Constructing a mean-variance portfolio of four assets

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Abstract- List of five special criteria is constructed and based on this list are selected four financial assets. It is calculated the return and risk for each of them. It is built up a mean-variance portfolio with fixed return and minimum risk conditions. It is calculated the portfolio structure and it is noticed that the investor prefers to invest the less in the first two assets which shows the lowest return and risk and prefers to invest an appropriate proportion in the latter two assets of the highest risk but with a more attractive return.

Index Terms- Assets, Mean-Variance portfolio, Return, Risk

I. Introduction

In 1990 Harry Markowitz received the Nobel Prize in Economics for his work in the 50s of XX century, which offers the first systematic solution to the dilemma that every investor faces: conflicting objectives of high profit and low risk.
The model of Markowitz also called Mean-Variance modelused the statistical analysis for measurement of risk and selection of assets in a portfolio in an efficient manner. His framework led to the concept of efficient portfolios. An efficient portfolio is expected to yield the highest return for a given level of risk or lowest risk for a given level of return [1-8].

Markowitz generated a number of portfolios within a given amount of money or wealth and given preferences of investors for risk and return. Individuals vary widely in their risk tolerance and asset preferences. Their means, expenditures and investment requirements vary from individual to individual [9-15]. Given the preferences, the portfolio selection is not a simple choice of anyone security or securities, but a right combination of securities. Markowitz emphasised that quality of a portfolio will be different from the quality of individual assets within it. Thus, the combined risk of two assets taken separately is not the same risk of two assets together [16-23].

In this article we aim to show how can create a portfolio from four assets using Mean-Variance model proposed by Harry Markowitz.

II. MATERIALS AND METHODS

Markowitz Mean-Variance model

The model of Markowitz also called Mean-Variance model is parametric optimization model that is both common enough for most practical situations and simple enough for theoretical analysis and numerical solutions. This model has the following mathematical representation [24]:

$$(1)\quad \left| \begin{array}{l} \min \frac{1}{2}\sigma_P^2 = \min \frac{1}{2}\sum_{k=1}^{n}\sum_{j=1}^{n} x_k x_j \sigma_{kj} \\ \sum_{k=1}^{n} x_k \mu_k = \rho \\ \sum_{k=1}^{n} x_k = 1 \end{array} \right. ,$$

where x_k is the percentage of capital that will be invested in asset k; μ_k is the expected return per asset k; σ_{kj} is the covariance between assets k and j; σ_P^2 is the expected return of the portfolio and σ_P is the portfolio risk.

Selection criteria for selection of assets

The process of selecting the assets in which to invest certain amount of capital is done by the decision maker (investor). For this purpose, there are many strategies that investors can use to ready to combine or even ignored, as follows only his own flair. Let us in this paper the list of assetsfrom which to invest, to be built up based on the following rules:

- shares belong to different market sectors;
- thecoefficientPrice/Earnings Growth Ratio (PEG)have a sufficiently good values;
- reports of analysts based on the financial performance of the company and the state of the sector in which it operates, provide an estimate: the stock to be bought.
- to invest in large companies, because thanks to its size is more likely to overcome the problems negatively affecting the price of their assets.
- to take into account the index USATODAYStockMeter, which is associated with the reliability of companies.

Calculation of return

In practice there are different ways to calculate the return per asset.

Simple Return

Let P_i is the price of an asset at date t and assume for now that this asset pays no dividends and let P_{t-1} is the price in month $t-1$.Then the one-month simple net return on investments in asset between months $t-1$ and i is calculated by the formula [25]:

$$R_i = \frac{P_i - P_{i-1}}{P_{i-1}}.$$

Recording

$$\frac{P_i - P_{i-1}}{P_{i-1}} = \frac{P_i}{P_{i-1}} - 1,$$

the simple net return is defined by:

$$1 + R_i = \frac{P_i}{P_{i-1}}.$$

One month gross income is interpreted as the future value of 1 means money invested in stocks for a month.

Continuously compounded return

The continuously compounded return is denoted by r_i and it is defined [25]:

$$r_i = \ln(1+R_i) = \ln\left(\frac{P_i}{P_{i-1}}\right), \quad (2)$$

where $\ln(\cdot)$ the natural logarithm function.

Continuously compounded returns are very similar to simple returns with regard to the relatively small returns, which is generally true for monthly or daily rate, usually.

