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MODELING OF FINANCIAL PERFORMANCE OF URBAN ELECTRIC TRANSPORT ENTERPRISES IN THE WAR AND POST-WAR PERIODS

The object of research is the financial indicators of urban electric transport enterprises. The problem of modeling of the main financial indicators of the activities of urban electric transport enterprises of Ukraine in the war and post-war period is considered. Their research and analysis are a necessary condition for a general and comprehensive assessment of the effectiveness of the functioning and financial capacity of enterprises in the industry. This will allow assessing the profitability level and will allow predicting the ability of enterprises to fulfill their main duties – to transport passengers within cities, as well as adequately respond to the variability of external and internal factors of influence. The input data used were performance indicators (namely, income and expenses) of enterprises that are part of the Ukrelectrotrans Corporation and are located in large cities of Ukraine – Kyiv, Odesa, Dnipro and Zaporizhzhia. The profit of the specified enterprises was modeled and their forecast values in the future period were determined. A conceptual approach was formed to forecast profit, which includes 6 main stages, which are sequentially described in this work. The trend for determining the profit of enterprises with the best result according to the criterion of reliability of approximation is presented, and the results of modeling of the forecast values of enterprise profits for 2025–2026 are also presented. However, the obtained forecast values indicate a deterioration in the financial indicators of the studied enterprises due to a number of variable internal and external factors. Namely: military operations, objective economic difficulties, a decrease in demand for transport services, the absence of changes in tariff policy, imperfect and outdated methods of enterprise management, insufficient support from the state and local governments, and an almost complete lack of investment in the industry. A number of recommendations are offered to the heads of transport enterprises to ensure the effective use of financial resources for the restoration and further development of urban transport systems in Ukrainian cities. However, the question of how universal these recommendations can be for all urban electric transport enterprises without taking into account the specifics of each city of Ukraine remains debatable. It is important that the proposed measures be adapted to the real conditions, capabilities and needs of each specific enterprise.

Keywords: *urban electric transport, transport infrastructure, financial indicators, profit, development strategy, urban transport system.*

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1. Introduction

For many centuries, movement on the earth's surface has been a task of paramount importance for humanity. Wars, trade, the development of new territories, and simple communication could not do without the movement of large masses of the population. Over time, humanity was faced with the task of making such movements faster, more comfortable, and more regular. This is how transport appeared, and later its important part – urban public transport. And immediately the question arose of financing its activities. Since then, when public transport ceased to operate as a private initiative, its financing has been taken care of by the state and local authorities. In Ukraine, public transport is subordinate to city councils, and fixed assets have been transferred to transport enterprises under the right of economic management. The lion's share of financing falls on the city councils of Ukrainian cities. Therefore, due to imperfect tariff policy, large and uneconomical consumption of electricity, and extensive and complex infrastructure, urban electric transport remains a loss-making branch of the urban economy of all Ukrainian cities without exception. Similar problems accompany public transport almost all over the world. There are isolated attempts to create an urban transport system that would bring profit or at least not be unprofitable and subsidized. Based on strict economic calculations and using probabilistic modeling tools, various measures are being implemented to optimize the operation

of public transport, and in the last stages, artificial intelligence has begun to be connected to this process. New means of transportation are being invented: from individual micromobility vehicles to futuristic large-capacity vehicles. In Ukraine, during the years of the full-scale war, the quantitative and qualitative composition of rolling stock fleets has also changed, and the attitude towards the need to update the transport infrastructure – traction substations, rail tracks, depots, power plants, etc. has also changed. The process of re-equipping enterprises began a few years before the war, when enterprises first began to include new low-floor vehicles equipped with devices for sedentary segments of the population in their fleets. Then began the era of replacing vehicles powered by internal combustion engines (mostly diesel) with electric and hybrid vehicles – electric buses, duobuses, autonomous trolleybuses. And also, when micromobility vehicles were also included in urban public transport. All this further complicated the planning of financial indicators of public transport enterprises. Since new vehicles required a new, sometimes completely different transport infrastructure, and, first of all, charging stations that power transport on electric motors. During the years of full-scale invasion, urban transport became one of the sectors of the economy that suffered the most from military aggression. Depots were destroyed, power lines were damaged, rolling stock was destroyed and stolen, even the metro, which operates around the clock as a shelter, was damaged. However, urban transport continues to operate, in parallel it is being rebuilt, new and used vehicles are being purchased, the electricity sector is being modernized, the route network is adapting to new realities. All this requires a rapid redistribution of financial flows, and this is impossible without prior modeling of the activities of transport enterprises. Therefore, the issue of modeling of the financial indicators of the activities of transport enterprises, in particular urban electric transport, in the war and post-war periods, that is, in the conditions of today's challenges, is relevant and undoubtedly requires a scientific approach.

