Meng Wang

HW 6

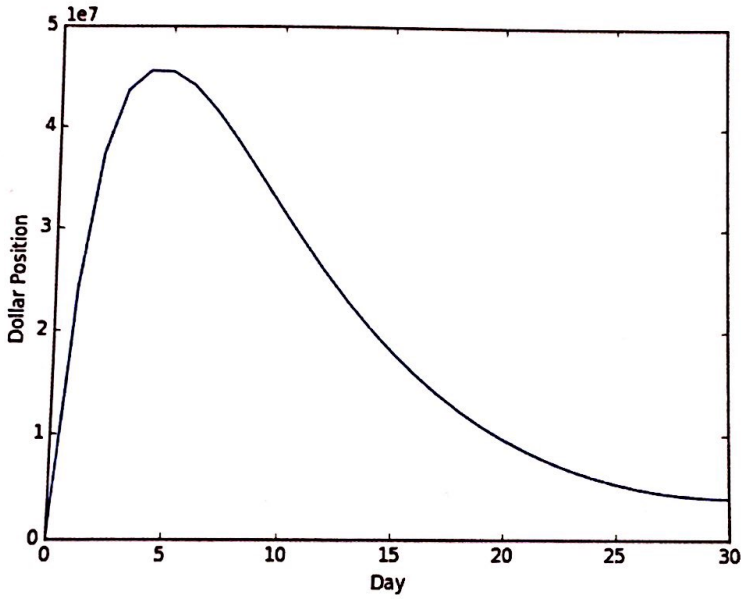
1. (a) $u(x_1, \dots, x_T) = \sum_{t=1}^{T} \left[x_t \alpha_t - \frac{k}{2}\sigma^2 x_t^2 - c(x_t - x_{t-1}) \right]$

maximize $u(x_1, \dots, x_T)$

$\Leftrightarrow$ minimize $\sum_{t=1}^{T} \left[\frac{k}{2}\sigma^2 x_t^2 + c(x_t - x_{t-1}) - x_t \alpha_t \right]$

$= \underbrace{\sum_{t=1}^{T} \left[\frac{k}{2}\sigma^2 x_t^2 - x_t \alpha_t \right]}_{\text{convex and differentiable}} + \underbrace{\sum_{t=1}^{T} c(x_t - x_{t-1})}_{\text{convex but not differentiable.}}$

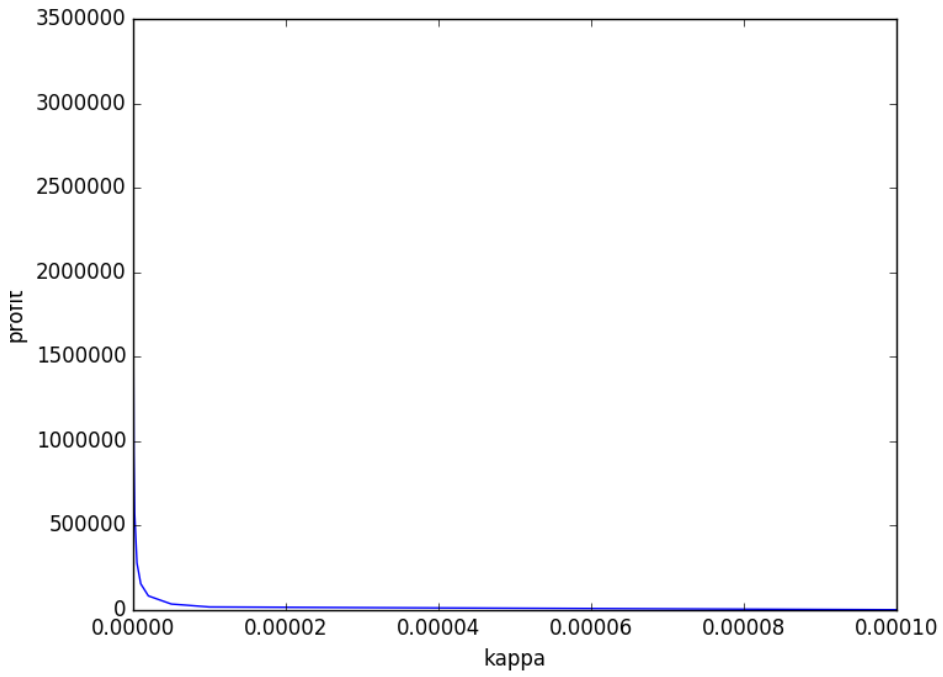
According to Tseng's theorem, we can use BCD to optimize.

