SHRI VILEPARLE KELAVANI MANDAL'S
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC ACCREDITED with "A" GRADE (CGPA : 3.18)

A.Y.: 2022-23   **Class/ Sem: T.Y.B.Tech/ Sem-VI**   **Sub:** Computational Finance

Experiment 2

Name : Bhuvi Ghosh   **SAPID : 60009210191**   **Batch : D22**

Aim: Analysis of Yahoo Finance Indexes, Currencies / FX, Cryptocurrencies, Funds & ETFs, Treasury Yields, Stock Fundamentals, Meta Data and Performance Metrics, Balance Sheet, P&L, Cashflows

Objective:
- Get historical data for stocks
- Plot the stock market data and analyse the performance
- Get the fundamental, futures and options data

Theory:

Historical Stock Price Data
Stocks are very volatile instruments and therefore very important to thoroughly analyse the price behaviour before making any trading decisions. Hence fetching and analysing the prices is crucial. The stock data can be downloaded from different packages such as yahoo finance, quandl and alpha vantage. This data can be fetched the daily and minute level from yahoo finance. It is essential to understand data structures, data analysis, dealing with financial data, and for generating trading signals. This experiment will build learning on how to fetch various data like pricing data of stocks, fundamental.

Yahoo Finance Market Data
Yahoo Finance: One of the first sources to get historical daily price-volume stock market data is Yahoo finance. Use pandas_datareader or yfinance module to get the data and then can download or store in a csv file by using pandas.to_csv method. The yfinance module has the download method which can be used to download the stock market data. To get stock market data for different geographies, search the ticker symbol on Yahoo finance and use that as the ticker.

Stock Market Data Visualization and Analysis
After having the stock market data, the next step is to create trading strategies and analyse the performance. The ease of analysing the performance is the key advantage of the Python.
Analyse the cumulative returns, drawdown plot, different ratios such as
- Sharpe ratio,
- Sortino ratio, and
- Calmar ratio.

Conclusion
To be able to use the Python codes to fetch the stock market data of your favourites stocks, build the strategies using this stock market data and analyse this data.

A.Y.: 2022-23   **Class/ Sem: T.Y.B.Tech/ Sem-VI**   **Sub:** Computational Finance

Lab Experiment to be done by students:

1. Analysis and Import Financial Indexes
2. Import Currencies / FX
3. Import Cryptocurrencies trading
4. Import Funds & ETFs
5. Import Treasury Yields
6. Generate Ticker Object
7. Implement Stock Fundamentals, Meta Data and Performance Metrics
8. Analyse Financials (Balance Sheet, P&L, Cashflows)
9. Generate Put / Call Options (Stocks)
10. Stream real-time Data Build a model by Importing Stocks data for market analysis.
11. Perform Dividend Indexes Analysis on specified data source.

Import Financial Indexes

```
[26] ticker = ['^DJI','^GSPC']
```

```
[27] yf.download(ticker,period = '5y').tail(10)
```

[*******************100%%*******************] 2 of 2 completed

Price	Adj Close		Close		High		Low		Open		Volume	
Ticker	^DJI	^GSPC	^DJI	^GSPC	^DJI	^GSPC	^DJI	^GSPC	^DJI	^GSPC	^DJI	^GSPC
Date												
2024-02-05	38380.121094	4942.810059	38380.121094	4942.810059	38633.878906	4957.189941	38220.398438	4918.089844	38546.769531	4957.189941	322290000	4023640000
2024-02-06	38521.359375	4954.229980	38521.359375	4954.229980	38545.281250	4957.770020	38350.460938	4934.879883	38392.898438	4950.160156	276140000	4440880000
2024-02-07	38677.359375	4995.060059	38677.359375	4995.060059	38748.109375	4999.890137	38571.011719	4969.049805	38613.890625	4973.049805	302210000	4895590000
2024-02-08	38726.328125	4997.910156	38726.328125	4997.910156	38755.679688	5000.399902	38544.359375	4987.089844	38702.109375	4995.160156	315510000	4341860000
2024-02-09	38671.691406	5026.609863	38671.691406	5026.609863	38734.281250	5030.060059	38567.898438	5000.339844	38731.968750	5004.169922	299970000	3912990000
2024-02-12	38797.378906	5021.839844	38797.378906	5021.839844	38927.078125	5048.390137	38628.921875	5016.830078	38656.761719	5026.830078	273020000	3805740000
2024-02-13	38272.750000	4953.169922	38272.750000	4953.169922	38699.171875	4971.299805	38039.859375	4920.310059	38699.171875	4967.939941	318390000	4302190000
2024-02-14	38424.269531	5000.620117	38424.269531	5000.620117	38442.558594	5002.520020	38194.621094	4956.450195	38372.671875	4976.439941	274610000	3845600000
2024-02-15	38773.121094	5029.729980	38773.121094	5029.729980	38781.890625	5032.720215	38397.941406	4999.439941	38397.941406	5003.140137	303840000	4137970000
2024-02-16	38627.988281	5005.569824	38627.988281	5005.569824	38825.031250	5038.700195	38583.238281	4999.520020	38751.710938	5031.129883	282210000	3833270000

```
[28] indexes = yf.download(ticker,period = '1y').Close
     indexes.tail(10)
```

