

# ІННОВАЦІЙНО-ІНВЕСТИЦІЙНІ ПРОЦЕСИ

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ПРАТ «ФФ «Дарниця»»

## EFFICIENT MANAGEMENT OF CURRENCY INVESTMENT PORTFOLIO ON THE EXAMPLE OF DARNYTSYA PHARMACEUTICAL COMPANY

### ЕФЕКТИВНЕ УПРАВЛІННЯ ВАЛЮТНИМ ІНВЕСТИЦІЙНИМ ПОРТФЕЛЕМ НА ПРИКЛАДІ ПРАТ «ФАРМАЦЕВТИЧНА ФІРМА «ДАРНИЦЯ»»

*The presented article explores the investment methodology and offers practical recommendations for the effective management of the foreign currency investment portfolio of the enterprise of the pharmaceutical industry. Based on the use of existing scientific and methodological approaches, including system analysis, statistical methods, risk and profitability analysis, improved methods and models of currency portfolio management were developed. Such tools allow enterprises to increase flexibility, optimize investment decisions and minimize risks, which is especially important in the context of market volatility. The results of the research are of practical importance for pharmaceutical companies, allowing them to optimize the management of currency investment portfolios and increase the efficiency of investments in conditions of global economic uncertainty.*

**Keywords:** currency investment portfolio, risk management, pharmaceutical companies, effective portfolio management.

У процесі реалізації поданого дослідження було здійснено глибокий аналіз теоретичних положень та практичних аспектів, пов'язаних з формуванням та управлінням валютним інвестиційним портфелем підприємства. Метою роботи було не лише вивчення сутності інвестицій та портфельного інвестування, але й розробка конкретних методичних рекомендацій, які допоможуть підприємствам оптимізувати свої інвестиційні стратегії у відповідь на динамічні зміни фінансового ринку. Це дослідження охоплює комплексний аналіз інвестиційної діяльності, включаючи оцінку ризиків та дохідності, а також формулювання інвестиційних цілей, що є ключовими для успішного управління валютними портфелями. Основну увагу було приділено аналізу тенденцій розвитку фінансового ринку, як у світі, так і в Україні, з метою виявлення перспективних напрямків для інвестування та визначення потенційних ризиків. Це дозволило сформулювати чітке розуміння сучасного стану інвестиційної сфери та виокремити ефективні стратегії управління портфелем в умовах економічної невизначеності. На основі використання існуючих науково-методичних підходів, включаючи системний аналіз, статистичні методи, аналіз ризиків та дохідності, було розроблено вдосконалені методики та моделі управління валютними портфелями. Наукова новизна поданого дослідження полягає у вдосконаленні методики та моделі управління валютним інвестиційним портфелем, адаптованих до умов фінансової кризи та економічної невизначеності. Під час експерименту дослідження на ПРАТ «Фармацевтична фірма «Дарниця»» було доведено, що портфель, сформований за моделлю Шарпа демонструє найкращі показники дохідності та ризику у порівнянні з альтернативними інвестиційними стратегіями, що свідчить про його надзвичайну ефективність. Очікувана дохідність портфеля склала 30,47%, перевищуючи базовий показник на 20,7 п.п. Також важливим аспектом покращення ефективності інвестиційного портфеля було використання 14 валютних пар. Такий підхід забезпечив широкі можливості для диверсифікації, зменшуючи ризик, пов'язаний з концентрацією на вузькому наборі валют. Включення такої кількості валютних пар у портфель сприяло збалансуванню потенційних прибутків та ризиків, вносячи вклад у загальну стійкість інвестиційної стратегії.

**Ключові слова:** валютний інвестиційний портфель, управління ризиками, фармацевтичні підприємства, ефективне управління портфелем.

**Problem statement.** Investment is a critical aspect of the financial strategy of any enterprise. It serves as a driver of its growth, innovation, and capital increase. In the context of the modern economy, understanding the nature, goals, and types of investments is key to effective capital management and achieving the long-term financial goals of the enterprise.

Currency investment portfolios are an important tool for protection against volatility and a source of financial stability. To effectively manage them, you can use various strategies and methods of market analysis. For example, diversification of investments, analysis of financial statements of companies, assessment of macroeconomic trends, etc. Companies and investors must constantly improve their knowledge and skills in the field of finance in order to successfully manage their investments in the conditions of constant change and the need to quickly react to the situation.

**Analysis of recent research and publications.** Famous economists M. Brennan [1], H. Henry Kao [2], L. Gladstein [3], and B. Durham [4] made a significant contribution to the field of portfolio investments and their impact on international financial markets. The works of H. Markowitz [5] and V. Sharp [6] are devoted to the formation of effective investment portfolios and corresponding risk assessment. However, many issues remain not studied enough. In particular, the problems of forming and managing currency investment portfolios of Ukrainian enterprises of the pharmaceutical industry require in-depth research.

**Formulating the purposes of the article.** The purpose of the study is the development of theoretical provisions and the development of practical recommendations for the effective management of the currency investment portfolio of pharmaceutical industry enterprises.

