Computer Assignment 3

Equilibrium		bar R	beta	sigma^2_ei	sigma_ei	sigma_i^2	sigma_i	bar R - Rf	ones
	1	25,1%	2	0,002	4,47%	0,162	40,25%	20%	1
	2	19,8%	1,5	0,003	5,48%	0,093	30,50%	15%	1
*	3	17,0%	1,2	0,004	6,32%	0,0616	24,82%	12%	1
	4	14,8%	1	0,005	7,07%	0,045	21,21%	10%	1
	5	12,8%	0,8	0,006	7,75%	0,0316	17,78%	8%	1
*	6	12,0%	0,7	0,007	8,37%	0,0266	16,31%	7%	1

sigma_M^2	0,04	Rbar_m	15%	Rbar_m-Rf	10,00%
sigma_M	20,00%				
R_f	5,00%				

1.

Rbar	V	1	2	3	4	5	6
25%	1	0,162	0,12	0,096	0,08	0,064	0,056
20%	2	0,12	0,093	0,072	0,06	0,048	0,042
17%	3	0,096	0,072	0,0616	0,048	0,0384	0,0336
15%	4	0,08	0,06	0,048	0,045	0,032	0,028
13%	5	0,064	0,048	0,0384	0,032	0,0316	0,0224
12%	6	0,056	0,042	0,0336	0,028	0,0224	0,0266

V^-1	1	2	3	4	5	6
1	215,235	-142,383	-85,430	-56,953	-37,969	-28,477
2	-142,383	262,142	-42,715	-28,477	-18,984	-14,238
3	-85,430	-42,715	224,371	-17,086	-11,391	-8,543
4	-56,953	-28,477	-17,086	188,609	-7,594	-5,695
5	-37,969	-18,984	-11,391	-7,594	161,604	-3,797
6	-28,477	-14,238	-8,543	-5,695	-3,797	140,009

2. **Tangent portfolio**

(a)

Z	X	X_lintner		T	
1,40175605	125,84%	58,14%	=>	T	0,46201747
-0,2157886	-19,37%	-8,95%		riskless	0,53798253
0,27052682	24,29%	11,22%			
-0,2196488	-19,72%	-9,11%			
-0,2130992	-19,13%	-8,84%			
0,09017561	8,10%	3,74%			

sum z	1,11392185	Rbar T	27,48%	Rbar Lintner	15,39%
sum |z|	2,4109951	sigma^2 T	0,201837542	sigma^2_Lintn	0,04308427
		sigma_T	44,93%	sigma_Lint	20,76%
		SR_T	0,5004	SR_lint	0,500

Envelop hyperbola

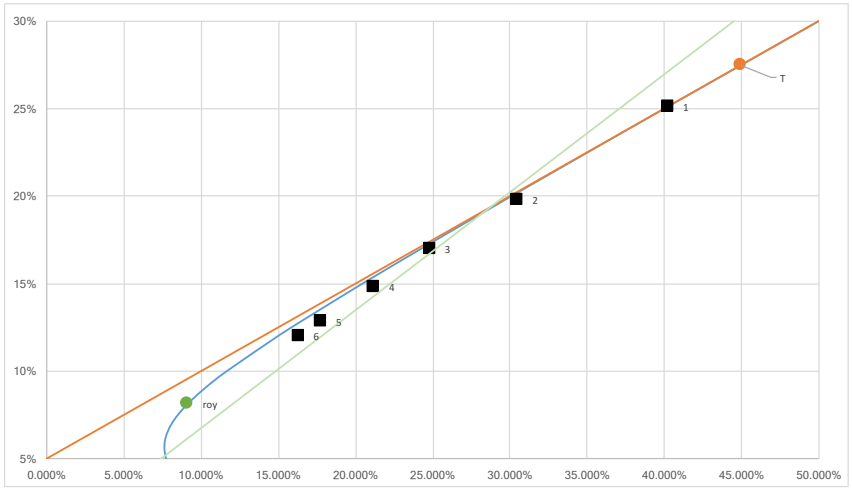
A=1' V^-1 1	172,512261		
B= 1' V^-1bar R	9,73953488	AC-B^2	41,9639145
C=bar R' V^-1 bar R	0,79311728		

(i) EF: sigma^2_p = 4,110966833 bar R_p^2 - 0,464186194 bar R_p + 0,01889998 (general formula)

