

### Příklad 1

Uvažujme s několika portfolii, tvořenými dvěma cennými papíry.

	$\bar{r}_i$	$\sigma_i$	$\rho_{1,2} = 1$	$\rho_{1,2} = 0,5$
$C_1$	5%	20%	$\rho_{1,2} = -1$	$\rho_{1,2} = -0,5$
$C_2$	15%	40%	$\rho_{1,2} = 0$	

Podíly (váhy) jednotlivých cenných papírů v portfoliích budou:

	$P_1$	$P_2$	$P_3$	$P_4$	$P_5$	$P_6$	$P_7$
$X_1$	1	0.83	0.67	0.5	0.33	0.17	0
$X_2$	0	0.17	0.33	0.5	0.67	0.83	1

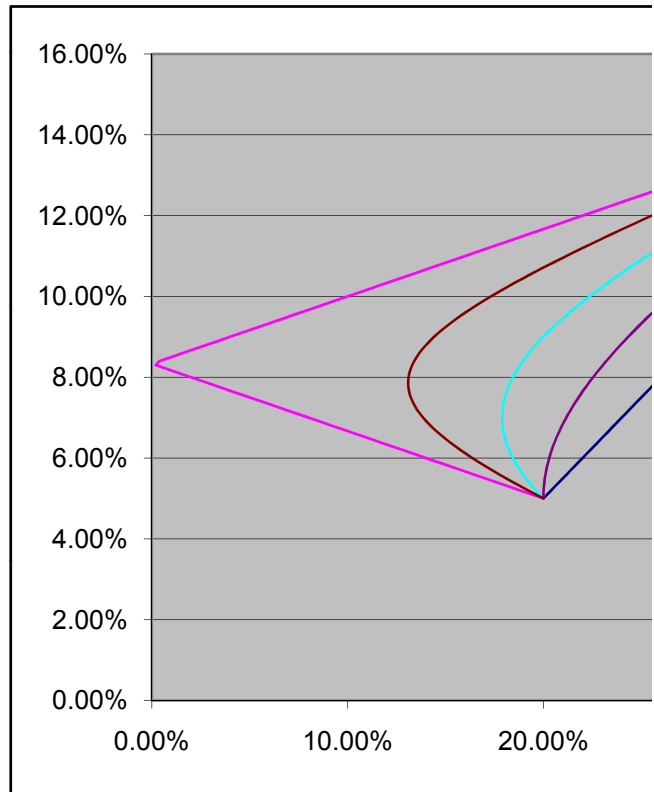
Vypočítat výnosnosti a rizika jednotlivých portfolií. Sestrojit spojnicový graf.

	1	-1	0	0.5	-0.5
rp1	5.00%	20.00%	20.00%	20.00%	20.00%
rp2	5.10%	20.20%	19.40%	19.80%	19.60%
rp3	5.20%	20.40%	18.80%	19.62%	19.21%
rp4	5.30%	20.60%	18.20%	19.44%	18.83%
rp5	5.40%	20.80%	17.60%	19.27%	18.45%
rp6	5.50%	21.00%	17.00%	19.10%	18.08%
rp7	5.60%	21.20%	16.40%	18.95%	17.72%
rp8	5.70%	21.40%	15.80%	18.81%	17.37%
rp9	5.80%	21.60%	15.20%	18.68%	17.03%
rp10	5.90%	21.80%	14.60%	18.55%	16.69%
rp11	6.00%	22.00%	14.00%	18.44%	16.37%
rp12	6.10%	22.20%	13.40%	18.34%	16.06%
rp13	6.20%	22.40%	12.80%	18.24%	15.76%
rp14	6.30%	22.60%	12.20%	18.16%	15.47%
rp15	6.40%	22.80%	11.60%	18.09%	15.19%
rp16	6.50%	23.00%	11.00%	18.03%	14.93%
rp17	6.60%	23.20%	10.40%	17.98%	14.69%
rp18	6.70%	23.40%	9.80%	17.94%	14.45%
rp19	6.80%	23.60%	9.20%	17.91%	14.24%
rp20	6.90%	23.80%	8.60%	17.89%	14.04%
rp21	7.00%	24.00%	8.00%	17.89%	13.86%
rp22	7.10%	24.20%	7.40%	17.89%	13.69%
rp23	7.20%	24.40%	6.80%	17.91%	13.55%
rp24	7.30%	24.60%	6.20%	17.94%	13.42%
rp25	7.40%	24.80%	5.60%	17.98%	13.31%
rp26	7.50%	25.00%	5.00%	18.03%	13.23%
rp27	7.60%	25.20%	4.40%	18.09%	13.16%
rp28	7.70%	25.40%	3.80%	18.16%	13.12%
rp29	7.80%	25.60%	3.20%	18.24%	13.10%
rp30	7.90%	25.80%	2.60%	18.34%	13.10%
rp31	8.00%	26.00%	2.00%	18.44%	13.11%