**Methodology.** The work uses a wide range of theoretical and methodological approaches, including system analysis, statistical methods, risk and profitability analysis, as well as generalization and comparison methods

for effective identification and analysis of key factors that affect investment portfolio management.

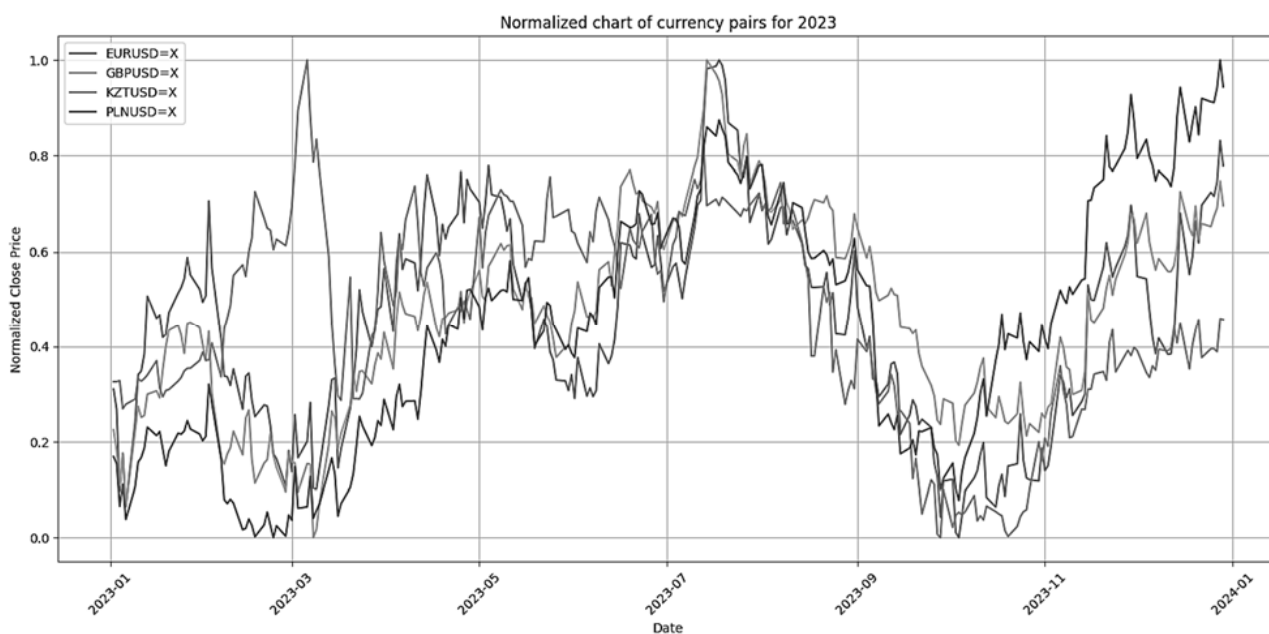
**Presentation of the main research material.** In the context of modern globalization and the integration of world economies, financial markets are undergoing rapid and significant changes, covering all areas of the economy – from capital markets to exchange rates. Understanding and adapting to these global trends are becoming key success factors for companies, especially those involved in international trade and investment.

The response of financial markets to global events such as pandemics, geopolitical crises, and technological breakthroughs requires companies to review their investment policies and risk management strategies. Where one of the key elements of the risk minimization strategy is the diversification of the investment portfolio. For international companies, investments in the currencies of different countries and global financial instruments become part of a diversification strategy, based on the analysis of economic prospects and currency trends. The distribution of investments between different assets, economic sectors, and geographical regions allows to reduce the overall level of portfolio risk.

To protect against risks, there is the potential for profit from foreign exchange investments within the framework of a sensibly structured investment portfolio. Based on the dynamics of exchange rates, investing in the most liquid currency pairs can provide investors with unique opportunities for earning thanks to speculative strategies, but this requires a deep understanding of market processes and constant analysis of market trends (Figure 1).

The Ukrainian financial market is facing unprecedented challenges and difficulties in the context of the ongoing war with Russia. Observing the graph of the hryvnia/dollar exchange rate, one can notice a significant increase in the exchange rate of this currency pair, which indicates the weakening of the hryvnia exchange rate and its devaluation (Figure 2).

Such fluctuations in currency rates directly affect the country's economy, as they cause significant financial losses