During the years of the Russian-Ukrainian war, a fairly large number of works devoted to the problems of the post-war revival of Ukrainian transport appeared in the scientific periodical literature: ways, development priorities, sequence of actions, legal consequences, etc. Thus, at the end of 2022, work [1] was published on the post-war development of public transport in the context of a document called the "Plan for the Restoration of Ukraine". Work [2] discusses how the implementation of world experience in building an economy can be applied in Ukraine as a model of post-war restoration. The author of work [3] deals with similar issues. In [4], the priority of restoring transport infrastructure in the post-war period is emphasized and how this will affect the life of cities is substantiated. And in [5], the features, problems and prospects for the development of logistics processes in the war and post-war period in Ukraine are investigated. The authors of work [6] dealt with the problems of public transport service quality management processes in the post-war reconstruction of regions of Ukraine. In work [7], the development of the transport industry in conditions of military threats is described and conclusions are drawn regarding such a prospect. More general problems of martial law in Ukraine are considered in [8, 9], which describe in detail the ways of functioning of the transport sector of Ukraine under the legal regime of martial law, as well as the socio-economic and humanitarian consequences of Russian aggression for Ukrainian society. Regarding the modeling of the transport system of Ukrainian cities, attention should be paid to the works [10–12], which investigate the application of simulation modeling methods to assess the effectiveness of optimizing urban passenger transport routes. They also consider the modeling of mass service systems and their special case – passenger flow service systems. In addition to these issues, the above-mentioned works investigated the economic risks of the operation of transport systems and the reliability of their operation using methods of mathematical modeling of economic systems in conditions where uncertainty is an economic category and the environment for the operation of transport enterprises. Emphasis was placed on more applied issues: modeling of rational passenger traffic, selection of transport systems according to the criterion of maximum reliability, etc. Works [13, 14] are devoted to the study of the features of simulation modeling and the behavior of various economic systems, in particular transport systems, in the most general form. The analysis of financial and other economic indicators of the activities of urban electric transport enterprises of Ukraine in different periods of its life cycle is devoted to works [15, 16]. Ways to achieve sustainable operation of all types of transport (aviation, sea, river, railway and automobile) are also studied in [17]. The issues of sustainable operation of urban transport systems and the functioning of individual types of public transport – trolleybus systems [18, 19], tram networks [20], bus services [21], and sustainable operation of metros [22] are also investigated.

The uniqueness and uncertainty of economic systems were addressed by the authors of [23]. And the issues of modeling of the behavior of economic systems were addressed by the authors of [24–26]. It is also worth highlighting the works [27–31], where the authors, using the example of real economic systems and their behavior during their life cycle, made a number of conclusions regarding their stability and productivity. Based on the literature analysis, it is possible to conclude that there are no studies devoted to the key tasks facing the state and society during the war period and in the post-war period of public transport development. During such a period, modeling of the financial performance of urban electric transport enterprises (due to large amounts of uncertainty) becomes especially important. Such modeling should affect forecasts and plans for the restoration of the industry: the purchase of rolling stock, the renewal of transport infrastructure, methods and methods of industry management, and other important issues of life support for the transport systems of Ukrainian cities. Therefore, it is possible to consider the chosen topic of the article to be relevant, timely and such that it necessitates the conduct of selected research, namely, modeling of the financial indicators of the activities of urban electric transport enterprises in the war and post-war periods.

