4.1 CHALLENGE

Sunday, August 14, 2022   6:08 PM

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```
# Collecting the real data from returns of MSFT from July 2019 until July 2022
MSFT = pdr.get_data_yahoo("MSFT", start = "2017-07-01", end = "2022-06-30", interval = "d")
MSFT
```

Date	High	Low	Open	Close	Volume	Adj Close
2017-07-03	69.599998	68.019997	69.330002	68.169998	16165500.0	63.851696
2017-07-05	69.440002	68.220001	68.260002	69.080002	21176300.0	64.704063
2017-07-06	68.779999	68.120003	68.269997	68.570000	21117600.0	64.226341
2017-07-07	69.839996	68.699997	68.699997	69.459999	16878300.0	65.059990
2017-07-10	70.250000	69.199997	69.459999	69.980003	15014500.0	65.547058
...	...	...	...	...	...	...
2022-06-24	267.980011	261.720001	261.809998	267.700012	33923200.0	267.700012
2022-06-27	268.299988	263.279999	268.209991	264.890015	24615100.0	264.890015
2022-06-28	266.910004	256.320007	263.980011	256.480011	27295500.0	256.480011
2022-06-29	261.970001	255.759995	257.589996	260.260010	20069800.0	260.260010
2022-06-30	259.529999	252.899994	257.049988	256.829987	31730900.0	256.829987

1258 rows × 6 columns
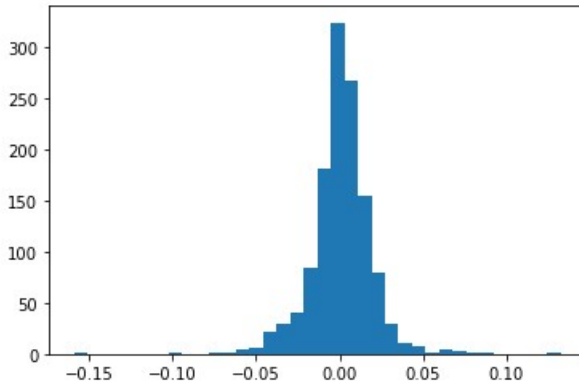
```
# Null: mean of monthly cc <= 0. Alternative mean of monthly return > 0
```

```
# Calculating the daily cc returns
MSFT["r"] = (np.log(MSFT["Adj Close"]) - np.log(MSFT["Adj Close"].shift(1)))
```

```
# Plotting the cc returns
plt.hist(MSFT['r'], bins=36)
plt.show()
```



```
# We calculate the mean
MSFT_mean = MSFT['r'].mean()
MSFT_mean
```

0.0011072801833995791

```
# Calculate the std
MSFT_std = MSFT['r'].std()
MSFT_std
```

0.018531582710542352

```
# Calculate the grouped std
MSFT_std_grouped = MSFT_std / math.sqrt(60)
MSFT_std_grouped
```

0.002392417040559861

```
# Calculating the t-statistic
t_statistic = (MSFT_mean - 0) / MSFT_std_grouped
t_statistic
```

0.46282908231604103

```
# min(95% C.I.)
MIN_CI = MSFT_mean - 2 * (MSFT_std_grouped)
MIN_CI
```

-0.003677553897720143

```
# max(95% C.I.)
MAX_CI = MSFT_mean + 2 * (MSFT_std_grouped)
MAX_CI
```

0.005892114264519301

THE RESULT IS THAT THE DIFFERENCE BETWEEN THE TWO MEANS IS 0.46 STANDARD DEVIATIONS. THUS, THE ALTERNATIVE
HYPOTHESIS CAN NOT BE CONFIRMED.

```
# Another way to calculate the grouped std and mean is:
MSFT_month_cc = MSFT.groupby(MSFT.index.strftime('%Y-%m'))['r'].mean()
MSFT_month_cc_mean = MSFT_month_cc.mean()
MSFT_month_cc_std = MSFT_month_cc.std()
print(f'Mean: {MSFT_month_cc_mean}')
print(f'Std:  {MSFT_month_cc_std}')
```

Mean: 0.0010871479264452162
Std: 0.002737447607223224