**Figure 1. Normalized chart of currency pairs for 2023**

Source: graph built in Python Notebook environment based on currency value data

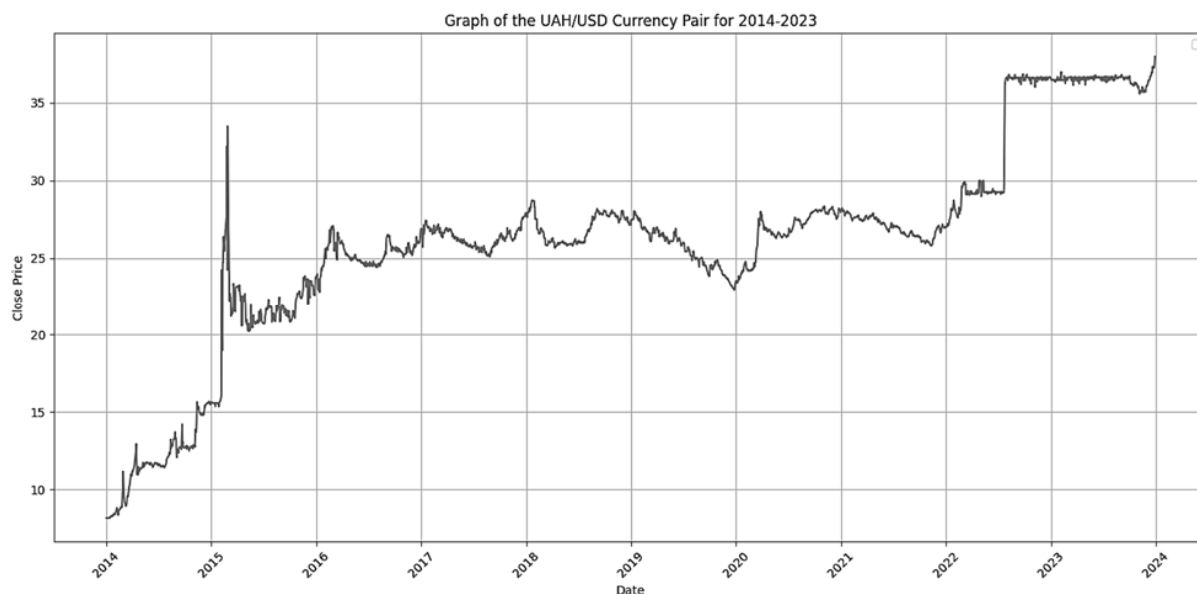


Figure 2. Graph of the UAH/USD currency pair for 2014–2023

Source: graph built-in Python Notebook environment based on currency value data

for all economic entities operating in the country. Industries that depend on imports are particularly sensitive, as the devaluation of the national currency makes the purchase of foreign goods and raw materials more expensive.

Pharmaceutical enterprises belong to the category of such sensitive industries. Most pharmaceutical companies purchase raw materials and components on international markets in foreign currency, while revenues from product sales are received in national currency. This makes them particularly vulnerable to exchange rate fluctuations, as the weakening of the national currency directly affects the growth of costs and, as a result, reduces the profitability of operations. In this context, to minimize currency risks and protect against unforeseen losses, pharmaceutical companies resort to the formation of currency portfolios as a strategic hedging tool.

In the presented study, the approbation of scientific and applied hypotheses was carried out on the example of PJSC "Pharmaceutical Firm "Darnytsya". The company is recognized as a leader in the field of pharmaceutical production in Ukraine and ranks first in terms of sales of medicinal products in the domestic market (Table 1).

Table 1  
The market share of pharmaceutical companies of Ukraine in 2022

Company	Million UAH	MS, %
Farmak (Ukraine)	5 587	5,38%
Darnytsya (Ukraine)	5 032	4,84%
TEVA (Israel)	3 941	3,79%
Acino (Switzerland)	3 934	3,79%
KRKA (Slovenia)	3 539	3,41%
Arterium (Ukraine)	3 532	3,40%
Sanofi (France)	3 493	3,36%
Berlin-Chemie (Germany)	3 376	3,25%
Kyiv Vitamin Plant (Ukraine)	3 287	3,16%
Kusum Farm (Ukraine)	2 926	2,82%
Others	65 221	62,8%

Source: compiled by the authors based on the company's financial statements

The company also sells its products on international markets (Table 2).

Table 2

Countries to which the products of PJSC "FF Darnytsya" are exported

Country	Net income, UAH million	Net income, %
Ukraine	4 981,1	94,9%
United Kingdom	69,7	1,3%
Kazakhstan	64,1	1,2%
Poland	41,1	0,8%
Georgia	40,9	0,8%
Moldova	12,3	0,2%
Yemen	10,3	0,2%
Armenia	9,7	0,2%
Other countries	18,0	0,3%
<b>Total</b>	<b>5 247,2</b>	<b>100,00%</b>

Source: compiled by the author based on the company's financial statements

During the study of financial indicators, the sensitivity of the company to changes in the exchange rate of the Ukrainian hryvnia was established. In the case of a 20% strengthening of the Ukrainian hryvnia against the corresponding currency, there is an equivalent opposite effect on pre-tax profit. Therefore, the authors are offered the formation of a currency portfolio, which will include the currencies of the countries with which the company actively cooperates on the trade market. This will provide an opportunity to smooth out currency fluctuations and reduce the risk of losses from adverse changes in exchange rates.

The tasks that were set during the creation of the currency portfolio in the company included the following items:

- protection against currency fluctuations;
- optimization of currency operations;
- risk diversification;
- opportunities for earning on currency transactions;
- ensuring liquidity;

– investment opportunities.