Thus, *the aim of research* is to assess, analyze and forecast the financial indicators of the activities of urban electric transport enterprises, taking into account the main factors affecting their financial capacity and efficiency of functioning.

To achieve this aim, the following objectives were set:

– to assess the financial indicators of the activities of urban electric transport (UET) enterprises, which are critically important for determining their financial capacity and stability;

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– to model the financial indicators of urban electric transport enterprises in the war and post-war periods;
– to analyze the obtained forecast values of urban electric transport enterprises and to formulate recommendations for ensuring the effective use of financial resources for the restoration and development of UET enterprises.

2. Materials and Methods

The object of research is the financial indicators of urban electric transport enterprises. To solve the problems related to forecasting and developing recommendations for the restoration and development of urban electric transport enterprises, the study proposes a conceptual model built on the basis of economic and mathematical methods and models. The information base for this study was data on the financial indicators of UET enterprises that carry out passenger transportation.

The main hypothesis of the study is the assumption that the development of electric transport in wartime conditions and in post-war recovery conditions has features that require additional financial support. This is due to the need to improve the quality of transport services, the integration of Ukraine into the European transport system and the reform of the industry, which involves attracting public, private and international investments.

The study uses a wide range of methods and models for forecasting financial indicators. In particular, the most common are trend forecasting models [32, 33], which are used to analyze one-dimensional time series. Such models allow to effectively assess future trends in the development of financial indicators of activity, without leveling the cumulative deviations of actual values. The advantage of trend models is their simplicity, speed of calculations and the absence of the need to use additional software tools. In particular, these models make it possible to continue the trends observed in the past into the future.

Thanks to trend models that take into account the evolution of indicators over time, it is possible to build self-adjusting economic and mathematical models that are able to accurately predict future values of indicators. An important feature is also the ability of these models to adapt to changes and take into account the information value of different stages of time series. The study also applied forecasting methods with multiplicative seasonality, which allow processing data taking into account variable fluctuations.

To summarize the results obtained, tabular and graphical methods are used, which allow to clearly compare retrospective and prospective values of financial indicators, assessing the effectiveness and dynamics of their activities in the field of urban electric transport.

3. Results and Discussions

3.1. Assessment and analysis of financial indicators of UET enterprises, which are critically important for determining their financial capacity and stability

A study of the financial indicators of urban electric transport enterprises is a necessary condition for a general and comprehensive assessment of their efficiency and financial capacity. Such analysis allows to assess key aspects of financial activity, in particular, the level of profitability. And this, in turn, makes it possible to predict the ability of UET enterprises to fulfill obligations, ensure uninterrupted operation of transport, as well as respond to external and internal factors affecting the activities of enterprises. Analysis of financial indicators also contributes to the development of management strategies, cost optimization and resource allocation, which are important for increasing the overall efficiency of UET enterprises. In addition, financial analysis is the basis for making informed decisions on attracting investments, both in the domestic and international markets, which is critically important for the modernization of infrastructure and renewal of UET rolling stock fleets.

The input data for the analysis of UET enterprises were financial performance indicators, namely income and expenses. Thus, as of 2024, the Corporation of Municipal Electric Transport Enterprises of Ukraine "Ukrelectrotrans" [34] unites 69 enterprises and organizations, including 33 municipal operating enterprises of municipal electric transport of various cities of Ukraine. The Corporation includes state and private enterprises whose activities are related to municipal electric transport. However, taking into account the realities of today, some of the enterprises are located in occupied territories or territories where active hostilities are underway, which complicates the timely publication of their statistical data in official sources. Also, of particular interest are UET enterprises located in large cities of Ukraine, namely: Kyiv – UC "Kyivpastrans", Odessa – UC "Odesamiskelectrotrans", Dnipro – CUC "Dniprovskyi Elektrotransport", Zaporizhzhia – UC "Zaporizhelectrotrans" and Lviv – UC "Lvivelectrotrans". Fig. 1 shows the dynamics of changes in the costs of selected UET enterprises for 2013–2023. Moreover, in Fig. 1 (and the following figures) the indicators are given in the national currency of Ukraine – in hryvnias (thousands of hryvnias), and in the further discussion for a better understanding of the readers, the monetary indicators are converted into the most common currency in the world – in US dollars.

