

**Ceny akcií za 70 dnů (denní, Kč):**

datum	CETV	CEZ	KOBA
1	1,856.00	1,059.00	4,266.00
2	1,913.00	1,072.00	4,108.00
3	1,905.00	1,094.00	4,108.00
4	1,868.00	1,182.00	4,072.00
5	1,860.00	1,186.00	3,987.00
6	1,865.00	1,192.00	3,835.00
7	1,859.00	1,200.00	3,886.00
8	1,832.00	1,293.00	3,832.00
9	1,871.00	1,302.00	3,953.00
10	1,853.00	1,307.00	4,002.00
11	1,854.00	1,399.00	4,047.00
12	1,862.00	1,302.00	3,994.00
13	1,870.00	1,239.00	4,030.00
14	1,864.00	1,214.00	4,133.00
15	1,834.00	1,123.00	4,271.00
16	1,808.00	1,140.00	4,257.00
17	1,814.00	1,159.00	4,261.00
18	1,836.00	1,203.00	4,318.00
19	1,807.00	1,186.00	4,239.00
20	1,812.00	1,224.00	4,216.00
21	1,843.00	1,226.00	4,274.00
22	1,834.00	1,219.00	4,266.00
23	1,831.00	1,238.00	4,142.00
24	1,860.00	1,246.00	4,208.00
25	1,878.00	1,273.00	4,175.00
26	1,872.00	1,255.00	4,228.00
27	1,938.00	1,243.00	4,300.00
28	1,975.00	1,265.00	4,273.00
29	1,954.00	1,277.00	4,316.00
30	2,010.00	1,293.00	4,294.00
31	2,054.00	1,279.00	4,239.00
32	2,063.00	1,268.00	4,242.00
33	2,053.00	1,266.00	4,280.00

34	2,047.00	1,261.00	4,295.00
35	2,010.00	1,245.00	4,236.00
36	2,015.00	1,257.00	4,230.00
37	2,072.00	1,270.00	4,292.00
38	2,036.00	1,301.00	4,201.00
39	2,064.00	1,343.00	4,155.00
40	2,161.00	1,384.00	4,087.00
41	2,213.00	1,360.00	4,033.00
42	2,175.00	1,344.00	3,987.00
43	2,213.00	1,365.00	4,002.00
44	2,201.00	1,375.00	4,033.00
45	2,183.00	1,385.00	4,008.00
46	2,059.00	1,411.00	4,056.00
47	2,046.00	1,386.00	4,102.00
48	1,996.00	1,392.00	4,209.00
49	1,909.00	1,372.00	4,220.00
50	1,945.00	1,367.00	4,201.00
51	1,928.00	1,400.00	4,205.00
52	1,992.00	1,424.00	4,401.00
53	1,966.00	1,430.00	4,382.00
54	1,929.00	1,525.00	4,344.00
55	1,916.00	1,518.00	4,288.00
56	1,900.00	1,535.00	4,261.00
57	1,870.00	1,538.00	4,248.00
58	1,892.00	1,585.00	4,278.00
59	1,913.00	1,590.00	4,230.00
60	1,911.00	1,579.00	4,173.00
61	1,880.00	1,556.00	4,120.00
62	1,914.00	1,525.00	4,157.00
63	1,898.00	1,530.00	4,216.00
64	1,910.00	1,425.00	4,133.00
65	1,968.00	1,360.00	4,303.00
66	2,034.00	1,334.00	4,373.00
67	2,032.00	1,308.00	4,328.00
68	2,036.00	1,254.00	4,396.00