To simulate an improved currency portfolio, 14 currency pairs were included and short sales were allowed, this can significantly increase portfolio returns:

- Euro/US dollar (EUR/USD);
- British Pound/US Dollar (GBP/USD);
- Polish zloty/US dollar (PLN/USD);
- New Zealand dollar/US dollar (NZD/USD);
- US Dollar/Japanese Yen (USD/JPY);
- US Dollar/Swiss Franc (USD/CHF);
- US dollar/Canadian dollar (USD/CAD);
- US Dollar/Chinese Yuan (USD/CNY);
- Australian dollar/US dollar (AUD/USD);
- US dollar/Mexican peso (USD/MXN);
- US Dollar/Brazilian Real (USD/BRL);
- US Dollar/Indian Rupee (USD/INR);
- US dollar/Swedish krona (USD/SEK);
- Kazakhstan tenge/US dollar (KZT/USD).

The selected currency pairs provide high liquidity, which allows for quick and efficient transactions without a significant impact on the market price. Diversification across different currency pairs is key to reducing overall portfolio risk, allowing potential losses in one currency to be offset by gains in another. Also important is the geographical distribution of foreign exchange assets,

which helps manage regional risks and take into account different economic cycles.

To model the current performance of the portfolio, we will take data for the last 12 months, from January 1, 2023, to December 29, 2023 (Figure 3).

The portfolio's expected return is the total expected return of the currencies included in it, weighted by their share in the portfolio. In Figure 4 shows the dynamics of daily rate changes for each currency pair of the portfolio.

In Figure 5 presents the expected returns of currency pairs.

The results of the calculation of the standard deviations of the returns of the currencies of the proposed portfolio are presented in Figure 6.

So, all the necessary data is obtained to build a chart that compares all combinations in terms of volatility (or risk) and return. The red point is obtained from the previous calculations above and will reflect the yield and volatility for the simulation with the maximum Sharpe ratio (Figure 7) [6].

The obtained coefficients for the portfolio with the maximum Sharpe ratio and minimum volatility are shown in Figure 8.

In Figure 9 shows the profitability of the optimized portfolio when simulating the investment portfolio from December 2023 to January 2024.

	AUDUSD	EURUSD	GBPUSD	KZTUSD	NZDUSD	PLNUSD	USDBRL	USDCAD	USDCHE	USDCNY	USDINR	USDJPY	USDMXN	USDSEK
2023-12-25	0.680879	1.102657	1.267700	0.002190	0.631930	0.254349	0.205345	0.754330	1.169495	0.141177	0.012024	0.007025	0.058898	0.100174
2023-12-26	0.680601	1.102026	1.270487	0.002190	0.630600	0.254303	0.205350	0.754717	1.168579	0.140144	0.012023	0.007031	0.058909	0.100146
2023-12-27	0.682380	1.104301	1.272718	0.002189	0.632851	0.255331	0.207749	0.757851	1.171536	0.140009	0.012022	0.007019	0.058915	0.100152
2023-12-28	0.685470	1.110864	1.280082	0.002205	0.634949	0.257294	0.207207	0.757461	1.187183	0.140052	0.012010	0.007072	0.059124	0.100725
2023-12-29	0.682630	1.106819	1.273399	0.002205	0.633489	0.255393	0.206177	0.755881	1.185733	0.140706	0.012150	0.007071	0.058993	0.100290

Figure 3. Current values of currency pairs for a portfolio with short sales allowed