rp32	8.10%	26.20%	1.40%	18.55%	22.70%	13.16%
rp33	8.20%	26.40%	0.80%	18.68%	22.87%	13.22%
rp34	8.30%	26.60%	0.20%	18.81%	23.04%	13.30%
rp35	8.40%	26.80%	0.40%	18.95%	23.21%	13.40%
rp36	8.50%	27.00%	1.00%	19.10%	23.39%	13.53%
rp37	8.60%	27.20%	1.60%	19.27%	23.57%	13.67%
rp38	8.70%	27.40%	2.20%	19.44%	23.75%	13.83%
rp39	8.80%	27.60%	2.80%	19.62%	23.94%	14.01%
rp40	8.90%	27.80%	3.40%	19.80%	24.14%	14.21%
rp41	9.00%	28.00%	4.00%	20.00%	24.33%	14.42%
rp42	9.10%	28.20%	4.60%	20.20%	24.53%	14.65%
rp43	9.20%	28.40%	5.20%	20.42%	24.73%	14.90%
rp44	9.30%	28.60%	5.80%	20.63%	24.94%	15.16%
rp45	9.40%	28.80%	6.40%	20.86%	25.15%	15.43%
rp46	9.50%	29.00%	7.00%	21.10%	25.36%	15.72%
rp47	9.60%	29.20%	7.60%	21.34%	25.57%	16.01%
rp48	9.70%	29.40%	8.20%	21.58%	25.79%	16.33%
rp49	9.80%	29.60%	8.80%	21.84%	26.01%	16.65%
rp50	9.90%	29.80%	9.40%	22.10%	26.23%	16.98%
rp51	10.00%	30.00%	10.00%	22.36%	26.46%	17.32%
rp52	10.10%	30.20%	10.60%	22.63%	26.69%	17.67%
rp53	10.20%	30.40%	11.20%	22.91%	26.92%	18.03%
rp54	10.30%	30.60%	11.80%	23.19%	27.15%	18.40%
rp55	10.40%	30.80%	12.40%	23.48%	27.38%	18.77%
rp56	10.50%	31.00%	13.00%	23.77%	27.62%	19.16%
rp57	10.60%	31.20%	13.60%	24.07%	27.86%	19.55%
rp58	10.70%	31.40%	14.20%	24.37%	28.10%	19.94%
rp59	10.80%	31.60%	14.80%	24.67%	28.35%	20.35%
rp60	10.90%	31.80%	15.40%	24.98%	28.60%	20.75%
rp61	11.00%	32.00%	16.00%	25.30%	28.84%	21.17%
rp62	11.10%	32.20%	16.60%	25.62%	29.10%	21.58%
rp63	11.20%	32.40%	17.20%	25.94%	29.35%	22.01%
rp64	11.30%	32.60%	17.80%	26.26%	29.60%	22.43%
rp65	11.40%	32.80%	18.40%	26.59%	29.86%	22.87%
rp66	11.50%	33.00%	19.00%	26.93%	30.12%	23.30%
rp67	11.60%	33.20%	19.60%	27.26%	30.38%	23.74%
rp68	11.70%	33.40%	20.20%	27.60%	30.64%	24.19%
rp69	11.80%	33.60%	20.80%	27.94%	30.90%	24.63%
rp70	11.90%	33.80%	21.40%	28.29%	31.17%	25.08%
rp71	12.00%	34.00%	22.00%	28.64%	31.43%	25.53%
rp72	12.10%	34.20%	22.60%	28.99%	31.70%	25.99%
rp73	12.20%	34.40%	23.20%	29.34%	31.97%	26.45%
rp74	12.30%	34.60%	23.80%	29.70%	32.24%	26.91%
rp75	12.40%	34.80%	24.40%	30.05%	32.51%	27.37%
rp76	12.50%	35.00%	25.00%	30.41%	32.79%	27.84%