The analysis of the costs of the studied enterprises indicates their stable annual growth, with a significant acceleration of growth rates since 2017 (as an example of UC "Kyivpastrans"). This may be due to large-scale investments in infrastructure renewal, purchase of new vehicles and increase in energy tariffs. Since 2020, the costs of some enterprises (UC "Kyivpastrans", UC "Zaporizhelectrotrans") have begun to decrease, which, first of all, may be a consequence of the COVID-19 pandemic and a decrease in transportation volumes. In 2022, there is a decrease in costs for UC "Kyivpastrans", UC "Odesamiskelectrotrans" and UC "Zaporizhelectrotrans", which is associated with the full-scale Russian invasion of the territory of independent Ukraine. However, on the contrary, at the CUC "Dniprovskyi Elektrotransport" and the UC "Lvivelektrotrans" their growth is observed compared to the previous year 2021, which may be a consequence of the influx of population to safer cities, such as Lviv and Dnipro at the beginning of the invasion. In general, all the studied enterprises demonstrate a steady increase in costs, which is characteristic of the industry that requires constant capital investments in the development and modernization of transport and infrastructure. However, high costs require attention to their control and increase in operational efficiency to ensure profitability and maintain financial stability. To understand the effectiveness of the financial activities of UET enterprises, it is also important to analyze their income. It is worth noting that the studied UET enterprises are municipal enterprises that are on the city's balance sheet. Therefore, usually their costs are covered by subsidies from local budgets, and the main income, nevertheless, is considered to be income from the sale of tickets. So, Fig. 2 shows the total revenue of UET enterprises for 2013–2023.