Toggle header visibility

[*******************100%%*******************] 2 of 2 completed

Ticker	^DJI	^GSPC
Date		
2024-02-05	38380.121094	4942.810059
2024-02-06	38521.359375	4954.229980
2024-02-07	38677.359375	4995.060059
2024-02-08	38726.328125	4997.910156
2024-02-09	38671.691406	5026.609863
2024-02-12	38797.378906	5021.839844
2024-02-13	38272.750000	4953.169922
2024-02-14	38424.269531	5000.620117
2024-02-15	38773.121094	5029.729980
2024-02-16	38627.988281	5005.569824

```
[29] norm = indexes.div(indexes.iloc[0]).mul(100)
     norm.tail(10)
```

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[29]

Ticker	^DJI	^GSPC
Date		
2024-02-05	113.461055	121.174329
2024-02-06	113.878590	121.454292
2024-02-07	114.339765	122.455252
2024-02-08	114.484528	122.525123
2024-02-09	114.323009	123.228704
2024-02-12	114.694572	123.111766
2024-02-13	113.143640	121.428304
2024-02-14	113.591569	122.591559
2024-02-15	114.622860	123.305195
2024-02-16	114.193812	122.712902

[30]
```python
norm.plot()
plt.show()
```


[31]
```python
ticker = ['^DJITR','^GSPCTR']
```

[51]
```python
index = yf.download(ticker,period='5y').Close
```
```
[*********************100%%*********************]  1 of 1 completed
```

[52]
```python
index
```
```
Date
2019-02-19     42.732498
2019-02-20     43.007500
2019-02-21     42.764999
2019-02-22     43.242500
2019-02-25     43.557499
                 ...
2024-02-12    187.149994
2024-02-13    185.039993
2024-02-14    184.149994
2024-02-15    183.860001
2024-02-16    182.309998
Name: Close, Length: 1259, dtype: float64
```

Import Currencies

[34]
```python
ticker   = 'EURUSD=x'
ticker2  = 'USDEUR=x'
```

[53]
```python
yf.download(ticker,period = '5y')
```

[53]
```
[*********************100%%*********************]  1 of 1 completed
```

Date	Open	High	Low	Close	Adj Close	Volume
2019-02-19	42.427502	42.860001	42.372501	42.732498	41.138523	75891200
2019-02-20	42.797501	43.330002	42.747501	43.007500	41.403263	104457600
2019-02-21	42.950001	43.092499	42.575001	42.764999	41.169815	68998800
2019-02-22	42.895000	43.250000	42.845001	43.242500	41.629505	75652800
2019-02-25	43.540001	43.967499	43.487499	43.557499	41.932762	87493600
...	...	...	...	...	...	...
2024-02-12	188.419998	188.669998	186.789993	187.149994	187.149994	41781900
2024-02-13	185.770004	186.210007	183.509995	185.039993	185.039993	56529500
2024-02-14	185.320007	185.529999	182.440002	184.149994	184.149994	54630500
2024-02-15	183.550003	184.490005	181.350006	183.860001	183.860001	65434500
2024-02-16	183.419998	184.850006	181.669998	182.309998	182.309998	49701400

1259 rows × 6 columns

[54]
```python
yf.download(ticker2,period='5y')
```

```
[54] [********************100%%**********************]  1 of 1 completed
```