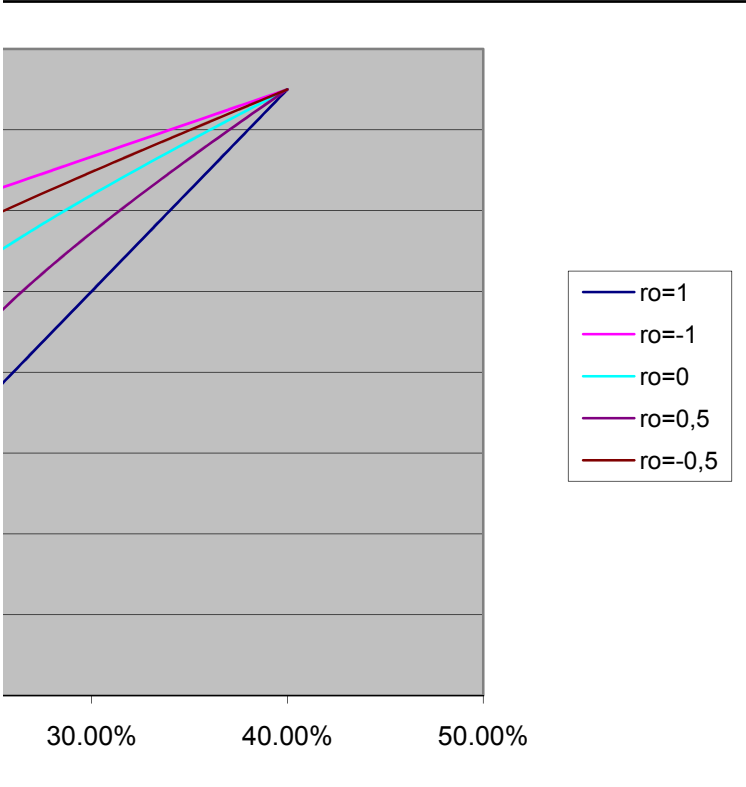
rp77	12.60%	35.20%	25.60%	30.78%	33.06%	28.31%
rp78	12.70%	35.40%	26.20%	31.14%	33.34%	28.78%
rp79	12.80%	35.60%	26.80%	31.51%	33.62%	29.25%
rp80	12.90%	35.80%	27.40%	31.88%	33.90%	29.72%
rp81	13.00%	36.00%	28.00%	32.25%	34.18%	30.20%
rp82	13.10%	36.20%	28.60%	32.62%	34.46%	30.68%
rp83	13.20%	36.40%	29.20%	33.00%	34.74%	31.16%
rp84	13.30%	36.60%	29.80%	33.37%	35.02%	31.64%
rp85	13.40%	36.80%	30.40%	33.75%	35.31%	32.12%
rp86	13.50%	37.00%	31.00%	34.13%	35.59%	32.60%
rp87	13.60%	37.20%	31.60%	34.51%	35.88%	33.09%
rp88	13.70%	37.40%	32.20%	34.90%	36.17%	33.58%
rp89	13.80%	37.60%	32.80%	35.28%	36.46%	34.06%
rp90	13.90%	37.80%	33.40%	35.67%	36.75%	34.55%
rp91	14.00%	38.00%	34.00%	36.06%	37.04%	35.04%
rp92	14.10%	38.20%	34.60%	36.44%	37.33%	35.53%
rp93	14.20%	38.40%	35.20%	36.83%	37.63%	36.03%
rp94	14.30%	38.60%	35.80%	37.23%	37.92%	36.52%
rp95	14.40%	38.80%	36.40%	37.62%	38.21%	37.01%
rp96	14.50%	39.00%	37.00%	38.01%	38.51%	37.51%
rp97	14.60%	39.20%	37.60%	38.41%	38.81%	38.01%
rp98	14.70%	39.40%	38.20%	38.80%	39.10%	38.50%
rp99	14.80%	39.60%	38.80%	39.20%	39.40%	39.00%
rp100	14.90%	39.80%	39.40%	39.60%	39.70%	39.50%
rp101	15.00%	40.00%	40.00%	40.00%	40.00%	40.00%