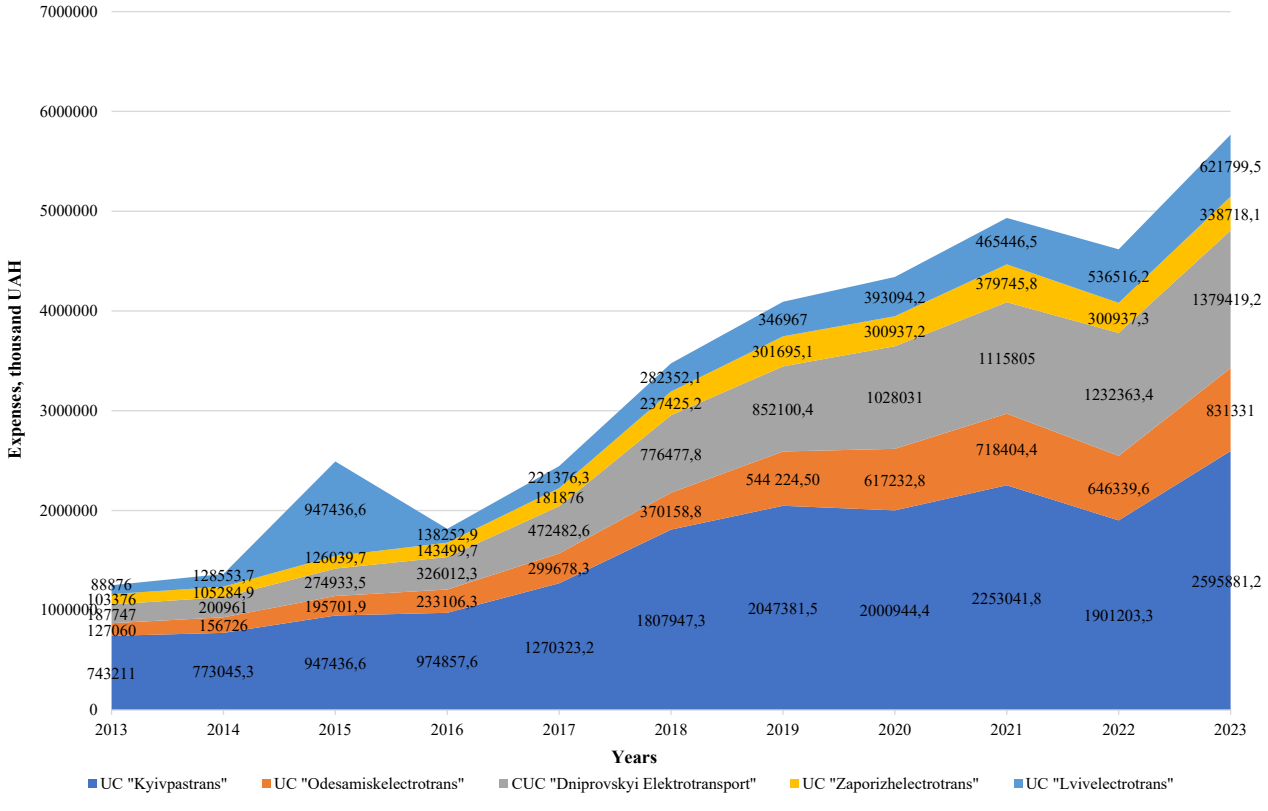

Fig. 1. Expenditure volumes of UET enterprises for 2013–2023 (formed by the authors based on [34])

