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# REVENUE PLANNING OF PHARMACEUTICAL COMPANIES

*The exceptional circumstances of martial law, economic turbulence in the country, and the dynamic development of the global pharmaceutical market influence the financial planning approaches of pharmaceutical enterprises. Under these conditions, combining traditional financial planning methods with modern analytical and statistical tools becomes crucial. This integration enables adaptation to external conditions and ensures sustainable revenue growth. The research is based on the hypothesis that a correlation exists between key financial indicators of pharmaceutical companies (specifically net sales) and the level of investment, intangible assets, and labor resources. The aim of the research is to identify and assess the impact of key factors on the revenue of pharmaceutical enterprises. The research employs methods including theoretical generalization, system analysis, grouping, abstraction, statistical methods for information collection and processing, deduction, induction, and regression analysis. The research utilizes data from the State Statistics Service of Ukraine, financial statements of pharmaceutical companies obtained from analytical systems and open data portals (YouControl, Opendatabot, Clarity Project), and relevant scientific articles. Based*

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# ПЛАНУВАННЯ ДОХОДІВ ФАРМАЦЕВТИЧНИХ ПІДПРИЄМСТВ

*Виняткові обставини воєнного стану, економічна турбулентність в країні, динамічний розвиток глобального фармацевтичного ринку впливають на підходи до фінансового планування фармацевтичних підприємств. Важливим за таких умов стає поєднання традиційних методів фінансового планування з сучасними аналітичними та статистичними інструментами, що дозволяє адаптуватися до зовнішніх викликів та забезпечити стійке зростання доходів. Дослідження ґрунтується на гіпотезі про існування кореляції між фінансовими показниками фармацевтичних компаній (чистим доходом) і рівнем інвестицій, обсягом нематеріальних активів й трудовими ресурсами. Метою статті є виявлення та оцінка впливу ключових чинників на дохід фармацевтичних підприємств. У дослідженні застосовано методи теоретичного узагальнення, системного аналізу, групування та абстрагування, статистичні методи збирання та обробки інформації, дедукції та індукції, статистичний метод регресійного аналізу. Дослідження виконане за даними Державної служби статистики України, фінансової звітності підприємств фармацевтичної галузі, отриманої з аналітичних систем та порталів відкритих даних: YouControl,*

*on this data, the study generated consolidated financial statements for Ukraine's leading pharmaceutical companies (those with the highest net sales) for 2024. The impact of specific factors on these companies' revenue levels was analyzed using regression analysis. This allowed for an assessment of the strength and direction of the influence exerted by internal factors: investment levels, the share of intangible assets, and the number of employees. The obtained results can be used for more informed revenue planning by pharmaceutical companies. The identified relationships between revenue and key factors enable the modeling of potential financial outcomes under various development scenarios. This empowers enterprises to optimize cost structures, investments, and resource management by focusing on indicators that demonstrate a statistically significant impact on revenue. Consequently, the study's findings serve as a valuable tool for supporting strategic management decision-making.*

*Keywords:* revenue, revenue planning, investments, intangible assets, labor resources, regression model.

**JEL Classification:** L52, O21, C60.

*Опендатабот, Clarity Project, наукових джерел. Сформовано узагальнені дані фінансової звітності провідних фармацевтичних компаній України за 2024 р., які мають найбільші обсяги чистого доходу. Проведено аналіз впливу окремих чинників на рівень доходу фармкомпаній з використанням регресійного аналізу, що дозволило оцінити силу та напрям впливу внутрішніх факторів: рівня інвестицій, частки нематеріальних активів та кількості працівників. Отримані результати можуть бути використані для більш обґрунтованого планування доходів фармацевтичних компаній. Виявлені залежності між доходом та ключовими чинниками дозволяють моделювати можливі фінансові результати за різних сценаріїв розвитку. Це дає змогу підприємствам оптимізувати структуру витрат, інвестицій та управління ресурсами, орієнтуючись на ті показники, які мають статистично значущий вплив на дохід. Результати дослідження можуть слугувати інструментом підтримки прийняття стратегічних управлінських рішень.*

*Ключові слова:* дохід, планування доходів, інвестиції, нематеріальні активи, трудові ресурси, регресійна модель.