	Open	High	Low	Close	Adj Close	Volume
Date						
2019-02-19	2.493	2.493	2.459	2.470	2.470	0
2019-02-20	2.458	2.476	2.454	2.475	2.475	0
2019-02-21	2.496	2.518	2.488	2.508	2.508	0
2019-02-22	2.503	2.503	2.454	2.468	2.468	0
2019-02-25	2.493	2.500	2.483	2.486	2.486	0
...	...	...	...	...	...	...
2024-02-12	4.114	4.154	4.112	4.128	4.128	0
2024-02-13	4.116	4.318	4.114	4.318	4.318	0
2024-02-14	4.295	4.311	4.224	4.245	4.245	0
2024-02-15	4.211	4.238	4.163	4.217	4.217	0
2024-02-16	4.272	4.342	4.270	4.288	4.288	0

1259 rows × 6 columns

```
[57] ticker3 = "USDGBP=X"
```

```
[58] yf.download(ticker3, period  = "5y")
```

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[58] `[********************100%*********************] 1 of 1 completed`

Date	Open	High	Low	Close	Adj Close	Volume
2019-02-18	0.77500	0.77556	0.772960	0.77486	0.77486	0
2019-02-19	0.77383	0.77540	0.766480	0.77375	0.77375	0
2019-02-20	0.76560	0.76842	0.764210	0.76562	0.76562	0
2019-02-21	0.76664	0.76760	0.763800	0.76657	0.76657	0
2019-02-22	0.76682	0.77088	0.764490	0.76679	0.76679	0
...	...	...	...	...	...	...
2024-02-12	0.79122	0.79318	0.790260	0.79131	0.79131	0
2024-02-13	0.79192	0.79505	0.788430	0.79192	0.79192	0
2024-02-14	0.79420	0.79764	0.792959	0.79424	0.79424	0
2024-02-15	0.79566	0.79728	0.793870	0.79565	0.79565	0
2024-02-16	0.79370	0.79653	0.793500	0.79370	0.79370	0

1304 rows × 6 columns

Import CryptoCurrencies

[37] `ticker = ['BTC-EUR','ETH-INR']`

[38] `yf.download(ticker).tail(10)`

[38] `[********************100%*********************] 2 of 2 completed`

Price	Adj Close		Close		High		Low		Open		Volume	
Ticker	BTC-EUR	ETH-INR	BTC-EUR	ETH-INR	BTC-EUR	ETH-INR	BTC-EUR	ETH-INR	BTC-EUR	ETH-INR	BTC-EUR	ETH-INR
Date												
2024-02-08	41128.156250	201143.093750	41128.156250	201143.093750	41161.210938	202662.843750	39758.714844	195312.046875	40057.257812	197065.406250	19605874860	8.017216e+11
2024-02-09	42032.652344	200810.515625	42032.652344	200810.515625	42291.101562	204117.875000	41141.054688	200405.265625	41141.054688	201170.890625	24267239777	8.250014e+11
2024-02-10	43717.242188	206500.468750	43717.242188	206500.468750	44635.871094	209396.359375	42007.203125	200757.906250	42028.769531	200799.500000	36456475765	1.131840e+12
2024-02-11	44295.917969	207638.812500	44295.917969	207638.812500	44643.535156	208924.828125	43492.960938	205532.671875	43723.109375	206511.640625	15205677486	5.374743e+11
2024-02-12	44724.175781	208159.218750	44724.175781	208159.218750	45004.945312	210664.781250	44153.238281	207139.578125	44293.777344	207630.656250	17888096185	6.099118e+11
2024-02-13	46378.316406	220598.234375	46378.316406	220598.234375	46671.140625	221079.359375	44319.140625	205367.859375	44726.460938	208159.906250	32038925926	1.080759e+12
2024-02-14	46451.382812	219473.515625	46451.382812	219473.515625	46758.019531	222951.203125	45174.007812	215993.765625	46362.664062	220720.250000	33238143997	1.517703e+12
2024-02-15	48291.339844	230608.531250	48291.339844	230608.531250	48542.078125	231391.734375	46022.781250	217792.265625	46442.980469	219431.984375	36438018997	1.780594e+12
2024-02-16	48212.640625	234451.250000	48212.640625	234451.250000	49030.914062	237914.062500	47686.433594	229429.046875	48300.738281	230583.562500	35797869001	1.970196e+12
2024-02-17	47714.898438	229256.156250	47714.898438	229256.156250	48418.882812	232750.156250	47714.898438	229256.156250	48401.339844	232750.156250	19673128960	1.510748e+12

