

## Homework 8

### Problem 1

You have collected data on monthly returns of 10 securities, as shown in the table below

Asset	Monthly Returns											
	1	2	3	4	5	6	7	8	9	10	11	12
1	0.004	-0.025	0.009	0.012	0.047	0.006	-0.019	-0.037	0.025	0.021	0.017	0.019
2	0.014	0.000	-0.039	0.016	-0.006	-0.021	0.07	-0.022	0.019	0.025	0.054	0.040
3	0.001	0.006	0.005	0.019	0.016	-0.052	0.057	0.027	0.039	0.000	0.011	0.002
4	-0.012	-0.021	0.062	0.036	-0.002	0.015	-0.038	-0.003	0.024	0.012	0.048	-0.007
5	-0.043	0.005	0.023	0.000	0.023	0.034	0.04	0.029	-0.013	-0.040	0.011	0.003
6	0.015	-0.027	-0.010	-0.027	0.002	0.056	0.038	-0.004	0.080	0.001	0.013	0.026
7	-0.001	0.011	0.056	-0.024	0.019	-0.015	-0.048	0.019	0.062	0.023	0.002	-0.017
8	0.039	0.030	0.003	-0.004	0.016	0.003	-0.021	0.018	-0.026	-0.022	0.026	0.073
9	0.017	0.020	-0.024	-0.004	0.019	-0.03	0.039	0.025	0.021	0.054	-0.011	0.056
10	0.108	-0.003	0.061	0.008	0.024	-0.013	-0.037	0.053	-0.009	-0.021	0.026	-0.009

These data are the same as in the previous homework.

You treat these realizations as equally likely scenarios, each with probability 1/12.

You plan to invest \$100,000 and you are considering three possible portfolios:

*Portfolio 1:* All money in asset 9;

*Portfolio 2:* Money distributed uniformly among all assets (equally weighted);

*Portfolio 3:* Invest equally in assets 2, 3, 6, 8, and 9 and nothing in the other assets.

Calculate the Value at Risk and the Average Value at Risk of the profit of these portfolios, for the risk levels  $\alpha = 0.1$ , 0.2, and 0.3. Use linear programming.