(ii) EF: Rbar_p= 5,00% + 0,5004 sigma_p

Graphical representation

				(b)		5.		4.	
	bar R	hyperbola	EF	basic assets vol	25% line	full hyperbola (no short)	hyperbola seg (no sh	hyperbola 3 as	EF (3 assets)
	0%	13,748%			0,00%	16,42%		16,90%	
	1%	12,112%			1,48%	14,83%		15,30%	
	2%	10,612%			2,97%	13,38%		13,83%	
	3%	9,314%			4,45%	12,10%		12,53%	
	4%	8,313%			5,93%	11,07%		11,47%	
	5%	7,725%	0,000%		7,41%	10,36%		10,71%	0,00%
	6%	7,647%	1,998%		8,90%	10,03%		10,33%	2,00%
	7%	8,094%	3,996%		10,38%	10,12%		10,35%	4,00%
	8%	8,986%	5,995%		11,86%	10,62%		10,79%	6,01%
	9%	10,209%	7,993%		13,34%	11,48%		11,59%	8,01%
	10%	11,658%	9,991%		14,83%	12,63%		12,69%	10,01%
6:	12,0%	14,965%	13,988%		17,79%	15,50%		15,51%	14,01%
MV (no short)	12,25%	15,405%	14,489%	16,31%	18,16%	15,90%	15,90%	15,90%	14,51%
5:	12,8%	16,382%	15,586%	17,78%	18,98%	16,80%	16,80%	16,79%	15,61%
4:	14,8%	20,062%	19,583%	21,21%	21,94%	20,28%	20,28%	20,25%	19,62%
	15%	20,437%	19,982%		22,24%	20,64%	20,64%	20,61%	20,02%
	16%	22,332%	21,980%		23,72%	22,47%	22,47%	22,44%	22,02%
3:	17,0%	24,248%	23,979%	24,82%	25,20%	24,34%	24,34%	24,31%	24,02%
	18%	26,180%	25,977%		26,69%	26,24%	26,24%	26,21%	26,02%
	19%	28,127%	27,975%		28,17%	28,17%	28,17%	28,14%	28,02%
2:	19,8%	29,691%	29,574%	30,50%	29,36%	29,72%	29,72%	29,70%	29,62%
	21%	32,049%	31,972%		31,13%	32,08%	32,08%	32,06%	32,03%
	22%	34,022%	33,970%		32,62%	34,05%	34,05%	34,04%	34,03%
T (no short):	23%	36,822%	36,795%		34,71%	36,86%	36,86%	36,86%	36,86%
	24%	37,985%	37,966%		35,58%	38,03%	38,03%	38,03%	38,03%
	25,00%	39,974%	39,964%		37,07%	40,03%	40,03%	40,04%	40,03%
1, mas Rbar (no short):	25,1%	40,173%	40,164%	40,25%	37,21%	40,23%	40,23%	40,25%	40,23%
	27%	43,961%	43,961%		40,03%	44,05%		44,09%	44,04%
T:	27,48%	44,926%	44,926%		40,75%	45,03%		45,07%	45,00%
	29%	47,960%	47,957%		43,00%	48,10%		48,15%	48,04%
	30%	49,963%	49,956%		44,48%	50,12%		50,19%	50,04%



(b) The basic assets are no longer efficient.

3.

(a) Pr(R_T <= 0%)

(0%-RbarT)/sigma_T = -0,6117375

Prob 27,04% => likelihood that the tangent portfolio has negative returns

(b) Roy portfolio for RL= 0%

Z	-5,39701	X_Roy	-55,41%
	0,55149502		5,66%
	3,23089701		33,17%
	3,42059801		35,12%
	3,88039867		39,84%
	4,05315615		41,62%
sum z	9,73953488		1

Rbar_roy	8,14%		
sigma^2_roy	0,008361053		
sigma_roy	9,14%	slope alpha	25%
slope_roy	0,8906	-normsinv(.)	0,67448975
(0%-RbarT)/sigma_T =	-0,89057132		
Prob	18,66%	intercept	28,73%

4.

(a) CAPM equilibrium

Rbar*		Rbar	
	25,00%		25,1%
	20,00%		19,8%
	17,00%		**17,0%**
	15,00%		14,8%
	13,00%		12,8%
	12,00%		**12,0%**

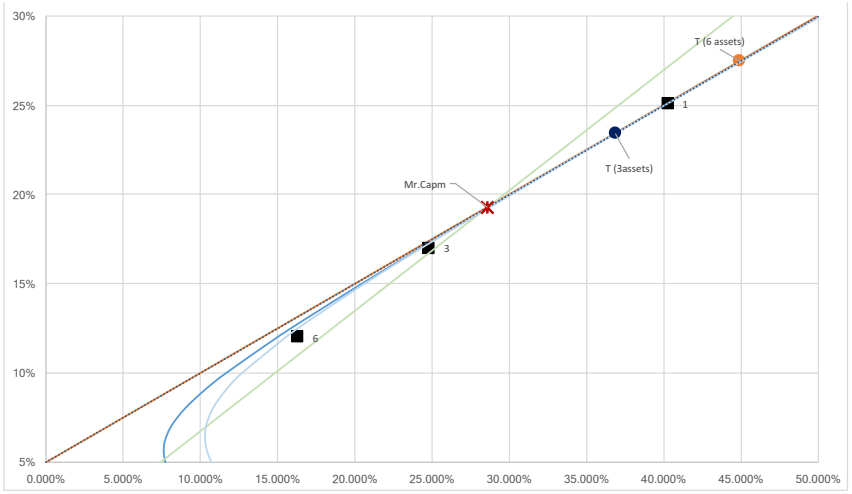
(b) Only assets 3 and 6 are in equilibrium.
Asset 1 is underpriced. => we can use only assets 1, 3 and 6
Assets 2 and 4 are overpriced.