However, for the purposes of modeling and statistics it is much more convenient to use continuous complicated returns due to additive properties.Moreover, asset prices are positive integers in which $R_i = \frac{P_i - P_{i-1}}{P_{i-1}} \in (-1, +\infty)$ and $r_i = \ln\left(\frac{P_i}{P_{i-1}}\right) \in \mathbf{R}$. Thus, the representation is advantageous because it is assumed that the returns are normally distributed, and there are in the interval $(-\infty, +\infty)$.

Calculation of mathematical expectation, variance and covariance based on historical data of stock prices

Let us have a portfolio $X(x_1, x_2, \dots, x_k)$, consisting of k number of assets. Then the expected return μ_k per asset k is calculated by [8]:

$$\mu_k = E[r^k] = \frac{\sum_{i=1}^{m} r_i^k}{m} = \overline{r^k}, \quad (3)$$

where r_i^k is the return per asset k between periods $i-1$ and i $(i = 1, \dots, m)$, and m is the number of periods, whose return we have calculated.

The variance and the covariance per asset are calculated using the following formulas[8]:

$$\sigma_k^2 = Var[r^k] = \frac{\sum_{i=1}^{m} [r_i^k - \overline{r^k}]^2}{m-1}, \quad (4)$$

$$\sigma_{kj} = \frac{\sum_{i=1}^{m} [r_i^k - \overline{r^k}][r_i^j - \overline{r^j}]}{m}. \quad (5)$$

Whenworking with assets dimensions of risk are organized in the return covariance matrix $\Omega_{n\times n}$, usually. This matrix contains vriances in its main diagonal and covariances between all pairs of assets other items, i.e.

$$\Omega = \begin{pmatrix} \sigma_1^2 & \sigma_{12} & \dots & \sigma_{1n} \\ \sigma_{21} & \sigma_2^2 & \dots & \sigma_{2n} \\ \dots & \dots & \dots & \dots \\ \sigma_{n1} & \sigma_{n2} & \dots & \sigma_n^2 \end{pmatrix}. \quad (6)$$

Portfolio return and risk

According to [26] the variance of a portfolio is calculated using by:

(7)

$$\sigma_P^2 = X^T \Omega X,$$

$$X = \lambda_1 \Omega^{-1}\mu + \lambda_2 \Omega^{-1} e,$$

$$\mu = (\mu_1, \mu_2, \dots, \mu_N)^T, \quad e = (1, 1, \dots, 1)^T, \quad \lambda_1 = \frac{A\rho - B}{D}, \quad \lambda_2 = \frac{C - \rho B}{D},$$

$$A = e^T \Omega^{-1} e, \quad B = e^T \Omega^{-1} \mu, \quad C = \mu^T \Omega^{-1} \mu, \quad D = AC - B^2.$$

The first identity of (7) can be overwritten in terms of the portfolio return R_P and matrices A, B, C and D as:

$$\sigma_P^2 = \frac{1}{D}\left(AR_P^2 - 2BR_P + C\right). \quad (8)$$

This identity emphasizes the effective relationship between portfolioreturn R_P and its variance σ_P^2. According to(8), theportfolio return R_P is given by:

$$R_P = \frac{B}{A} + \sqrt{\frac{D}{A}}\sqrt{\sigma_P^2 - \frac{1}{A}}. \quad (9)$$

The risk of portfolio is

$$\sigma_P = \sqrt{\sigma_P^2}.$$

III. RESULTS AND DISCUTIONS

Based on selected five rules, the list of assetsamong which will be invested, has four companies that provisionally we will denote with *I*, *II*,*III*and*IV*.

There are many sources of free access, which can be obtained historical price data (daily, weekly or monthly) for each asset.For the purposes of this work we use historical data of assets prices provided by websitewww.finance.yahoo.com. Prices of each of the four assetswe use weekly data for a period of four years.Let us denote the order of these observations $i = \overline{0, m}$. Due to the fact that a year has 52 weeks, for a selected period we have $m = 208$. Then with P_i^k we denote the price for a period i perasset k $(k = 1, 2, 3, 4)$.

Using price per asset k $(k = 1, 2, 3, 4)$ for two consecutive periods $i-1$ and i we calculate using formula (2) the returns r_i^k for period i .The results are presented in Appendix I.

