Q1

GME, year indicated within brackets:

```
wr_dfs[2017]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.941	0.106	7.0	0.869	0.076	5.0	1.043	0.032
2	0.996	0.041	5.0	0.959	0.036	7.0	1.022	0.016
3	0.999	0.034	7.0	0.975	0.02	5.0	1.033	0.018
4	0.98	0.061	7.0	0.942	0.052	5.0	1.033	0.021

```
wr_dfs[2018]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.998	0.075	7.0	0.944	0.017	5.0	1.074	0.056
2	0.998	0.035	6.0	0.969	0.022	6.0	1.028	0.018
3	0.976	0.039	8.0	0.96	0.038	4.0	1.01	0.008
4	1.0	0.07	6.0	0.939	0.036	6.0	1.061	0.033

```
wr_dfs[2019]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.966	0.143	5.0	0.837	0.126	7.0	1.059	0.057
2	0.974	0.077	7.0	0.922	0.049	5.0	1.047	0.042
3	1.002	0.069	5.0	0.934	0.033	7.0	1.05	0.041
4	1.004	0.067	7.0	0.96	0.032	5.0	1.066	0.052

```
wr_dfs[2020]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	1.039	0.174	5.0	0.905	0.12	7.0	1.135	0.14
2	1.039	0.185	5.0	0.853	0.062	7.0	1.172	0.118
3	1.066	0.2	4.0	0.86	0.035	8.0	1.17	0.166
4	1.05	0.127	5.0	0.932	0.043	7.0	1.135	0.095

```
wr_dfs[2021]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.954	0.263	8.0	0.843	0.247	4.0	1.175	0.111
2	1.109	0.388	9.0	0.923	0.056	3.0	1.667	0.423
3	1.039	0.265	7.0	0.895	0.089	5.0	1.241	0.295
4	1.471	1.147	7.0	0.934	0.041	5.0	2.223	1.479

For 2017, 2018, 2019, and 2021 there are more weeks with negative returns than non-negative returns, and the reverse for 2020.

My stock tends to gain more on up weeks than it loses in down weeks, with the second and fourth weeks of 2021 accounting for much of that discrepancy.

These results are not the same for all weeks of the month and across all years. With only 12 observations per week of the month for each year, there is bound to be significant variability in these statistics across years for a volatile stock like GME.

SPY:

```
wr_dfs[2017]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.97	0.05	4.00	0.90	0.01	8.00	1.01	0.01
2	1.00	0.01	8.00	0.99	0.00	4.00	1.01	0.01
3	1.00	0.01	4.00	1.00	0.00	8.00	1.01	0.01
4	1.00	0.01	1.00	0.99	0.00	11.00	1.01	0.01

```
wr_dfs[2018]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.96	0.05	9.00	0.94	0.04	3.00	1.01	0.01
2	1.00	0.03	4.00	0.97	0.02	8.00	1.02	0.01
3	1.00	0.03	4.00	0.97	0.03	8.00	1.01	0.01
4	0.99	0.03	6.00	0.97	0.02	6.00	1.01	0.01

```
wr_dfs[2019]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.98	0.03	7.00	0.96	0.02	5.00	1.01	0.01
2	1.00	0.01	3.00	0.98	0.01	9.00	1.01	0.01
3	1.01	0.01	5.00	0.99	0.00	7.00	1.02	0.01
4	1.00	0.01	7.00	0.99	0.00	5.00	1.01	0.00

```
wr_dfs[2020]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.99	0.03	7.00	0.98	0.02	5.00	1.02	0.01
2	1.01	0.05	4.00	0.96	0.03	8.00	1.03	0.04
3	0.99	0.04	5.00	0.96	0.05	7.00	1.01	0.01
4	1.00	0.05	8.00	0.98	0.04	4.00	1.05	0.03

```
wr_dfs[2021]
```

	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	1.00	0.02	6.00	0.98	0.01	6.00	1.02	0.01
2	1.01	0.02	4.00	0.99	0.01	8.00	1.02	0.01
3	1.00	0.01	8.00	0.99	0.01	4.00	1.01	0.01
4	1.00	0.02	4.00	0.98	0.01	8.00	1.02	0.01

1)
2)
3)

There are 24 more positive return weeks than negative return weeks.
On the whole, there is a 14.8/20 or 0.74% net positive return when getting the average across week-years.
