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CS 677
HW1

Question 1

1. For each of the 5 years, compute the mean and standard deviation for the sets R, R− and R+ of daily returns for your stock for each day of the week
   Please see the code file Question 1.py

2. Summarize your results in the table as shown below (5 tables total).

2016

Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	-0.0004068421734123125 4	0.009891133787249169	23	-0.00782364229195974	0.007046009381472826	23	0.007009957945135114	0.006000413235248954 4
Tuesday	0.0009692185449976947	0.01115686771970263	25	-0.0072018171723898395	0.007078791954155565	27	0.008534992357393559	0.008618139898733753
Wednesday	0.002185073206051288	0.008788833531046524	22	-0.005594736552573037	0.004652003947298656	30	0.00789026702904246	0.006409693340103134
Thursday	0.001185025881988337	0.010462230617851618	23	-0.007958025492319542	0.006467555519574495	28	0.008695389510884095	0.006319608848513005 5
Friday	0.0011945313401022545	0.01317284245401868	20	-0.011107197091418669	0.008901839419678478	31	0.009131130328180269	0.00858642897097434

2017

Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	0.0004234558649413023	0.009904760355804619	24	-0.006266750148034637	0.005164328537035684	22	0.007721862424551418	0.00859870242335312
Tuesday	-0.0005566667399987658	0.009125370544866063	27	-0.006923110133091297	0.007010902668252148	24	0.006605582077230332	0.004976053966362915
Wednesday	0.0003288721925492227	0.008365676714493255	20	-0.008088778093170462	0.005476845978734579	32	0.005589903518270788	0.004797240270057787
Thursday	-0.0005109629466876818	0.010161177482967947	25	-0.008093968124160376	0.008031223127336284	26	0.006780388185497601	0.005661626139532691
Friday	0.0001950994271724077 8	0.011205180567277208	24	-0.007898460610471378	0.007316871182402422	27	0.007389375016189106	0.00892123721583539

2018

Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	0.0009853141864949524	0.016555762107527267	22	-0.011949503393745902	0.009726523688932912	26	0.011930159831314137	0.012829983981789384
Tuesday	-0.0012690379640662409	0.010885739402498052	28	-0.008784756663265102	0.007043926217393654	23	0.007880532626262808	0.007062290545349502
Wednesday	0.0012732752304504059	0.012133762484294356	22	-0.008580480058591107	0.00753760663344412	28	0.009015511528983024	0.009057284370580652
Thursday	0.0003932294529912396 6	0.013525923668537424	23	-0.010879939569505026	0.010271860105221138	28	0.009653332578613172	0.007511418788866865
Friday	0.0003326659015733453 3	0.011858497840303621	27	-0.008072889610169363	0.007864382955718823	24	0.009788915852283891	0.007767924898461061 5

2019

Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	-0.0018328638762578249	0.010385725880193977	30	-0.008425588390339038	0.00530532950917248	18	0.009155010313877 53	0.006895737577571654
Tuesday	0.0004621246064729356 3	0.0122715714601125	24	-0.009755003447897204	0.008314154563715 13	28	0.009219662938790198	0.007365348261399663
Wednesday	0.0023306975569368465	0.013130689570707675	19	-0.009357155883498981	0.006332996640210302	32	0.00927036053719562	0.011031969037020 25
Thursday	0.003461694932409194	0.008599251118700428	17	-0.005206419341542358	0.005809616789292175	33	0.007927087134141812	0.006006350495713 89
Friday	0.0007114633032282 74	0.009009275203968613	23	-0.00713860755924215	0.005507525502206667	28	0.007159735797400408	0.005542931705956 8365

2020

Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	0.0018052098234031557	0.039054719754341 27	22	-0.02656763119597992	0.03347833704742299	26	0.02581299837826576	0.02469764493075883
Tuesday	0.0004883913458186434	0.028674197664700 62	25	-0.0193519989312875	0.013955044374287929	27	0.018859123083879888	0.026480760926224412
Wednesday	-0.004031262648420925	0.034682881954855 14	27	-0.027335940671110736	0.028564931447254905	25	0.02113778961608407	0.020019170839901946
Thursday	9.125831879062173e-05	0.030306083626865276	22	-0.024594414332378026	0.024753163746453852	29	0.018818320330022013	0.018368617498834682
Friday	-0.0007229521003149515	0.030635123024005936	28	-0.019594323714900174	0.01490247894816564	21	0.024438876719132013	0.028031959549706 96

3. Are there more days with negative or non-negative returns?

2016: Since negative day is 113, non-negative day is 139, there are more days with non-negative returns