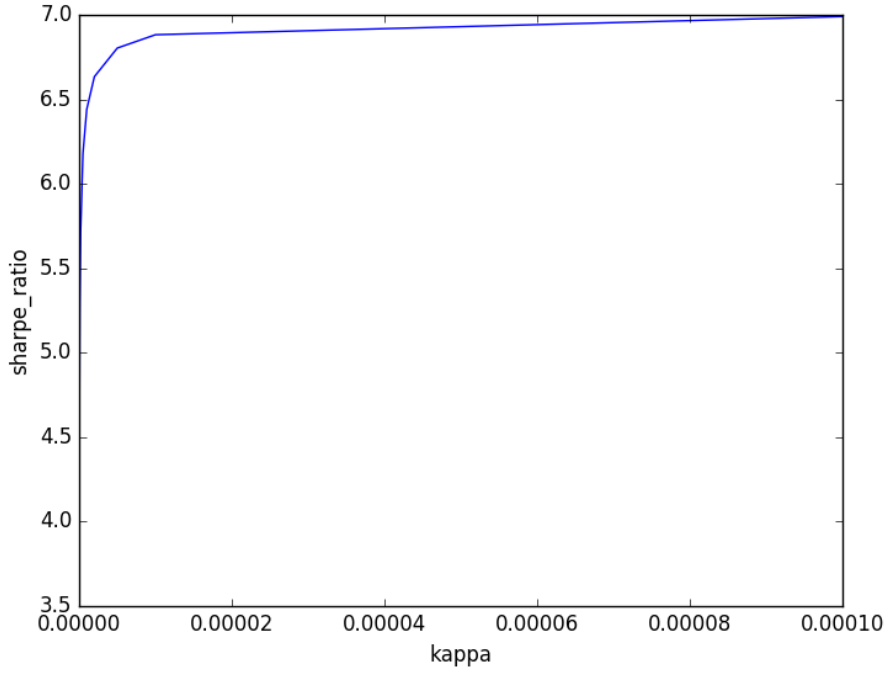


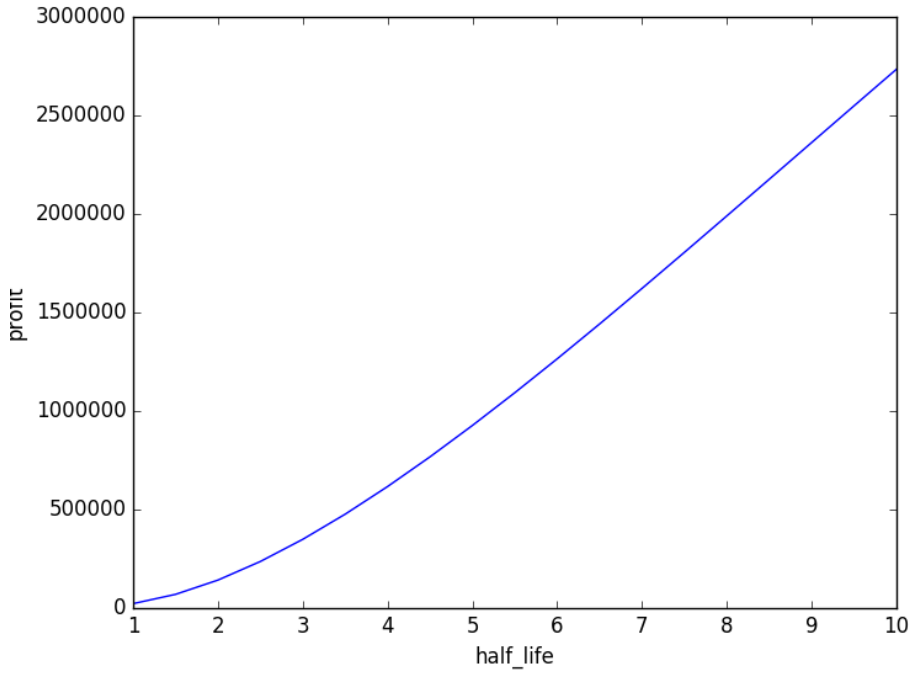
	Dollar Position
0	0.000000e+00
1	2.416064e+07
2	3.738725e+07
3	4.362881e+07
4	4.559349e+07
5	4.554123e+07
6	4.414489e+07
7	4.172509e+07
8	3.871189e+07
9	3.542785e+07
10	3.209312e+07
11	2.884944e+07
12	2.578240e+07
13	2.293884e+07
14	2.033964e+07
15	1.798878e+07
16	1.587976e+07
17	1.399992e+07
18	1.233341e+07
19	1.086322e+07
20	9.572422e+06
21	8.445113e+06
22	7.466919e+06
23	6.625375e+06
24	5.910165e+06
25	5.313249e+06
26	4.828892e+06
27	4.453498e+06
28	4.185039e+06
29	4.021447e+06
30	3.955970e+06

