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Class: CS 677

Date: 3/18/2023

Non-code answers to assignment.

**Question 1-1.** Computations of the mean and standard deviation can be found in the attached question1.py file.

**Question 1-2.** Please see the summarized results for ticker ‘TGT’ in the years 2018-2022 below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2018** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 48 | 0.003983808 | 0.000278201 | 20 | -0.010731592 | 0.000120265 | 28 | 0.014494808 | 0.000125858 |
| **Tuesday** | 51 | -0.001992810 | 0.000518561 | 21 | -0.021457440 | 0.000485890 | 30 | 0.011632432 | 0.000090572 |
| **Wednesday** | 50 | 0.000576372 | 0.000357828 | 24 | -0.013865933 | 0.000154852 | 26 | 0.013907731 | 0.000174930 |
| **Thursday** | 51 | -0.001675500 | 0.000229743 | 29 | -0.012104909 | 0.000072677 | 22 | 0.012072357 | 0.000104398 |
| **Friday** | 51 | 0.000319687 | 0.000147815 | 23 | -0.009521912 | 0.000074885 | 28 | 0.008403859 | 0.000062806 |
|  |  |  |  |  |  |  |  |  |  |
| **2019** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 48 | 0.001638833 | 0.000210055 | 23 | -0.010047115 | 0.000053406 | 25 | 0.012389906 | 0.000112950 |
| **Tuesday** | 52 | 0.001662597 | 0.000164354 | 28 | -0.007231952 | 0.000023464 | 24 | 0.012039572 | 0.000128746 |
| **Wednesday** | 51 | 0.008377252 | 0.001357948 | 22 | -0.008538812 | 0.000053639 | 29 | 0.021210127 | 0.001965660 |
| **Thursday** | 50 | 0.002763132 | 0.000182208 | 18 | -0.010631561 | 0.000102552 | 32 | 0.010297647 | 0.000069324 |
| **Friday** | 51 | 0.000316337 | 0.000216198 | 25 | -0.010977246 | 0.000127202 | 26 | 0.011175551 | 0.000061210 |
|  |  |  |  |  |  |  |  |  |  |
| **2020** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 48 | 0.004028526 | 0.000504213 | 18 | -0.017122719 | 0.000308975 | 30 | 0.016719273 | 0.000191875 |
| **Tuesday** | 52 | 0.002777224 | 0.000454952 | 25 | -0.011626101 | 0.000076196 | 27 | 0.016113636 | 0.000435703 |
| **Wednesday** | 52 | 0.001832422 | 0.000825254 | 29 | -0.014028231 | 0.000388499 | 23 | 0.021830637 | 0.000658830 |
| **Thursday** | 52 | -0.004673559 | 0.000514128 | 29 | -0.016280487 | 0.000499013 | 23 | 0.009961263 | 0.000149143 |
| **Friday** | 49 | 0.004492296 | 0.000413281 | 20 | -0.012629005 | 0.000088794 | 29 | 0.016300090 | 0.000295476 |
|  |  |  |  |  |  |  |  |  |  |
| **2021** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 47 | 0.001817852 | 0.000170852 | 22 | -0.009157220 | 0.000049434 | 25 | 0.011475916 | 0.000078423 |
| **Tuesday** | 52 | -0.001388829 | 0.000230785 | 25 | -0.012443339 | 0.000206592 | 27 | 0.008846828 | 0.000035267 |
| **Wednesday** | 52 | -0.001133148 | 0.000307565 | 28 | -0.011253650 | 0.000165373 | 24 | 0.010674104 | 0.000214548 |
| **Thursday** | 51 | 0.003426187 | 0.000198277 | 18 | -0.010640657 | 0.000143293 | 33 | 0.011099011 | 0.000061464 |
| **Friday** | 50 | 0.003668447 | 0.000162875 | 22 | -0.006403321 | 0.000031816 | 28 | 0.011581979 | 0.000123523 |
|  |  |  |  |  |  |  |  |  |  |
| **2022** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 45 | -0.004408873 | 0.000324314 | 24 | -0.016936268 | 0.000228424 | 21 | 0.009908149 | 0.000049571 |
| **Tuesday** | 52 | 0.002364975 | 0.000679663 | 25 | -0.017674113 | 0.000158998 | 27 | 0.020919686 | 0.000445664 |
| **Wednesday** | 52 | -0.005790807 | 0.001977072 | 26 | -0.030357208 | 0.002547806 | 26 | 0.018775593 | 0.000199322 |
| **Thursday** | 51 | 0.003221531 | 0.000624735 | 26 | -0.015398122 | 0.000193402 | 25 | 0.022585969 | 0.000337780 |
| **Friday** | 51 | -0.001846156 | 0.000462912 | 27 | -0.017380937 | 0.000202436 | 24 | 0.015630473 | 0.000179019 |

Please see charts below generates from the mean values in the tables.

**Question 1-3.**

Based off of the output for 1.3, there are more non-negative returns than negative across all of 2018-2022 for TGT.

On an individual year basis, there are more non-negative returns for all years, except for 2022.

On a weekday basis, Mondays have more non-negative returns except for in 2022, Tuesdays have more non-negative returns except for in 2019, Wednesdays only have more non-negative returns in 2018-2019, Thursdays only have more non-negative returns in 2019 and 2021, and Fridays have more non-negative returns except for in 2022.

**Question 1-4.**

Based off of the code output for this problem, TGT typically gains more on an “up” day than lose more on a “down” day. This is true for the years 2019, 2020, and 2021.