2017: Since negative day is 120, non-negative day is 131, there are more days with non-negative returns

2018: Since negative day is 122, non-negative day is 129, there are more days with non-negative returns

2019: Since negative day is 113, non-negative day is 139, there are more days with non-negative returns

2020: Since negative day is 124, non-negative day is 128, there are more days with non-negative returns

4. Does your stock lose more on a ”down” day than it gains on an ”up” days.

2016: Since average losing of down day is-0.007860636587019023, average earning of up day is 0.008308761034081659. My stock gains more on a up day than it lose on a down days

2017:Since average losing of down day is-0.0074251149730419, average earning of up day is 0.0067411837712852505. My stock gains more on a up day than it lose on a down days

2018: Since average losing of down day is-0.009556061082754305, average earning of up day is 0.0096829303991141. My stock gains more on a up day than it lose on a down days

2019: Since average losing of down day is-0.008118325654114815, average earning of up day is 0.008501142178993325. My stock gains more on a up day than it lose on a down days

2020: Since average losing of down day is-0.023355455137445615, average earning of up day is 0.02162286501698578. My stock gains more on a up day than it lose on a down days

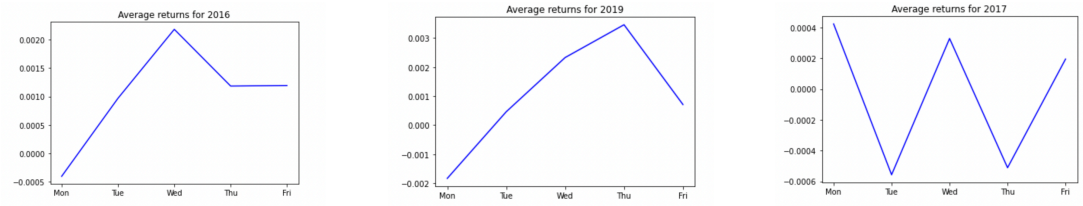
5. Are these results the same across days of the week?

The results are not the same across day of the week since there are not even the same in year.

Question 2

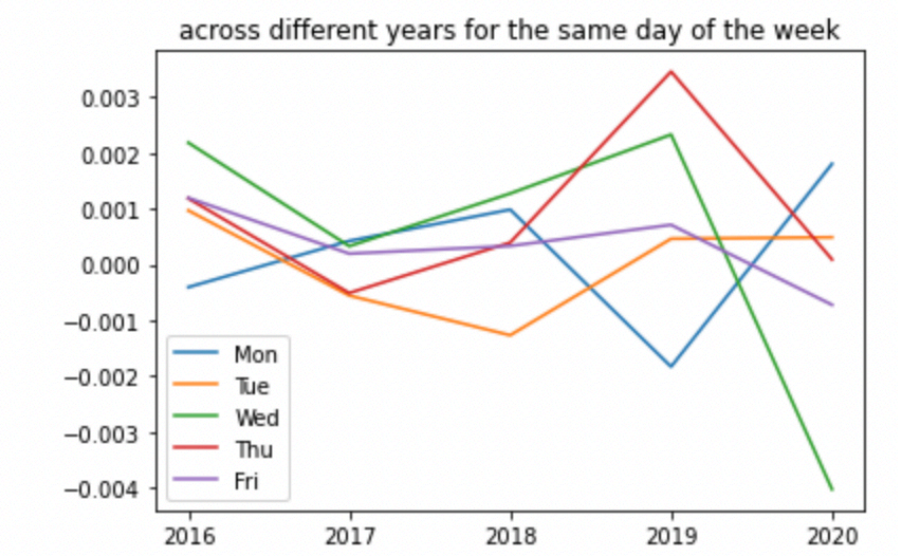
1. Are there any patterns across days of the week?

   There are some funny patterns across days of the week, for example in 2016 and 2019, the average of all returns across days of the week is like a mountain shape, which means it start from a very low position, continuously go up to the top and then going down; and in 2017 the value pattern looks like a "W".



2. Are there any patterns across different years for the same day of the week?

The picture below shows the average return across different years for the same day of the week, from the picture we know that Monday's return looks like an "N"; Wednesday's return is a big "7" shape.



3. What are the best and worst days of the week to be invested for each year.

   2016:
   Best: Wednesday, Worst: Monday;

2017:
Best: Monday, Worst: Tuesday;
2018:
Best: Wednesday, Worst: Tuesday
2019:
Best: Thursday, Worst: Monday;
2020:
Best: Monday, Worst: Wednesday;

4. Do these days change from year to year for your stock?

   Yes, it changes from year to year.