## Introduction

The use of adaptive and flexible revenue planning methods to ensure the financial stability and competitiveness of enterprises is one of the main functions of financial management of pharmaceutical companies in conditions of market uncertainty. Domestic pharmaceutical enterprises during martial law in Ukraine not only provide critical needs for medical care, but also contribute to the development of the country's export potential, strengthening its competitiveness in the global market. The volume of production of basic pharmaceutical products and preparations in 2024 reached UAH 63 496 million, which is 14.7% more than in 2023. Pharmaceutical products worth UAH 9 898.2 million were sold outside Ukraine, in the total volume of exported industrial products this share is 15.9% (State Statistics Service of Ukraine, n. d.).

It is export that largely stimulates the development of necessary research in this area, since pharmaceuticals is a science-intensive industry that cannot develop without the introduction of technological innovations. An important direction of the pharmaceutical business is R&D (research and development work), which ensures the creation of new drugs, prolongs the life cycle of products, and competitive advantages of companies in the market. Pharmaceutical companies need to modernize production facilities, which requires significant financial resources, the main source of which is revenue.

Therefore, the issue of effective planning of income of pharmaceutical enterprises is a relevant part of scientific research, which affects the effectiveness of their activities, competitiveness in domestic and international markets and contributes to the development of the Ukrainian economy and strengthening the export potential of the country.

Given the significant importance of the pharmaceutical industry for the economic and social development of the country, it is advisable to use the generalized linear regression model with negative binomial distribution to assess the dependence of the revenue of pharmaceutical enterprises on a number of factors: the level of investment, the share of intangible assets in the total assets of the enterprise and the number of employees.

The diverse financial and economic aspects of the functioning and development of the pharmaceutical business are disclosed in the scientific works of Ukrainian and foreign scientists, experts of international consulting agencies.

The issue of improving the system of indicators for assessing financial condition, taking into account international standards of financial analysis, is considered in the work (Posylkina & Gladkova, 2020). A comparative analysis of national and foreign financial analysis systems was conducted; the most significant differences were identified, it was proposed to unify and bring the national practice of financial analysis closer to foreign experience and IFRS, introducing it into the activities of domestic pharmaceutical manufacturers, which will contribute to increasing the transparency of their activities and investment attractiveness for foreign investors.

A significant part of scientific research in the field of pharmaceuticals is devoted to the impact of the COVID-19 pandemic on financial performance. In particular, an economic review of the state and trends in the development of the global pharmaceutical market was conducted by the authors (Voytko & Koroleva, 2021), in addition, an analysis of the indicators of the state of functioning of the largest pharmaceutical companies in the world was carried out and a correlation was established between the total income of companies and expenses for research and development. The conclusion of scientists about the significant impact of R&D investment on the revenue of pharmaceutical companies is important. This conclusion is also confirmed by Greek researchers in a scientific article devoted to the search for a connection between the financial indicators of pharmaceutical companies in Europe and investments in scientific research and development. Based on the results of regression analysis, scientists have proven the presence of a positive and significant correlation between R&D spending and the operating profit of the enterprise (Asad & Homolka, 2023).

The results of the analysis of profitability trends of pharmaceutical business entities in Ukraine are presented in the article (Shostak et al., 2022). The authors present the dynamics of financial results and profitability indicators of pharmaceutical companies over 10 years. The study showed that in the period before the start of the full-scale war in Ukraine, the volumes of production and sales of products manufactured by pharmaceutical industry enterprises, operating profit and profitability level had positive dynamics.