69	2,021.00	1,228.00	4,343.00
70	2,001.00	1,208.00	4,373.00

**Výnosy akcií (30-denní):**

datum	CETV	CEZ	KOBA
31	0.1067	0.2077	-0.0063
32	0.0784	0.1828	0.0326
33	0.0777	0.1572	0.0419
34	0.0958	0.0668	0.0548
35	0.0806	0.0497	0.0625
36	0.0804	0.0545	0.1030
37	0.1146	0.0583	0.1045
38	0.1114	0.0062	0.0963
39	0.1032	0.0315	0.0511
40	0.1662	0.0589	0.0212
41	0.1936	-0.0279	-0.0035
42	0.1681	0.0323	-0.0018
43	0.1834	0.1017	-0.0069
44	0.1808	0.1326	-0.0242
45	0.1903	0.2333	-0.0616
46	0.1388	0.2377	-0.0472
47	0.1279	0.1959	-0.0373
48	0.0871	0.1571	-0.0252
49	0.0564	0.1568	-0.0045
50	0.0734	0.1168	-0.0036
51	0.0461	0.1419	-0.0161
52	0.0862	0.1682	0.0316
53	0.0737	0.1551	0.0579
54	0.0371	0.2239	0.0323
55	0.0202	0.1925	0.0271
56	0.0150	0.2231	0.0078
57	-0.0351	0.2373	-0.0121
58	-0.0420	0.2530	0.0012
59	-0.0210	0.2451	-0.0199
60	-0.0493	0.2212	-0.0282
61	-0.0847	0.2166	-0.0281
62	-0.0722	0.2027	-0.0200
63	-0.0755	0.2085	-0.0150

64	-0.0669	0.1301	-0.0377
65	-0.0209	0.0924	0.0158
66	0.0094	0.0613	0.0338
67	-0.0193	0.0299	0.0084
68	0.0000	-0.0361	0.0464
69	-0.0208	-0.0856	0.0452
70	-0.0740	-0.1272	0.0700
Průměry:	0.0530	0.1241	0.0137
Rozptyly:	0.0067	0.0093	0.0017
Sm.odchylky:	0.0821	0.0962	0.0406
	CETV	CEZ	KOBA





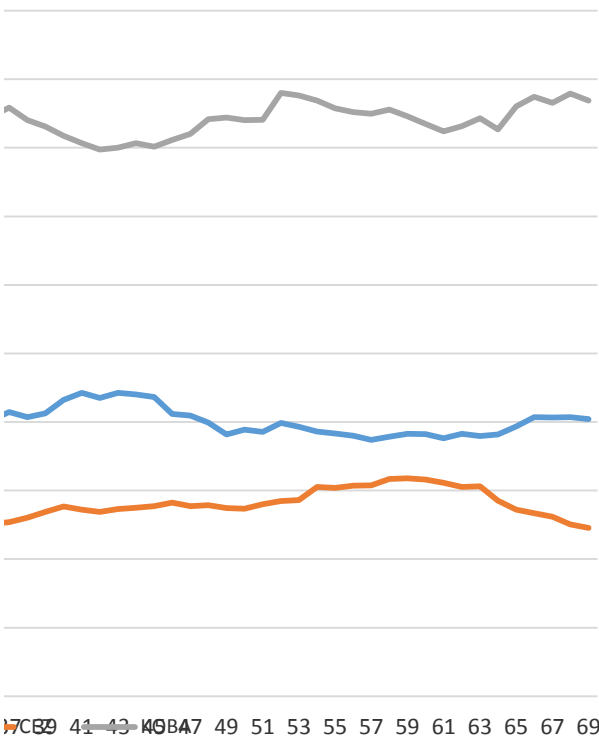
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KOBA	ING konto	0.002167
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-0.00232	0	
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akcií



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## Markowitzův model

Model používá 30-tidenní výnosy

Průměrné výnosy, tj  $R_i$ : 

0.0530	0.1241	0.0137
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Průměrné riziko tj  $S_i$ : 

0.0821	0.0962	0.0406
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Kovarianční matice, tj.  $S_{ij}$ : 

	CETV	CEZ	KOBA
CETV	0.0067	-0.0010	0.0001
CEZ	-0.0010	0.0093	-0.0023
KOBA	0.0001	-0.0023	0.0017

$Z_i$ : 

