# Assignment 3

Note: I used the data which generated before.

## Question 1

1.1 shown below

1.2

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day/2015 | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | -0.26% | 1.50% | 24 | -1.31% | 1.31% | 24 | 0.79% | 0.77% |
| Tuesday | -0.23% | 1.37% | 30 | -1.08% | 0.96% | 22 | 0.94% | 0.89% |
| Wednesday | 0.36% | 1.24% | 18 | -0.97% | 0.81% | 34 | 1.06% | 0.75% |
| Thursday | 0.04% | 1.01% | 26 | -0.74% | 0.51% | 25 | 0.85% | 0.70% |
| Friday | -0.12% | 1.31% | 29 | -0.88% | 0.86% | 20 | 0.98% | 1.03% |

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| Day/2016 | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | -0.34% | 0.16% | 29 | -1.20% | 1.15% | 17 | 1.12% | 0.98% |
| Tuesday | 0.16% | 0.17% | 23 | -1.30% | 1.21% | 29 | 1.32% | 1.06% |
| Wednesday | 0.34% | 0.17% | 22 | -1.06% | 0.98% | 30 | 1.37% | 1.33% |
| Thursday | 0.06% | 0.12% | 26 | -0.87% | 0.77% | 25 | 1.03% | 0.81% |
| Friday | -0.01% | 0.20% | 26 | -1.20% | 1.96% | 25 | 1.22% | 1.05% |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day/2017 | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | 0.24% | 0.95% | 18 | -0.67% | 0.42% | 28 | 0.83% | 0.68% |
| Tuesday | 0.14% | 1.11% | 18 | -0.82% | 1.22% | 33 | 0.67% | 0.57% |
| Wednesday | 0.27% | 0.84% | 23 | -0.47% | 0.46% | 29 | 0.85% | 0.58% |
| Thursday | 0.02% | 1.02% | 25 | -0.61% | 0.68% | 26 | 0.63% | 0.92% |
| Friday | -0.03% | 0.50% | 26 | -0.40% | 0.36% | 25 | 0.34% | 0.31% |

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| Day/2018 | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | -0.01% | 1.23% | 28 | -0.73% | 0.66% | 20 | 1.00% | 1.15% |
| Tuesday | -0.19% | 1.08% | 26 | -0.97% | 0.86% | 25 | 0.62% | 0.58% |
| Wednesday | 0.23% | 1.27% | 20 | -0.95% | 0.64% | 30 | 1.02% | 0.92% |
| Thursday | -0.21% | 1.28% | 31 | -1.00% | 0.95% | 20 | 1.02% | 0.52% |
| Friday | -0.13% | 0.86% | 25 | -0.86% | 0.58% | 26 | 0.56% | 0.35% |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day/2019 | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | -0.22% | 1.21% | 26 | -0.97% | 1.05% | 22 | 0.67% | 0.67% |
| Tuesday | 0.05% | 0.85% | 24 | -0.65% | 0.69% | 28 | 0.64% | 0.42% |
| Wednesday | 0.01% | 0.91% | 22 | -0.76% | 0.71% | 29 | 0.59% | 0.52% |
| Thursday | -0.001% | 0.61% | 25 | -0.47% | 0.28% | 25 | 0.47% | 0.46% |
| Friday | 0.21% | 1.09% | 22 | -0.71% | 0.54% | 29 | 0.90% | 0.87% |

1.3

For each day of a week in each year, the answer of ‘more negative or non-negative returns’ shown below

* 2015:
  + Monday: same
  + Tuesday: negative
  + Wednesday: non-negative
  + Thursday: negative
  + Friday: negative
  + All year: negative
* 2016:
  + Monday: negative
  + Tuesday: non-negative
  + Wednesday: non-negative
  + Thursday: negative
  + Friday: negative
  + All year: same
* 2017:
  + Monday: non-negative
  + Tuesday: non-negative
  + Wednesday: non-negative
  + Thursday: non-negative
  + Friday: negative
  + All year: non-negative
* 2018:
  + Monday: negative
  + Tuesday: negative
  + Wednesday: non-negative
  + Thursday: negative
  + Friday: non-negative
  + All year: negative
* 2019:
  + Monday: negative
  + Tuesday: non-negative
  + Wednesday: non-negative
  + Thursday: same
  + Friday: non-negative
  + All year: non-negative

1.4

For each day of a week in each year, the answer of ‘lose more on a down day than gain on an up day’ shown below.

2015:

* + Monday: lose more
  + Tuesday: lose more
  + Wednesday: gain more
  + Thursday: gain more
  + Friday: gain more
  + All year: lose more
* 2016:
  + Monday: lose more
  + Tuesday: gain more
  + Wednesday: gain more
  + Thursday: gain more
  + Friday: gain more
  + All year: gain more
* 2017:
  + Monday: gain more
  + Tuesday: lose more
  + Wednesday: gain more
  + Thursday: gain more
  + Friday: lose more
  + All year: gain more
* 2018:
  + Monday: gain more
  + Tuesday: lose more
  + Wednesday: gain more
  + Thursday: gain more
  + Friday: lose more
  + All year: lose more
* 2019:
  + Monday: lose more
  + Tuesday: lose more
  + Wednesday: lose more
  + Thursday: same
  + Friday: gain more
  + All year: lose more

1.5 None of the results are same across days of the week, and the most same one of the returns is year 2017. It has 4 days of non-negative returns more than negative returns. And the most same of the lost or gain is year 2016, it has 4 days of gain more than lose more.

### Question 2

Because I am not sure whether my views belong to 2.1 or 2.2, maybe I put them in the wrong place. So you can combine them together.