Source: graph built-in Python Notebook environment based on currency value data

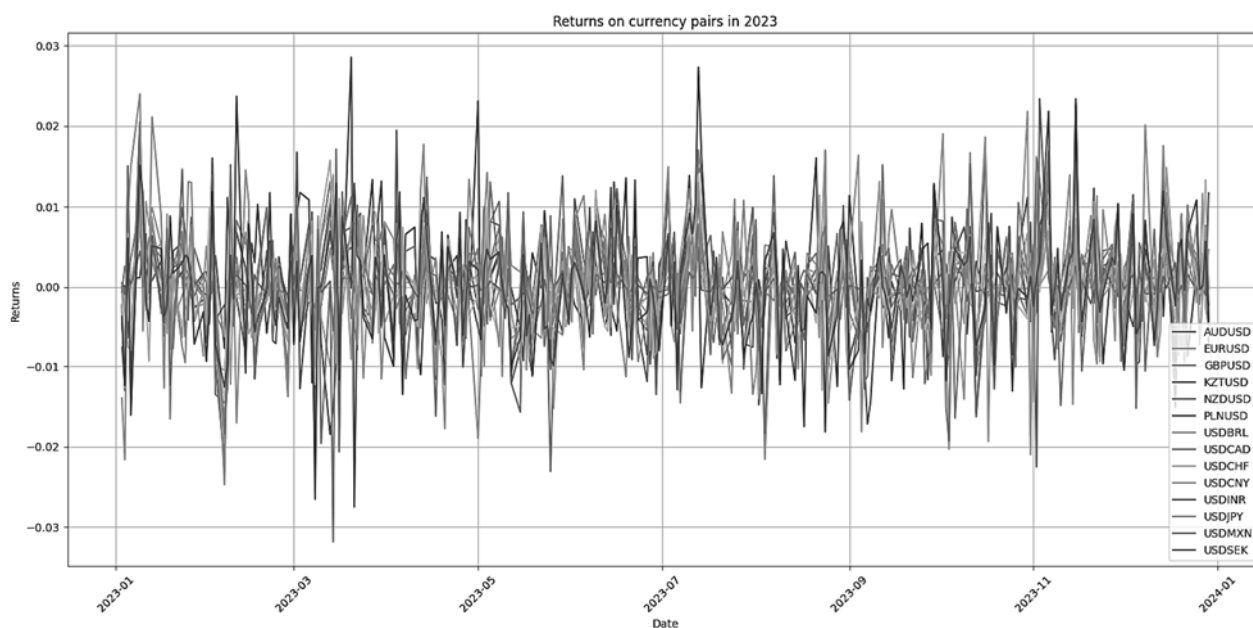


Figure 4. Dynamics of exchange rates for each currency pair of the portfolio

Source: graph built-in Python Notebook environment based on currency value data



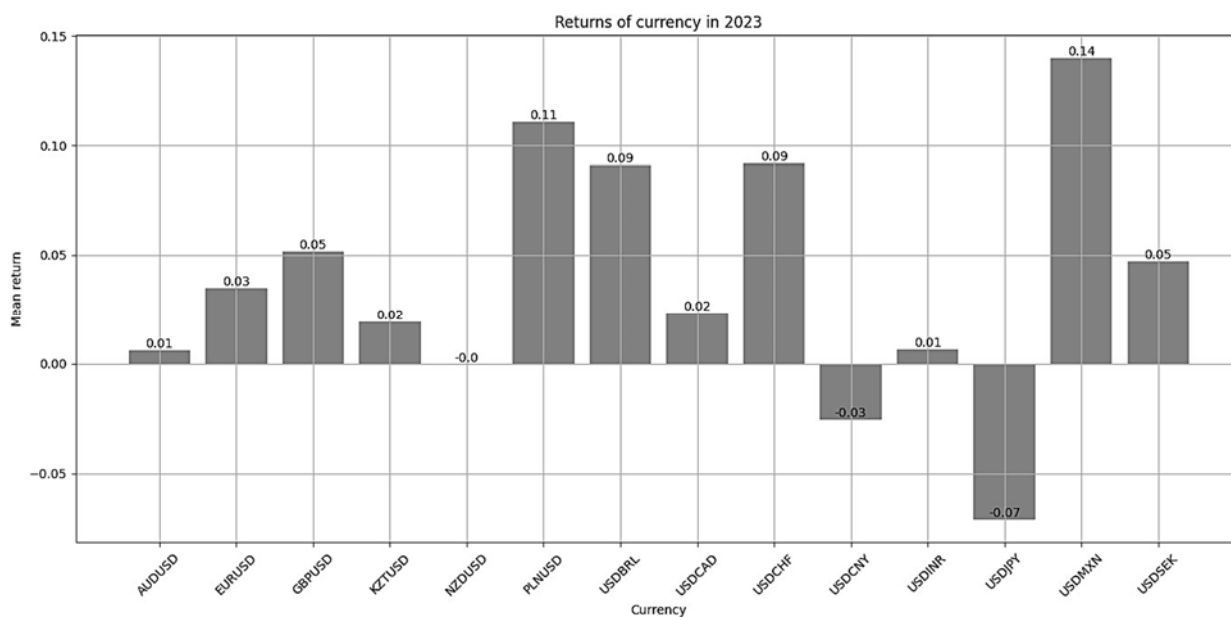


Figure 5. The expected return of currency pairs for the period from January 1, 2023, to December 29, 2023, %