Scientists Zhaldak and Tokarskaya (2023) analyzed the impact of the full-scale war of the Russian Federation against Ukraine on the activities of domestic pharmaceutical companies. The authors substantiated the changes that occurred in the volumes and structure of demand for medicines in accordance with the latest trends in the external environment, and also focused on the growth of innovativeness in drug production, the development of digitalization of business processes of pharmaceutical companies and their orientation towards cooperation with foreign partners.

The issue of the influence of exogenous and endogenous factors on the innovative potential of the pharmaceutical business is presented in Kudyrko's work (2025). Among the main factors that contributed to the development of innovations, the impact of COVID-19, the development of artificial intelligence processes and modern marketing technologies were identified.

The challenge of ensuring the efficiency of the pharmaceutical business through the implementation of the latest marketing strategies and innovative marketing tools were considered by scientists Melnychenko (2024), Lyutak et al. (2025).

Despite the availability of thorough research on the financial and economic problems of the development of companies in the pharmaceutical sector, the main attention in the publications is focused on such factors of influence on financial results as innovations and marketing tools. These factors are certainly significant and should be taken into account when planning the income of a pharmaceutical enterprise. At the same time, identifying and taking into account such internal factors as the level of investment, the share of intangible assets, and the number of personnel in the pharmaceutical business are critically important for ensuring financial stability and sustainable revenue growth in a volatile market environment, which makes the study relevant.

The research is based on the hypothesis that there is a relationship between the revenue of a pharmaceutical company, the level of investment, the share of intangible assets and the number of employees, which affect the forecast indicators of net sales.

The aim of the research is to identify and assess the impact of key factors on the revenue of pharmaceutical companies.

The authors set key tasks, such as: to form a group of pharmaceutical companies that are leaders in terms of net sales and to investigate on their basis the existence of a relationship between the level of income and investments, intangible assets and the number of personnel in order to further use the results in the process of income planning. To carry them out, a complex of general scientific methods was used, in particular theoretical generalization, system analysis, grouping and abstraction, statistical methods of collecting and processing information, deduction and induction, statistical method of regression analysis – generalized linear regression with negative-binomial distribution.

The research was conducted on the basis of financial reporting data of pharmaceutical companies, whose type of economic activity according to the classifier of types of economic activity (National Classifier of State Statistics

of Ukraine 009:2010, 2010) belongs to groups 21.1 "Production of basic pharmaceutical products" and 21.2. "Production of pharmaceutical preparations and materials".

To create an empirical database for economic research, data from the State Statistics Service of Ukraine, analytical systems and open data portals, in particular, (YouControl, n. d.; Opendatabot, n. d.) were used.

In the first section of the main part of the article, generalized financial reporting data of the leading pharmaceutical companies of Ukraine for 2024, which have the largest volumes of net sales, an analysis of the main indicators of their performance was conducted. The sample covers about 18% of pharmaceutical companies in the industry on the Ukrainian market, it accounts for the main share of the volumes of products sold (works, services) and resources used. The second part conducts a regression analysis between revenue (net sales) for a sample of pharmaceutical companies and factors such as the level of investment and the number of employees. The third section is devoted to conducting a regression analysis of the impact of the level of investment and the share of intangible assets on revenue for a sample of research companies.

Given the significant impact of the pharmaceutical industry on the economic and social development of the country, the study, based on the use of statistical tools, analyzed the dependence of pharmaceutical companies' revenues on a number of factors: the share of investments, the share of intangible assets, the number of employees. Confirmation of the hypothesis is of fundamental importance for planning the development strategy of the pharmaceutical business, given the need for GDP growth in the country, increased competitiveness, and increased export and innovation potential.

## 1. Analysis of the activities of pharmaceutical companies in Ukraine

The full-scale war in Ukraine significantly affected the state and prospects for the development of the pharmaceutical market. Before the full-scale invasion of the Russian Federation, the Ukrainian pharmaceutical market grew by 10–12% annually. According to Proxima Research, the total sales volume in hryvnia terms for 8 months of 2022 decreased by 5% (Farmak, 2022).