2.1

* 2015: The Monday of the year has the largest average downward trend and also the largest volatility. The standard deviation of this day is the largest in 5 days, mainly because the standard deviation of the decline is the largest. It is not because there are the biggest number of decline days, but the magnitude of the decline varies greatly. Wednesday is the largest increase on average, compared to Wednesday in the whole year with the most rising days and the fewest falling days. At the same time, Wednesday in 2015 was also the day with the largest average increase in 5 years.
* 2016: Monday of the year is still the largest average downward trend, but not the largest standard deviation. But it still has the most falling days and the least rising days in a year. Wednesday is still the largest average rise, and it also has the least number of falling days and the most rising days of the year. The daily fluctuations during the year were very small, which also resulted in a small standard deviation of 5 days, which is equivalent to 1/10 of the other years.
* 2017: During the year, the stock showed an overall upward trend, and only fell slightly on Friday, with an average decline of only 0.03%.
* 2018: During the year, the stock showed an overall downward trend, only Wednesday still maintained a substantial upward trend.
* 2019: The overall change of the stock during this year is not very large, and the average change for three days is below 0.05. And the average decline in four days was higher than the average rise.

2.2

* Monday: Most Mondays were down, and it was the worst down in 5 days. Four of the five years have fallen on Mondays, and three of them have fallen the most in five days.
* Tuesday: Tuesday may be the most changing day of the five days.
* Wednesday: It is not difficult to find that Wednesdays in different years have an upward trend, and most of them have the highest average annual increase. And the number of rising days is at least 6 days longer than the number of falling days.
* Thursday: The average rise and fall on Thursdays in four of the five years has not changed much, and only Thursday in 2018 has an average fall of 0.21%. At the same time, the number of days of increase and the number of days of decline on Thursday are also roughly the same, with a difference of less than one day in 4 of the five years. Moreover, the average increase and average decrease in the next three years are also very similar. Finally, as for the standard deviation, the 10 standard deviations in 5 years are basically the smallest on Thursday. The closeness of the data directly led to little change in Thursday's rise and fall.
* Friday: In five years, Fridays have basically fallen, except for the last year's rise of 0.21%. At the same time, the number of growth days and decline days in the middle three years were roughly the same.

2.3

* 2015:
  + Best: Wednesday
  + Worst: Monday
* 2016:
  + Best: Wednesday
  + Worst: Monday
* 2017:
  + Best: Wednesday
  + Worst: Friday
* 2018:
  + Best: Wednesday
  + Worst: Thursday
* 2019:
  + Best: Friday
  + Worst: Monday

2.4 for the first four years the best day always the Wednesday, but it changed at the fifth year to the Friday. And for the first two year the worst day is the Monday, but it changes to Friday, Thursday and back to Monday at the last year.

### Question 3

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| Day/HSBC | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | -0.12% | 1.32% | 125 | -0.99% | 1.01% | 111 | 0.87% | 0.84% |
| Tuesday | -0.01% | 1.27% | 121 | -0.97% | 1.00% | 137 | 0.84% | 0.77% |
| Wednesday | 0.24% | 1.23% | 105 | -0.83% | 0.76% | 152 | 0.98% | 0.90% |
| Thursday | -0.02% | 1.06% | 133 | -0.75% | 0.71% | 121 | 0.79% | 0.73% |
| Friday | -0.02% | 1.25% | 128 | -0.83% | 1.06% | 125 | 0.79% | 0.83% |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day/SPY | (R) | (R) | |R-| | (R-) | (R-) | |R+| | (R+) | (R+) |
| Monday | 0.01% | 0.89% | 108 | -0.65% | 0.81% | 128 | 0.56% | 0.50% |
| Tuesday | 0.04% | 0.80% | 117 | -0.59% | 0.58% | 141 | 0.55% | 0.54% |
| Wednesday | 0.10% | 0.86% | 112 | -0.54% | 0.62% | 145 | 0.60% | 0.67% |
| Thursday | 0.06% | 0.78% | 119 | -0.52% | 0.64% | 135 | 0.58% | 0.48% |
| Friday | 0.03% | 0.89% | 113 | -0.66% | 0.75% | 140 | 0.58% | 0.55% |

3.1

* HSBC
  + BEST: Wednesday
  + WORST: Monday
* S&P-500
  + BEST: Wednesday
  + WORST: Monday

3.2 Yes, they are same for HSBC and S&P-500

### Question 4

4.1 I will have $24582.22 on the last trading day of 2019

4.2 I will have $5092.75 on the last trading day of 2019

### Question 5

5.1 For HSBC, I will have $112.82 on the last trading day of 2019. For SPY, I will have $172.89 on the last trading day of 2019

5.2 Comparing the results in question 4, of course, will be far from the results of this question. Because the oracle in question 4 can accurately predict the rise and fall of the day, so that I avoid those falling days. The 100 dollars I invested will naturally continue to rise. As for the "buy-and-hold" strategy, I cannot predict any day, so I can only hold this stock for 5 years and then see the result. At the same time, I also compared the final result with the actual stock price. It is found that it is not accurate to calculate the rise and fall of stocks solely from the return value. There may be dividends or other circumstances that may cause the stock price to fall, but this is not reflected in the return.

### Question 6

6.1

* HSBC
  + Scenario a: $16323.71
  + Scenario b: $9865.34
  + Scenario c: $12114.35
* SPY
  + Scenario a: $3818.12
  + Scenario b: $2696.44
  + Scenario c: $3146.46

6.2

Compare with question 4

* HSBC
  + Scenario a: lose more
  + Scenario b: lose more
  + Scenario c: lose more
* SPY
  + Scenario a: lose more
  + Scenario b: lose more
  + Scenario c: lose more

6.3

Yes, for both my stock and S&P-500