**Question 1-5.**

Based off of the code output for this problem:

* In 2018, Tues, Thurs, and Fri went with the year trend which is losing more on a “down” day.
* In 2019, all weekdays except Thurs went with the year trend of gaining more on an “up” day.
* In 2020, all weekdays except Mon and Thursday went with the year trend of gaining more on an “up” day.
* In 2021, all weekdays except Tues and Wed went with the year trend of gaining more on an “up” day.
* In 2022, all weekdays except Mon and Thurs went with the year trend of losing more on a “down” day.

Around 56% of weekdays went with the overall trend of gaining more on an “up” day. So it is a close call.

**Question 2-1.** According to the data tables and charts above, typically the middle of the week tends to have higher non-negative returns overall. While the negative returns don’t have a clear trend, I do generally see greater values towards the end of the week.

**Question 2-2.** Monday tends to keep the overall mean closer to 0 since non-negative and negative averages seem to even out. This trend seems to stay the same for all years. For Tuesday, negative returns tend to dominate across all years. Wednesday tends to have the largest difference. For years that negative returns dominate, it seems to be by a lot, and same for vice versa. Thursday seems to stay the same across all years except for 2022, where it suddenly contains a high value of non-negative results. For Fridays, with the exception of 2021, both negative and non-negative returns tend to increase in magnitude.

**Question 2-3.** According to the data tables we have here and the output of the code for this problem, see my answers below.

2018 Best Weekday: Monday, 2018 Worst Weekday: Tuesday

2019 Best Weekday: Wednesday, 2019 Worst Weekday: Friday

2020 Best Weekday: Friday, 2020 Worst Weekday: Thursday

2021 Best Weekday: Friday, 2021 Worst Weekday: Tuesday

2022 Best Weekday: Thursday, 2022 Worst Weekday: Wednesday

**Question 2-4.** These days do change from year to year with TGT. But it seems the best and worst days are usually right next to each other.

**Question 3.** Please see aggregate tables below for both SPY and TGT stocks

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TGT** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 236 | 0.001484304 | 0.000306960 | 107 | -0.012727605 | 0.000159468 | 129 | 0.013272477 | 0.000122804 |
| **Tuesday** | 259 | 0.000694969 | 0.000413155 | 124 | -0.013682982 | 0.000200664 | 135 | 0.013901383 | 0.000244042 |
| **Wednesday** | 257 | 0.000744353 | 0.000989492 | 129 | -0.015750733 | 0.000732289 | 128 | 0.017368307 | 0.000698135 |
| **Thursday** | 255 | 0.000583195 | 0.000361716 | 120 | -0.013386897 | 0.000222506 | 135 | 0.013001053 | 0.000157776 |
| **Friday** | 252 | 0.001356461 | 0.000285515 | 117 | -0.011591227 | 0.000123681 | 135 | 0.012577791 | 0.000154563 |
|  |  |  |  |  |  |  |  |  |  |
| **SPY** | **|R|** | **µ(R)** | **σ(R)** | **|R−|** | **µ(R−)** | **σ(R−)** | **|R+|** | **µ(R+)** | **σ(R+)** |
| **Monday** | 236 | -0.000019137 | 0.000230918 | 104 | -0.010816274 | 0.000216440 | 132 | 0.008487697 | 0.000078110 |
| **Tuesday** | 259 | 0.000941296 | 0.000164754 | 127 | -0.007570464 | 0.000061031 | 132 | 0.009130640 | 0.000127778 |
| **Wednesday** | 257 | 0.000842614 | 0.000164348 | 110 | -0.009210751 | 0.000110111 | 147 | 0.008365539 | 0.000072709 |
| **Thursday** | 255 | 0.000060489 | 0.000191789 | 117 | -0.009664768 | 0.000169047 | 138 | 0.008305815 | 0.000062898 |
| **Friday** | 252 | 0.000330896 | 0.00017117 | 114 | -0.009722986 | 0.000082437 | 138 | 0.008636277 | 0.000091990 |

**Question 3-1.** Please see the code generated data below for aggregated data

TGT - Best Weekday: Monday, Worst Weekday: Thursday

SPY - Best Weekday: Tuesday, Worst Weekday: Monday

**Question 3-2.** No, the results for best and worst day for TGT differ from the best and worst for SPY.

**Question 4-1.** TGT – You will have $910234.35 on the last trading day of 2022

**Question 4-2.** SPY - You will have $34367.18 on the last trading day of 2022

**Question 5-1.**

TGT - You will have $248.18 on the last trading day of 2022

SPY - You will have $154.98 on the last trading day of 2022

**Question 5-2.**

The results from question 5 are **incredibly** smaller than the results in question 4. This proves that the oracle method in question 4 is very successful at getting the most return for the money that you put in.

**Question 6-1.**

1. TGT - Scenario A: You will have $339689.53 on the last trading day of 2022

SPY - Scenario A: You will have $19243.94 on the last trading day of 2022

1. TGT - Scenario B: You will have $302838.67 on the last trading day of 2022

SPY - Scenario B: You will have $18129.01 on the last trading day of 2022

1. TGT - Scenario C: You will have $224608.65 on the last trading day of 2022

SPY - Scenario C: You will have $16183.39 on the last trading day of 2022

**Question 6-2.**

You would gain most in scenario A, where you miss the 10 best days. You gain the least by missing the best 5 and worst 5.

**Question 6-3.**

My results in part c are extremely lower than the results from question 4. TGT is about 75% less and SPY is about 50% less.