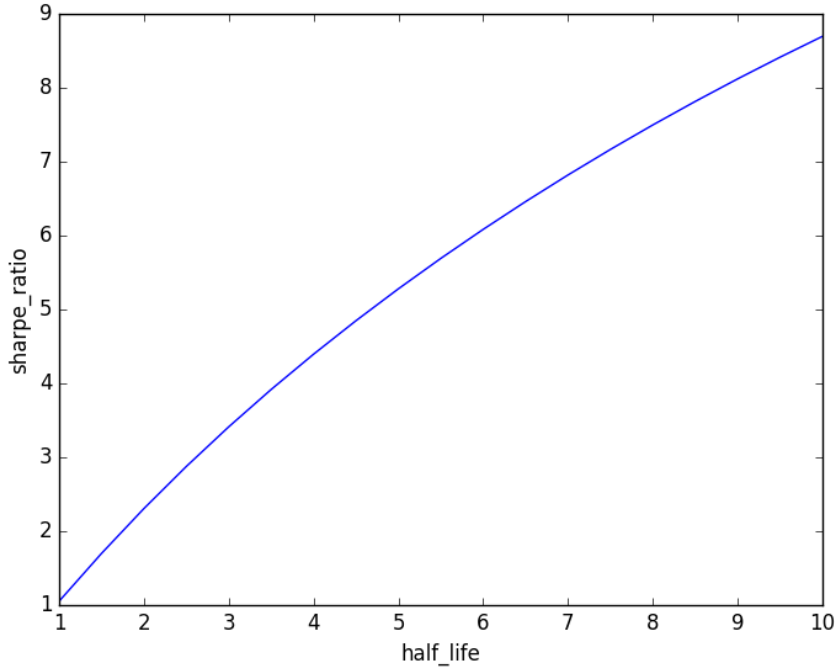
computation time: 3.42548
Note: computation time may vary at each computation and on different machines.