5) Overall, there is not huge variability, with most weeks having positive weeks returning .02 and negative weeks returning -.02

Question 2:

GME:

1) Any patterns: There are no clear patterns across the weeks of the month

2) 2019 but especially 2020 have more positive return weeks, though still there is no clear trend across weeks of the month over the years.

3) 2017: best: Week3 worst: week1; 2018: best: week4 worst: week3; 2019: best: week4 worst: week1; 2020: best: week3 worst: week1; 2021: best: week4 worst: week1

4) These weeks do change from year to year for my stock.

SPY:

1) There are no clear patterns between weeks-of-month on aggregate and between years.
2) Not much of a pattern, other than random variability.
3) 2017: B: Week 4, with tie in returns broken by low negative return count. W: week 1
2018: w: wk1 b: wk2, with highest positive week returns and lowest negative week volatility.
2019: b: week3, w: wk1; 2020: b: wk2, w: wk1; 2021: b: wk2, w: wk3
4) these weeks do change year to year, but it seems marginal and random.

`WoM_stats_all_years`

WoM	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.980	0.169140	32	0.879	0.152	28	1.094	0.102
2	1.023	0.202575	32	0.926	0.060	28	1.134	0.246
3	1.017	0.156553	31	0.932	0.064	29	1.107	0.174
4	1.101	0.551271	32	0.942	0.042	28	1.283	0.766

Question 3:
1) GME: best week: 4 worst week: 1
2)
3) There are only five weeks with absolute returns differences from the mean greater than or equal to 1.96. There should be around 12, so this substantial differential indicates that the distribution has fatter tails than would be expected from a normal distribution, with a few weeks accounting for an outsized portion of the variance.
4)

SPY:

WoM	mu(R)	sigma(R)	|R-|	mu(R-)	sigma(R-)	|R+|	mu(R+)	sigma(R+)
1	0.98	0.04	33	0.95	0.04	27	1.01	0.01
2	1.00	0.03	23	0.98	0.02	37	1.02	0.02
3	1.00	0.03	26	0.98	0.03	34	1.01	0.01
4	1.00	0.03	26	0.98	0.02	34	1.02	0.02

1) b: wk2 w: wk1
2) These weeks are the same!
3) Only two weeks outside two sd! This is not consistent, since there should be twelve.

Question 4:

1) GameStop: 104,159,415.61
2) SP500: $1,291.28
3) Gamestop would take 16 weeks and spy would take 54 weeks

Question 5:

Gamestop:

	GameStop
B&H	610.53
B&H w/o month 1	60.22
B&H w/o month 2	2,872.66
B&H w/o month 3	451.57
B&H w/o month 4	582.09
B&H w/o month 5	737.96
B&H w/o month 6	706.27
B&H w/o month 7	1,172.47
B&H w/o month 8	444.90
B&H w/o month 9	210.09
B&H w/o month 10	591.99
B&H w/o month 11	407.09
B&H w/o month 12	701.93

	GameStop
B&H	610.53
B&H_Summer_Vacay	988.36

On the last trading day of year 5 I will have $610.53, which is 1/170,604 or around 5 orders of magnitude less.

With a summer vacay, I happen to miss some bad trading months and end up with $988. For GameStop this is a good strategy.

The best and worst month to vacation: January and February respectively. Feb seems to be a bounce back month.

SP500:
1) $205.92
2) This is a lot less, around 1/6th the total from q4!
3) Summer vacay means I end up with 142.29, and thus it is not a good strategy.

	SP500
B&H	205.92
B&H w/o month 1	201.08
B&H w/o month 2	209.02
B&H w/o month 3	234.36
B&H w/o month 4	164.69
B&H w/o month 5	195.61
B&H w/o month 6	189.56
B&H w/o month 7	168.60
B&H w/o month 8	188.79
B&H w/o month 9	209.85
B&H w/o month 10	209.64
B&H w/o month 11	169.14
B&H w/o month 12	198.16

	SP500
B&H	205.92
B&H_Summer_Vacay	142.29

Best vacay month: March (Pandemic!) worst: April.