0.1216	0.2857	0.5927
--------	--------	--------

 suma:

krátký prodej: 

0	0	0
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$Z_i * \text{Kov.mat.}$ : 

0.0006	0.0012	0.0003
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Výnos:

Zadaný výnos:

Riziko:

1 =

## Sharpeův model

Model používá 30-tidenní výnosy

Průměrné výnosy, tj $R_i$ :	0.0530	0.1241	0.0137
Průměrné riziko tj $S_i$ :	0.0821	0.0962	0.0406

Kovarianční matice, tj. $S_{ij}$ :	CETV	CEZ	KOBA
CETV	0.0067	-0.0010	0.0001
CEZ	-0.0010	0.0093	-0.0023
KOBA	0.0001	-0.0023	0.0017

$Z_i$ : 

0.1536	0.3713	0.4750
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 suma: 1

krátký prodej: 

0	0	0
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$Z_i * \text{Kov.mat.}$ : 

0.0007	0.0022	-0.0001
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Výnos:

Riziko:

Zadané riziko:

=

## Blackův model (s bezrizikovým aktivem)

Minimalizace rizika při zadaném výnosu

Model používá 30-tidenní výnosy

Průměrné výnosy, tj $R_i$ :	0.0530	0.1241	0.0137	0.0022
Průměrné riziko tj $S_i$ :	0.0821	0.0962	0.0406	0.0000

Kovarianční matice, tj. $S_{ij}$ :	CETV	CEZ	KOBA	ING konto
CETV	0.0067	-0.0010	0.0001	0.0000
CEZ	-0.0010	0.0093	-0.0023	0.0000
KOBA	0.0001	-0.0023	0.0017	0.0000
ING konto	0.0000	0.0000	0.0000	0.0000

$Z_i$ :	0.1236	0.2947	0.4882	0.0935
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krátký prodej:	0	0	0	0
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$Z_i * \text{Kov.mat.}$ :	0.0006	0.0015	0.0001	0.0000
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Výnos:

Zadaný výnos:

Riziko:

suma: 1.0000 =



**Tobinův model s krátkým prodejem (a bezrizikovým ak**  
**Maximalizace výnosu při zadaném riziku a krátkém prodej**  
**Model používá 30-tidenní výnosy**

Průměrné výnosy, tj $R_i$ :	0.0530	0.1241
Průměrné riziko tj $S_i$ :	0.0821	0.0962

Kovarianční matice, tj. $S_{ij}$ :	CETV	CEZ
CETV	0.0067	-0.0010
CEZ	-0.0010	0.0093
KOBA	0.0001	-0.0023
ING konto	0.0000	0.0000

$Z_i$ :	0.2233	0.5575
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krátký prodej:	-1	-1
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$Z_i * \text{Kov.mat.}$ :	0.0010	0.0044
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(tivem)  
ji 100%

0.0137	0.0022
0.0406	0.0000

Výnos:

KOBA	ING konto
0.0001	0.0000
-0.0023	0.0000
0.0017	0.0000
0.0000	0.0000

Riziko:

0.2192	0.0000
--------	--------

suma:

1.0000

=

-1	0
----	---

-0.0009	0.0000
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0.0840

0.0500

Zadané riziko: 0.05

1

**Ceny akcií (denní):**

datum	CETV	CEZ	KOBA	PX
1	1,856.00	1,059.00	4,266.00	1,798.60
2	1,913.00	1,072.00	4,108.00	1,812.10
3	1,905.00	1,094.00	4,108.00	1,806.30
4	1,868.00	1,182.00	4,072.00	1,776.20
5	1,860.00	1,186.00	3,987.00	1,762.40
6	1,865.00	1,192.00	3,835.00	1,757.50
7	1,859.00	1,200.00	3,886.00	1,765.00
8	1,832.00	1,293.00	3,832.00	1,755.70
9	1,871.00	1,302.00	3,953.00	1,770.20
10	1,853.00	1,307.00	4,002.00	1,761.90
11	1,854.00	1,399.00	4,047.00	1,747.80
12	1,862.00	1,302.00	3,994.00	1,750.80
13	1,870.00	1,239.00	4,030.00	1,780.70
14	1,864.00	1,214.00	4,133.00	1,790.90
15	1,834.00	1,123.00	4,271.00	1,793.80
16	1,808.00	1,140.00	4,257.00	1,792.10
17	1,814.00	1,159.00	4,261.00	1,802.90
18	1,836.00	1,203.00	4,318.00	1,825.30
19	1,807.00	1,186.00	4,239.00	1,816.30
20	1,812.00	1,224.00	4,216.00	1,828.80
21	1,843.00	1,226.00	4,274.00	1,845.50
22	1,834.00	1,219.00	4,266.00	1,835.10
23	1,831.00	1,238.00	4,142.00	1,862.70
24	1,860.00	1,246.00	4,208.00	1,881.50
25	1,878.00	1,273.00	4,175.00	1,896.10
26	1,872.00	1,255.00	4,228.00	1,883.40
27	1,938.00	1,243.00	4,300.00	1,881.00
28	1,975.00	1,265.00	4,273.00	1,900.70
29	1,954.00	1,277.00	4,316.00	1,898.80
30	2,010.00	1,293.00	4,294.00	1,908.30
31	2,054.00	1,279.00	4,239.00	1,886.30
32	2,063.00	1,268.00	4,242.00	1,892.20
33	2,053.00	1,266.00	4,280.00	1,886.00

34	2,047.00	1,261.00	4,295.00	1,876.10
35	2,010.00	1,245.00	4,236.00	1,848.40
36	2,015.00	1,257.00	4,230.00	1,867.60
37	2,072.00	1,270.00	4,292.00	1,872.60
38	2,036.00	1,301.00	4,201.00	1,884.60
39	2,064.00	1,343.00	4,155.00	1,910.10
40	2,161.00	1,384.00	4,087.00	1,936.10
41	2,213.00	1,360.00	4,033.00	1,913.40
42	2,175.00	1,344.00	3,987.00	1,908.30
43	2,213.00	1,365.00	4,002.00	1,925.50
44	2,201.00	1,375.00	4,033.00	1,908.30
45	2,183.00	1,385.00	4,008.00	1,888.60
46	2,059.00	1,411.00	4,056.00	1,903.30
47	2,046.00	1,386.00	4,102.00	1,871.40
48	1,996.00	1,392.00	4,209.00	1,860.90
49	1,909.00	1,372.00	4,220.00	1,832.10
50	1,945.00	1,367.00	4,201.00	1,820.50
51	1,928.00	1,400.00	4,205.00	1,811.10
52	1,992.00	1,424.00	4,401.00	1,828.30
53	1,966.00	1,430.00	4,382.00	1,797.40
54	1,929.00	1,525.00	4,344.00	1,793.80
55	1,916.00	1,518.00	4,288.00	1,770.60
56	1,900.00	1,535.00	4,261.00	1,767.10
57	1,870.00	1,538.00	4,248.00	1,728.20
58	1,892.00	1,585.00	4,278.00	1,742.00
59	1,913.00	1,590.00	4,230.00	1,767.90
60	1,911.00	1,579.00	4,173.00	1,771.10
61	1,880.00	1,556.00	4,120.00	1,737.70
62	1,914.00	1,525.00	4,157.00	1,748.10
63	1,898.00	1,530.00	4,216.00	1,757.60
64	1,910.00	1,425.00	4,133.00	1,774.10
65	1,968.00	1,360.00	4,303.00	1,766.90
66	2,034.00	1,334.00	4,373.00	1,756.60
67	2,032.00	1,308.00	4,328.00	1,778.80
68	2,036.00	1,254.00	4,396.00	1,812.80