In the reviewed model (1), using equation (3), we calculate the expected returns of each of the selected assets

$$\mu = \left(0.00234, -0.00024, 0.000005, 0.00625\right)^T.$$

For a return covariance matrix, using (4), (5) and (6), we get:

$$\Omega = \begin{pmatrix} 0.00268 & 0.00129 & 0.00077 & 0.00165 \\ 0.00129 & 0.00350 & 0.00090 & 0.00151 \\ 0.00077 & 0.00090 & 0.00123 & 0.00057 \\ 0.00165 & 0.00151 & 0.00057 & 0.00351 \end{pmatrix}.$$

Then the inverse of a matrix Ω, we have

$$\Omega^{-1} = \begin{pmatrix} 606.61695 & -71.40607 & -226.64758 & -217.63695 \\ -71.40607 & 412.69751 & -206.05924 & -110.51266 \\ -226.64758 & -206.05924 & 1097.83196 & 16.90990 \\ -217.63695 & -110.51266 & 16.90990 & 432.00468 \end{pmatrix}.$$

By successive calculations of equations (7), we get

$$\Omega^{-1}e = \begin{pmatrix} 90.92635 \\ 24.71953 \\ 682.03504 \\ 120.76497 \end{pmatrix}, \quad \Omega^{-1}\mu = \begin{pmatrix} 0.07526 \\ -0.95787 \\ -0.36973 \\ 2.21737 \end{pmatrix},$$

(10)

$$A = 918.44589, \quad B = 0.96503, \quad C = 0.01413, \quad D = 12.04636.$$

Let us have the following additional requirement to the portfolio, which will be drawn, namely: portfolio return not less than triple the compound interest formula. Let us assume that the investor has chosen one particular bank, whose compound interest for one-year deposit with increasing interest for a period of one week is 7.25%. Therefore, to be prepared on a weekly return greater than

$$\rho = (1 + 3 * 0.0725)^{1/52} - 1 = 0.0038.$$

Hence, from equations (7) and received by the above results, we calculate successively

$$\lambda_1 = 0.22486, \quad \lambda_2 = 0.00085.$$

Therefore the portfolio is

$$X = \begin{pmatrix} 0.09421 \\ 0.00318 \\ 0.30136 \\ 0.60081 \end{pmatrix},$$

and the variance of a portfolio is

$$\sigma_P^2 = 0.00185.$$

From here the risk of portfolio we compute by

$$\sigma_P = \sqrt{\sigma_P^2} = \sqrt{0.00185} = 0.04302.$$

Thus, the risk of portfolio in percentage is

$$\sigma_P = 4.3\%.$$

Using by (9) from portfolio return, we have

$$R_P = \frac{B}{A} + \sqrt{\frac{D}{A}}\sqrt{\sigma_P^2 - \frac{1}{A}} = 0.00421.$$

This relation is valid for $\sigma_P \geq 0.0330$ provide effective for any size portfolio return R_P according to the risk assumed σ_P.

In view of the fact that the derivative of a function is, in terms of geometric slope of the tangent taken at the graph of the function at that point, it is clear that the equation of the tangent taken at the point (σ_P, R_P) to the hyperbola, which is Markowitz border (efficient frontier portfolios) will be:

(11) $$R - R_P = (R_P)'_{\sigma_P}\left(\sigma - \sigma_P\right).$$

According to (10) and (11)the tangent equation at the point $M(0.04302, 0.00421)$ is

$$R = 0.14497\sigma + 0.00347.$$

Therefore the intersection with the ordinates axis is obtained for $\sigma = 0$ and is $R = 0.00347$.

IV. CONCLUSIONS

This article aims to show how can create a portfolio using Mean-Variance model proposed by Harry Markowitz.For this purpose under a special criteria we selected four financial assetsfor which we calculated the return and risk for each of them. We built up a portfolio of fixed return of 0.4%, with minimum risk conditions.The portfolio structure is: $x_I = 9.4\%,\ x_{II} = 0.3\%,\ x_{III} = 30.1\%,\ x_{IV} = 60.1\%$, while the minimum risk of the portfolio is 4.3%.By correlating the results with the initial data of the problem we can noticethat an investor prefers to invest the less in the assets x_I and x_{II} which shows thelowest return and risk and prefers to invest an appropriate proportion in theassets of the highest risk, x_{III} and x_{IV}, but with a more attractive return. By building up the portfolio, the investor bearing a behavior of Markowitz type succeeded to get a risk of 4.3%, a value below the risk of any other asset of the portfolio, here the significance of the Markowitz model being observed to the best.

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AppendixI:Calculated returns of selected assetsfor a period of four years.