Linear Separability:

Question 6:

GME:

	GameStop
B&H	610.53
p = 0.0	0.00
p = 0.1	0.01
p = 0.2	0.04
p = 0.3	0.39
p = 0.4	18.69
p = 0.5	2,407.51
p = 0.6	8,860.82
p = 0.7	295,904.94
p = 0.8	1,709,185.70
p = 0.9	16,042,487.87
p = 1.0	104,159,415.61

1) Sci-Py gives .45 as the p equivalent to buy and hold. This will depend on the random generator's seed, but from looking at the table this looks about right. There appears to be the steepest rise from p of .4 to .5 and also from .6 to .7, with most of the .1 steps in p resulting in 10-100x increases in cumulative returns.

SP500:

1) Sci-Py gives 0.56, but visually it looks more like .58,.59. This is higher than with GameStop. There's around a 2x change for much of the .1 increments.

	SP500
B&H	205.92
p = 0.0	15.95
p = 0.1	24.38
p = 0.2	35.36
p = 0.3	67.52
p = 0.4	96.82
p = 0.5	163.78
p = 0.6	208.03
p = 0.7	299.29
p = 0.8	499.29
p = 0.9	774.80
p = 1.0	1,291.28

Question 7)
GME:

	GME
Never Lose	104,159,415.61
Miss best ten	220,749.03
Invest worst 10	1,289,000.43
Miss best 5, invest worst 5	50,428.61
Trade Green	93,650,954.89
B&H	610.53

