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Evaluating the Efficiency of Investing in Securities of Russian Companies

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Abstract. The article presents various methods of investment performance evaluation that are currently in use. To evaluate and compare the efficiency of each financial assessment tool, three largest Russian industrial companies were selected and their six-year financial quotes were used. The evaluation findings revealed the most preferable methods that could be used given Russia's circumstances.

1. Introduction

The investment portfolio is a complex financial instrument purposefully created in line with a specific investment strategy and is a collection of certain types of investment. The investment portfolio creation depends on the adopted investment tactics and strategy; its focus is to make up the most viable and safest investments in accordance with the adopted strategy [1].

In this case, the investment viability and safety are determined by such indicators as [2]:

- support of a set income level
- risk minimization
- reduction of operating expense

The investment portfolio should be selected in such a way that would ensure that the included assets give maximum return, while the risk associated with the investment is minimal.

It is impossible to achieve all goals at the same time in view of the nature of those indicators that are fundamental in portfolio creation. It is virtually impossible to increase the return on investment while reducing the level of risk and enhancing liquidity. However, in our opinion, it is objectively possible to have a lower-boundary limited income, within a certain period, when the risk is below the set value provided that during this time there are no significant revolutionary changes in the economy at the macro-structure level.

It would be unviable to solve this problem using conventional optimization procedures due to the existing profit margin-exposure relation. The solution to this problem consists in selecting such a portfolio of assets that would cover exposure to loss at the extreme and yield maximum profit under favorable circumstances.

2. Materials and methods

The investment analysis practice lacks a single approach to creating an investment portfolio, despite the relevance of the task. It should be noted that the foreign authors take the development of such approaches rather seriously.

One of the approaches to assessing the investment attractiveness is described in the portfolio theory supported by H. Markowitz in his "Portfolio Selection" published in 1952, in which he proposed to use mathematical models to create investment portfolios [3].

In his theory, Markowitz inferred that an investor can reduce the risk of asset loss by selecting non-intercorrelated stocks, and proposed a probabilistic approach to determining the risks and returns on investment.

Currently, there are multiple approaches to evaluating investment performance. The majority of these tools are considered in the work of N.I. Berzon, and D.I. Doroshin [2].

One of the first solutions for such evaluation is the Capital Asset Pricing Model (CAPM). W. Sharpe proposed this model back in 1964.

Pursuant to the developed model, we should highlight two main points:

- The choice of a financial instrument is determined only by the mathematical expectation and variance of return of the instrument.

- Since all risk sources, except a market risk, can be reduced through diversification, only the market risk can be payable.

These two key assumptions formed the very model of investment performance evaluation:

$$\bar{r}_p = r_f + \beta_p \left(\bar{r}_m - r_f \right), \tag{1}$$

where

$\bar{r}_p$, = an expected return provided by a financial instrument

$\bar{r}_m$ = a measure of the expected return provided by the market in general

rf = risk free rate

βp = risk measure

The given portfolio risk measure is calculated using the formula:

$$\beta_p = \frac{\operatorname{cov}\left(r, r_m\right)}{\sigma_m^2}, \tag{2}$$

where

σ2m = variance of market return

Based on the CAPM model proposed by W. Sharpe, various researchers then proposed at once several measures that allow for an evaluation of investment performance.

One of the most commonly used indexes today is F. Modigliani index, which aims to estimate probable return on investment if the total asset risk were equal to the market risk [4]:

$$Md = \left(r - r_f \right) \frac{\sigma_m}{\sigma_p} + r_f, \tag{3}$$

where

r = return in general

rf = risk free rate

σm = standard deviation of market return

σp = standard deviation of portfolio return

F. Sortino and L. Price ratio could be used as a second measure of investment performance evaluation, which only takes into account the price risk, i.e. downside volatility [5]:

$$St = \frac{r_t - r_{\min}}{\sqrt{\frac{\sum_{i=1}^{T}\left(r_t - r_{\min}\right)^2}{T}}}, \quad (4)$$

where

rmin = minimum return level required by the investor

T = investment period

rt = return at time t

This method of calculation allows for a more adequate evaluation of investment performance.

Instead of the earnings yield of risk-free investments, the Sortino ratio uses the rmin measure (the minimum return level to which the investor agrees), since it is obvious that the investor implies to earn more than could be done without any risk [6].

In 1968, M. Jensen proposed yet another approach, which is referred to as Jensen's alpha [7].

$$\alpha_p = r_p - \left[r_f + \left(r_m - r_f\right) \times \beta_p\right], \quad (5)$$

where

rp = portfolio return

rm = market return

βp = portfolio risk measure

In 1994, W. Sharpe suggested the use of a new ratio for investment performance evaluation [8]:

$$Sh = \frac{r - r_f}{\sigma_p}, \quad (6)$$

where

σp = standard deviation of portfolio return

J. Treynor proposed another measure, which is based on the market risk, [9]:

$$Tr = \frac{r - r_f}{\beta_p}, \quad (7)$$

The Treynor ratio is similar to Sharpe ratio, the difference between the two being in the assessment of the additional returns only in relation to a risk that cannot be eliminated systematically [6].