Period	I	II	III	IV	Period	I	II	III	IV
22.8.20012 - 29.8.2012	0,017	0,085	0,023	0,010	17.9.2014 - 24.9.2014	0,013	0,004	0,000	0,063
29.8.2012 - 6.9.2012	0,036	0,010	0,015	0,104	24.9.2014 - 1.10.2014	0,046	0,024	0,040	0,051
6.9.2012 - 12.9.2012	0,004	-0,020	0,015	-0,002	1.10.2014 - 8.10.2014	0,070	0,000	0,006	0,035
12.9.2012 - 19.9.2012	0,049	0,020	0,002	0,038	8.10.2014 - 15.10.2014	0,011	-0,083	-0,056	0,019
19.9.2012 - 26.9.2012	0,003	-0,003	0,018	0,008	15.10.2014 - 22.10.2014	0,045	0,020	0,044	0,080
26.9.2012 - 3.10.2012	-0,011	-0,037	-0,033	-0,044	22.10.2014 - 29.10.2014	0,053	-0,004	-0,005	0,017
3.10.2012 - 10.10.2012	-0,055	-0,034	-0,044	0,051	29.10.2014 - 5.11.2014	-0,069	-0,060	-0,014	-0,128
10.10.2012 - 17.10.2012	0,138	-0,108	-0,014	0,030	5.11.2014 - 12.11.2014	-0,047	-0,014	0,000	0,006
17.10.2012 - 24.10.2012	0,052	0,043	0,044	-0,022	12.11.2014 - 19.11.2014	0,066	-0,012	0,001	0,030
24.10.2012 - 31.10.2012	0,086	0,048	-0,023	0,116	19.11.2014 - 26.11.2014	0,024	0,047	0,026	0,060
31.10.2012 - 7.11.2012	0,000	0,024	-0,004	0,006	26.11.2014 - 3.12.2014	0,031	0,031	0,031	0,064
7.11.2012 - 14.11.2012	0,025	0,043	0,000	0,048	3.12.2014 - 10.12.2014	-0,035	-0,011	-0,037	-0,020
14.11.2012 - 21.11.2012	0,069	0,012	0,011	0,071	10.12.2014 - 17.12.2014	0,010	-0,009	0,003	0,018
21.11.2012 - 28.11.2012	-0,026	0,015	-0,004	0,046	17.12.2014 - 24.12.2014	0,008	0,006	-0,014	0,030
28.11.2012 - 5.12.2012	-0,021	-0,012	0,008	0,023	24.12.2014 - 31.12.2014	-0,067	-0,065	-0,013	-0,104
5.12.2012 - 12.12.2012	0,050	0,026	0,010	-0,044	31.12.2014 - 7.1.2015	-0,029	-0,037	0,036	-0,042
12.12.2012 - 19.12.2012	0,002	-0,019	-0,002	0,031	7.1.2015 - 14.1.2015	-0,061	-0,044	-0,068	-0,068
19.12.2012 - 27.12.2012	-0,038	-0,013	-0,007	-0,020	14.1.2015 - 22.1.2015	-0,058	0,049	-0,081	-0,216
27.12.2012 - 3.1.2013	0,116	0,045	0,015	0,060	22.1.2015 - 28.1.2015	-0,093	0,085	0,062	0,028
3.1.2013 - 9.1.2013	0,001	0,031	-0,013	0,115	28.1.2015 - 4.2.2015	0,002	-0,054	-0,009	-0,064
9.1.2013 - 17.1.2013	-0,155	-0,021	0,005	-0,118	4.2.2015 - 11.2.2015	0,025	0,028	-0,001	-0,007
17.1.2013 - 23.1.2013	0,082	0,105	-0,001	-0,055	11.2.2015 - 19.2.2015	-0,042	0,017	-0,019	-0,042
23.1.2013 - 30.1.2013	-0,128	0,009	-0,034	-0,003	19.2.2015 - 25.2.2015	-0,075	0,016	-0,033	0,045
30.1.2013 - 6.2.2013	-0,051	0,009	0,008	-0,065	25.2.2015 - 3.3.2015	-0,084	-0,035	-0,007	-0,022
6.2.2013 - 13.2.2013	0,017	0,047	0,009	0,043	3.3.2015 - 10.3.2015	0,010	0,068	-0,010	0,035
13.2.2013 - 21.2.2013	0,023	0,009	0,002	0,017	10.3.2015 - 17.3.2015	-0,010	-0,013	0,015	0,051
21.2.2013 - 27.2.2013	0,002	0,026	0,001	-0,054	17.3.2015 - 24.3.2015	0,010	0,043	0,003	0,071
27.2.2013 - 6.3.2013	-0,114	-0,050	-0,032	-0,069	24.3.2015 - 31.3.2015	0,073	0,010	0,046	0,068
6.3.2013 - 13.3.2013	0,007	0,072	0,005	0,023	31.3.2015 - 7.4.2015	-0,029	-0,040	0,029	-0,040
13.3.2013 - 20.3.2013	0,074	-0,010	-0,021	-0,075	7.4.2015 - 14.4.2015	0,165	0,136	0,011	0,090
20.3.2013 - 27.3.2013	0,064	-0,050	-0,021	0,045	14.4.2015 - 21.4.2015	0,009	-0,036	-0,009	0,053
27.3.2013 - 3.4.2013	0,041	0,042	-0,009	0,107	21.4.2015 - 28.4.2015	0,066	0,007	0,018	0,064

