

Evaluation of Financial Investment Effectiveness

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Abstract. The article is dedicated to description of an economic situation in the Russian banking sector, composition of models of an evaluation of financial investments, creation of an effective portfolio of financial investments based on modified Sharp model.

Key words. Portfolio investment, modified Sharp model, residual risk, sensitivity degree, coefficient β , average profitability.

Introduction

At the basis of investment decisions the evaluation of investment qualities of estimated objects of investment is lie which according to a technique of the modern investment analysis is conducted on a certain set of criteria indicators of efficiency. Determination of values of indicators of efficiency of investments allows estimating considered investment object from an acceptability position for the further analysis, to make a comparative assessment of a number of competing investment objects and their ranging, to carry out a choice of set of the investment objects providing the set ratio of efficiency and risk.

The evaluation of efficiency of investments is the most responsible stage of adoption of the investment decision, results of which depends on degree of realization of the purpose of investment considerably. In turn objectivity and reliability of the received results in many respects are caused by used methods of the analysis. The methods of definition of efficiency of investments developed in world practice are used for an assessment of efficiency both real investment projects, and financial investments, and also for a choice of investment objects.

The problem of formation of an investment portfolio of securities arose with the advent of securities and turned out to be consequence of natural unwillingness of the investor completely to connect the financial wellbeing with destiny of only one company. Its emergence and development are connected with such names, as G. Markovits, U. Sharp, J. Lintner, J. Tobin, etc.¹

The Russian managing directors of funds faced need of understanding and application of the portfolio theory also when forming portfolios of securities in conditions over the risky Russian financial market, as defines relevance of this graduation work.

The subject studied in work is actual from the scientific point of view to what the large volume of literature used as base for research testifies.

1. Financial investments.

Financial investments include securities, including debt (bonds, notes), contributions to the authorized capital of other organizations granted to other organizations loans and etc².

Their distinguishing feature is an external orientation beyond the enterprise. Speculative investments represent purchase of assets only for the sake of the possible change in price.

Portfolio investment is investment into various financial assets mainly for the purpose of obtaining the income in a type of cash flow or increase in their stock³.

Portfolio investment which represents an ordered that impact of subjects (portfolio investors and issuers) on investment mechanism in order to generate income in cash may be one of perspective ways of financing innovation in enterprises. Thus the part of this income can be directed on financing of perspective innovations.

¹ Semenkov E.V., Securities Transactions . - M. , 2011, ch. 6.

² Investments in Russia. 2007:Stat.sb. / Rosstat. – M., 2007 . Page 149.

³ Krushvits L. financing and investments. Neoclassical bases of the theory of finance. – SPb. : St. Petersburg, 2011

The main subjects of portfolio investment are investors (owners of free cash capital) and the issuers who are carrying out release of investment tools. Portfolio investment can also be undertaken by private persons and the state (in the process of formation of reserve funds), as well as socio-political and religious associations, charitable and other funds¹.

2. Models for evaluation of financial investments effectiveness

It should be noted that for effective work in unstable stock markets the new model of formation of an investment portfolio which received name modified Sharp model was offered. This model is based on interrelation of profitability of each security from all set of N securities with profitability of a single portfolio of these papers. In general modified Sharp model strongly resembles model offered by U. Sharp, but there are some differences. We will consider main assumptions of the modified Sharp model:

1. Profitability of a security estimates as a mathematical expectation of profitabilities. This assumption is and in Sharp's model.

2. The single portfolio represents the portfolio consisting of all considered securities, taken in an identical proportion. In Sharp's model the so-called market portfolio which dynamics is described often by a share index undertakes a reference portfolio (benchmark). For the Russian stock market it is the RTS index (RTSI), for the Ukrainian market the PFTS index, for the American stock market it is S&P500.

3. Profitability of a security in direct ratio profitabilities of a single portfolio. The same assumption in Sharp's model for a market portfolio.

4. The risk of a security calculates as sensitivity of change of profitability of a security from change of profitability of a single portfolio. Similarly for Sharp's model.

5. In difference from Sharp's model average profitability of a single portfolio, instead of state obligations undertakes a risk-free rate.

¹ Prather L., Bertin W.J., Henker T. Mutual funds characteristics, managerial attributes, and fund performance // Review of Financial Economics. - 2004. - Vol. 13, no. 4., p. 305-326.

