**Lecture 8**

**Example 1**

Calculate the optimal portfolio using tangential approach. Further you know that the risk free return is 3,5 % p. a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | O2 | ČEZ | Erste Bank | CETV | Fortuna | PX |
| 20 | 570 | 98,4 | 669,1 | 53,9 | 103,5 | 333,4 |
| 19 | 569 | 98,2 | 715 | 53,8 | 103 | 338,9 |
| 18 | 563,8 | 96,6 | 725 | 53,2 | 101,9 | 346,8 |
| 17 | 575,3 | 96,5 | 716 | 53,9 | 100 | 347,8 |
| 16 | 595,1 | 97 | 725 | 55,6 | 101,6 | 350,9 |
| 15 | 602,8 | 98,4 | 727,5 | 57 | 101,2 | 348,1 |
| 14 | 601,8 | 99 | 716,6 | 54,7 | 102 | 349,4 |
| 13 | 601,3 | 105,4 | 721,5 | 55,6 | 101,6 | 354,2 |
| 12 | 614,8 | 116,9 | 718,6 | 55,9 | 101,7 | 361,1 |
| 11 | 628,1 | 119,6 | 717,8 | 56,5 | 100,5 | 372,7 |
| 10 | 629 | 113,2 | 729,5 | 56,4 | 103,4 | 371,6 |
| 9 | 618,6 | 109,5 | 702,6 | 54,9 | 102,3 | 395,9 |
| 8 | 638 | 105 | 750,8 | 55 | 102,8 | 397,6 |
| 7 | 656 | 104,9 | 789,7 | 56,6 | 99,8 | 406,1 |
| 6 | 662 | 105,3 | 799,1 | 56,9 | 101,4 | 400,7 |
| 5 | 669,4 | 105,7 | 805 | 56 | 100,9 | 396,6 |
| 4 | 700,7 | 108,5 | 870 | 56,7 | 95,3 | 398,2 |
| 3 | 709 | 110,3 | 937,6 | 57 | 65,7 | 400,9 |
| 2 | 713 | 112,6 | 948,8 | 56,8 | 99,4 | 399,1 |
| 1 | 708 | 113,9 | 951,5 | 56,5 | 99,2 | 401,1 |

Then compare the results (return, risk) with the global minimum approach.

**Example 2**

Calculate the beta and equilibrium return for the stock K. Further, calculate the portfolio return and risk of expected return in the portfolio:

1. by global minimum,

2. by required return of 13%,

3. by tangential portfolio.

For the calculation use the monthly returns. The risk free rate is 4 % p. a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | K | L | M | Index |
| 22.2.2016 | 176,39999 | 82,39 | 15,86121 | 112,48 |
| 19.2.2016 | 182,01 | 82,5 | 25,05275 | 110,49 |
| 18.2.2016 | 186,21001 | 82,45 | 9,439176 | 111,34 |
| 17.2.2016 | 182,61 | 82 | 28,95428 | 108,98 |
| 16.2.2016 | 175,49001 | 81,22 | 18,83143 | 106,03 |
| 12.2.2016 | 177,75 | 81,03 | 3,040745 | 107,33 |
| 11.2.2016 | 180,05 | 79,6 | 8,759708 | 107,23 |
| 10.2.2016 | 182,95 | 79,35 | 30,16247 | 108,61 |
| 9.2.2016 | 182,47 | 80,08 | 3,064378 | 108,03 |
| 8.2.2016 | 181,62 | 81,16 | 12,43475 | 106,82 |
| 5.2.2016 | 183,53 | 80,08 | 28,47809 | 108,74 |
| 4.2.2016 | 182,01 | 79,83 | 19,2481 | 107,32 |
| 3.2.2016 | 180,23 | 78,48 | 31,10395 | 105,26 |
| 2.2.2016 | 177,14 | 74,59 | 29,55045 | 105,35 |
| 1.2.2016 | 174,09 | 76,29 | 25,21651 | 102,71 |
| 29.1.2016 | 169,84 | 77,85 | 29,17203 | 100,7 |
| 28.1.2016 | 164,62 | 76,99 | 12,35519 | 96,45 |
| 27.1.2016 | 163,94 | 75,29 | 2,982268 | 96,96 |
| 26.1.2016 | 165,73 | 76,7 | 31,57403 | 98,53 |
| 25.1.2016 | 165,71001 | 73,98 | 12,09742 | 99,96 |
| 22.1.2016 | 158,99001 | 76,57 | 22,51798 | 97,39 |
| 21.1.2016 | 161,39 | 74,1 | 14,8775 | 99,52 |
| 20.1.2016 | 155,61 | 73,18 | 17,93703 | 97,13 |
| 19.1.2016 | 156,82001 | 76,4 | 31,18719 | 96,66 |
| 15.1.2016 | 153,75 | 77,58 | 9,428935 | 96,79 |
| 14.1.2016 | 151,64999 | 79,12 | 13,27212 | 96,3 |
| 13.1.2016 | 156,86 | 75,65 | 22,00399 | 101,42 |
| 12.1.2016 | 151,12 | 75,2 | 26,23458 | 99,44 |
| 11.1.2016 | 154,45 | 73,69 | 3,208768 | 99,99 |
| 8.1.2016 | 153,72 | 74,69 | 3,180001 | 93,42 |
| 7.1.2016 | 157,06 | 76,23 | 12,89221 | 94,09 |
| 6.1.2016 | 161,56 | 77,47 | 23,94523 | 97,34 |
| 5.1.2016 | 159,64999 | 78,12 | 21,27231 | 96,43 |
| 4.1.2016 | 151,7 | 77,46 | 18,1377 | 94,48 |
| 31.12.2015 | 152,67999 | 77,95 | 25,8186 | 96,35 |
| 30.12.2015 | 156,49001 | 78,11 | 18,82358 | 96,6 |
| 29.12.2015 | 156,47 | 79,16 | 15,40536 | 94,02 |
| 28.12.2015 | 149,25 | 78,74 | 7,53424 | 95,01 |
| 24.12.2015 | 148,25 | 79,33 | 11,47335 | 94,99 |
| 23.12.2015 | 147,23 | 80,19 | 7,742066 | 94,27 |
| 22.12.2015 | 140,69 | 77,65 | 14,87221 | 93,7 |
| 21.12.2015 | 146,13001 | 77,26 | 25,70735 | 93,99 |
| 18.12.2015 | 149,02 | 77,28 | 18,05419 | 96,64 |
| 17.12.2015 | 150,94 | 77,96 | 38,05016 | 98,12 |
| 16.12.2015 | 147,73 | 79,15 | 39,50302 | 96,26 |
| 15.12.2015 | 146,91 | 79,43 | 30,98474 | 96,04 |
| 14.12.2015 | 148,78999 | 76,03 | 3,72283 | 96,88 |