3.4.2013 - 10.4.2013	-0,010	0,027	-0,030	-0,049	28.4.2015 - 5.5.2015	-0,014	-0,013	-0,018	0,014
10.4.2013 - 17.4.2013	0,083	0,015	0,024	0,009	5.5.2015 - 12.5.2015	0,012	0,024	-0,011	0,022
17.4.2013 - 24.4.2013	-0,045	-0,028	-0,002	0,049	12.5.2015 - 19.5.2015	-0,063	-0,026	-0,030	-0,035
24.4.2013 - 1.5.2013	-0,058	0,054	0,013	0,021	19.5.2015 - 27.5.2015	0,073	0,013	0,005	0,041
1.5.2013 - 8.5.2013	-0,053	-0,027	-0,029	-0,060	27.5.2015 - 2.6.2015	-0,033	-0,033	-0,009	-0,017
8.5.2013 - 15.5.2013	-0,011	-0,067	0,013	-0,048	2.6.2015 - 9.6.2015	0,008	0,019	0,020	-0,074
15.5.2013 - 22.5.2013	0,030	0,022	0,024	-0,015	9.6.2015 - 16.6.2015	-0,045	-0,030	-0,034	0,017
22.5.2013 - 30.5.2013	-0,005	-0,022	0,032	-0,030	16.6.2015 - 23.6.2015	-0,034	-0,070	-0,044	-0,030
30.5.2013 - 5.6.2013	0,019	-0,075	0,000	-0,040	23.6.2015 - 30.6.2015	0,017	-0,048	-0,001	0,000
5.6.2013 - 12.6.2013	0,011	0,044	-0,022	-0,029	30.6.2015 - 7.7.2015	-0,006	-0,007	0,014	0,014
12.6.2013 - 19.6.2013	0,036	0,022	-0,007	0,022	7.7.2015 - 14.7.2015	-0,103	0,021	-0,016	-0,044
19.6.2013 - 26.6.2013	0,035	0,032	0,010	-0,027	14.7.2015 - 21.7.2015	0,022	-0,006	0,005	-0,019
26.6.2013 - 3.7.2013	0,003	-0,026	0,013	-0,033	21.7.2015 - 28.7.2015	-0,050	-0,034	-0,023	-0,034
3.7.2013 - 10.7.2013	-0,041	-0,048	-0,003	-0,089	28.7.2015 - 4.8.2015	0,056	0,040	0,019	0,079
10.7.2013 - 17.7.2013	-0,034	-0,008	0,021	0,181	4.8.2015 - 11.8.2015	0,030	-0,008	-0,015	0,036
17.7.2013 - 24.7.2013	-0,005	0,041	0,030	0,077	11.8.2015 - 18.8.2015	-0,039	-0,001	0,011	0,006
24.7.2013 - 31.7.2013	-0,037	0,026	0,017	0,040	18.8.2015 - 25.8.2015	-0,057	0,007	0,002	-0,042
31.7.2013 - 7.8.2013	-0,014	-0,087	-0,009	-0,071	25.8.2015 - 2.9.2015	-0,042	-0,099	-0,041	-0,057
7.8.2013 - 14.8.2013	0,040	0,019	0,002	0,065	2.9.2015 - 8.9.2015	-0,015	0,021	0,044	-0,073