In 1981, D. Sterling Jones developed and proposed his own ratio, which is based on the average maximum drawdown [10]:

$$Sl = \frac{r - r_f}{\bar{\delta}}, \quad (8)$$

where

$\bar{\delta}$ = value of the average maximum drawdown over a period

In 2000, one more measure for investment performance evaluation was proposed by M. Stutzer [11]:

$$I_p = \max_{\theta}\left[-\log\left(\frac{1}{T}\right)\sum_{i=1}^{T} e^{\theta\left(r - r_{\min}\right)}\right], \quad (9)$$

where

θ = maximization parameter.

The Stutzer index has some drawbacks associated with its instability, yet this property exhibits to a lesser extent, since this index accounts for the higher moments of distribution [6].

However, recently, some of the researchers have become inclined to believe that data distribution should be taken into account when evaluating investment performance. In particular, J. Pezier and A. White [12], having regard to the popularity of the Sharpe ratio in portfolio performance evaluations, suggested a modification of the ratio achieved through a calculation of such distribution parameters as skewness and kurtosis. The resulting ratio was called the Modified Sharpe Ratio, which is calculated by the following formula:

$$Sh\,\mathrm{mod} = Sh \cdot \left(1 + \left(\frac{As}{6}\right) \cdot Sh - \left(\frac{Ex}{24}\right) \cdot Sh^2\right), \tag{10}$$

where

Sh = standard Sharpe ratio
As = skewness of distribution
Ex = kurtosis

The considered evaluation methods allow for the analysis of stock-market securities. An express condition for the analysis is that the issuer is on the open market, and basic information on the issuer required for the analysis is on open access, in particular, his profit indicators, cost parameters, corporate governance level, etc. [13]

Table 1. Data on the Actual and "Fair" Price of Stock Items of the Selected Issuers, Rub.

Period		PJSC Lukoil Oil Company	PJSC MMC Norilsk Nickel	PJSC Mechel
2010	Q1	1670.5	4520	530
	Q2	1615	5440	788
	Q3	1733	4870	645
	Q4	1742	5950	738
2011	Q1	2032.5	6010	919
	Q2	1777.5	7500	834
	Q3	1637.5	7050	687
	Q4	1702.5	6350	357
2012	Q1	1781.5	5400	299
	Q2	1801.5	5550	264
	Q3	1922.5	5150	196
	Q4	2000	4900	208
2013	Q1	1998.5	5320	203
	Q2	1890.5	5290	133
	Q3	2055	4690	100
	Q4	2040	4720	103
2014	Q1	1960	5350	65
	Q2	2036	6020	47
	Q3	2015	6900	50
	Q4	2225	7600	19
2015	Q1	2705	10000	32
	Q2	2470	9910	62
	Q3	2243	9420	60
	Q4	2346	9450	65

Among all the papers, which meet these criteria, we shall choose the following three [14]:
- PJSC Lukoil Oil Company
- PJSC MMC Norilsk Nickel
- PJSC Mechel

To evaluate the efficiency of investment in any such company, it is necessary to provide data on their stock quotations over some time period. A six-year period (from 2010 to 2015) was analyzed. All of the above methods of investment performance evaluation were applied to the acquired figures.
All data are provided in Table 1.

3. Results and discussion

To evaluate the investment performance, the real 2016-2017 figures were selected.

Comparison of portfolio performance is provided in Table 2.

Table 2. Comparison of Investment Portfolios Performance.

Index	PJSC Lukoil Oil Company	PJSC MMC Norilsk Nickel	PJSC Mechel	Total Deviation
Modigliani Index	31.6	-4.7	45.9	7.3
Sortino and Price Ratio	37.6	3.6	46.4	13.3
Jensen's Alpha	36.7	11.4	38.7	27.9
Sharpe Ratio	29.7	-3.6	47.2	6.8
Treynor Ratio	29.4	-6.9	51.2	10.2
Jones Ratio	26.1	4.3	49.7	15.2
Modified Sharpe Ratio	33.4	1.2	49.1	4.6
Real Return	33.7	-2.9	49.3	X

In summary, different indexes provide for a different investment evaluation. The modified Sharpe ratio was the most powerful for these financial instruments, the total deviation for the entire portfolio was only 4.6%. The Sharpe ratio was almost as powerful with 6.8% deviations, and the Modigliani index with a total deviation of 7.3%. Deviations of the other indexes were over 10%. Jensen's alpha turned out to be the worst index that could be used for the instruments in question with deviations equaling a total of 27.9%.

The presented data show the extent of differences between the methods used to determine the efficiency of investment in securities of some companies.

4. Conclusion

As a result, we can conclude that for the Russian market, for a period of a relatively sustainable growth during 2010-2017, the use of the modified Sharpe ratio is the most acceptable. Moreover, the use of the Modigliani index and the Sharpe ratio (standard) to evaluate the efficiency of investment in certain Russian companies also yields a rather decent result. Other indexes give less accurate results.

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