Computer Assignment 2B

	bar R	sigma	rho			Rf 1	bar R - Rf	Rf 2	bar R - Rf2
A	15%	10%	1	0,5	0	3%	12%	7%	8%
B	10%	6%	0,5	1	0,25	3%	7%	7%	3%
C	20%	15%	0	0,25	1	3%	17%	7%	13%

1.

(a)

bar R	V			V^-1			Ones
15%	0,01	0,003	0	136,3636	-121,212	12,121212	1
10%	0,003	0,0036	0,00225	-121,212	404,0404	-40,40404	1
20%	0	0,00225	0,0225	12,12121	-40,404	48,484848	1

(b)

Tangent Portfolio 1 (T1) Rf1 = 3%

Z	9,9393939	X_T	41,98%
	6,8686869		29,01%
	6,8686869		29,01%
sum z	23,676768		1

bar R	sigma^2	sigma	SR T1
15,00%	0,0050683	7,12%	1,68558955

Minimum Variance Portfolio (MV)

MV	9,41%		
	83,62%		
	6,97%		
	1		

bar R mv	sigma^2 mv	sigma mv
11,17%	0,003449	5,87%

Tangent Portfolio 2 (T2) Rf2= 7%

Z	8,848485	X_T2	73,24%
	-2,82828		-23,41%
	6,060606		50,17%
sum	12,08081		1

bar R_T2	sigma^2_T2	sigma_T2	SLOPE T2
18,68%	0,009667	9,83%	1,179454

(d)

Envelop Hyperbola

A=1' V^-1 1	289,899		
B= 1' V^-1bar R	32,37374	AC-B^2	263,0752
C=bar R' V^-1 bar R	4,522727		

(i)

EF: sigma^2_p = 1,10196246 bar R_p^2 - 0,246118 bar R_p + 0,017192
for Rbar > 11,17% (minimum variance portfolio expected return)

(ii)

EF: Rbar_p= 3% + 1,6855895 sigma_p for sigma_p< 7,12%
sigma^2_p = 0 1,10196246 bar R_p^2 - 0,246118 bar R_p + 0,017192 for 7,12% <= sigma_p<= 9,83%
Rbar_P= 7% + 1,1794537 sigma_p for sigma_p> 9,83%

(c)

(i) The IOS is the entire area contained within the envelop hyperbola determined in (b)

(ii) The IOS can be described as the union of three sets:
(1) the part of a cone with vertice at Rf=3% and delimited by the first tangent line and line with symetric slope, for sigma_p < hyperbola
(2) the part of a cone with certice ar Rf=7% and delimited by the second tangent line and the line with symetric slope, for sigma_p> hyperbola
(3) The are contained within the envelop hyperbola

(b)

(e) **Hyperbola of the Two tangents**

	bar R	sigma
T1	15,00%	7,12%
T2	18,68%	9,83%

COV (T, T2) 0,0066221

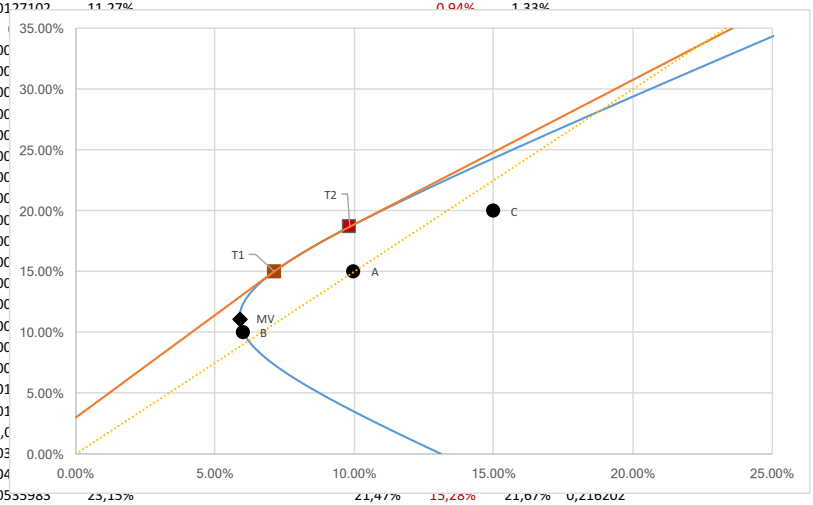
X_MV 0,133005 = > invest in T and 1-x in T2
0,862069

bar R_mv 0,180976

Graphical Representation

	bar R	sigma^2	sigma Hyper EF hyper	sigma line 1	sigma line 2	Roy line	Telser line	line 2 (no sl	sigma hype EF hyper (no s	CCM hyper
	0,00%	0,0171918	13,11%			0,00%	0,00%			15,88%
	1,00%	0,0148408	12,18%			0,47%	0,67%			14,65%
	2,00%	0,0127102	11,27%			0,94%	1,33%			13,44%
	3,00%									12,26%
	4,00%	0,00								11,10%
	5,00%	0,00								9,98%
	6,00%	0,00								8,92%
	7,00%	0,00								7,94%
	8,00%	0,00								7,07%
B:	9,00%	0,00								6,36%
	10,00%	0,00								5,86%
	11,00%	0,00								5,63%
	12,00%	0,00								5,71%
	13,00%	0,00								6,08%
A, T1:	14,00%	0,00								6,69%
	15,00%	0,00								7,49%
T2 (no short):	16,00%	0,00								8,42%
	17,10%	0,00								9,55%
T2:	18,00%	0,00								10,54%
C:	18,68%	0,00								11,30%
	20,00%	0,01								12,85%
	22,50%	0,01								15,88%
	25,00%	0,0								19,00%
	27,50%	0,03								22,17%
	30,00%	0,04								25,38%
	32,50%	0,05								28,60%
	35,00%	0,066041	25,70%			23,57%	16,46%	23,33%	0,237398	31,85%

Effficient Frontier



(d) None of the basic assets A,B,C is efficient anymore.