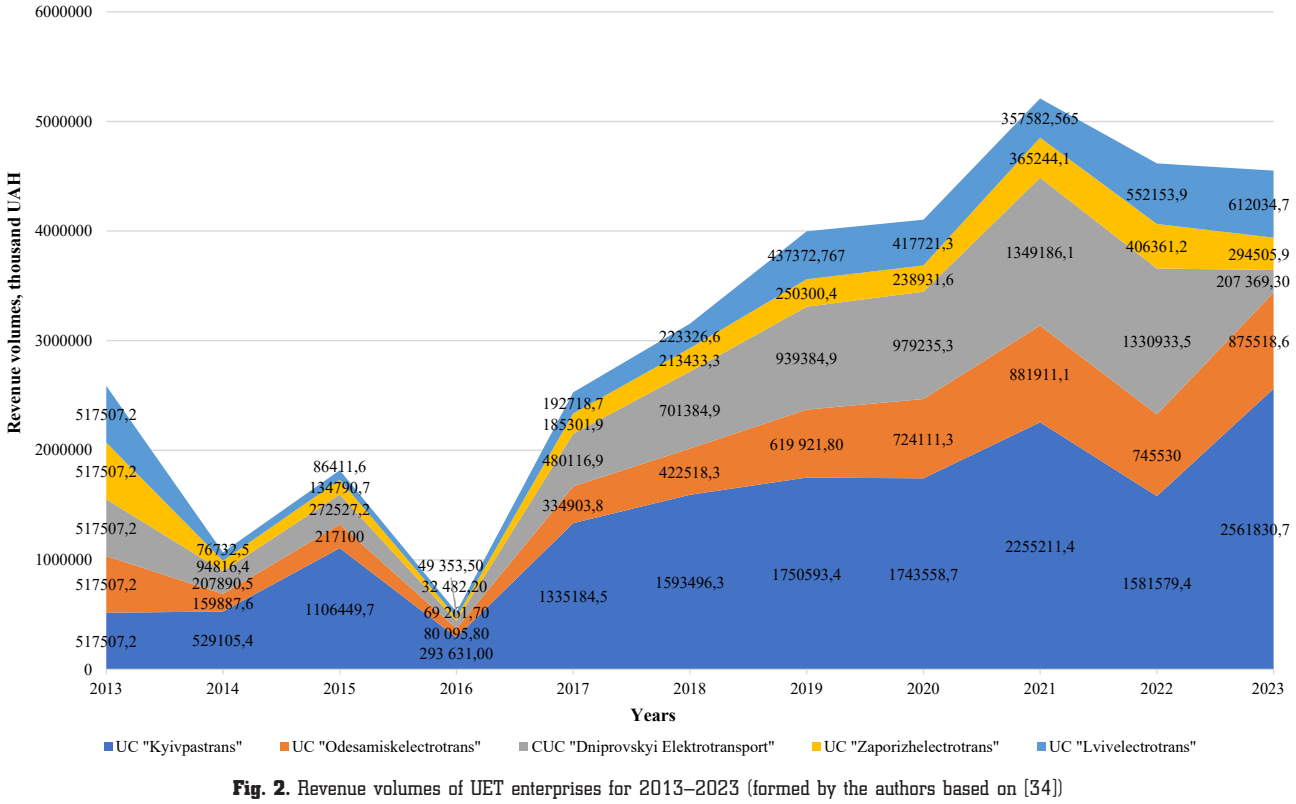

Fig. 2. Revenue volumes of UET enterprises for 2013–2023 (formed by the authors based on [34])

A general analysis of the revenues of UET enterprises showed that the main financial indicators are significantly affected by the scale of cities and the demand for transport services. Thus, the UC "Kyivpastrans" is the undisputed leader in revenues (in 2023, the revenue of the UC "Kyivpastrans" amounted to 2,561,830.7 thousand UAH or about 64,000 USD). This is explained by the large passenger flow and the relatively high level of tariffs for transport services in the capital. Also, stable revenue growth is observed at the enterprises of the city of Dnipro (207,369.30 thousand UAH or 5,184 USD in 2023) and the city of Odesa (875,518.6 thousand UAH or 21,890 USD in 2023), where

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the demand for electric transport services remains high. At the same time, the enterprise UC "Zaporizhelectrotrans" of the city of Zaporizhzhia has lower revenues due to a lower level of passenger traffic and less favorable operating conditions (294505.9 thousand UAH or 7,360 USD in 2023). In general, most UET enterprises have stable revenue growth, except for 2016, where all the surveyed enterprises had a significant drop in revenue, which is associated with the termination of subventions from the state budget this year. From 2017 to 2021, UC "Kyivpastrans" – first of all, like the enterprises of urban electric transport of other cities, managed to restore and significantly increase their revenues. This indicates successful adaptation to changing conditions, external support and a successfully launched mechanism for modernization of transport infrastructure. It is worth noting that 2022 turned out to be a difficult year, not only for UET enterprises, but also for the state as a whole, which caused a significant drop in revenues. However, in 2023, a stable increase in revenues is again observed, which confirms the effectiveness of management measures to support and restore the industry during the war period.

Therefore, in order to maintain its financial capacity and profitability, each of the studied urban electric transport enterprises needs to optimize its costs. And also find opportunities to attract additional funds for further development and implement effective management of financial resources.

3.2. Modeling of financial indicators of urban electric transport enterprises in the war and post-war periods

The analysis of the financial indicators of UET enterprises allows not only to assess the effectiveness of their activities, but also to identify key factors that affect the financial capacity and stability of the industry. This makes it possible to formulate recommendations for optimizing costs, increasing revenues, and improving management decisions, contributing to the development and modernization of urban electric transport enterprises. However, for such work it is important to predict financial indicators that characterize the performance of both UET enterprises and the industry as a whole. The main and most important indicator that characterizes the performance of urban electric transport enterprises is profit, since it reflects the ability of the enterprise not only to cover its costs, but also to generate additional resources for development and investment. Profit is the main criterion of financial capacity and efficiency of management decisions, because it determines the ability of UET enterprises to modernize the technical base, improve the quality of passenger service and invest in infrastructure development.

In addition, stable profit growth allows enterprises to maintain their economic balance, reduce financial risks and ensure continuity of activity in the war and post-war periods. Thus, the UET enterprises profit: UC "Kyivpastrans", UC "Odesamiskelectrotrans", CUC "Dniprovskyi electrotransport", UC "Zaporizhelectrotrans", UC "Lvivelectrotrans" for the last 5 years is given in Table 1.