The modified Sharp model connects profitability of a security to profitability of a single portfolio and risk of this security by means of function of linear regression.

Creation of a portfolio of real financial investments

We will construct an investment portfolio on the basis of the modified model of evaluation of capital assets of MCAPM in the Russian stock market. The model of evaluation of capital assets was offered by U. Sharp in 1961. After that there was a set of additions and specifications of this model.

Dynamics of prices of stocks of three companies is presented in table 4. We will construct a portfolio according to week data; it means that we will try to find a portfolio with the set week average profitability, residual week risks and coefficient β .

We constructed effective financial investments portfolio on the basis of modified Sharp model.

According to Sharp, the profit on each separate stock strictly correlates with the general market index that considerably simplifies procedure of finding of an effective portfolio. Application of model of Sharp demands considerably smaller number of calculations therefore it was more suitable for practical use.

Analyzing behaviour of stocks in the market, Sharp came to a conclusion that it isn't so obligatory to define covariance of each action with each other. It is quite enough to establish as each stock interacts with all market. And as it is a question of securities, therefore, it is necessary to take all size of the market of securities into account. However it must be kept in mind that the number of securities and first of all stocks in any country is rather great. With them daily enormous number of transactions as on exchange, and the off-exchange market is carried out. Stock prices constantly change therefore to determine any indicators by all market size it is almost impossible. At the same time it is established that if we will choose a quantity of certain securities, they will be able to characterize

movement of all securities market rather precisely. As such market indicator it is possible to use share indexes (see table1 in appendix).

3. Results of an evaluation of financial investments

3.1. Creation of a portfolio of real financial investments

We reject at once from consideration stocks of Sberbank and Rosneft as for they showed negative profit.

We find the expected income and a standard deviation for each share.

The following stage, for each stock we calculate average value of profitability for all year, that is for all time spans.

Further we calculate profitability of a single portfolio.

Having made necessary calculations, we calculate profitabilities of a single portfolio and its average profitability for entire periods. Profitability of single portfolio represents profitability of a portfolio made of the used stocks taken in equal proportions.

And so, let's generalize all obtained data in the table 2.

Name	Coefficient(β)	Average profitability	Residual risk
JSC Norilsk Nickel	0,3983	1,04%	0,05%
JSC Gazprom	1,1408	0,13%	0,18%
JSC Alrosa	1,4609	0,31%	0,28%

Table 2. Summarizing of all indicators

We work out the equation for finding of an optimum portfolio. As we will set an admissible maximum level of risk at 0,15%.

$$\left\{ \begin{array}{l} 1,04X_1 + 0,13X_2 + 0,31X_3 \rightarrow \max \\ \sqrt{0,3983 \cdot X_1^2 + 1,1408 \cdot X_2^2 + 1,4609 \cdot X_3^2} \leq 0,15 \\ X_1 + X_2 + X_3 = 1 \\ X_1, X_2, X_3 \geq 0 \end{array} \right. \quad (1)$$

We enter the obtained data in the table for calculations of shares (X_i) of each stock in a portfolio. It was necessary to solve the received equation and to calculate shares of each stock, for this purpose we will use embedded in an Excel “Solver”.

After superstructure start “Solver” we establish criterion function, it is profitability of all portfolio. After that we put a tag on maximizing value of this criterion function. Cells for change corresponds shares of stocks which need to be found. As it is necessary to impose restrictions on that sum of all shares would be equal 1, and that each share wouldn't be negative and the risk of a portfolio would be less than 0,15%.

After the done work shares in an investment portfolio for each stock is defined.

The optimum portfolio will consist of 62,22% of stocks of Norilsk Nickel (GMKN), 21,40% of stocks of Gazprom (GAZP) and 16,38% of stocks of Alrosa (ALRS). Profitability of all portfolio make 0,73% at the risk of a portfolio established in advance in 0,15%.

3.2. Evaluation efficiency of investments into the constructed portfolio

Linear regression is most often used type of the regression analysis. As a rule, the purpose of carrying out the regression analysis in this case is not so much equation calculation, how many creation of a trend (that is the approximating curve which is graphically showing dependence between variables).¹ On the received equation it is possible to predict what will be value of one variable at change (increase or reduction) another.