Source: graph built-in Python Notebook environment based on currency value data

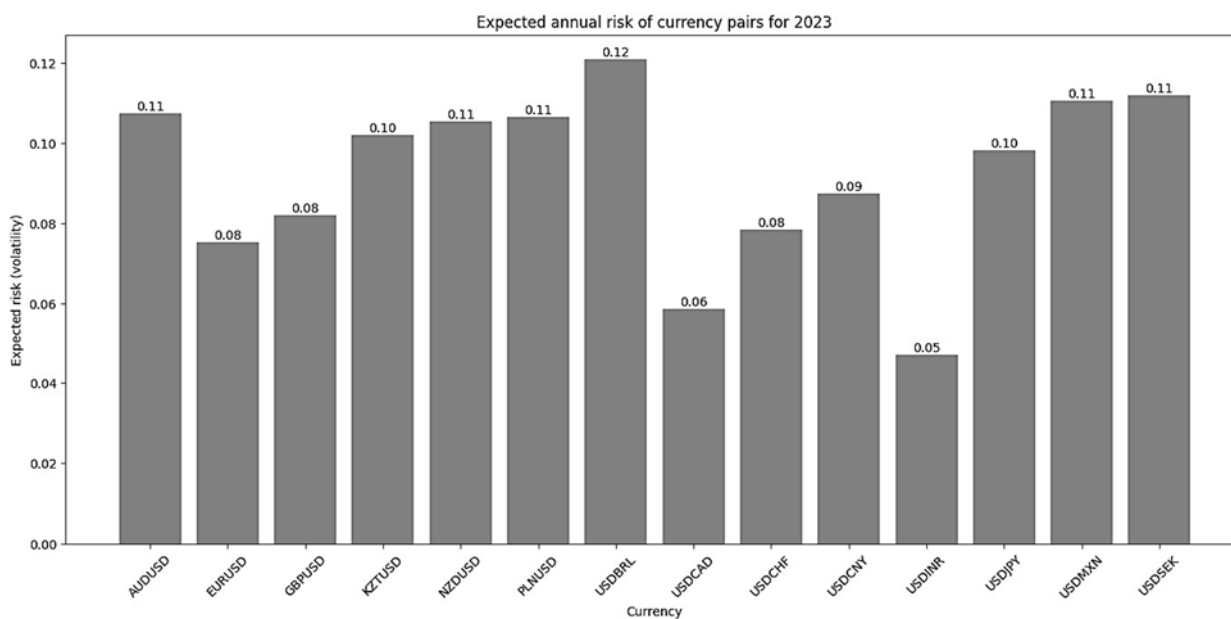


Figure 6. Expected risk of currency pairs for the period from January 1, 2023, to December 29, 2023

Source: graph built in Python Notebook environment

The obtained indicators are positive, and these strategies may interest conservative investors, but when using more flexible strategies and a larger number of currency pairs in the portfolio, it is possible to get higher returns.

The application of modern portfolio theory has traditionally been limited to stocks and bonds. However, the presented thesis demonstrated its universality, having spread to foreign exchange markets. By increasing the portfolio width to 14 currency pairs and allowing short sales, the portfolio return increased from 9.77% to 30.47%, the portfolio risk increased from 9.29% to 11.45%, and the Sharpe ratio – a measure of risk-adjusted return, increased from 1.05 to 2.49.

The obtained results testify to the effectiveness of the proposed changes and emphasize their importance in portfolio management. By applying this advanced approach to portfolio construction, currency portfolio managers can improve their risk-return ratio, increase their resilience to market fluctuations, and potentially generate significantly higher returns

In the process of testing the investment strategy of the currency portfolio on the data of 2024, a capital growth of 7.4% was found in just two months. Such an indicator is an indicator of the high efficiency of selected investment decisions and confirmation of a competent approach to portfolio formation. Taking into account the dynamic and sometimes unpredictable nature of currency markets,

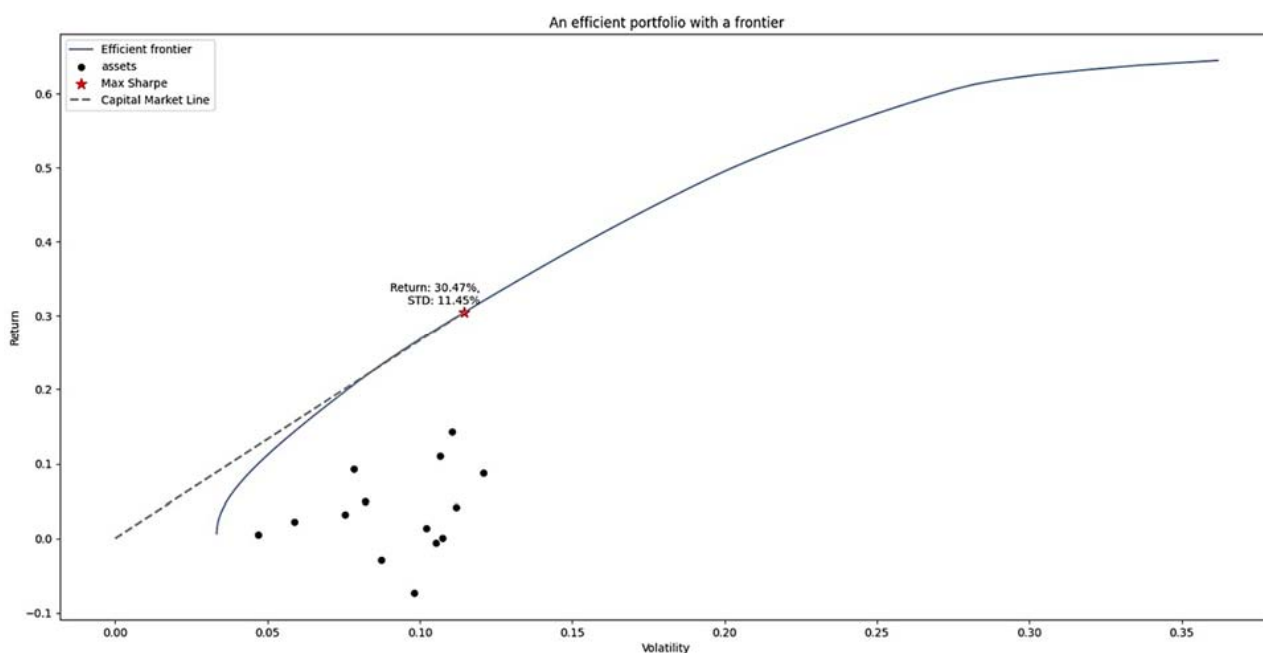


Figure 7. Visualization of investment portfolio simulation and constructed effective frontier