$x_1$	$x_2$	
1	0	P1
0.99	0.01	P2
0.98	0.02	P3
0.97	0.03	P4
0.96	0.04	P5
0.95	0.05	P6
0.94	0.06	P7
0.93	0.07	P8
0.92	0.08	P9
0.91	0.09	P10
0.9	0.1	P11
0.89	0.11	P12
0.88	0.12	P13
0.87	0.13	P14
0.86	0.14	P15
0.85	0.15	P16
0.84	0.16	P17
0.83	0.17	P18
0.82	0.18	P19
0.81	0.19	P20
0.8	0.2	P21
0.79	0.21	P22
0.78	0.22	P23
0.77	0.23	P24
0.76	0.24	P25
0.75	0.25	P26
0.74	0.26	P27
0.73	0.27	P28
0.72	0.28	P29
0.71	0.29	P30
0.7	0.3	P31



0.69	0.31	P32
0.68	0.32	P33
0.67	0.33	P34
0.66	0.34	P35
0.65	0.35	P36
0.64	0.36	P37
0.63	0.37	P38
0.62	0.38	P39
0.61	0.39	P40
0.6	0.4	P41
0.59	0.41	P42
0.58	0.42	P43
0.57	0.43	P44
0.56	0.44	P45
0.55	0.45	P46
0.54	0.46	P47
0.53	0.47	P48
0.52	0.48	P49
0.51	0.49	P50
0.5	0.5	P51
0.49	0.51	P52
0.48	0.52	P53
0.47	0.53	P54
0.46	0.54	P55
0.45	0.55	P56
0.44	0.56	P57
0.43	0.57	P58
0.42	0.58	P59
0.41	0.59	P60
0.4	0.6	P61
0.39	0.61	P62
0.38	0.62	P63
0.37	0.63	P64
0.36	0.64	P65
0.35	0.65	P66
0.34	0.66	P67
0.33	0.67	P68
0.32	0.68	P69
0.31	0.69	P70
0.3	0.7	P71
0.29	0.71	P72
0.28	0.72	P73
0.27	0.73	P74
0.26	0.74	P75
0.25	0.75	P76

0.24	0.76	P77
0.23	0.77	P78
0.22	0.78	P79
0.21	0.79	P80
0.2	0.8	P81
0.19	0.81	P82
0.18	0.82	P83
0.17	0.83	P84
0.16	0.84	P85
0.15	0.85	P86
0.14	0.86	P87
0.13	0.87	P88
0.12	0.88	P89
0.11	0.89	P90
0.1	0.9	P91
0.09	0.91	P92
0.08	0.92	P93
0.07	0.93	P94
0.06	0.94	P95
0.05	0.95	P96
0.04	0.96	P97
0.03	0.97	P98
0.02	0.98	P99
0.01	0.99	P100
0	1	P101



### Příklad 2

Vypočítejte a graficky zobrazte vytvořená portfolia jestliže známe matici výnosnosti a kov

$$[\sigma_{ij}] = \begin{pmatrix} 459 & -211 & 112 \\ -211 & 312 & 215 \\ 112 & 215 & 179 \end{pmatrix}$$