¹ Uotshem T.W., Parramou K. Quantitative methods in finance. - Moscow: Unity, 2009.

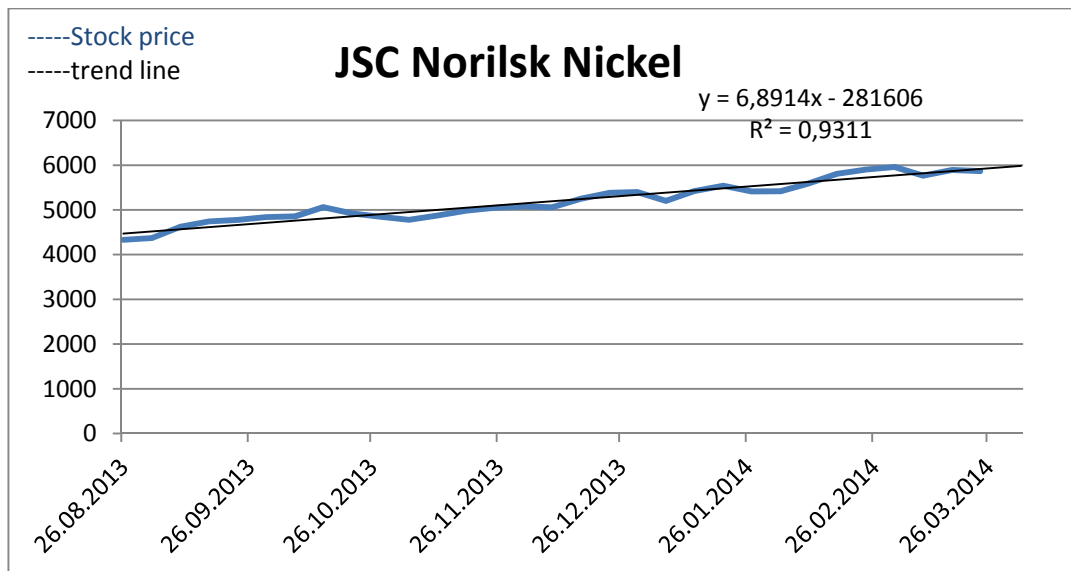


Chart 1. Linear regression of JSC Norilsk Nickel

Then it is necessary to consider the coefficient of R^2 showing, what share of a cumulative variation in a dependent variable is described by the chosen set of independent variables. The size R^2 changes from 0 to 1. As a rule, this indicator has to exceed 0,5 (the higher it is, the constructed regression model is more indicative). In our model R^2 of JSC Norilsk Nickel equals to 0,93 it means that the regression model described 93% of cases (dispersion in a total assessment of flight). Thus, at interpretation of results of the regression analysis it must be kept in mind essential restriction constantly: the constructed model is fair for 93% of cases; reliability of approximation is approximately close to one, which means the line of a trend chosen by us is ideally suited.

Charts for JSC Alrosa and JSC Gazprom (see in appendix).

We need to build the trend line for the period from March 10 to May 26 to trace the current conjuncture of our investment portfolio.