Source: graph built in Python Notebook environment

	Актив	Інвестиції	Інвестиції %
1	EURUSD	-15967.400954	15.967401
8	USDCHF	15967.400954	15.967401
5	PLNUSD	12330.027017	12.330027
0	AUDUSD	-11590.417005	11.590417
2	GBPUSD	9230.115796	9.230116
7	USDCAD	9000.344896	9.000345
12	USDMXN	8189.839623	8.189840
11	USDJPY	-7461.566466	7.461566
4	NZDUSD	-2764.116779	2.764117
9	USDCNY	-2762.041017	2.762041
3	KZTUSD	2021.313287	2.021313
13	USDSEK	-1253.600649	1.253601
6	USDBRL	1244.818578	1.244819
10	USDINR	-216.996979	0.216997

Figure 8. Coefficients for the portfolio with the maximum Sharpe ratio

Source: graph built in Python Notebook environment

capital growth by such a significant percentage in a short period indicates a well-chosen composition of assets, the effectiveness of applied risk management strategies, and a high level of market intuition.

The two-month return of 7.4% is particularly significant in the context of global economic volatility and changing market conditions beyond 2023. This indicates that the

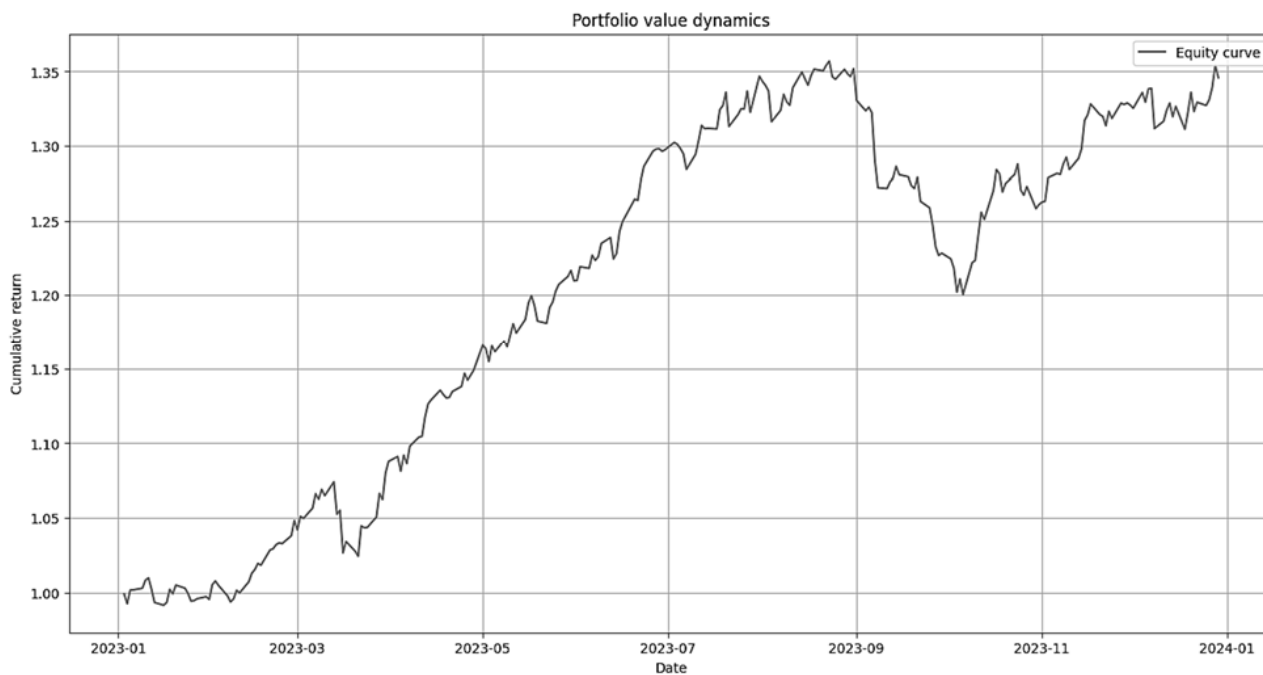
portfolio has not only been able to adapt to changing market conditions but also successfully used these changes to the investor's benefit, demonstrating the ability to grow even in difficult economic situations.

The projected return of the portfolio for 2024 is about 32%, which indicates a potentially significant growth compared to the previous period (Figure 10). This conclusion is based on a linear regression model applied to existing data on cumulative returns at the initial stage of the year.

Despite the positive trend, it should be taken into account that the projected yield may be affected by some external factors, such as changes in financial markets, exchange rate fluctuations, geopolitical risks, and macroeconomic indicators. It is important to note that since linear regression does not take into account the potential non-linearity and volatility of the market, there is significant uncertainty in long-term forecasts, which requires constant monitoring and adjustment of the investment strategy according to the current market situation.

