

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

2015	u(R)	std(R)	-R	u(-R)	std(-R)	+R	u(+R)	std(+R)
Monday	-0.008225	0.032466	27	-0.026187	0.032483	21	0.014869	0.010223
Tuesday	-0.002338	0.020795	27	-0.016908	0.017100	25	0.013397	0.010334
Wednesday	0.005833	0.032834	26	-0.016091	0.017101	26	0.027757	0.030041
Thursday	0.004383	0.024035	24	-0.013838	0.011575	27	0.020579	0.020362
Friday	0.001010	0.033336	26	-0.022282	0.020079	23	0.027340	0.024601
2016	u(R)	std(R)	-R	u(-R)	std(-R)	+R	u(+R)	std(+R)
Monday	-0.005102	0.035701	25	-0.027822	0.030528	21	0.021946	0.018337
Tuesday	0.002378	0.029433	29	-0.017812	0.013454	23	0.027835	0.023840
Wednesday	-0.000870	0.028344	25	-0.021775	0.022868	27	0.018486	0.016845
Thursday	-0.004759	0.026063	36	-0.017535	0.014255	15	0.025905	0.022133
Friday	0.000929	0.025462	24	-0.017979	0.017365	27	0.017736	0.018875
2017	u(R)	std(R)	-R	u(-R)	std(-R)	+R	u(+R)	std(+R)
Monday	0.012054	0.025674	16	-0.013405	0.014648	30	0.025632	0.019138
Tuesday	-0.002322	0.027992	28	-0.020771	0.018597	23	0.020139	0.019939
Wednesday	0.009169	0.042044	20	-0.018995	0.016145	32	0.026771	0.043635
Thursday	0.002106	0.026657	30	-0.015287	0.011267	21	0.026952	0.022246
Friday	0.002880	0.023291	27	-0.012705	0.009423	24	0.020412	0.021731
2018	u(R)	std(R)	-R	u(-R)	std(-R)	+R	u(+R)	std(+R)
Monday	-0.005807	0.029915	27	-0.026934	0.019649	21	0.021356	0.015409
Tuesday	-0.007695	0.037097	29	-0.027310	0.034919	22	0.018160	0.020182
Wednesday	0.001721	0.042557	21	-0.034358	0.034671	29	0.027847	0.025040
Thursday	-0.000007	0.029004	24	-0.023101	0.018604	27	0.020520	0.019644
Friday	0.001957	0.028820	24	-0.021520	0.015087	27	0.022825	0.021004
2019	u(R)	std(R)	-R	u(-R)	std(-R)	+R	u(+R)	std(+R)
Monday	0.003470	0.028392	21	-0.020700	0.019854	27	0.022269	0.017852
Tuesday	-0.000095	0.031683	27	-0.022136	0.017321	25	0.023709	0.025936
Wednesday	-0.002474	0.024689	28	-0.020352	0.017420	23	0.019291	0.010925
Thursday	-0.003160	0.020770	33	-0.014827	0.012898	17	0.019488	0.012988
Friday	0.001714	0.026813	25	-0.019413	0.016145	26	0.022029	0.017824

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

In 2015, there are 130 negative days, 122 non-negative days;

In 2016, there are 139 negative days, 113 non-negative days;

In 2017, there are 121 negative days, 130 non-negative days;

In 2018, there are 125 negative days, 126 non-negative days;

In 2019, there are 134 negative days, 118 non-negative days;

In all five years, there are 649 negative days, 609 non-negative days;

4. does your stock lose more on a down day than it gains on up days.

Suppose, if average-return  $> 0$ , we say it loses more, otherwise, it gains more, then:

(2015, gain more, average return rate is 0.02%

(2016, lose more, average return rate is -0.14%

(2017, gain more, average return rate is 0.46%

(2018, lose more, average return rate is -0.19%

(2019, lose more, average return rate is -0.01%

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

These results are not the same cross days of the week.

In 2015,

{(Monday, lose more): average return rate is -0.8225%

(Tuesday, lose more): average return rate is -0.2338%

(Wednesday, gain more): average return rate is 0.5833%

(Thursday, gain more): average return rate is 0.4383%

(Friday, gain more): average return rate is 0.101%

In 2016,

{(Monday, lose more): average return rate is -0.5102%

(Tuesday, gain more): average return rate is 0.2378%

(Wednesday, lose more): average return rate is -0.087%

(Thursday, lose more): average return rate is -0.4759%

(Friday, gain more): average return rate is 0.0929%

In 2017,

{(Monday, gain more): average return rate is 1.2054%

(Tuesday, lose more): average return rate is -0.2322%

(Wednesday, gain more): average return rate is 0.9169%

(Thursday, gain more): average return rate is 0.2106%

(Friday, gain more): average return rate is 0.288%

In 2018,

{(Monday, lose more): -0.5807%

(Tuesday, lose more): -0.7695%

(Wednesday, gain more): 0.1721%  
(Thursday, lose more): -0.0007%  
(Friday, gain more): 0.1957%

In 2019,  
{(Monday, gain more): 0.347%  
(Tuesday, lose more): -0.0095%  
(Wednesday, lose more): -0.2474%  
(Thursday, lose more): -0.316%  
(Friday, gain more): 0.1714%

## Question 2:

Examine your 5 tables.