Despite the increase in demand for medicines in the first days of the war, pharmaceutical manufacturers in 2022 had to overcome challenges that arose due to the loss of infrastructure facilities, logistics complications, rising prices for fuel and raw materials, a decrease in consumer solvency, staff turnover, etc. At the same time, demand for domestic drugs increased due to their lower price compared to imported analogues. In terms of physical quantities (packaging), 65% of the market is occupied by Ukrainian companies, which produce 61% of medicines from the National List of Medicines, while in monetary terms, 64% of products on the market are foreign-made products, which are presented in a more expensive segment (Farmak, 2022).

There are about 220 companies operating in the pharmaceutical market of Ukraine – manufacturers of pharmaceutical products, preparations and materials (State Statistics Service of Ukraine, n. d.). The main absolute indicators of the activities of the 20 pharmaceutical companies that received the largest amounts of revenue in 2024 are given in *Table 1*.

The leader among pharmaceutical enterprises in Ukraine in terms of net sales in 2024 and net profit is JSC "Farmak". The second place in terms of net income is occupied by PrJSC "Pharmaceutical Firm "Darnytsia".

Despite lower income and a small number of employees, the profit received by the company "Pharma Start" indicates high efficiency of activity. In contrast, the Corporation "Arterium" with a fairly high level of income has a 100 times lower profit indicator.

Investment costs of pharmaceutical companies, in particular investments in research and development (R&D), in new production facilities or technologies, are one of the key factors that shape their revenue in the long term. In the pharmaceutical industry, the life cycle of products is closely related to scientific discoveries and patent protection; investments allow creating new products that ensure the formation of a significant share of income. JSC "Farmak", PrJSC "Pharmaceutical Firm "Darnytsia" and LLC "Pharma Start" are the leaders in terms of investment costs.

A key role in generating revenue in the pharmaceutical sector is played by the presence of intangible assets, which include patents for medicines, licenses and trademarks, which are critically important in a highly competitive market. Companies with large intangible assets usually have a sustainable competitive advantage, as they have exclusive rights to produce medicines, which allows them to receive stable income from the sale of patented products. Among the studied group of companies, the largest volumes of intangible assets are held by PrJSC "Kyivmedpreparat", JSC "Farmak" and PrJSC "Pharmaceutical Firm "Darnytsia".

In conditions of martial law, the outflow of personnel is a serious challenge for companies in the pharmaceutical industry. The company's staffing directly affects its operational capacity and scale of activities, and therefore the amount of revenue e. A sufficient number of employees contributes to the more effective functioning of the company's production, research and development and other divisions. Staff growth is usually associated with business expansion, increased sales volumes and entry into new markets. Not only the quantitative, but also the qualitative composition of the staff is important, companies that invest in the development of employee qualifications, avoid unnecessary duplication of functions and optimize management structures are able to achieve higher labor productivity and, accordingly, higher revenue. Among the studied sample of enterprises, JSC "Farmak" has the largest number of personnel and the largest amount of income for 2024.

Relative indicators that characterize the efficiency of the activities of pharmaceutical enterprises, the share of investments and intangible assets in the total assets of enterprises are given in *Table 2*.

*Table 1*

Key absolute performance indicators for pharmaceutical companies in Ukraine (2024)