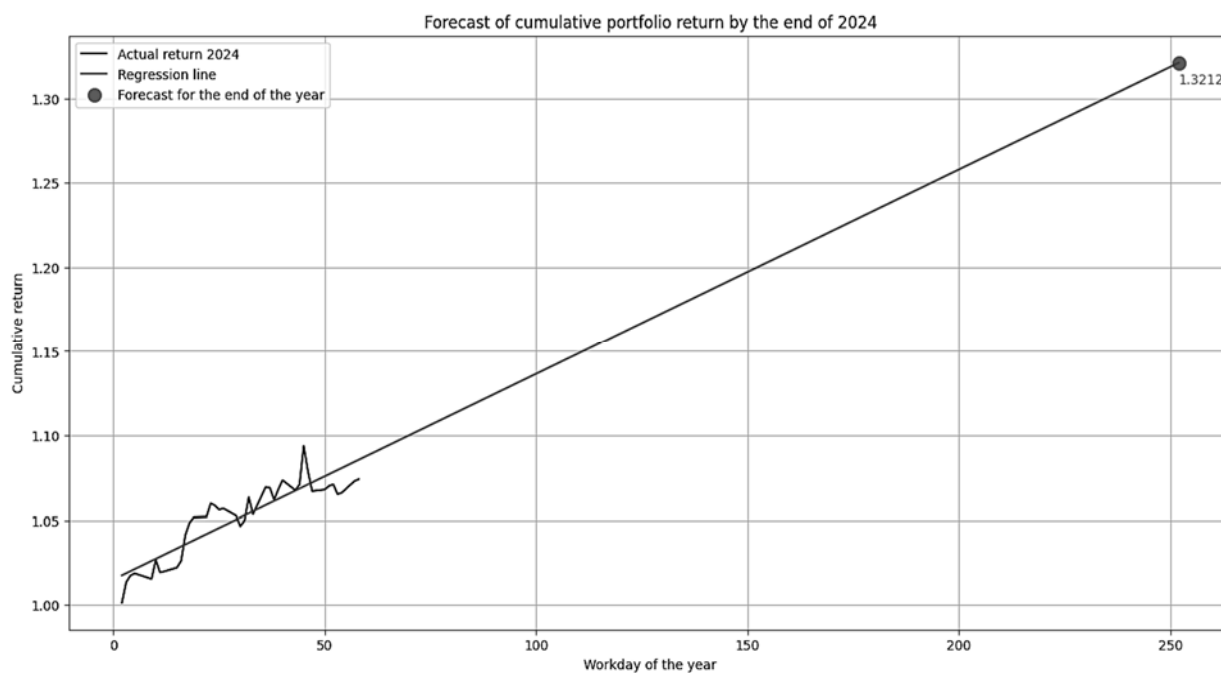
**Conclusions.** The application of diversification as a key element of the portfolio strategy allowed to mitigate the risk of losses in the context of fluctuations of some currencies, thereby ensuring a stable growth of the total capital. The selective selection of currency assets that are part of the portfolio is based on thorough analysis and forecasting of their growth potential and reaction to macroeconomic trends, which demonstrates a professional approach to investing.

By forecasting indicators of the currency investment portfolio, high-quality diversification of assets became key elements in minimizing risks and optimizing profitability. The creation of a diversified portfolio of 14 different currency assets made it possible to achieve greater resistance to unidirectional market changes due to negative or low correlation between individual assets. In particular,



**Figure 9. Profitability of the optimized portfolio when simulating the investment portfolio from January 2023 to January 2024**

Source: graph built-in Python Notebook environment



**Figure 10. Profitability of the optimized portfolio when simulating the investment portfolio in 2024**

Source: graph built-in Python Notebook environment

taking into account geopolitical risks, macroeconomic indicators and monetary policies of different countries help to form a reasonable assumption about future exchange rate fluctuations, thereby ensuring effective management of the portfolio's currency positions.

In the context of analyzing the application of diversification in a currency investment portfolio, the

implementation of a practical strategy covering assets with different geographical areas and economic characteristics is a fundamental principle of reducing the overall portfolio risk. A portfolio made up of assets with varying levels of volatility and potential returns allows not only to diversify risks but also to optimize the portfolio's overall return through efficient capital allocation.

**References:**

1. Brennan M. J. (1998). The Role of Learning in Dynamic Portfolio Decisions. *European Finance Review*, no. 1(3), pp. 295–306.
2. Kao, G.W. (1999). Determinants of Portfolio Performance. *Financial Analysts Journal*, no. 55(4), pp. 6–26.
3. Gladstein, L. (2001). Investment Strategies and Portfolio Management. *Journal of Wealth Management*, no. 4(2), pp. 22–34.
4. Durham, B. (2003). Volatility and Risk in Equity Markets. *Financial Markets, Institutions & Instruments*, no. 12(2), pp. 97–125.
5. Markowitz, H. (1952). Portfolio Selection. *Journal of Finance*, no. 7, pp. 77–91.
6. Sharpe, W. (1994). The Sharpe Ratio. *Journal of Portfolio Management*, no. 21, pp. 49–58.