Question 3

Compute the aggregate table across all 5 years, one table for both your stock and one table for S&P-500 (using data for ”spy”).

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opened file for ticker:  Y
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Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	0.0001980165941740132	0.02068027349442558	121	-0.011822234619438385	0.01715355163550013	115	0.012845411349366188	0.016002598739515993
Tuesday	2.6028116091964715e-05	0.016177176507314654	129	-0.010316764693847706	0.010101969115197928	129	0.010368820926031638	0.014401582318430629
Wednesday	0.0004032250453086938	0.018480890338281365	110	-0.012631697156504465	0.017326690797899592	147	0.010157248461631465	0.012255036972439034
Thursday	0.0009140583963845199	0.016742317821218097	110	-0.011501896760404648	0.01479800817916847	144	0.010398468585598467	0.010928769473381927
Friday	0.0003505814452982519	0.016945871583555254	122	-0.01100413158880355	0.01083753524277877	131	0.010925199690797643	0.01460544959815015

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Day	μ(R)	σ(R)	|R-|	μ(R-)	σ(R-)	|R+|	μ(R+)	σ(R+)
Monday	0.0005086132250447507	0.013913143970618 58	99	-0.008612717305084245	0.014801994941518	137	0.007099939666524828	0.008459571492397315
Tuesday	0.001214949909073148	0.011464608656649762	112	-0.0067091663071241325	0.006934892906156432	146	0.007293723992731336	0.010500112431639666
Wednesday	0.000906263926963854	0.011115279568283003	106	-0.007368795083211805	0.010126313108174596	151	0.006715245748676568	0.007515470365710536
Thursday	-2.1385118132058127e-05	0.011676391510707056	117	-0.007136063380936379	0.012439600003672852	137	0.006054653982219077	0.006361777529120333
Friday	0.0005557825526898351	0.011110796227916367	111	-0.007257188665140695	0.008449445609814088	142	0.006663105124374263	0.008895293563073723

1. What is the best and worst days of the week for each?

   As we can see from the table,

   My stock Y: best: Tuesday, worst: Monday

S&P-500: best: Tuesday, worst:Thursday

2. Are these days the same for your stock as they are for S&P- 500?

   For my stock and S&P-500, they both have the same best day Tuesday.

Question 4

You listen to the oracle and follow its advice. How much much money will you have on the last trading day of 2020:

1. Your stock?

   For my stock, I will have 125983.85639775243 dollars on the last trading day of 2020

2. S&P-500 stock?

   For S&P-500 stock, I will have 11985.076468564423 dollars on the last trading day of 2020

Question 5

Consider ”buy-and-hold” strategy: you buy on the first trading day and sell on the last day. So you do not listen to your oracle at all. As before, assume that you start with $100 for both your stock and ”spy”.

1. How much money will you have on the last trading day of 2020?

   For my stock, I will have 131.90063800699082 dollars on the last trading day of 2020

   For S&P-500 stock, I will have 203.81486684670827 dollars on the last trading day of 2020

2. How do these results compare with results obtained in question 4?

   Comparing to the results in question 4, it’s totally a different, since in question 4 we avoid all chance to lose by listening the Oracle, so the we earned more than 100 times money than question 5.

Question 6

1. For each of the scenarios above (a,b and c), compute the final amount that you will have for both your stock and ”spy”

(a) Oracle gave you wrong results for the best 10 trading days. In other words, you missed the best 10 days and your overall profit will be lower.

By missing the best 10 days, my stock will have 56003.84267770594 dollars on the last trading day of 2020

By missing the best 10 days, S&P-500 stock will have 6849.91547326207 dollars on the last trading day of 2020

(b) Oracle gave you wrong results for worst 10 trading days. In other words, you missed the worst 10 days and your overall profit will be lower.

By missing the worst 10 days, my stock will have 51430.549459777576 dollars on the last trading day of 2020

By missing the worst 10 days, S&P-500 stock will have 6333.209918469919 dollars on the last trading day of 2020

(c) Oracle gave you wrong results for best 5 days and for the worst 5 days.

By getting wrong results for best 5 days and the worst 5 days, my stock will have 43116.014670398545 dollars on the last trading day of 2020

By getting wrong results for best 5 days and the worst 5 days, S&P-500 stock will have 5648.882716024927 dollars on the last trading day of 2020

2. Do you gain more by missing the worst days or by missing the best days?

I gain more by missing the best days for both my stock and S&P-500 stock.

3. Are the results in part (c) different from results that you obtained in question 4.

Yes, they are totally different, by listening the Oracle all the way down can make me gain more money.