| Company title | Revenue, thousand UAH | Net profit, thousand UAH | Investment expenses, thousand UAH | Total intangible assets, thousand UAH | Total assets, thousand UAH | Number of employees, persons |
|---|---|---|---|---|---|---|
| Farmak JSC | 10 783 728 | 1 639 761 | 990 756 | 292 495 | 15 101 930 | 2 610 |
| PJSC Pharmaceutical Company "Darnytsia" | 6 875 780 | 656 781 | 623 177 | 256 022 | 8 124 203 | 1 223 |
| Yuria Farm LLC | 5 741 656 | 752 103 | 437 874 | 5 532 | 6 243 441 | 1 666 |
| Arterium Corporation | 5 235 605 | 51 825 | 4 472 | 81 890 | 2287104 | 500 |
| Kyiv Vitamin Plant JSC | 4 944 130 | 156 840 | 203 996 | 0 | 3 212 056 | 457 |
| TEVA Ukraine LLC | 3 839 622 | 27 629 | 0 | 4 247 | 3 497 393 | 873 |
| Kyivmedpreparat PJSC | 3 568 427 | 73165 | 106 489 | 1 226 649 | 3 374 986 | 850 |
| Biofarma Plasma LLC | 3 550 542 | 852 408 | 310 938 | 0 | 3 101 801 | 813 |
| Servier Ukraine LLC | 2 481 518 | 42 469 | 12 888 | 41 | 1 199 697 | 1 257 |
| Pharma Start LLC | 2 337 352 | 761 271 | 285 722 | 6 194 | 3 487 167 | 176 |
| Borshchahivskyi Chemical and Pharmaceutical Plant PJSC | 2 078 848 | 273 402 | 109 041 | 20 303 | 3 091 067 | 1 020 |
| LLC Pharmaceutical Company "Zdorovya" | 2 031 665 | 146 468 | 28 737 | 2 630 | 2 050 619 | 300 |
| Sandoz Ukraine LLC | 1 996 884 | 260 342 | 1 784 | 2 | 1 232 161 | 122 |
| Sanofi-Aventis Ukraine LLC | 1 918 229 | 146 519 | 14 519 | 0 | 1 343 873 | 311 |
| GlaxoSmithKline Pharmaceuticals Ukraine LLC | 1 845 220 | 62 540 | 81 146 | 7 | 957 820 | 274 |
| Polpharma UA LLC | 1 372 645 | 13 069 | 0 | 1 961 | 519 074 | 2 370 |
| Sperco Ukraine LLC | 1 253 831 | 168 298 | 14 243 | 9 053 | 914 003 | 277 |
| Interchem LLC | 1 212 205 | 200 561 | 267 997 | 15 332 | 125 8107 | 293 |
| DKP Pharmaceutical Factory LLC | 1 210 809 | 53 581 | 28 401 | 420 | 763 920 | 221 |
| Movi Health LLC | 915 053 | 22 773 | 0 | 195 | 599 593 | 108 |

*Source:* compiled by the authors based on data (YouControl, n. d.; OpenDataBot, n. d.).

*Table 2*

Key relative performance indicators of Ukrainian pharmaceutical companies (2024)

| Company title | Return on sales, % | Return on assets, % | Share of investments in assets, % | Share of intangible assets, % | Labor productivity, thousand UAH per employee |
|---|---|---|---|---|---|
| Farmak JSC | 15.2 | 10.9 | 6.6 | 1.9 | 4 132 |
| PJSC Pharmaceutical Firm "Darnytsia" | 9.6 | 8.1 | 7.7 | 3.2 | 5 622 |
| Yuria Farm LLC | 13.1 | 12.0 | 7.0 | 0.1 | 3 446 |
| Arterium Corporation | 1.0 | 2.3 | 0.2 | 3.6 | 2 209 |
| Kyiv Vitamin Plant JSC | 3.2 | 4.9 | 6.4 | 0 | 5 817 |
| TEVA Ukraine LLC | 0.7 | 0.8 | – | 0.1 | 13 105 |
| Kyivmedpreparat PJSC | 2.1 | 2.2 | 3.2 | 36.3 | 2 839 |
| Biofarma Plasma LLC | 24.0 | 27.5 | 10.0 | 0 | 7 101 |
| Servier Ukraine LLC | 1.7 | 3.5 | 1.1 | 0 | 9 057 |
| Pharma Start LLC | 32.6 | 21.8 | 8.2 | 0.2 | 5 115 |
| Borshchahivskyi Chemical and Pharmaceutical Plant PJSC | 13.2 | 8.8 | 3.5 | 0.7 | 2 557 |
| LLC Pharmaceutical Company "Zdorovya" | 7.2 | 7.1 | 1.4 | 0.1 | 1 992 |
| Sandoz Ukraine LLC | 13.0 | 21.1 | 0.1 | 0 | 7 209 |
| Sanofi-Aventis Ukraine LLC | 7.6 | 10.9 | 1.1 | 0 | 15 723 |
| GlaxoSmithKline Pharmaceuticals Ukraine LLC | 3.4 | 6.5 | 8.5 | 0 | 10 484 |
| Polpharma UA LLC | 1.0 | 2.5 | – | 0.4 | 12 710 |
| Sperco Ukraine LLC | 13.4 | 18.4 | 1.6 | 1.0 | 4 032 |
| Interchem LLC | 16.5 | 15.9 | 21.3 | 1.2 | 1 389 |
| DKP Pharmaceutical Factory LLC | 4.4 | 7.0 | 3.7 | 0.1 | 4 036 |
| Movi Health LLC | 2.5 | 3.8 | – | 0 | 4 141 |

