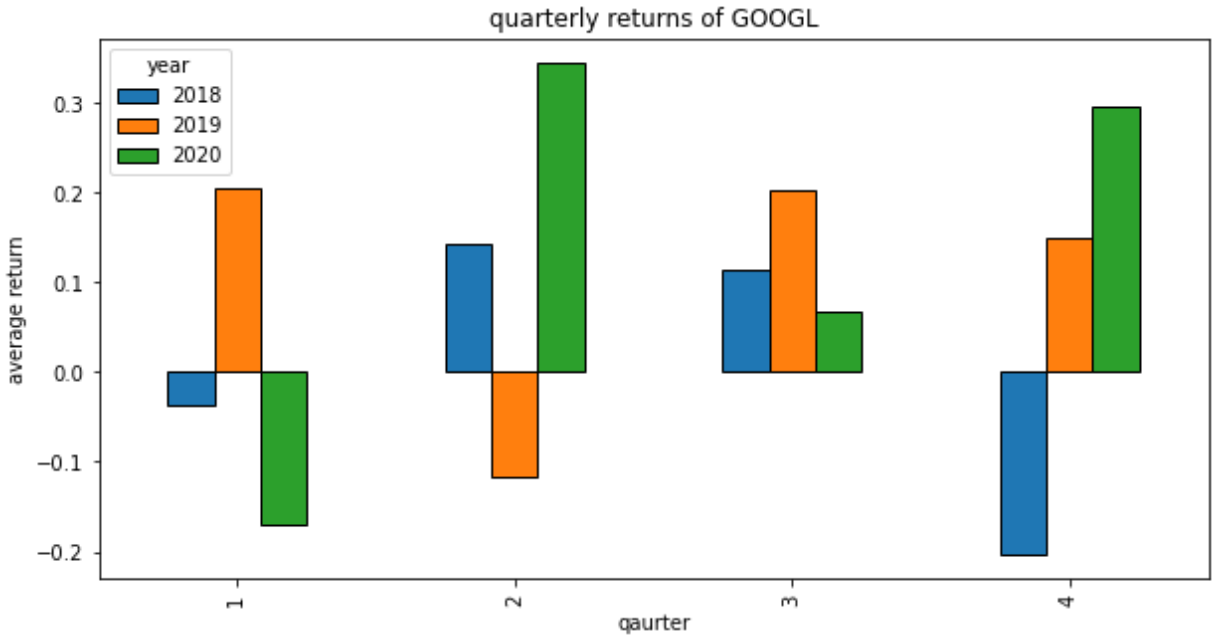
In [15]:
```
df2=df1.groupby(["quarter","year"]).mean()['return_GOOGL'].unstack(1).mul(100)
df2
```

Out[15]:

year	2018	2019	2020
quarter			
1	-0.037352	0.205808	-0.169978
2	0.143397	-0.117663	0.344716
3	0.113487	0.202507	0.066761
4	-0.203295	0.148799	0.295098

1.7 Use pandas visualization to create the following bar plot of quarterly returns of GOOGL.

In [16]:
```
df2.plot(kind="bar",figsize = (10,5), edgecolor='black')
plt.xlabel('qaurter')
plt.ylabel('average return')
plt.title('quarterly returns of GOOGL');
```



1.8 Use the matplotlib function-oriented interface to create the following scatter plot of GOOGL's returns and market returns.

In [17]:
```
plt.figure(figsize = (10, 5))
plt.scatter(x=df1["return"],y=df1["return_GOOGL"])
plt.xlabel('market return')
plt.ylabel('GOOGL return')
plt.title('GOOGL return and market return');
```