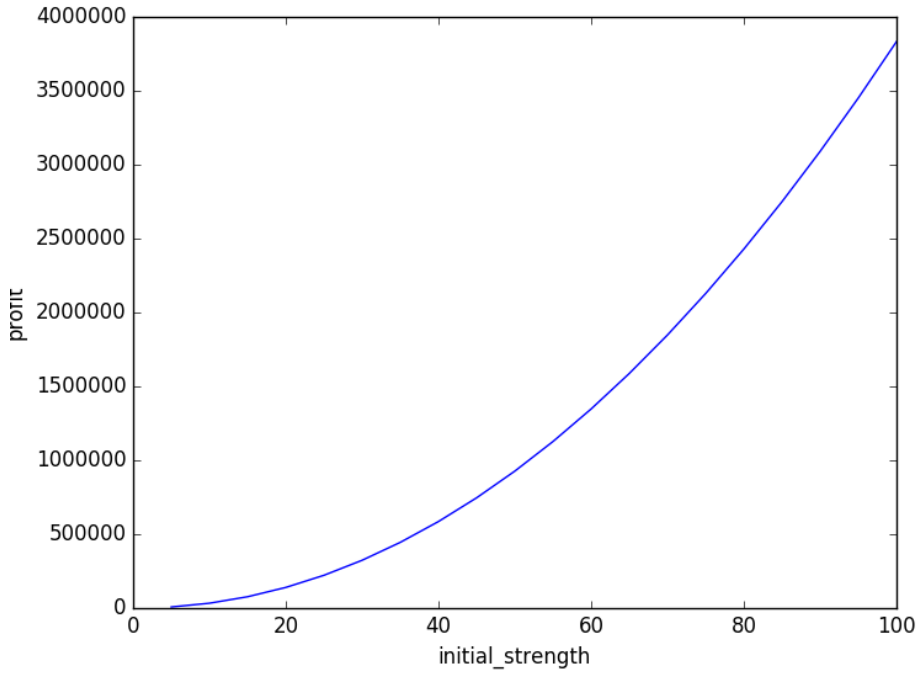
(b)

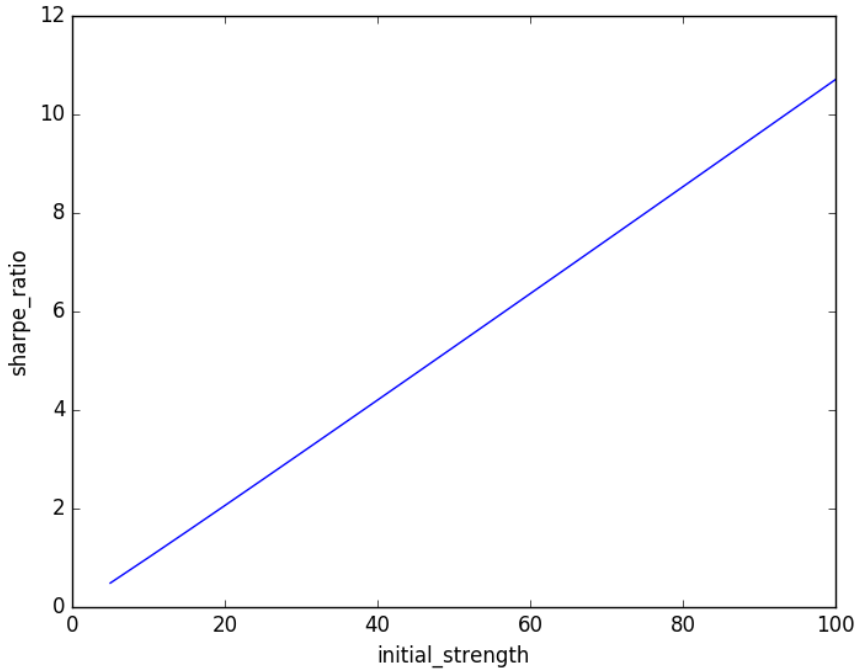

3500000
3000000
2500000
2000000
1500000
1000000
500000
0
profit
0.00000
0.00002
0.00004
0.00006
0.00008
0.00010
kappa