*Source:* compiled by the authors based on data (YouControl, n. d.; OpenDataBot, n. d.).

The highest profitability of sales was demonstrated by the enterprise "Pharma Start" and LLC "Biopharma Plasma", these same companies have the highest indicators of profitability of assets. The largest share of investments in assets is held by TDV "Interkhim". The share of intangible assets is the highest in PrJSC "Kyivmedpreparat". As for labor productivity, the highest values are observed in LLC "Sanofi-Aventis Ukraine" and LLC "GlaxoSmithKline Pharmaceuticals Ukraine". Thus, the efficiency indicators of the studied enterprises vary significantly and depend on many factors.

The level of investment determines the opportunities for modernization of production processes, development of new products and implementation of innovative technologies. The share of intangible assets, in particular patents, trademarks and know-how, plays an important role in forming a market advantage and protecting intellectual property. The number and qualification of personnel directly affect the efficiency of operational activities, the quality of research and the ability of the enterprise to adapt to changes in the market environment. Comprehensive analysis and consideration of these factors during revenue planning allow developing effective development strategies, minimizing risks, and ensuring stable growth in the financial results of a pharmaceutical company.

## 2. Regression analysis of the relationship between investment levels, number of employees, and income

In order to analyze the impact of individual factors on the level of income of pharmaceutical companies, a statistical method of regression analysis was used, namely: a generalized linear regression model with a negative binomial distribution.

To conduct regression analysis and determine the impact of individual factors on revenue, this study used financial reporting indicators of 39 pharmaceutical companies in Ukraine that carry out production activities.

The final set of independent variables after conducting a certain number of experiments included:

- the share of the company's investment costs *(iv_as)*;
- the number of employees of the company (*sp*).

Since the model used variables with different measurement scales, all numerical indicators were standardized by converting them to z-scores: $Z = (X - \mu)/\sigma$, where X is the variable value, μ is the mean, σ is the standard deviation.

This allowed us to avoid the scaling problem and improved the interpretation of the coefficients. After modeling, we obtained estimates of the coefficients of the negative binomial regression model and the free term. The logarithmic equation of the model has the form:

$$\log(\hat{y}) = 14.1485 + 0.1579 \cdot \text{iv\_as}_{\text{stand}} + 0.6625 \cdot \text{sp}_{\text{stand}} \quad (1).$$

To calculate the value of ŷ, we need to use the expression:

$$\hat{y} = \exp(14.1485 + 0.1579 \cdot iv\_as_{stand} + 0.6625 \cdot sp_{stand}), \quad (2)$$

where: $iv\_as_{stand}$ and $sp_{stand}$ – standardized values of the variables "share of company investment costs" and "number of employees"; const = 14.1485 – value of the free member of the model.