2) Missing the best ten is worse than hitting the worst 10. Missing and hitting best/worst five shows the difference between 1-5 and 6-10, ranked by returns
3) miss best 5 hit worst 5: p = ~.665 | Hit worst ten: p = ~.77438 | Miss best 10: p = ~.69375

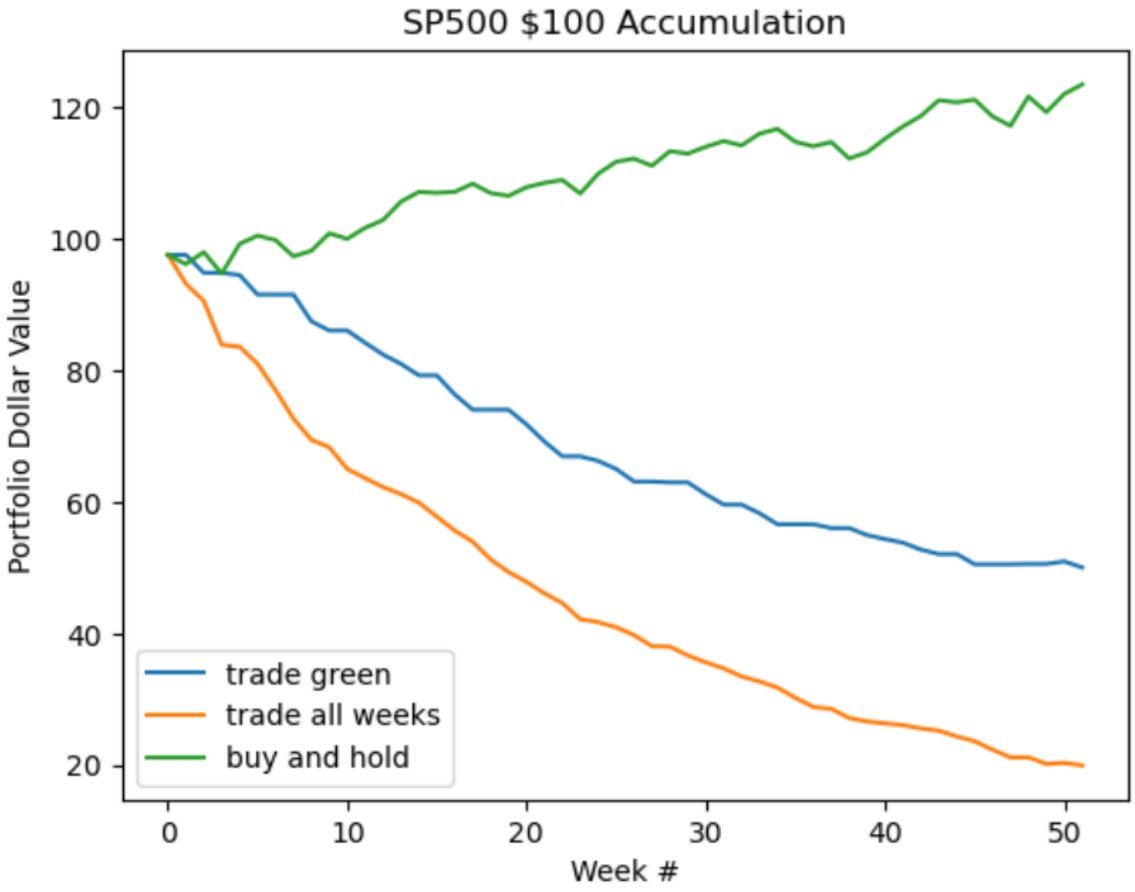
	spy
Never Lose	1,291.28
Miss best ten	714.08
Invest worst 10	570.21
Miss best 5, invest worst 5	506.93
Trade Green	1,153.28
B&H	205.92

Missing the best ten weeks is not as bad as investing in the worst ten

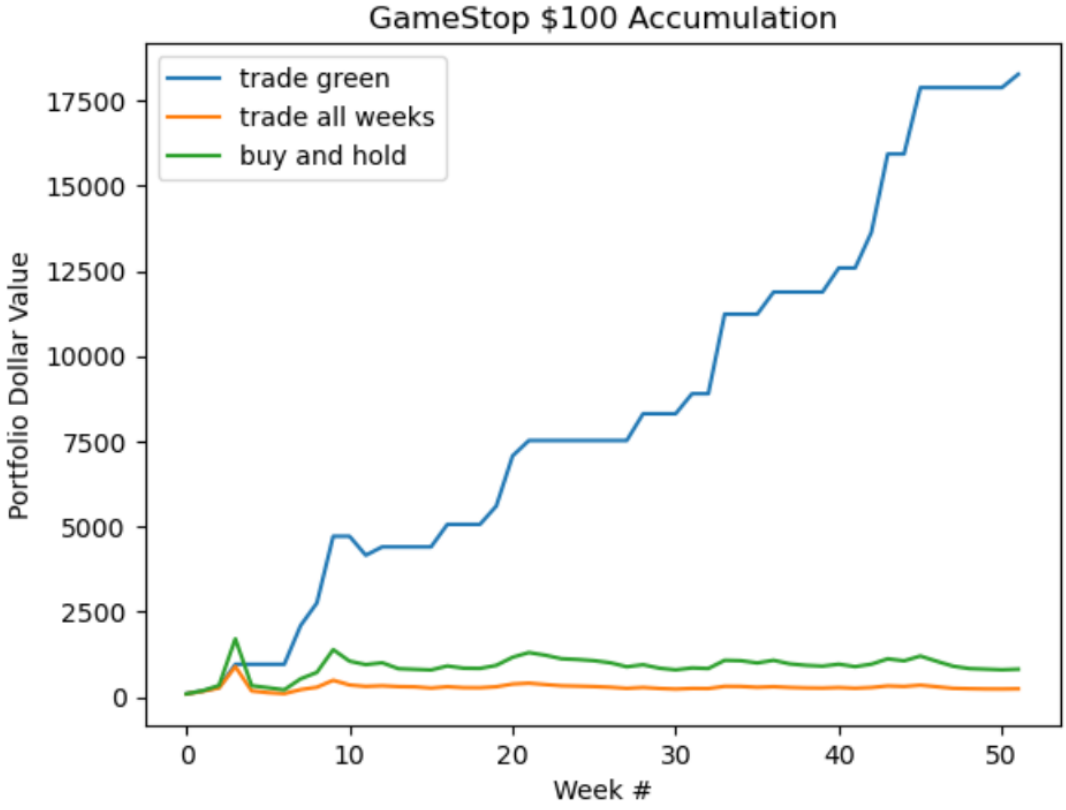
For missing best ten, I'd guess around .9, but Sci-Py gives 0.88125.

For Investing worst ten, I"d guess around .8, but Sci-Py gives .868. For the 5-5 split, I'd guess .8, and Sci-Py gives .818

Linear separability



This analysis is skewed by open prices being significantly higher than adjusted close prices for all weeks for sp500. Latter analysis with statistical oracle uses adj close to adj close.


GameStop $100 Accumulation
trade green
trade all weeks
buy and hold
Portfolio Dollar Value
17500
15000
12500
10000
7500
5000
2500
0
0
10
20
30
40
50
Week #