[39] `a = yf.download(ticker).Close`

`a.plot()`

`<Axes: xlabel='Date'>`

Importing funds and Exchange Traded Funds(EFTs)

```python
[60] ticker = 'TLT' # 20+ years treasury bond ETF
     ticker2 = 'OMOIX' # Vivaldi multi-stratergy Fund class
```

```python
[42] yf.download(ticker,period = '2y')
```

[*********************100%**********************] 1 of 1 completed

Date	Open	High	Low	Close	Adj Close	Volume
2022-02-17	136.449997	137.570007	135.899994	136.789993	128.921448	24508200
2022-02-18	137.520004	138.369995	137.160004	138.229996	130.278580	17522600
2022-02-22	137.690002	138.669998	137.470001	138.589996	130.617889	19534000
2022-02-23	137.679993	137.850006	136.570007	136.679993	128.817734	17757800
2022-02-24	139.100006	139.369995	136.250000	136.770004	128.902573	28150400
...	...	...	...	...	...	...
2024-02-12	93.900002	94.139999	93.500000	93.959999	93.959999	27890300
2024-02-13	92.860001	93.059998	92.330002	92.349998	92.349998	49768500
2024-02-14	92.300003	93.050003	92.230003	92.820000	92.820000	44191600
2024-02-15	93.559998	93.720001	93.000000	93.300003	93.300003	49598500
2024-02-16	92.480003	92.849998	92.339996	92.760002	92.760002	33100500

502 rows × 6 columns

```python
[61] yf.download(ticker2,period = '2y')
```

[*********************100%**********************] 1 of 1 completed

Date	Open	High	Low	Close	Adj Close	Volume
2023-04-17	24.100000	24.100000	24.100000	24.100000	24.100000	0
2023-04-18	24.100000	24.100000	24.100000	24.100000	24.100000	0
2023-04-19	24.110001	24.110001	24.110001	24.110001	24.110001	0
2023-04-24	24.120001	24.120001	24.120001	24.120001	24.120001	0
2023-04-25	23.959999	23.959999	23.959999	23.959999	23.959999	0
2023-04-26	23.990000	23.990000	23.990000	23.990000	23.990000	0
2023-04-27	24.049999	24.049999	24.049999	24.049999	24.049999	0
2023-04-28	24.070000	24.070000	24.070000	24.070000	24.070000	0
2023-05-01	24.090000	24.090000	24.090000	24.090000	24.090000	0
2023-05-02	24.030001	24.030001	24.030001	24.030001	24.030001	0
2023-05-03	23.990000	23.990000	23.990000	23.990000	23.990000	0
2023-05-04	23.879999	23.879999	23.879999	23.879999	23.879999	0
2023-05-05	23.980000	23.980000	23.980000	23.980000	23.980000	0
2023-05-08	23.990000	23.990000	23.990000	23.990000	23.990000	0
2023-05-09	23.990000	23.990000	23.990000	23.990000	23.990000	0
2023-05-10	24.010000	24.010000	24.010000	24.010000	24.010000	0
2023-05-11	24.020000	24.020000	24.020000	24.020000	24.020000	0

Import treasury yields

```python
[62] ticker1 = '^TNX' # 5 yr tresury Yield
     ticker2 = '^FVX' # 10 yr tresury Yield
```

```python
[44] ticker = ['^TNX','^FVX']
```

```python
[45] yf.download(ticker,period = '3y')
```