2.

(a)

RL= 0% alpha= Prob (R_A< 0%)

First we compute alpha

Prob (R_A< 0%)= 6,681%

R bar p => 0% - -1,5000 sigma p

(b)

All portfolios that satisfy this have

R bar p >= 0% + 1,5 sigma p

EF line 2: R bar p = 7% + 1,1794537 sigma p

crossing point

sigma_p 21,838%

All portfolios is a volatility less or equal to 21,838%

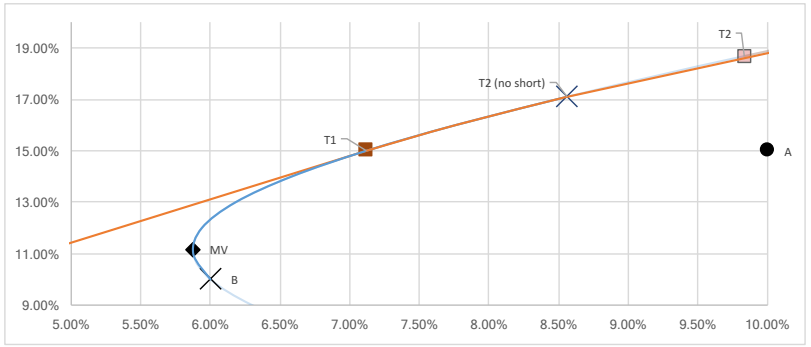
4.

Shortselling restrictions

X_T2 (no sh	58,06%	X_min Slope	0
	0,00%		1,000001
	41,94%		0
	1		1,000001

R bar T2	sigma^2 T2	sigma T2	SLOPE	
17,10%	0,0073283	8,56%	1,17945373	=> max slope (solver solution)
10,00%	0,0036	6,00%	0,50000117	=> min slope (solver solution)

OBS: same hyperbola as before by with ending points at min and max slope (X in picture)
previous T2 not feasible



5.

CCM	corr	1	0,25	0,25
average correlation		0,25	1	0,25
0,25		0,25	0,25	1

(a)

V (CCM)	10%	6%	15%
	0,01000	0,00150	0,00375
	0,00150	0,00360	0,00225
	0,00375	0,00225	0,02250

V (CCM)^-1		
111,1111	-37,037	-14,8148
-37,037	308,642	-24,6914
-14,8148	-24,6914	49,38272

(b)

CCM Tangent Portfolio 1 (T1)

Z		X T1 (CCM)	
	8,2222222		31,53%
	12,962963		49,72%
	4,8888889		18,75%
sum z	26,074074		100,00%

	R bar T1	sigma^2 T1	sigma T1	SR T1
TRUE	13,45%	0,0040353	6,35%	1,64530704
CCM	13,45%	0,0040085	6,33%	1,65081349

CCM Tangent Portfolio 2 (T2)

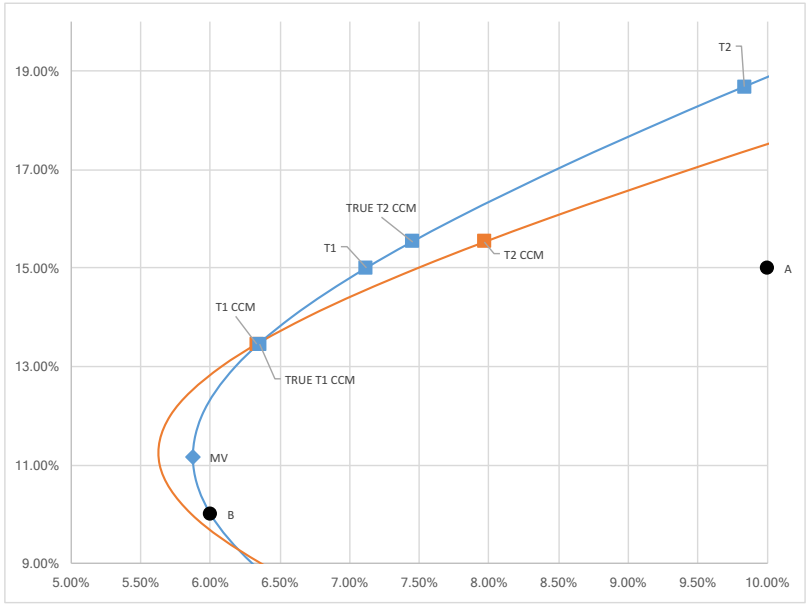
Z		X T2 (CCM)	
	5,851852		43,57%
	3,08642		22,98%
	4,493827		33,46%
sum z	13,4321		100,00%

	R bar T2	sigma^2 T2	sigma T2	Slope T2
TRUE	15,52%	0,005553	7,45%	1,143856
CCM	15,52%	0,006346	7,97%	1,070018

Envelop (CCM)

A=1' V^-1 1	316,0494		
B= 1' V^-1bar R	35,55556	AC-B^2	181,43576
C=bar R' V^-1 bar R	4,574074		

sigma^2_p =	1,74193548	bar R_p^2	-	0,391935	bar R_p	+	0,02521



OBS: The two hyperbolas are quite different, but T1 CCM is quite close to the true T1.
So for investors with risk level lower 6.3%, that choose combination of deposit with T1, model risk should be relatively small.