$$[R_i] = \begin{pmatrix} 16,2 \\ 24,6 \\ 22,8 \end{pmatrix}$$

21.42429

17.66352

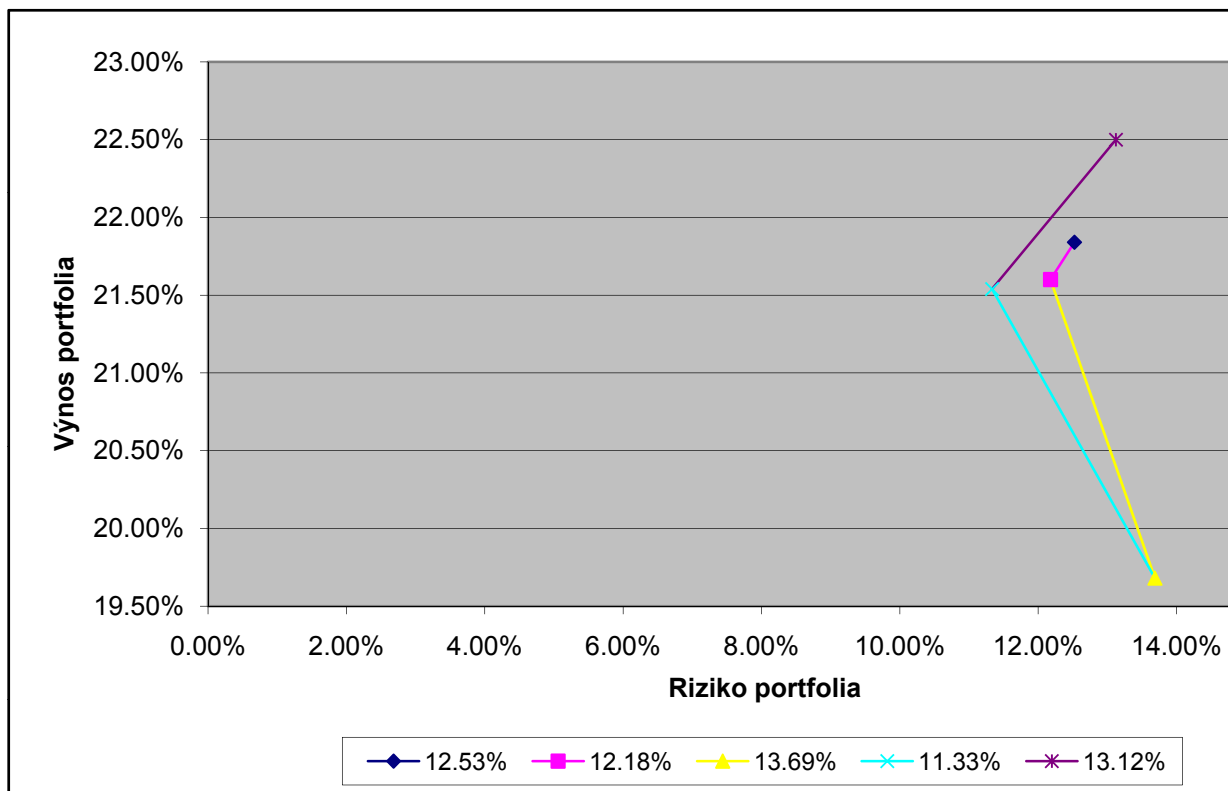
13.37909

$X_i / P_i$	A	B	C	D	E
$X_1$	0.2	0.25	0.5	0.3	0.1
$X_2$	0.2	0.25	0.1	0.4	0.2
$X_3$	0.6	0.5	0.4	0.3	0.7

$$\sigma_p^2 = x_1^2 \cdot \sigma_1^2 + x_2^2 \cdot \sigma_2^2 + x_3^2 \cdot \sigma_3^2 + 2 \cdot x_1 \cdot x_2 \cdot \sigma_{12} + 2 \cdot x_1 \cdot x_3 \cdot \sigma_{13} + 2 \cdot x_2 \cdot x_3 \cdot \sigma_{23}$$

rPa      rPb      rPc      rPd      rPe

sigmaPa    sigmaPb    sigmaPc    sigmaPd    sigmaPe

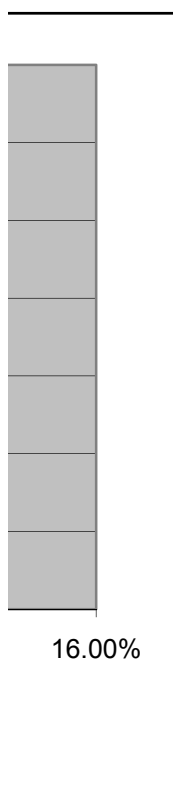




varianční matici.