[*********************100%**********************] 2 of 2 completed

Price	Adj Close		Close		High		Low		Open		Volume	
Ticker	^FVX	^TNX	^FVX	^TNX	^FVX	^TNX	^FVX	^TNX	^FVX	^TNX	^FVX	^TNX
Date												
2021-02-17	0.566	1.301	0.566	1.301	0.596	1.331	0.543	1.269	0.580	1.314	0	0
2021-02-18	0.548	1.287	0.548	1.287	0.572	1.318	0.542	1.277	0.561	1.301	0	0
2021-02-19	0.581	1.345	0.581	1.345	0.590	1.362	0.561	1.308	0.568	1.313	0	0
2021-02-22	0.597	1.370	0.597	1.370	0.603	1.370	0.574	1.326	0.602	1.359	0	0
2021-02-23	0.579	1.362	0.579	1.362	0.600	1.389	0.568	1.342	0.584	1.359	0	0
...	...	...	...	...	...	...	...	...	...	...	...	...
2024-02-12	4.128	4.172	4.128	4.172	4.154	4.197	4.112	4.150	4.114	4.152	0	0
2024-02-13	4.318	4.316	4.318	4.316	4.318	4.316	4.114	4.150	4.116	4.152	0	0
2024-02-14	4.245	4.267	4.245	4.267	4.311	4.322	4.224	4.246	4.295	4.308	0	0
2024-02-15	4.217	4.240	4.217	4.240	4.238	4.255	4.163	4.191	4.211	4.226	0	0

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```python
yields = yf.download(ticker, period = "5y").Close
```
```
[*******************100%*******************]  1 of 1 completed
```

```python
[66] yields.plot()
     plt.legend()
     plt.show()
```


Ticker Object

```python
[46] ticker = 'DIS'
```

```python
[68] dis = yf.Ticker(ticker)
```

```python
[69] dis
```
```
yfinance.Ticker object <TLT>
```

```python
[70] dis.ticker
```
```
'TLT'
```

```python
[71] dis.history()
```

Date	Open	High	Low	Close	Volume	Dividends	Stock Splits	Capital Gains
2024-01-17 00:00:00-05:00	94.296604	94.695322	93.858020	94.366379	55506800	0.00	0.0	0.0
2024-01-18 00:00:00-05:00	94.157054	94.276672	93.210104	93.489204	77339100	0.00	0.0	0.0
2024-01-19 00:00:00-05:00	93.409460	93.867984	92.960906	93.788239	47020300	0.00	0.0	0.0
2024-01-22 00:00:00-05:00	94.515896	94.775064	94.087275	94.346443	35756400	0.00	0.0	0.0
2024-01-23 00:00:00-05:00	93.588884	93.688562	93.130360	93.598854	35786700	0.00	0.0	0.0
2024-01-24 00:00:00-05:00	94.206897	94.236799	92.801415	93.050613	54574900	0.00	0.0	0.0

Stock Fundamentals, Meta Data and Performance Metrics

```python
dis
```
```
yfinance.Ticker object <TLT>
```

```python
[73] pd.Series(dis.info)
```
```
phone                                             1-800-474-2737
longBusinessSummary        The fund will invest at least 80% of its asset...
maxAge                                                     86400
priceHint                                                      2
previousClose                                               93.3
open                                                       92.48
dayLow                                                     92.34
dayHigh                                                   92.845
regularMarketPreviousClose                                  93.3
regularMarketOpen                                          92.48
regularMarketDayLow                                        92.34
regularMarketDayHigh                                      92.845
forwardPE                                                -4638.0
volume                                                  32769318
regularMarketVolume                                     32769318
averageVolume                                           47780378
averageVolume10days                                     40994750
averageDailyVolume10Day                                 40994750
bid                                                        92.89
ask                                                        93.02
bidSize                                                     3200
askSize                                                    21500
yield                                                     0.0346
totalAssets                                           50027499520
fiftyTwoWeekLow                                            82.42
fiftyTwoWeekHigh                                           109.1
fiftyDayAverage                                          96.0216
```

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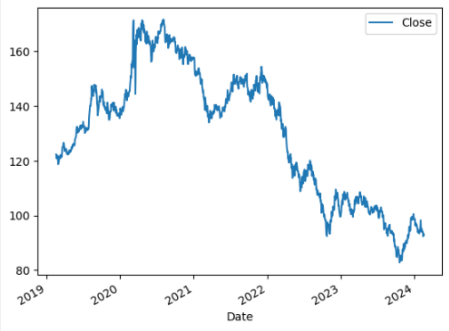NAAC ACCREDITED with "A" GRADE (CGPA : 3.18)

A.Y.: 2022-23   **Class/ Sem: T.Y.B.Tech/ Sem-VI**   **Sub:** Computational Finance