69	2,021.00	1,228.00	4,343.00	1,842.70
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**Výnosy akcií (30-denní):**

CETV	CEZ	KOBA	PX	ING konto
0.1067	0.2077	-0.0063	0.0488	0.0022
0.0784	0.1828	0.0326	0.0442	0.0022
0.0777	0.1572	0.0419	0.0441	0.0022
0.0958	0.0668	0.0548	0.0562	0.0022
0.0806	0.0497	0.0625	0.0488	0.0022
0.0804	0.0545	0.1030	0.0626	0.0022
0.1146	0.0583	0.1045	0.0610	0.0022
0.1114	0.0062	0.0963	0.0734	0.0022
0.1032	0.0315	0.0511	0.0790	0.0022
0.1662	0.0589	0.0212	0.0989	0.0022
0.1936	-0.0279	-0.0035	0.0947	0.0022
0.1681	0.0323	-0.0018	0.0900	0.0022
0.1834	0.1017	-0.0069	0.0813	0.0022
0.1808	0.1326	-0.0242	0.0656	0.0022
0.1903	0.2333	-0.0616	0.0528	0.0022
0.1388	0.2377	-0.0472	0.0621	0.0022
0.1279	0.1959	-0.0373	0.0380	0.0022
0.0871	0.1571	-0.0252	0.0195	0.0022
0.0564	0.1568	-0.0045	0.0087	0.0022
0.0734	0.1168	-0.0036	-0.0045	0.0022
0.0461	0.1419	-0.0161	-0.0186	0.0022
0.0862	0.1682	0.0316	-0.0037	0.0022
0.0737	0.1551	0.0579	-0.0351	0.0022
0.0371	0.2239	0.0323	-0.0466	0.0022
0.0202	0.1925	0.0271	-0.0662	0.0022
0.0150	0.2231	0.0078	-0.0618	0.0022
-0.0351	0.2373	-0.0121	-0.0812	0.0022
-0.0420	0.2530	0.0012	-0.0835	0.0022
-0.0210	0.2451	-0.0199	-0.0689	0.0022
-0.0493	0.2212	-0.0282	-0.0719	0.0022
-0.0847	0.2166	-0.0281	-0.0788	0.0022
-0.0722	0.2027	-0.0200	-0.0762	0.0022
-0.0755	0.2085	-0.0150	-0.0681	0.0022

	-0.0669	0.1301	-0.0377	-0.0544	0.0022
	-0.0209	0.0924	0.0158	-0.0441	0.0022
	0.0094	0.0613	0.0338	-0.0594	0.0022
	-0.0193	0.0299	0.0084	-0.0501	0.0022
	0.0000	-0.0361	0.0464	-0.0381	0.0022
	-0.0208	-0.0856	0.0452	-0.0353	0.0022
Cov(Xi,P)	0.0045	-0.0022	0.0006	0.0037	0.0000
Var(Xi)	0.0065	0.0078	0.0016	0.0037	0.0000
BETAi	0.6872	-0.2802	0.3555	1.0000	0.0000
E(Xi)	0.0563	0.1305	0.0122	0.0021	0.0022
ALFAi	0.0548	0.1311	0.0115	0.0000	0.0022
Var(ei)	0.0048	0.0075	0.0011	0.0000	0.0000





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### Sharpeův Indexový model

Model používá 30-tidenní výnosy

$$R_{PF} = \sum E(X_i) Z_i$$

$$\sigma_{PF}^2 = \text{Var}(F) \sum \sum \beta_i \beta_j Z_i Z_j$$

$$\text{Var}(X_i) - \beta_i^2 \text{Var}(F) = \text{Var}(e_i)$$

Průměrné výnosy, tj Ri:

0.0530	0.1241	0.0137	0.0022
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Kovariance s PX:

	CETV	CEZ	KOBA	ING konto	PX
PX50	0.0045	0.0040	0.0021	0.0000	0.003666
Koeficient BETAi:	BETA	0.6872	0.8066	1.1853	0.0000
Koeficient ALFAi:	ALFA	0.0548	0.1267	0.0337	0.0000
Individ.riziko:	Var(ei)	0.0048	0.0026	-0.0034	0.0000

Zi:

0.0113	0.7058	0.0000	0.2829	suma:	1.0000
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krátký prodej:

0	0	0	0
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Zi<sup>2</sup>:

0.0001	0.4981	0.0000	0.0800
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(suma BETAi\*Zi)<sup>2</sup> = 0.3330

$$+ \sum Var(e_i) Z_i^2$$

$e_i$ )

Výnos: **0.088797**

Riziko: **0.050001**

Zadané rizí **0.05**

= **1**

**Markowitzův Indexový model**

Model používá 30-tidenní výnosy

$$R_{PF} = \sum (\alpha_i + \beta_i E(F)) Z_i$$

$$\sigma^2_{PF} = Var(F) \sum \sum \beta_i \beta_j Z_i Z_j + \sum Var(e_i)$$

$$Var(X_i) - \beta_i^2 Var(F) = Var(e_i)$$

Průměrné výnosy, tj Ri:

0.0530	0.1241	0.0137	0.0022
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Kovariance s PX:

	CETV	CEZ	KOBA	ING konto	PX
PX50	0.0045	0.0040	0.0021	0.0000	0.003666
Koeficient BETAi:	BETA	0.6872	0.8066	1.1853	0.0000
Koeficient ALFAi:	ALFA	0.0548	0.1267	0.0337	0.0000
Individ.riziko:	Var(ei)	0.0048	0.0026	-0.0034	0.0000

Zi:

0.0123	0.7693	0.0000	0.2184	suma:	1.0000
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krátký prodej:

0	0	0	0
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Zi^2.:

0.0002	0.5918	0.0000	0.0477
--------	--------	--------	--------

(suma BETAi\*Zi)^2 = 0.3956

$e^{i} Z_i^2$

Výnos: 0.096595

Riziko: 0.054501

Zadaný výnos: 0.10

= 1

## Kataokův model

Model používá 30-tidenní výnosy

1-alpha = 0.95

k\_alpha = 1.64485

Průměrné výnosy, tj Ri: 

0.0322	0.1046	0.0137
--------	--------	--------

Průměrné riziko tj Si: 

0.0805	0.0885	0.0401
--------	--------	--------

Kovarianční matice, tj. Sij: 

	CETV	CEZ	KOBA
CETV	0.0065	-0.0018	0.0003
CEZ	-0.0018	0.0078	-0.0020
KOBA	0.0003	-0.0020	0.0016

Zi: 

0.0000	1.0000	0.0000
--------	--------	--------

 suma:

krátký prodej: 

0	0	0
---	---	---

Zi\*Kov.mat.: 

-0.0018	0.0078	-0.0020
---------	--------	---------

Výnos:

Účel.fce:

Riziko:

1 =



## Min-Risk model

Model používá 30-tidenní výnosy  
maximalizuje se pravděpodobnost dosažení **zadané hodnoty**

Průměrné výnosy, tj  $R_i$ : 

0.0322	0.1046	0.0137
--------	--------	--------

Průměrné riziko tj  $S_i$ : 

0.0805	0.0885	0.0401
--------	--------	--------

Kovarianční matice, tj.  $S_{ij}$ : 

	CETV	CEZ	KOBA
CETV	0.0065	-0.0018	0.0003
CEZ	-0.0018	0.0078	-0.0020
KOBA	0.0003	-0.0020	0.0016

$Z_i$ : 

0.2035	0.4139	0.3826
--------	--------	--------

 suma:

krátký prodej: 

0	0	0
---	---	---

$Z_i \cdot \text{Kov.mat.}$ : 

0.0007	0.0021	-0.0001
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výnosu PF

Výnos:

Zadaný výnos: 0.02

Riziko:

Účel. fce:

1 =