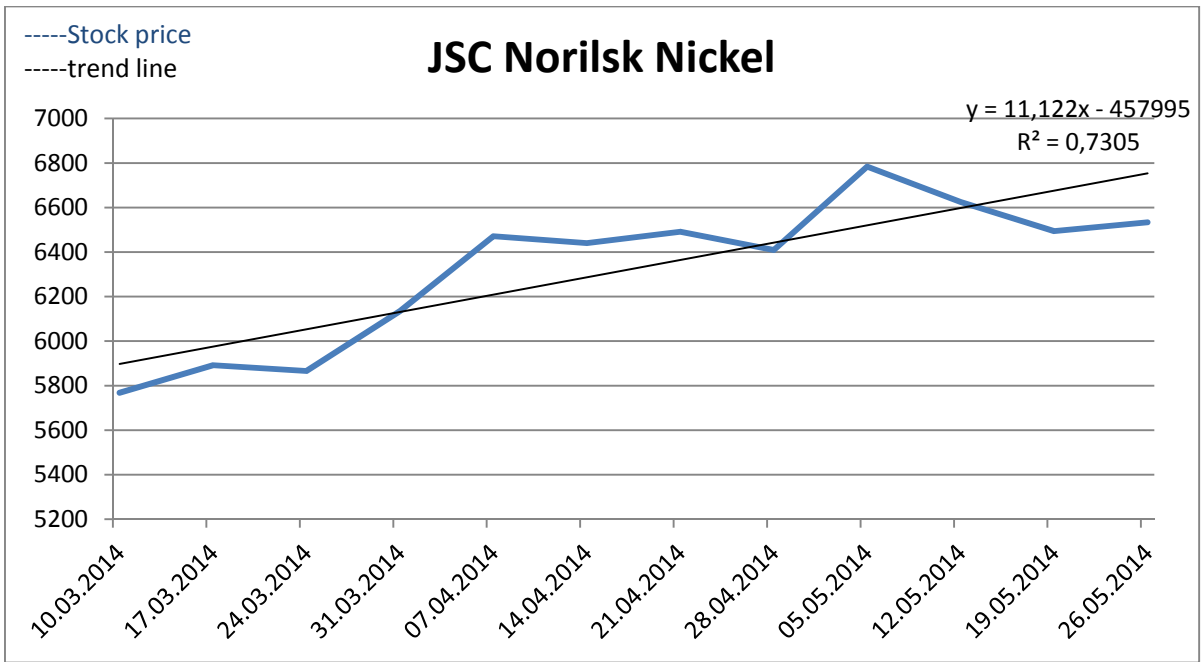


Chart 2. Linear regression of JSC Norilsk Nickel

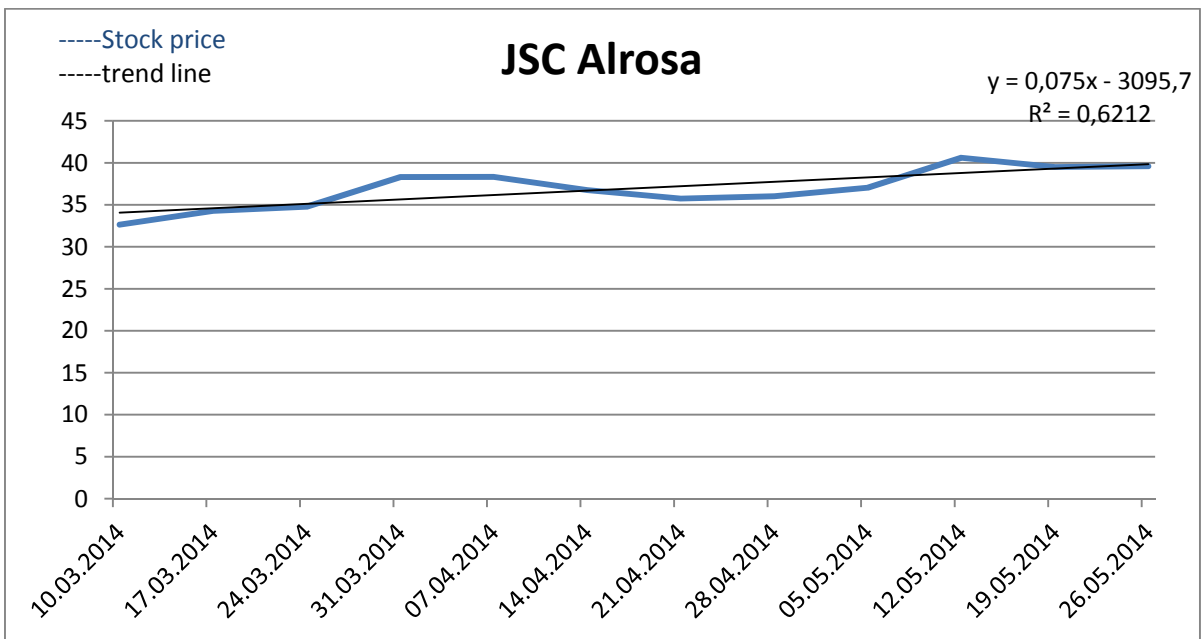


Chart 3. Linear regression of JSC Alrosa

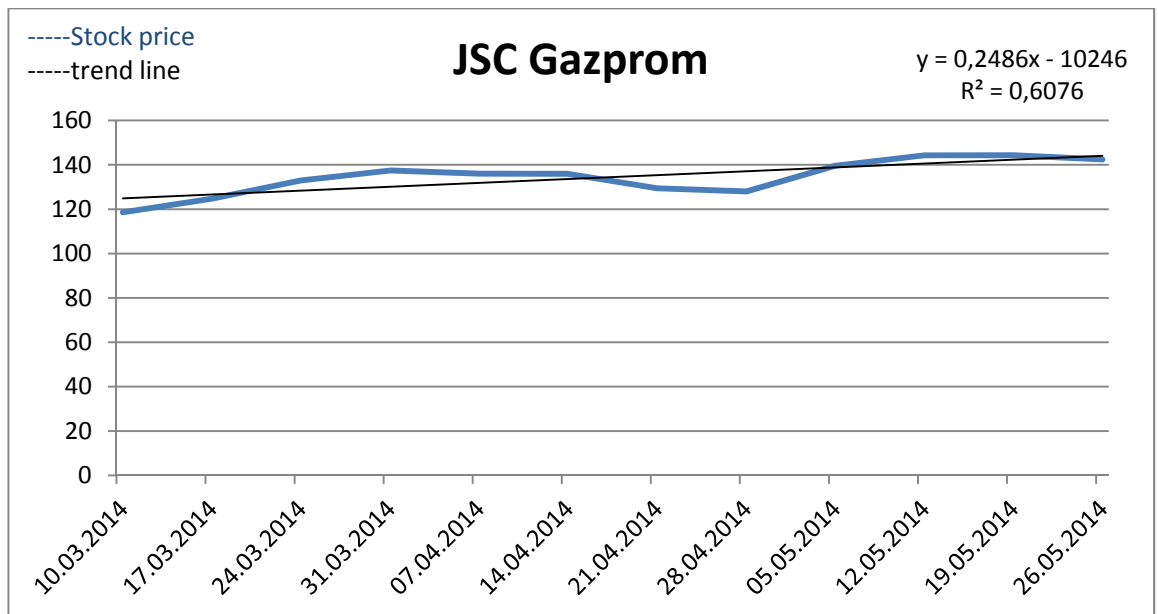


Chart 4. Linear regression of JSC Gazprom

The coefficient of determination is also commonly used to show how accurately a regression model can predict future outcomes. In JSC Norilsk Nickel, Gazprom and Alrosa the coefficient of determination is close to 1, it specifies that the model works very well (has the high importance), so our model can be used for future analysis.

One of the most popular methods of forecasting in stock market is the method based on model of the moving average.

We construct predicted values on a moving average for stocks of Norilsk Nickel, Gazprom and Alrosa, and also for profitability of a single portfolio. The schedule of stocks is given below.

