Aidan Duffy

CS677

I used the ticker DB, for Deutsche Bank.

**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).

I was not sure if you wanted these values represented as the change in actual share price or percentage change, so I used actual value.

2016

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | -0.087 | 0.461 | 25 | 0.385 | 0.360 | 20 | 0.286 | 0.254 |
| Tuesday | -0.026 | 0.493 | 29 | 0.387 | 0.244 | 23 | 0.429 | 0.323 |
| Wednesday | 0.027 | 0.458 | 26 | 0.338 | 0.250 | 26 | 0.392 | 0.299 |
| Thursday | -0.034 | 0.403 | 28 | -0.312 | 0.252 | 23 | 0.305 | 0.272 |
| Friday | .008 | 0.686 | 21 | -0.501 | 0.660 | 30 | 0.364 | 0.432 |

2017

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | -0.002 | 0.404 | 24 | -0.270 | .197 | 22 | 0.290 | 0.367 |
| Tuesday | -0.131 | 0.746 | 29 | -0.416 | 0.874 | 22 | 0.245 | 0.190 |
| Wednesday | 0.078 | 0.342 | 25 | -0.184 | 0.143 | 27 | 0.320 | 0.291 |
| Thursday | -0.037 | 0.344 | 26 | -0.297 | 0.258 | 25 | 0.233 | 0.173 |
| Friday | 0.010 | 0.302 | 25 | -0.230 | 0.195 | 26 | 0.240 | 0.184 |

2018

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | 0.010 | 0.271 | 24 | -0.184 | 0.163 | 24 | 0.205 | 0.211 |
| Tuesday | -0.107 | 0.571 | 27 | -0.333 | 0.704 | 24 | 0.147 | 0.116 |
| Wednesday | -0.005 | 0.266 | 22 | -0.236 | 0.193 | 28 | 0.177 | 0.149 |
| Thursday | -0.068 | 0.265 | 29 | -0.244 | 0.166 | 22 | 0.165 | 0.176 |
| Friday | -0.115 | 0.320 | 32 | -0.259 | 0.321 | 19 | 0.127 | 0.092 |

2019

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | 0.014 | 0.192 | 22 | -0.136 | 0.145 | 26 | 0.141 | 0.123 |
| Tuesday | -0.010 | 0.154 | 28 | -0.127 | 0.087 | 24 | 0.127 | 0.090 |
| Wednesday | -0.284 | 2.024 | 22 | -0.808 | 2.998 | 29 | 0.114 | 0.123 |
| Thursday | -0.049 | 0.188 | 28 | -0.175 | 0.144 | 22 | 0.111 | 0.090 |
| Friday | 0.038 | 0.171 | 22 | -0.106 | 0.063 | 29 | 0.148 | 0.144 |

2020

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | 0.033 | 0.354 | 23 | -0.255 | 0.243 | 25 | 0.298 | 0.199 |
| Tuesday | 0.040 | 0.276 | 24 | -0.197 | 0.128 | 28 | 0.243 | 0.194 |
| Wednesday | 0.017 | 0.257 | 24 | -0.200 | 0.153 | 28 | 0.202 | 0.170 |
| Thursday | -0.286 | 1.981 | 27 | -0.733 | 2.662 | 25 | 0.198 | 0.250 |
| Friday | -0.028 | 0.224 | 30 | -0.163 | 0.142 | 19 | 0.186 | 0.152 |

1. are there more days with negative or non-negative returns?
   1. There are more negative days.
2. does your stock lose more on a "down" day than it gain on an "up" days.
   1. The average gain on an “up” day is about $0.236, and the average loss on a “down” day is about $0.241, so the down days are worse.
3. are these results the same across days of the week?
   1. The only day that is consistently more negative across all of the years and with more negative days is Thursday, otherwise these trends do no maintain year to year.