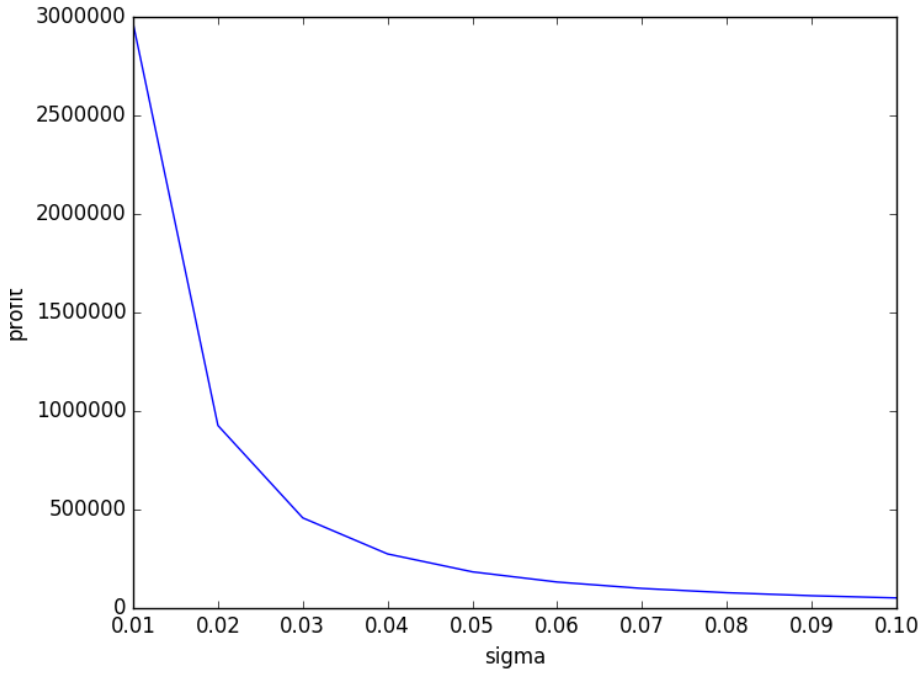

7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
sharpe_ratio
0.00000
0.00002
0.00004
0.00006
0.00008
0.00010
kappa

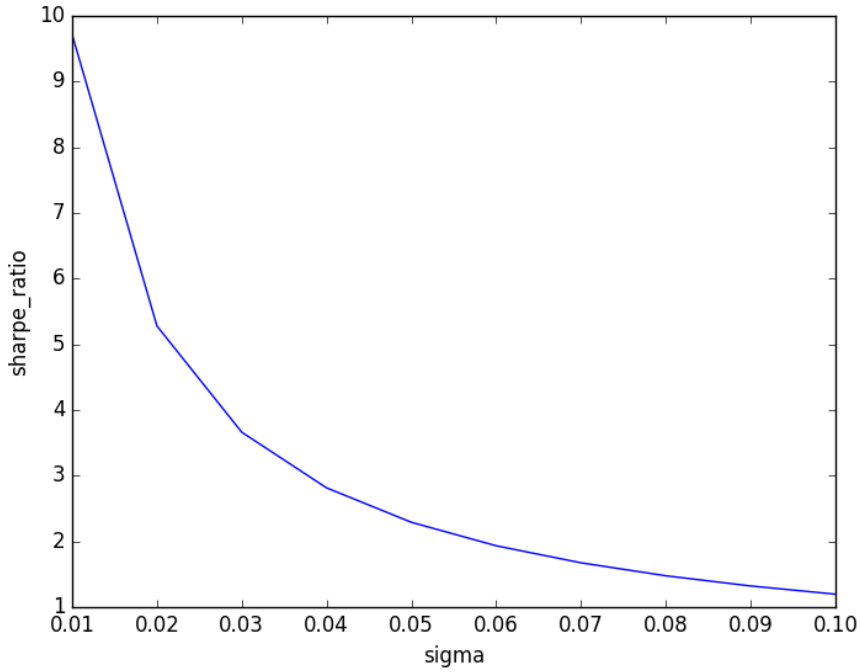

profit
3000000
2500000
2000000
1500000
1000000
500000
0
1
2
3
4
5
6
7
8
9
10
half_life


sharpe_ratio
9
8
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
9
10
half_life


4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
profit
0
20
40
60
80
100
initial_strength


12
10
8
6
4
2
0
sharpe_ratio
0
20
40
60
80
100
initial_strength


3000000
2500000
2000000
1500000
1000000
500000
0
profit
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
sigma


10
9
8
7
6
5
4
3
2
1
sharpe_ratio
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
sigma