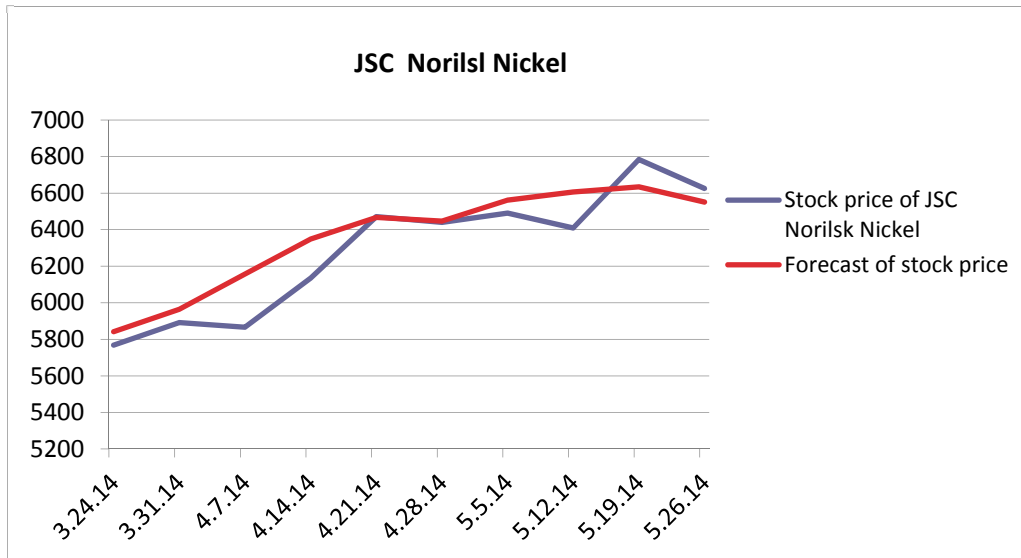


Chart 5. Quotations of Norilsk Nickel company

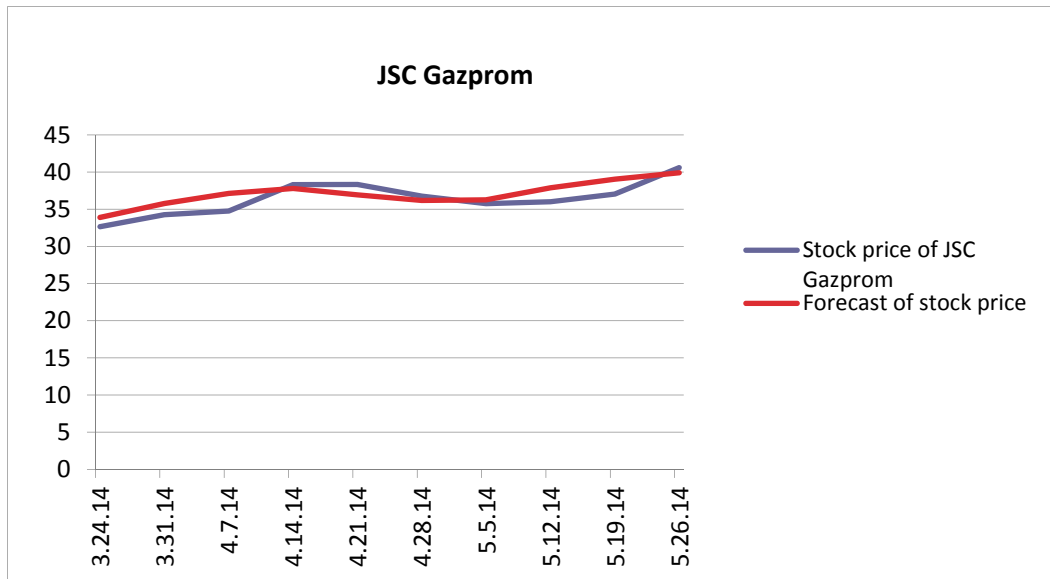


Chart 6. Quotations of Gazprom company

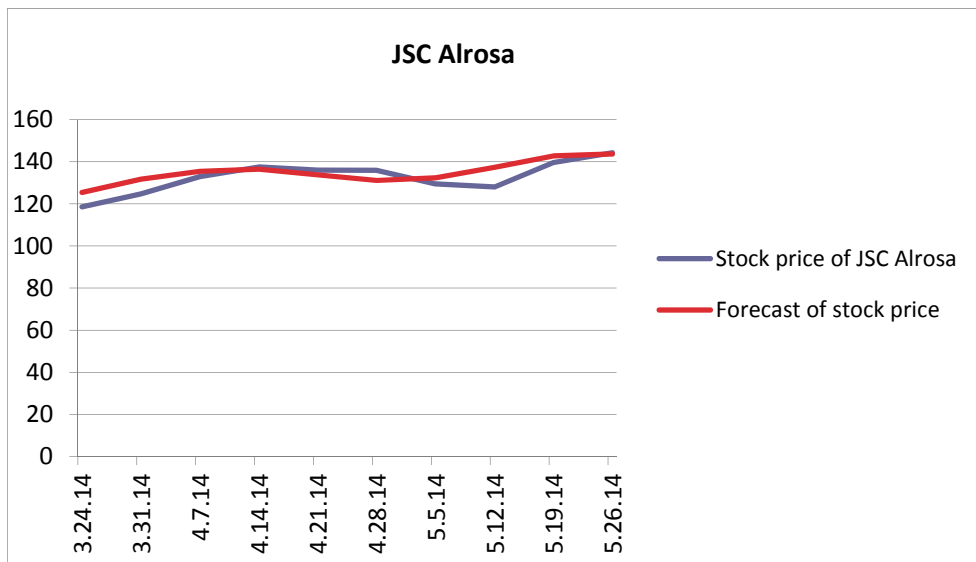


Chart 7. Quotations of Alrosa Company

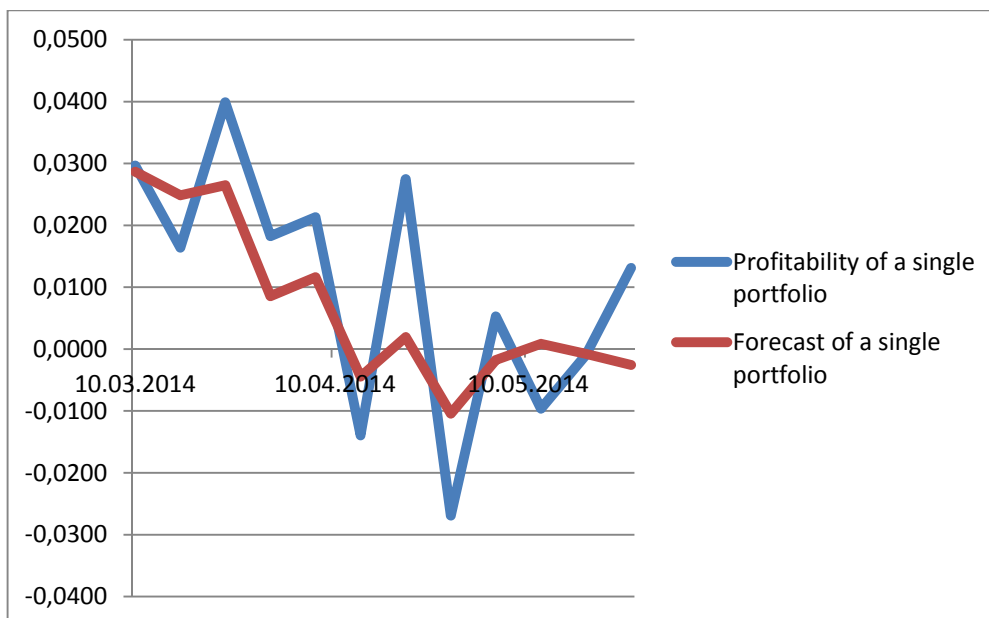


Chart 8. Real and target quotation of profitability of a single portfolio

Forecasting of indicators of economic activity is the integral component of economic process. In this regard there is a question of an evaluation of quality of the forecasts received in various ways¹.

¹ Tregub I.V., Evaluation of the period of efficiency of an investment portfolio methods of imitating modeling/ Actual problems of mathematical modeling in financially – economic area, issue 12 . Under Byvshev V.A. scientific edition. – M.: Financial University, 2013.

To learn, on how many approximate values differs from exact, it is necessary to subtract the smaller from bigger number. In other words, it is necessary to find the module of a difference of exact and approximate values, it is defined as following:

$$\sigma_k = \left| \frac{y_k - \tilde{y}_k}{y_k} \right| * 100\%; \quad (2)$$

where:

y_k - real data;

\tilde{y}_k – forecast data.

Therefore we should calculate forecasting error for Norilsk Nickel, Gazprom and Alrosa of May 26, 2014.

$$\sigma_{Norilsk\ Nickel} = 0,26\%$$

$$\sigma_{Gazprom} = 0,89\%$$

$$\sigma_{Alrosa} = 0,76\%$$

All three errors are less than 1, it testifies that the forecast is considered admissible as the forecast accuracy is higher, the lower value of error allowing to compare expected and actual values of studied value is. The future values can help to predict further fluctuations of stock price.

The modified model of evaluation of capital assets is more preferable, than the classical CAPM model, especially for unstable and being formed Russian stock market.

The effective set of the portfolio created by traditional approach, contains those portfolios which at the same time provide also the maximum expected profitability at a fixed risk level, and a minimum risk at a set level of expected profitability; it is supposed that the investor chooses an optimum portfolio from portfolios making an effective set.

The best technique for formation of optimum structure of a portfolio of securities is modified Sharp model because it is especially actual for the Russian stock market, for which character high instability. It demands use more exact methods of evaluation of the capital of the company.

The practical importance of the performed work consists that the analysis of approaches to formation of an investment portfolio on the basis of Sharp's model is carried out¹.

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¹ William F. Sharpe , Gordon J. Alexander , Jeffrey W. Bailey, "Investments", Infra-M ; 2011 .