459	-211	112	16.2
-211	312	215	24.6
112	215	179	22.8

rPa	21.84%	12.53%	tmave modra
rPb	21.60%	12.18%	ruzova
rPc	19.68%	13.69%	zluta
rPd	21.54%	11.33%	svetle modra
rPe	22.50%	13.12%	fialova



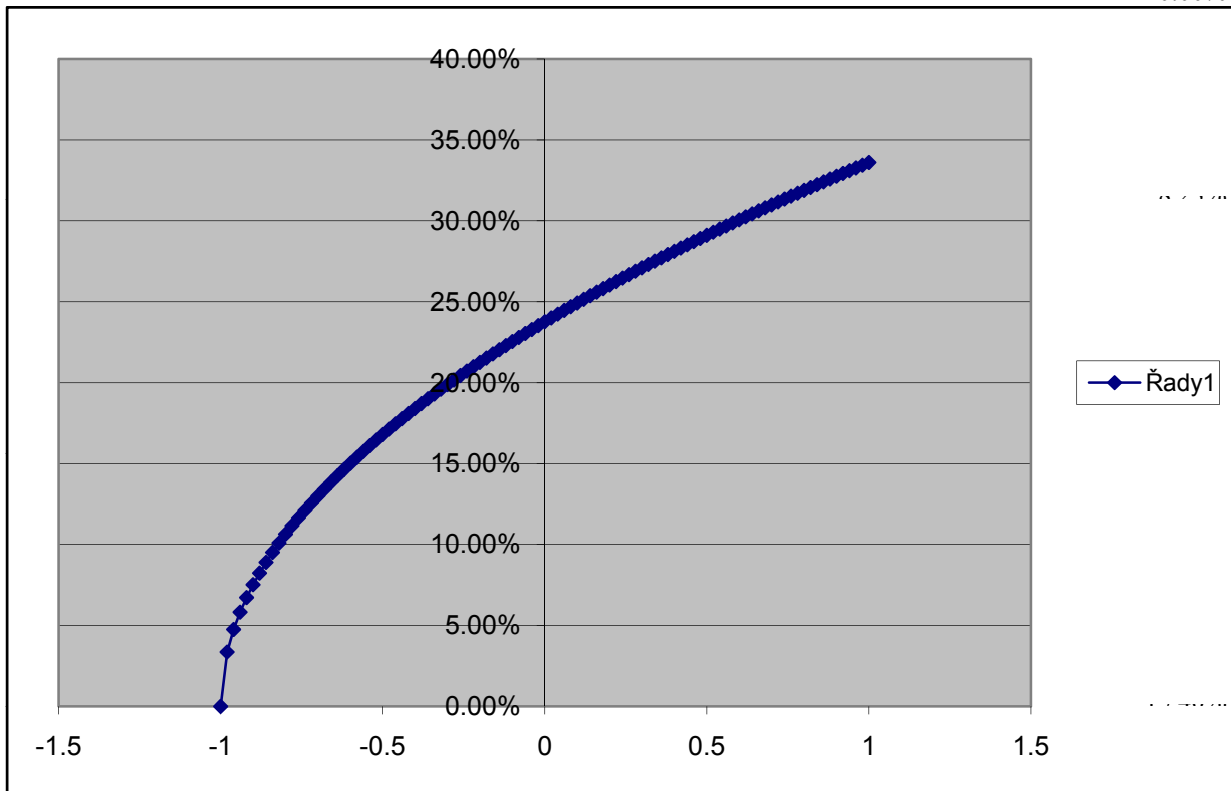
### Příklad 3

Je zadané portfolio, které se skládá ze dvou cenných papírů následovně:

Cenný papír
$C_i$
$C_1$
$C_2$

- úloha:** Vypočítejte očekávaný výnos portfolia
- úloha:** Vypočítejte celkové riziko portfolia, kdy koeficient korelace mezi složkami po  $h = 0,2$ . Určete nejmenší a největší riziko portfolia.