```
df = pd.Series(dis.info, name='DIS').to_frame().T
```

	phone	longBusinessSummary	maxAge	priceHint	previousClose	open	dayLow	dayHigh	regularMarketPreviousClose	regularMarketOpen	...	underlyingSymbol	shortName	longName
DIS	1-800-474-2737	The fund will invest at least 80% of its asset...	86400	2	93.3	92.48	92.34	92.845	93.3	92.48	...	TLT	iShares 20+ Year Treasury Bond	iShares 20+ Year Treasury Bond ETF

1 rows × 53 columns

```
[75] ticker = ["MSFT", "META"] # FB is now META!
```

```
[76] for i in ticker:
         df.loc["{}".format(i)] = pd.Series(yf.Ticker(i).info)
```

```
[77] df
```

	phone	longBusinessSummary	maxAge	priceHint	previousClose	open	dayLow	dayHigh	regularMarketPreviousClose	regularMarketOpen	...	underlyingSymbol	shortName	longN
DIS	1-800-474-2737	The fund will invest at least 80% of its asset...	86400	2	93.3	92.48	92.34	92.845	93.3	92.48	...	TLT	iShares 20+ Year Treasury Bond	iShares 20+ Treas Bond
MSFT	425 882 8080	Microsoft Corporation develops and supports so...	86400	2	406.56	407.96	403.53	408.27	406.56	407.96	...	MSFT	Microsoft Corporation	Micro Corpora

```
[78] df.info()
```

```
Data columns (total 53 columns):
 #   Column                      Non-Null Count  Dtype
---  ------                      --------------  -----
 0   phone                       3 non-null      object
 1   longBusinessSummary         3 non-null      object
 2   maxAge                      3 non-null      object
 3   priceHint                   3 non-null      object
 4   previousClose               3 non-null      object
 5   open                        3 non-null      object
 6   dayLow                      3 non-null      object
 7   dayHigh                     3 non-null      object
 8   regularMarketPreviousClose  3 non-null      object
 9   regularMarketOpen           3 non-null      object
 10  regularMarketDayLow         3 non-null      object
 11  regularMarketDayHigh        3 non-null      object
 12  forwardPE                   3 non-null      object
 13  volume                      3 non-null      object
 14  regularMarketVolume         3 non-null      object
 15  averageVolume               3 non-null      object
 16  averageVolume10days         3 non-null      object
 17  averageDailyVolume10Day     3 non-null      object
 18  bid                         3 non-null      object
 19  ask                         3 non-null      object
 20  bidSize                     3 non-null      object
 21  askSize                     3 non-null      object
 22  yield                       1 non-null      object
 23  totalAssets                 1 non-null      object
 24  fiftyTwoWeekLow             3 non-null      object
 25  fiftyTwoWeekHigh            3 non-null      object
 26  fiftyDayAverage             3 non-null      object
 27  twoHundredDayAverage        3 non-null      object
 28  trailingAnnualDividendRate  2 non-null      object
 29  trailingAnnualDividendYield 2 non-null      object
 30  navPrice                    1 non-null      object
 31  currency                    3 non-null      object
 32  category                    1 non-null      object
 33  ytdReturn                   1 non-null      object
```

∨ Import Financials (Balance Sheet, P & L, CashFlows)

```
dis
```
```
yfinance.Ticker object <TLT>
```

```
[80] dis.balance_sheet
```

```
[81] dis.income_stmt # income_stmt instead of financials!
```

```
dis.cashflow
```

```
[83] ticker = ["AAPL", "META", "AMZN"]
```

```
[84] for i in ticker:
         yf.Ticker(i).income_stmt.to_csv("{}.csv".format(i))
```

∨ Importing Put/Call Options(Stocks)

```
[86] dis
```
```
yfinance.Ticker object <TLT>
```

```
[88] dis.option_chain()
```

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A.Y.: 2022-23   **Class/ Sem: T.Y.B.Tech/ Sem-VI**   **Sub:** Computational Finance