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

For returns in 2015 from Monday to Friday:

$u(R)$  and  $u(+R)$  go up from Monday to the highest Wednesday and go down;  $u(-R)$  almost go up all the time from Monday until the end.

For returns in 2016 from Monday to Friday:

$u(R)$  and  $u(+R)$  go up on Tuesday and then down,  $u(-R)$  go up.

For returns in 2017 from Monday to Friday:

All  $u(R)$ ,  $u(-R)$  and  $u(+R)$  go down on Tuesday and up on the rest days.

For returns in 2018 from Monday to Friday:

$u(R)$  and  $u(+R)$  go down on Tuesday and go up on the rest day,  $u(-R)$  go down on Wednesday and go up.

For returns in 2019 from Monday to Friday:

$u(R)$  go down and go up,  $u(-R)$  almost keep up,  $u(+R)$  almost keep down.

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

For all returns on Monday from 2015 to 2019:

$u(R)$  and  $u(+R)$  go up from 2015 to 2017 and then down,  $u(-R)$  go down in 2017 and go up.

For all returns on Tuesday from 2015 to 2019:

All  $u(R)$ ,  $u(-R)$  and  $u(+R)$  go up in 2016 and go down, but  $u(+R)$  go up in 2019.

For all returns on Wednesday from 2015 to 2019:

All  $u(R)$ ,  $u(-R)$  and  $u(+R)$  go down and go up the next year repeatedly.

For all returns on Thursday from 2015 to 2019:

$u(R)$  and  $u(-R)$  go up in 2015 and then down,  $u(+R)$  go up from 2015 to 2017 and go down.

For all returns on Friday from 2015 to 2019:

Both  $u(R)$  and  $u(+R)$  don't have much change, but  $u(-R)$  go up in 2016 and 2017 and go down.

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

In 2015, the worst day is Monday, best day is Wednesday

In 2016, the worst day is Monday, best day is Tuesday

In 2017, the worst day is Tuesday, best day is Monday

In 2018, the worst day is Tuesday, best day is Friday

In 2019, the worst day is Monday, best day is Thursday

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

In most cases, the worst day is the beginning of the week.

But for the best day, every weekday could be the one.

### 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).

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

SPY	$u(R)$	$std(R)$	$ -R $	$u(-R)$	$std(-R)$	$ +R $	$u(+R)$	$std(+R)$
Monday	0.000066	0.008915	108	-0.006479	0.008071	128	0.005589	0.004992
Tuesday	0.000356	0.007980	117	-0.005899	0.005797	141	0.005547	0.005407
Wednesday	0.001025	0.008588	112	-0.005397	0.006158	145	0.005985	0.006705
Thursday	0.000624	0.007801	119	-0.005210	0.006343	135	0.005767	0.004751
Friday	0.000250	0.008919	113	-0.006593	0.007481	140	0.005772	0.005506
YY	$u(R)$	$std(R)$	$ -R $	$u(-R)$	$std(-R)$	$ +R $	$u(+R)$	$std(+R)$
Monday	-0.000793	0.031514	116	-0.023957	0.025710	120	0.021599	0.017149
Tuesday	-0.001991	0.030034	140	-0.021031	0.022076	118	0.020598	0.021301
Wednesday	0.002703	0.035074	120	-0.021950	0.023094	137	0.024297	0.029016
Thursday	-0.000276	0.025692	147	-0.016773	0.014170	107	0.022388	0.020087
Friday	0.001703	0.027715	126	-0.018696	0.016334	127	0.021942	0.021049

the best day for stock SPY is Wednesday, the worst day is Monday;

the best day for stock YY is Wednesday, the worst day is Tuesday.

2. are these days the same for your stock as they are for S&P- 500?  
The best day is the same for YY and SPY, but the worst day is not the same.

### **Question 4:**

You listen to the oracle and follow its advice. How much money will you have on the last trading day of 2019:

1. your stock?
2. S&P-500 stock?

my stock YY has \$ 56527947.020216;  
stock SPY has \$ 5092.722478

### **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 2019?

my stock YY has \$ 80.374543;  
stock SPY has \$ 172.896993

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

They are much smaller than results from question 4.

### **Question 6:**

Your oracle got very upset that you did not follow its advice. It decided to take revenge by giving you wrong advice from time to time. Specifically, let us consider the following three scenarios:

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

Please answer the following:

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.

if YY missed best 10 days, the final money is \$18,897,186.579201

if SPY missed best 10 days, the final money is \$3,818.101839

b.

if YY missed worst 10 days, the final money is \$15,486,547.369725

if SPY missed worst 10 days, the final money is \$3,596.596139

c.

if YY missed best and worst 5 days, the final money is \$14,205,935.763231

if SPY missed best and worst 5 days, the final money is \$3,534.629467

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

For my stock, I gain more by missing the best 10 days.

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

Yes, my result in part (c) is smaller than one in question 4.