The model coefficients and their significance are shown in *Table 3.*

*Table 3*

Model coefficients and their significance

| Variable | Coefficient | P-values |
|---|---|---|
| Free member (constant) | 14.1485 | <0.001 |
| Share of the company's investment costs in its assets | 0.1579 | <0.05 |
| Number of employees | 0.6625 | 0.001 |

*Source:* the result of the authors' modeling using the Python program and a set of generated data (YouControl, n. d.; Opendatabot, n. d.).

The free term and both coefficients for independent variables are statistically significant ($p<0.05$), which confirms the reliability of the model and indicates the presence of a significant relationship between the explanatory variables and the dependent variable.

The Pseudo $R^2$ indicator of the model is 95.15%, i. e. about 95.15% of the variation in the sales volume of pharmaceutical companies is explained by the combination of the variables "share of investment expenses of the company" and "number of employees".

In order to interpret the influence of the coefficients for independent variables on the dependent variable, we will transform the model with standardized variables into a model with natural units. In the initial form, the generalized linear regression model with negative binomial distribution was presented in the form:

$$log(\hat{y}) = \beta_0 + \beta_1 \cdot z_{iv\_as} + \beta_2 \cdot z_{sp},$$

where: $\hat{y}$ – expected value of the dependent variable (company revenue), $z_{iv\_as}$, $z_{sp}$ – standardized values of the corresponding independent variables, $\beta_0$ = 14.1485; $\beta_1$ = 0.1579; $\beta_2$ = 0.6625.

Standardized variables were calculated using the ratio:

$$z_i = (x_i - \mu_i)/\sigma_i.$$

The coefficients for the model equation in natural scale are calculated using the following ratios:

$$log(\hat{y}) = \beta_0' + \beta_1' \cdot iv\_as + \beta_2' \cdot sp,$$

$$\beta_1' = \frac{\beta_1}{\sigma_{iv\_as}}, \quad \beta_2' = \frac{\beta_2}{\sigma_{sp}},$$

$$\beta_0' = \beta_0 - \left(\frac{\beta_1 \cdot \mu_{iv\_as}}{\sigma_{iv\_as}} + \frac{\beta_2 \cdot \mu_{sp}}{\sigma_{sp}}\right).$$

Substituting the obtained statistical indicators from the data set:

$\mu_{iv\_as}$ = 0.0331; $\sigma_{iv\_as}$ = 0.0437;

$\mu_{sp}$ = 511.12; $\sigma_{sp}$ = 598.36, we obtain:

$\beta_0'$ = 13.4629; $\beta_1'$ = 3.612; $\beta_2'$ = 0.001107.

Thus, the model in natural units has the form:

$$log(\hat{y}) = 13.4629 + 3.612 \cdot iv\_as + 0.001107 \cdot sp, \quad (3)$$

or to find ŷ:

$$\hat{y} = exp(13.4629 + 3.612 \cdot iv\_as + 0.001107 \cdot sp) \quad (4).$$

The interpretation of unstandardized coefficients for the model on a natural scale is presented in *Table 4.*

*Table 4*

Interpretation of non-standardized model coefficients

| Variable | Coefficient | Interpretation |
|---|---|---|
| Share of investment costs in the company's assets | 3.612 | A 1% increase in a company's investment spending share of its total assets increases revenue by 3.70% |
| Number of employees | 0.001107 | Each additional 100 employees add 11.7% to the company's expected revenue |

*Source:* calculated by the authors based on the model obtained with non-standardized coefficients.

Therefore, according to the results presented in Table 4, we observe a statistically significant relationship between net revenue, investment costs share and the number of employees for pharmaceutical companies that are manufacturers of pharmaceutical products, pharmaceutical preparations and materials.

## 3. Regression analysis of the relationship between the level of investment, the share of intangible assets, and income

To assess the impact of factors on the revenue of pharmaceutical companies, negative binomial regression was also used in the second model. The following data were included in the final set of independent variables after conducting a certain number of experiments:

- the share of the company's investment costs in the company's assets (iv_as);
- the share of intangible assets in the company's assets (na_as).