```
16  TLT240221P00100000 2024-02-15 15:30:53+00:00     100.0     6.45   7.15
17  TLT240221P00105000 2024-02-13 18:30:20+00:00     105.0    12.26  12.15
18  TLT240221P00110000 2024-02-13 19:10:33+00:00     110.0    17.30  17.15

      ask   change  percentChange  volume  openInterest  impliedVolatility  \
0    0.01    0.00       0.000000     2.0           230           0.390631
1    0.01    0.00       0.000000     2.0             9           0.351569
2    0.01    0.00       0.000000   300.0           302           0.312507
3    0.01    0.00       0.000000     1.0             1           0.281257
4    0.01    0.00       0.000000     4.0            54           0.242195
5    0.01    0.00       0.000000     4.0            77           0.203133
6    0.02   -0.01     -50.000000    91.0           126           0.183602
7    0.03   -0.01     -25.000000   207.0           839           0.152352
8    0.06   -0.01     -14.285716   697.0           895           0.125009
9    0.17   -0.02     -10.526314  3297.0          2007           0.104501
10   0.55    0.07      15.217383  1227.0           749           0.096689
11   1.31    0.31      31.313124    86.0           452           0.099618
12   2.26    0.51      29.310343    72.0          1254           0.115243
13   3.30    0.00       0.000000     4.0             4           0.193367
14   4.25    0.50      12.820512     5.0            17           0.175789
15   6.30    0.00       0.000000    NaN             0           0.320319
16   7.30    0.00       0.000000     2.0             2           0.359381
17  12.30    0.00       0.000000     1.0             0           0.542973
18  17.30    0.00       0.000000    NaN             0           0.707034

    inTheMoney contractSize currency
0        False      REGULAR      USD
1        False      REGULAR      USD
2        False      REGULAR      USD
3        False      REGULAR      USD
4        False      REGULAR      USD
5        False      REGULAR      USD
6        False      REGULAR      USD
7        False      REGULAR      USD
8        False      REGULAR      USD
9        False      REGULAR      USD
10        True      REGULAR      USD
11        True      REGULAR      USD
12        True      REGULAR      USD
```

```
[89] calls = dis.option_chain()[0]
     calls
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	ask	change	percentChange	volume	openInterest	impliedVolatility	inTheMoney	contractSize	currency
0	TLT240221C00080000	2024-02-08 18:01:48+00:00	80.0	14.00	12.75	12.85	0.00	0.000000	NaN	1	0.601566	True	REGULAR	USD
1	TLT240221C00085000	2024-02-13 15:33:28+00:00	85.0	7.85	7.75	7.85	0.00	0.000000	NaN	35	0.445318	True	REGULAR	USD
2	TLT240221C00088000	2024-02-15 20:54:34+00:00	88.0	5.30	4.75	4.85	0.00	0.000000	22.0	10	0.297859	True	REGULAR	USD
3	TLT240221C00090000	2024-02-16 16:32:46+00:00	90.0	2.71	2.60	2.86	-0.64	-19.104475	26.0	12	0.200203	True	REGULAR	USD
4	TLT240221C00091000	2024-02-16 17:40:32+00:00	91.0	1.75	1.63	1.89	-0.61	-25.847452	120.0	113	0.157235	True	REGULAR	USD
5	TLT240221C00092000	2024-02-16 20:56:12+00:00	92.0	0.97	0.96	1.01	-0.56	-36.601303	339.0	843	0.126962	True	REGULAR	USD
6	TLT240221C00093000	2024-02-16 20:58:14+00:00	93.0	0.34	0.34	0.35	-0.42	-55.263157	6954.0	388	0.105966	False	REGULAR	USD
7	TLT240221C00094000	2024-02-16 20:56:12+00:00	94.0	0.09	0.08	0.09	-0.20	-68.965515	1971.0	3028	0.108407	False	REGULAR	USD
8	TLT240221C00095000	2024-02-16 20:49:51+00:00	95.0	0.02	0.02	0.03	-0.09	-81.818184	1596.0	2834	0.125009	False	REGULAR	USD
9	TLT240221C00096000	2024-02-16 20:47:10+00:00	96.0	0.01	0.00	0.01	-0.03	-75.000000	182.0	1505	0.140634	False	REGULAR	USD
10	TLT240221C00097000	2024-02-16 20:56:12+00:00	97.0	0.02	0.00	0.01	-0.01	-33.333336	125.0	449	0.175789	False	REGULAR	USD
11	TLT240221C00098000	2024-02-16	98.0	0.01	0.00	0.01	0.00	0.000000	24.0	734	0.210945	False	REGULAR	USD