1.	17.40%
2.	0.00%



16.46%
16.80%
17.13%
17.46%
17.78%

18.09%  
18.40%  
18.71%  
19.01%  
19.30%  
19.59%  
19.88%  
20.16%  
20.44%  
20.71%  
20.98%  
21.25%  
21.51%  
21.78%  
22.03%  
22.29%  
22.54%  
22.79%  
23.03%  
23.28%  
23.52%  
23.76%  
24.00%  
24.23%  
24.46%  
24.69%  
24.92%  
25.14%  
25.37%  
25.59%  
25.81%  
26.03%  
26.24%  
26.46%  
26.67%  
26.88%  
27.09%  
27.30%  
27.50%  
27.71%  
27.91%  
28.11%  
28.31%  
28.51%  
28.71%  
28.90%  
29.10%  
29.29%  
29.48%  
29.67%  
29.86%  
30.05%  
30.24%  
30.43%  
30.61%

30.79%  
30.98%  
31.16%  
31.34%  
31.52%  
31.70%  
31.88%  
32.05%  
32.23%  
32.40%  
32.58%  
32.75%  
32.92%  
33.09%  
33.26%  
33.43%  
33.60%

<i>Oček. výnos</i>	<i>Riziko</i>	<i>Podíl v portfoli u</i>
$r_i$	$\sigma_i$	$X_i$
0.15	0.28	0.6
0.21	0.42	0.4

(10)  $r_p$  je z intervalu

- 1
- 0.98
- 0.96
- 0.94
- 0.92
- 0.9
- 0.88
- 0.86
- 0.84
- 0.82
- 0.8
- 0.78
- 0.76
- 0.74
- 0.72
- 0.7
- 0.68
- 0.66
- 0.64
- 0.62
- 0.6
- 0.58
- 0.56
- 0.54
- 0.52
- 0.5
- 0.48
- 0.46
- 0.44

-0.42  
-0.4  
-0.38  
-0.36  
-0.34  
-0.32  
-0.3  
-0.28  
-0.26  
-0.24  
-0.22  
-0.2  
-0.18  
-0.16  
-0.14  
-0.12  
-0.1  
-0.08  
-0.06  
-0.04  
-0.02  
0  
0.02  
0.04  
0.06  
0.08  
0.1  
0.12  
0.14  
0.16  
0.18  
0.2  
0.22  
0.24  
0.26  
0.28  
0.3  
0.32  
0.34  
0.36  
0.38  
0.4  
0.42  
0.44  
0.46  
0.48  
0.5  
0.52  
0.54  
0.56  
0.58  
0.6  
0.62  
0.64  
0.66

0.68  
0.7  
0.72  
0.74  
0.76  
0.78  
0.8  
0.82  
0.84  
0.86  
0.88  
0.9  
0.92  
0.94  
0.96  
0.98  
1

#### Příklad 4

Mějme vícesložkové portfolio a matici korelačních koeficientů:

Cenný papír
$C_i$
$C_1$
$C_2$
$C_3$
$C_4$
$C_5$

1. úloha: Vypočítejte očekávaný výnos portfolio

2. úloha: Vypočítejte riziko portfolio vyjádřené rozptylem a směrodatnou odchylkou

$$\left[ \rho (C_i C_j) \right] = \begin{pmatrix} 1 & 0,30 & 0,41 & -0,23 & 0,13 \\ & 1 & 0,25 & -0,09 & 0 \\ & & 1 & -0,22 & 0,31 \\ & & & 1 & 0,14 \\ & & & & 1 \end{pmatrix}$$

1.

25.90%

2.

22.18%



Oček. výnos	Riziko	Podíl v portfoli u
$\bar{r}_i$	$\sigma_i$	$X_i$
0.13	0.28	0.2
0.25	0.42	0.4
0.21	0.35	0.1
0.41	0.48	0.2
0.3	0.39	0.1

	1	0.3	0.41	-0.23	0.13
	0.3	1	0.25	-0.09	0
	0.41	0.25	1	-0.22	0.33
	-0.23	-0.09	-0.22	1	0.14
	0.13	0	0.33	0.14	1