14.8.2013 - 21.8.2013	-0,027	-0,035	-0,013	0,012	8.9.2015 - 15.9.2015	0,026	0,016	-0,024	-0,055
21.8.2013 - 28.8.2013	0,014	0,019	0,022	-0,005	15.9.2015 - 22.9.2015	-0,041	-0,036	-0,027	-0,094
28.8.2013 - 5.9.2013	-0,002	0,001	-0,022	0,059	22.9.2015 - 29.9.2015	-0,108	-0,225	-0,044	-0,278
5.9.2013 - 11.9.2013	0,081	-0,029	0,016	0,022	29.9.2015 - 6.10.2015	-0,153	-0,172	-0,239	-0,003
11.9.2013 - 18.9.2013	-0,015	-0,041	-0,010	-0,015	6.10.2015 - 13.10.2015	0,115	-0,082	0,081	0,006
18.9.2013 - 25.9.2013	-0,005	0,047	0,007	0,053	13.10.2015 - 20.10.2015	-0,093	-0,166	0,021	-0,011
25.9.2013 - 2.10.2013	0,045	0,034	0,024	-0,037	20.10.2015 - 27.10.2015	0,057	0,137	0,052	0,110
2.10.2013 - 9.10.2013	0,016	0,015	0,071	0,011	27.10.2015 - 3.11.2015	-0,082	0,006	-0,042	-0,091
9.10.2013 - 16.10.2013	0,073	-0,153	0,033	0,064	3.11.2015 - 10.11.2015	-0,066	-0,040	0,002	-0,085
16.10.2013 - 23.10.2013	0,033	0,038	-0,009	0,006	10.11.2015 - 17.11.2015	-0,167	-0,064	-0,065	-0,089
23.10.2013 - 30.10.2013	-0,007	-0,014	-0,001	-0,027	17.11.2015 - 24.11.2015	0,110	0,168	0,076	0,115
30.10.2013 - 6.11.2013	0,004	-0,014	0,023	0,060	24.11.2015 - 1.12.2015	-0,031	-0,069	-0,045	0,014
6.11.2013 - 13.11.2013	0,052	0,022	-0,002	0,032	1.12.2015 - 8.12.2015	0,106	0,095	-0,002	0,044
13.11.2013 - 20.11.2013	0,012	0,031	0,005	0,065	8.12.2015 - 15.12.2015	-0,018	0,014	0,067	-0,088
20.11.2013 - 27.11.2013	-0,049	-0,027	0,010	-0,003	15.12.2015 - 22.12.2015	-0,032	0,001	0,006	-0,048
27.11.2013 - 4.12.2013	0,007	0,035	-0,003	-0,034	22.12.2015 - 29.12.2015	0,067	0,094	0,058	0,056
4.12.2013 - 11.12.2013	-0,008	-0,025	0,013	-0,006	29.12.2015 - 5.1.2016	-0,020	-0,082	-0,042	-0,002
11.12.2013 - 18.12.2013	-0,053	-0,020	0,003	-0,065	5.1.2016 - 12.1.2016	-0,050	-0,078	-0,004	-0,095

