RUTGERS BUSINESS SCHOOL
OPTIMIZATION MODELS IN FINANCE(26:711:564)

ASSIGNMENT 8

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1 Problem 1

The first part of this problem, VaR, is totally same with the previous assignment. Here we simply duplicate the result from the previous assignment.

1.1 Value at Risk

According to the requirements of the portfolio, we arrange the portion as follows,

Portfolio	Portfolio	Portfolio 3
0	0.1	0
0	0.1	0.2
0	0.1	0.2
0	0.1	0
0	0.1	0
0	0.1	0.2
0	0.1	0
0	0.1	0.2
1	0.1	0.2
0	0.1	0

Then the returns and the expected returns can be calculated as follows,

Returns													Expected
Portfolio 1	0.017	0.02	-0.024	-0.004	0.019	0.039	-0.03	0.025	0.021	0.054	-0.011	0.056	0.015166667
Portfolio 2	0.0142	-0.0004	0.0146	0.0032	0.0158	0.0081	-0.0017	0.0105	0.0222	0.0053	0.0197	0.0186	0.010841667
Portfolio 3	0.0172	0.0058	-0.013	-2.2E-19	0.0094	0.0366	-0.0088	0.0088	0.0266	0.0116	0.0186	0.0394	0.012683333

Since the distribution is uniform, we can simply re-arrange the return rate (by ascending order) and find the return rate accordingly. and find the value of that closest to $\alpha = 0.1, 0.2, 0.3$.

Portfolio1	Portfolio2	Portfolio3
-0.03	-0.017	-0.013
-0.024	-0.0004	-0.0088
-0.011	0.0032	0
-0.004	0.0053	0.0058
0.017	0.0081	0.0088
0.019	0.0105	0.0094
0.02	0.0142	0.0116
0.021	0.0146	0.0172
0.025	0.0158	0.0186
0.039	0.0186	0.0266
0.054	0.0197	0.0366
0.056	0.0222	0.0394

The uniform distribution quantile indicates that we should use the return rate at column 2,3 and 4, because the cumulative probability of the uniform distribution is 2/12, 3/12 and 4/12, which are the closest to $a = 0.1, 0.2, 0.3$ Then we just simply multiply the return rate with the capital we have, and obtain the final result,

Portfolio 1	Portfolio 2	Portfolio 3
2,400.0000000	40.0000000	880.0000000
1,100.0000000	(320.0000000)	0.0000000
400.0000000	(530.0000000)	(580.0000000)

which are $\alpha = 0.1, 0.2, 0.3$ accordingly.

1.2 Average Value at Risk

We use the formula

$$AVAR_\alpha^+(Z) = \min_{\eta \in R} \eta + \frac{1}{\alpha} \Sigma_{k=1}^K p_k (z_k - \eta)_+$$

and carry out the linear programming problem. My results are,

	alpha=0.1	alpha=0.2	alpha=0.3
avar1	0.151666667	0.0758333	0.050555556
avar2	0.108416667	0.0542083	0.036138889
avar3	0.126833333	0.0634167	0.042277778

The v and η I have obtained are as follows, with the sequence portfolio1 $\alpha = 0.1, 0.2, 0.3$, portfolio2 $\alpha = 0.1, 0.2, 0.3$, portfolio3 $\alpha = 0.1, 0.2, 0.3$.

v	eta
0.017	0
0.02	
-0.024	
-0.004	
0.019	
0.039	
-0.03	
0.025	
0.021	
0.054	
-0.011	
0.056	
alpha	0.1

v	eta
0.0142	0
-0.0004	
0.0146	
0.0032	
0.0158	
0.0081	
-0.0017	
0.0105	
0.0222	
0.0053	
0.0197	
0.0186	

v	eta
0.0172	0
0.0058	
-0.013	
0	
0.0094	
0.0366	
-0.0088	
0.0088	
0.0266	
0.0116	
0.0186	
0.0394	

v	eta
0.017	0
0.02	
-0.024	
-0.004	
0.019	
0.039	
-0.03	
0.025	
0.021	
0.054	
-0.011	
0.056	

v	eta	z
0.0142	0	
-0.0004		
0.0146		
0.0032		
0.0158		
0.0081		
-0.0017		
0.0105		
0.0222		
0.0053		
0.0197		
0.0186		

v	eta
0.0172	0
0.0058	
-0.013	
0	
0.0094	
0.0366	
-0.0088	
0.0088	
0.0266	
0.0116	
0.0186	
0.0394	

v	eta	z
0.017	0	
0.02		
-0.024		
-0.004		
0.019		
0.039		
-0.03		
0.025		
0.021		
0.054		
-0.011		
0.056		

v	eta	z
0. 0142	0	
-0. 0004		
0. 0146		
0. 0032		
0. 0158		
0. 0081		
-0. 0017		
0. 0105		
0. 0222		
0. 0053		
0. 0197		
0. 0186		

v	eta	z
0. 0172	0	
0. 0058		
-0. 013		
0		
0. 0094		
0. 0366		
-0. 0088		
0. 0088		
0. 0266		
0. 0116		
0. 0186		
0. 0394		