As a result of the modeling, estimates of the coefficients of the negative binomial regression model and the free term were obtained. The logarithmic equation of the model has the form:

$$log\,(\hat{y}) = 14.3631 + 0.4631 \cdot iv\_as_{stand} + 0.1730 \cdot na\_as_{stand} \quad (5).$$

To calculate the value of ŷ, the expression must be used:

$$\hat{y} = exp\ (14.3631 + 0.4631 \cdot iv\_as_{stand} + 0.1730 \cdot na\_as_{stand}), \quad (6)$$

where: $iv\_as_{stand}$ and $na\_as_{stand}$ are standardized values of the variables "share of investment expenses of the company" and "share of intangible assets in assets of the company"; const = 14.3631 is the value of the free term of the model.

The coefficients of the model and their significance are shown in *Table 5*.

*Table 5*

The coefficients of the model and their significance

| Variable | Coefficient | P-values |
|---|---|---|
| Free member (constant) | 14.3631 | <0.001 |
| Share of investment costs in the company's assets | 0.4631 | <0.001 |
| Share of intangible assets in the company's assets | 0.1730 | <0.05 |

*Source:* the result of modeling using the Python program and a set of generated data (YouControl, n. d.; Opendatabot, n. d.).

The free term and both coefficients for independent variables are statistically significant ($p<0.05$), which confirms the reliability of the model and indicates the presence of a significant relationship between the explanatory variables and the dependent variable. In order to interpret the influence of the coefficients for independent variables on the dependent variable, we will transform the model with standardized variables into a model with natural units.

After mathematical transformations, the model in natural units takes the form:

$$log(\hat{y}) = 13.9610 + 10.7 \cdot iv\_as + 2.94 \cdot na\_as, \quad (7)$$

or to find ŷ:

$$\hat{y} = exp(13.9610 + 10.7 \cdot iv\_as + 2.94 \cdot na\_as) \quad (8).$$

The interpretation of the unstandardized coefficients for the model at natural scale is presented in *Table 6*.

*Table 6*

Interpretation of the unstandardized coefficients of the model

| Variable | Coefficient | Interpretation |
|---|---|---|
| Share of investment costs in the company's assets | 10.7 | A 1% increase in the level of investment costs in the company's assets increases revenue by 11.29% |
| Share of intangible assets in the company's assets | 2.94 | A 1% increase in the share of intangible assets in the company's assets increases revenue by 2.98% |

*Source:* calculated by the authors based on the obtained model with unstandardized coefficients.

According to the results presented in *Table 6*, there is a statistically significant relationship between net revenue, the share of investment costs and intangible assets for pharmaceutical enterprises that produce basic pharmaceutical products, preparations and materials.

Thus, it was possible to illustrate the truth of the hypothesis and identify the argumentation for its confirmation based on the data of the formed sample of enterprises.

## Conclusions

Geopolitical and technological transformations, increased market competition, regulatory changes in the industry do not reduce the importance of planning the activities of pharmaceutical companies, but on the contrary, make it even more relevant. Revenue planning is a key element of financial management of the enterprise, because this indicator is the main internal source of financing costs, paying taxes, making profits and developing the business.

For domestic pharmaceutical enterprises belonging to section 21 "Manufacture of basic pharmaceutical products and pharmaceutical preparations" according to KVED-2010, the results of calculations based on empirical data revealed confirmation of the formulated hypothesis, which states that a larger volume of enterprise income is generated if the share of investments, intangible assets of the company and the number of personnel increases.

The results of the research can be used in the formation of a strategy for planning the income of pharmaceutical enterprises in particular, to justify the feasibility of attracting additional investments in production facilities, technologies, etc.; for the development of intangible assets (brand, patents, innovative developments, research and development), which form a long-term competitive advantage; for planning an optimal personnel policy focused on increasing labor productivity. The interrelationship of these factors allows the company to plan income more realistically, relying not only on the market situation, but also on internal management decisions.

Further research will be focused on the integration of AI, Big Data and real data into the financial planning of pharmaceutical enterprises.

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