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18.12.2013 - 26.12.2013	0,011	0,012	0,001	0,032	12.1.2016 - 20.1.2016	0,080	-0,103	-0,017	0,071
26.12.2013 - 3.1.2014	0,056	-0,018	-0,013	0,002	20.1.2016 - 26.1.2016	0,042	-0,145	-0,018	0,020
3.1.2014 - 8.1.2014	0,036	-0,008	-0,004	0,107	26.1.2016 - 2.2.2016	0,092	0,076	0,070	0,101
8.1.2014 - 16.1.2014	-0,031	-0,001	0,002	-0,067	2.2.2016 - 9.2.2016	-0,037	-0,073	-0,043	-0,006
16.1.2014 - 22.1.2014	0,012	0,028	0,031	-0,036	9.2.2016 - 17.2.2016	-0,032	-0,149	-0,077	-0,084
22.1.2014 - 29.1.2014	-0,029	0,066	0,023	-0,007	17.2.2016 - 23.2.2016	-0,025	-0,080	-0,049	-0,021
29.1.2014 - 5.2.2014	-0,042	-0,007	0,035	-0,018	23.2.2016 - 2.3.2016	-0,091	-0,058	-0,123	-0,046
5.2.2014 - 12.2.2014	0,017	0,043	0,010	0,019	2.3.2016 - 9.3.2016	0,050	0,142	0,018	0,117
12.2.2014 - 20.2.2014	0,001	-0,006	-0,003	0,049	9.3.2016 - 16.3.2016	0,018	0,011	0,088	0,057
20.2.2014 - 26.2.2014	-0,070	-0,065	-0,019	-0,042	16.3.2016 - 23.3.2016	0,052	0,114	-0,049	0,050
26.2.2014 - 5.3.2014	0,032	0,021	0,006	0,030	23.3.2016 - 30.3.2016	0,062	0,058	0,001	0,082
5.3.2014 - 12.3.2014	-0,027	-0,019	0,018	0,018	30.3.2016 - 6.4.2016	0,007	0,011	0,004	0,030
12.3.2014 - 19.3.2014	0,046	0,057	0,067	0,043	6.4.2016 - 13.4.2016	0,052	0,006	0,034	0,032
19.3.2014 - 26.3.2014	-0,008	0,002	-0,008	-0,007	13.4.2016 - 20.4.2016	-0,007	0,041	-0,043	0,004
26.3.2014 - 2.4.2014	0,029	0,009	0,002	0,019	20.4.2016 - 27.4.2016	0,011	0,103	0,029	0,027
2.4.2014 - 9.4.2014	-0,011	-0,013	-0,004	-0,048	27.4.2016 - 4.5.2016	0,034	0,062	-0,014	0,015
9.4.2014 - 16.4.2014	0,034	0,077	0,034	0,008	4.5.2016 - 11.5.2016	-0,043	-0,104	-0,047	-0,054
16.4.2014 - 23.4.2014	-0,007	0,027	0,000	0,094	11.5.2016 - 18.5.2016	0,009	-0,041	0,008	0,001
23.4.2014 - 30.4.2014	-0,017	-0,009	0,001	0,009	18.5.2016 - 26.5.2016	0,059	0,033	0,046	0,103
30.4.2014 - 7.5.2014	-0,009	0,024	-0,022	0,076	26.5.2016 - 1.6.2016	0,063	0,081	0,017	0,063
7.5.2014 - 14.5.2014	0,008	-0,001	0,005	0,012	1.6.2016 - 8.6.2016	-0,045	-0,019	0,044	-0,055
14.5.2014 - 21.5.2014	0,028	0,013	-0,039	0,032	8.6.2016 - 15.6.2016	-0,011	-0,114	0,013	0,018
21.5.2014 - 29.5.2014	0,034	0,032	0,007	0,041	15.6.2016 - 22.6.2016	0,012	0,027	0,009	0,021
29.5.2014 - 4.6.2014	0,030	0,005	-0,057	0,050	22.6.2016 - 29.6.2016	-0,040	-0,085	-0,012	-0,017
4.6.2014 - 11.6.2014	-0,019	0,033	0,030	-0,033	29.6.2016 - 6.7.2016	0,014	-0,039	0,009	-0,011
11.6.2014 - 18.6.2014	0,037	-0,003	-0,062	0,021	6.7.2016 - 13.7.2016	0,038	0,120	0,043	0,091
18.6.2014 - 25.6.2014	-0,004	-0,033	0,035	-0,008	13.7.2016 - 20.7.2016	0,038	0,212	0,038	0,053
25.6.2014 - 2.7.2014	0,031	0,006	0,009	0,081	20.7.2016 - 27.7.2016	-0,008	0,048	0,001	0,021
2.7.2014 - 9.7.2014	0,023	0,077	0,020	0,040	27.7.2016 - 3.8.2016	0,031	0,081	0,021	0,013
9.7.2014 - 16.7.2014	-0,060	-0,019	-0,004	0,043	3.8.2016 - 10.8.2016	0,006	-0,038	-0,003	0,008
16.7.2014 - 23.7.2014	-0,016	-0,090	-0,067	0,001					
23.7.2014 - 30.7.2014	-0,018	0,038	0,020	-0,087					
30.7.2014 - 6.8.2014	0,025	-0,018	0,071	-0,053					
6.8.2014 - 13.8.2014	-0,031	-0,065	-0,009	-0,024					
13.8.2014 - 20.8.2014	0,029	0,049	0,007	0,103					
20.8.2014 - 27.8.2014	0,000	-0,007	-0,050	0,023					
27.8.2014 - 4.9.2014	0,008	-0,031	0,001	-0,050					

4.9.2014 - 10.9.2014	0,018	-0,004	0,012	0,052					
10.9.2014 - 17.9.2014	0,058	0,066	0,022	0,038					