Envelop hyperbola (only assets 1, 3 and 6), shortselling allowed

Rbar		Rbar -Rf	V		1	3	6	omes
1	25,1%	20,10%		1	0,162	0,096	0,056	1
3	17,0%	12,00%		3	0,096	0,0616	0,0336	1
6	12,0%	7,00%		6	0,056	0,0336	0,0266	1
F	5,00%							

A=1' V^-1 1	94,4864708			
B= 1' V^-1bar R	6,07972069	AC-B^2	21,74516293	
C=bar R' V^-1 bar R	0,62133939			

sigma^2_p =	4,345171892	bar R_p^2	-	0,559179134	bar R_p	+	0,02857368



Mr.CAPM portfolio

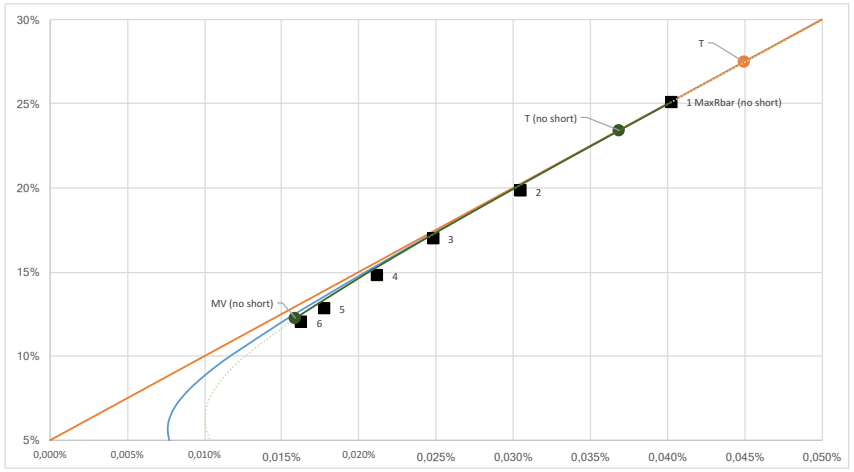
	X	beta	**conditions**	
1	63,57%	2	Rbar_capm	0,192815228
3	10,49%	1,2	sigma^2_capm	0,081720904
6	3,50%	0,7	sigma_capm	28,59%
T	77,56%	0	SR_capm	0,499583329
F	22,44%		beta_capm	1,42
			Prob(R_capm <0%)	25,00%
sum	100,00%			

tangent portfolio

	Z		X_T
	1,110997963		81,97%
	0,183299389		13,52%
	0,061099796		4,51%
sum z			
	1,355397149		1
		Rbar T	23,41%
		sigma^2_T	0,13585723
		sigma_T	36,86%
		SR_T	0,4996

5.

X_T (no short)	81,97%	X_minSR	0,00%	**X_minRbar**	0,00%
	0,00%	(extreme hyper)	0,00%	**(extreme 1)**	0,00%
	13,52%		0,00%		0,00%
	0,00%		0,00%		0,00%
	0,00%		100,00%		0,00%
	4,51%		0,00%		100,00%
	1		1		1
Rbar_T (no short)	23,41%	Rbar_minSR	12,80%	Rbar_minRbar	12,00%
sigma^2_Tno	0,13585663	sigma^2_roy	0,0316	sigma^2_minRbar	0,0266
sigma_Tno	36,86%	sigma_roy	17,78%	sigma_minRbar	16,31%
slope_Tno	0,4996	slope_roy	0,4388	slope_minRbar	0,4292
X_maxVol	100,00%	**X_MV (no short)**	0,00%	X_maxRbar	100,00%
(extreme 2)	0,00%		0,00%	(extreme 2)	0,00%
	0,00%		0,00%		0,00%
	0,00%		0,00%		0,00%
	0,00%		31,34%		0,00%
	0,00%		68,66%		0,00%
	1		1		1
Rbar_maxVol	25,10%	Rbar_MV	12,25%	Rbar_maxRbar	25,10%
sigma^2_maxVol	0,162	sigma^2_MV	0,025283582	sigma^2_maxRbar	0,162
sigma_maxVol	40,25%	sigma_MV	15,90%	sigma_maxRbar	40,25%
slope_maxVol	0,4994	slope_MV	0,4560	slope_maxRbar	0,4994



6. We have to use the cut-off method

Sorted by ERB

	bar R	beta	ERB	(bar R - Rf)beta/sigma^2_ei	beta^2/sigma^2ei	sum 1 (num)	sum 2 (den)	C	
1	25,1%	2	0,1005	201	2000	201	2000	0,0993	
3	17,0%	1,2	0,1000	36	360	237	2360	0,0994	
6	12,0%	0,7	0,1000	7	70	244	2430	0,0994	C*
2	19,8%	1,5	0,0987	74	750	318	3180	0,0992	
4	14,8%	1	0,0980	19,6	200	337,6	3380	0,0991	
5	12,8%	0,8	0,0975	10,4	106,6666667	348	3486,66667	0,0991	

In this case we invest in the three assets with no shortselling anyway so we can go back to our Zs

sum z1+z2+z6 1,27614302