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A.Y.: 2022-23   **Class/ Sem: T.Y.B.Tech/ Sem-VI**   **Sub:** Computational Finance

```
[90] puts = dis.option_chain()[1]
     puts
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	ask	change	percentChange	volume	openInterest	impliedVolatility	inTheMoney	contractSize	currency
0	TLT240221P00083000	2024-02-14 14:48:47+00:00	83.0	0.01	0.00	0.01	0.00	0.000000	2.0	230	0.390631	False	REGULAR	USD
1	TLT240221P00084000	2024-02-15 16:46:50+00:00	84.0	0.01	0.00	0.01	0.00	0.000000	2.0	9	0.351569	False	REGULAR	USD
2	TLT240221P00085000	2024-02-14 17:02:59+00:00	85.0	0.01	0.00	0.01	0.00	0.000000	300.0	302	0.312507	False	REGULAR	USD
3	TLT240221P00086000	2024-02-14 15:42:05+00:00	86.0	0.01	0.00	0.01	0.00	0.000000	1.0	1	0.281257	False	REGULAR	USD
4	TLT240221P00087000	2024-02-16 17:00:19+00:00	87.0	0.01	0.00	0.01	0.00	0.000000	4.0	54	0.242195	False	REGULAR	USD
5	TLT240221P00088000	2024-02-16 20:52:21+00:00	88.0	0.01	0.00	0.01	0.00	0.000000	4.0	77	0.203133	False	REGULAR	USD
6	TLT240221P00089000	2024-02-16 20:55:30+00:00	89.0	0.01	0.01	0.02	-0.01	-50.000000	91.0	126	0.183602	False	REGULAR	USD
7	TLT240221P00090000	2024-02-16 20:49:51+00:00	90.0	0.03	0.02	0.03	-0.01	-25.000000	207.0	839	0.152352	False	REGULAR	USD
8	TLT240221P00091000	2024-02-16 20:54:34+00:00	91.0	0.06	0.05	0.06	-0.01	-14.285716	697.0	895	0.125009	False	REGULAR	USD
9	TLT240221P00092000	2024-02-16 20:59:56+00:00	92.0	0.17	0.16	0.17	-0.02	-10.526314	3297.0	2007	0.104501	False	REGULAR	USD
10	TLT240221P00093000	2024-02-16 20:58:16+00:00	93.0	0.53	0.52	0.55	0.07	15.217383	1227.0	749	0.096689	True	REGULAR	USD
11	TLT240221P00094000	2024-02-16 20:42:01+00:00	94.0	1.30	1.26	1.31	0.31	31.313124	86.0	452	0.099618	True	REGULAR	USD

✓ Streaming Real-Time Data

```
[91] yf.download("EURUSD=X", interval = "1m", period = "1d").tail()
```
```
[*********************100%***********************]  1 of 1 completed
```

Datetime	Open	High	Low	Close	Adj Close	Volume
2024-02-16 22:24:00+00:00	1.077935	1.077935	1.077935	1.077935	1.077935	0
2024-02-16 22:25:00+00:00	1.077935	1.077935	1.077935	1.077935	1.077935	0
2024-02-16 22:26:00+00:00	1.077935	1.077935	1.077935	1.077935	1.077935	0
2024-02-16 22:27:00+00:00	1.077935	1.077935	1.077935	1.077935	1.077935	0
2024-02-16 22:28:00+00:00	1.077935	1.077935	1.077935	1.077935	1.077935	0

```
[92] data = yf.download("EURUSD=X", interval = "1m", period = "1d")
```
```
[*********************100%***********************]  1 of 1 completed
```

```
[93] print(data.index[-1], data.iloc[-1, 3])
```
```
2024-02-16 22:28:00+00:00 1.077934741973877
```

```
[95] import time
```

```python
while True:
    time.sleep(5)
    data = yf.download("EURUSD=X", interval = "1m", period = "1m", progress = False)
    print(data.index[-1], data.iloc[-1, 3])
```
```
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
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2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
2024-02-16 22:28:00+00:00 1.077934741973877
```

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