**Question 2**

**Examine the 5 tables.**

1. are there any patterns across days of the week?
   1. The largest moves in the stocks price occur during the middle three days.
2. are there any patterns across different years for the same day of the week?
   1. Thursdays always have an average of a negative return and have more down than up days.
   2. Mondays and Fridays typically have very little fluctuation. The years Mondays were either best or worst were still relatively small, and the net change on Fridays is also typically very small.
3. what are the best and worst days of the week to be invested for each year?
   1. 2016
      1. Best: Wednesdays performed the best by a significant margin.
      2. Worst: Mondays were the worst days for 2016.
   2. 2017
      1. Best: Wednesdays performed the best.
      2. Worst: Tuesdays had the most significant down days in 2017.
   3. 2018
      1. Best: Mondays were the only days, on average, to net gains in 2018.
      2. Worst: Friday performed the worst.
   4. 2019
      1. Best: Fridays performed the best in 2019
      2. Worst: Wednesdays performed the worst, by far.
   5. 2020
      1. Best: Tuesdays performed the best on average in 2020.
      2. Worst: Thursdays have, by far, the largest losses on down days.
4. do these days change from year to year for your stock?
   1. These do change year over year. For instance, both Mondays and Wednesdays are sometimes the best and sometimes the worst.

**Question 3**

Aggregate Table:

2016-2020 for $DB

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ ® | σ ® | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | -0.005 | 0.350 | 118 | -0.249 | 0.252 | 115 | 0.245 | 0.248 |
| Tuesday | -0.010 | 0.321 | 135 | -0.236 | 0.211 | 121 | 0.242 | 0.223 |
| Wednesday | 0.024 | 0.318 | 118 | -0.226 | 0.196 | 134 | 0.245 | 0.238 |
| Thursday | -0.037 | 0.314 | 137 | -0.248 | 0.219 | 112 | 0.218 | 0.215 |
| Friday | -0.017 | 0.390 | 130 | -0.245 | 0.352 | 118 | 0.232 | 0.267 |

2016-2020 for $SPY

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Day | µ (R) | σ (R) | |R-| | µ (R-) | σ (R-) | |R+| | µ (R+) | σ (R+) |
| Monday | 0.137 | 3.766 | 99 | -2.291 | 4.058 | 136 | 1.904 | 2.259 |
| Tuesday | 0.276 | 2.932 | 112 | -1.772 | 1.986 | 146 | 1.847 | 2.546 |
| Wednesday | 0.233 | 2.991 | 106 | -1.940 | 2.783 | 151 | 1.758 | 2.038 |
| Thursday | -0.024 | 3.188 | 117 | -1.903 | 3.539 | 138 | 1.569 | 1.620 |
| Friday | 0.133 | 2.799 | 111 | -1.863 | 2.125 | 142 | 1.693 | 2.209 |

1. what is the best and worst days of the week for each?
   1. $SPY makes the largest gains, on average (and more or less the most consistently as it has the 2nd lowest STDDEV), on Tuesdays.
   2. $DB makes the largest gains, on average and consistently, on Wednesdays.
2. are these days the same for your stock as they are for S&P-500?
   1. These are not the same, which could point to a lack of correlation between the two stocks’ movements.

**Question 4**

1. Investing in $DB with the oracle with $100 generates an unbelievable $15,071,829.66. As this is so large, that means this stock moved in particularly volatile ways compared to the rest of market. If you look at the data manually on Yahoo, it lost almost 2/3 of its value but then also recouped about 1/3 of that loss.
2. Investing in $SPY with the oracle with $100 generates $11,968.05

**Question 5**

1. Buying and holding $DB with $100 leaves you with $48.20. Buying and holding $SPY with $100 leaves you with $203.81
2. This obviously leaves you with significantly less money and actually a loss on Deutsche Bank.

**Question 6**

**1.**

1. $DB: $5,526,161.17 and $SPY: $6839.89
2. $DB: $6,568,881.66 and $SPY: $6432.18
3. $DB: $5,214,496.13 and $SPY: $5663.80

2. It is actually better to invest in the worst days for $DB than miss the best days and vice versa for $SPY.

3. Part c is different from question 4 because we are losing are most profitable days of trading because the values we are missing on the high side and investing in the low side affect our overall balance and compounding growth.