It is worth noting that UET enterprises have losses every year. The largest loss in 2023 was suffered by CUC "Dniprovskyi Elektrotransport" (3,084 thousand USD). This is the most negative result among all UET enterprises, which may indicate serious problems in the management of financial resources. The best result among the studied enterprises was shown by UC "Odesamiskelektrotrans", which has a consistently high profit due to large revenues from the local budget, but showed some decline in 2023. The indicated fluctuations in the results of other enterprises may indicate the general instability of the industry, dependence on various external factors, the need to optimize internal processes and the need for external financial support.

Therefore, it is important for UET enterprises to focus on stabilizing financial indicators and improving management and financial strategies to ensure their sustainable development in conditions of economic instability during the war period. Thus, it is proposed to conduct modeling of the profits of the above-mentioned enterprises to determine their forecast values in the future period. Modeling of financial indicators is a complex methodological task that requires specialized knowledge and practical skills in this area. For further forecasting of profits of urban electric transport enterprises, a conceptual approach has been formed, which includes 6 main stages (Fig. 3).

Table 1

UET enterprises profit for 2019–2023, thousand USD

Enterprise	2019	2020	2021	2022	2023
UC "Kyivpastrans"	–12630	–9192	80	–8757	–896
UC "Odesamiskelectrotrans	3221	3817	6056	2718	1163
CUC "Dniprovskyi electrotransport"	3714	–1742	8643	2700	–3084
UC "Zaporizhelectrotrans"	–2187	–2214	–537	2888	–1163
UC "Lvivelectrotrans"	3847	880	–3995	428	–257

Note: formed by the authors based on [34]

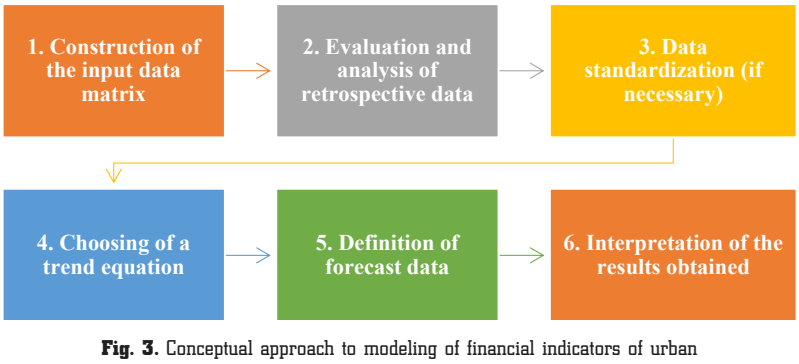

Fig. 3. Conceptual approach to modeling of financial indicators of urban electric transport enterprises

The complexity of modeling is manifested immediately in the first 2 stages, which is associated with the timely coverage of information on the activities of UET enterprises in official open sources due to military operations. Thus, the input data of the matrix was the profit of UC "Kyivpastrans", UC "Odesamiskelectrotrans", CUC "Dniprovskyi electrotransport", UC "Zaporizhelectrotrans", UC "Lvivelectrotrans: for 2013–2023 [34]. If it

is necessary to reduce the indicators to single units of measurement and better interpret them, the indicators are standardized (stage 3):

$$S=(Y_{ir}-\min_j Y_{ij})/(\max_j Y_{ir}-\min_j Y_{ij}), \quad (1)$$

where S – the indicator reduced to a standardized form; Y_{ir} – the input performance indicators of UET enterprises.

The choice of the trend equation with the definition of the R^2 determination indicator, which characterizes the accuracy of the trend approximation to the actual data, was influenced by the following. The higher the level of approximation, the higher the R^2 indicator. However, it should be borne in mind that sometimes an increase in the R^2 indicator may not coincide with the economic interpretation of the analyzed indicators.

At the fifth stage, forecast values are calculated by substituting the ordinal numbers of the forecast periods into the trend equations: linear, exponential, polynomial, logarithmic and power. In this case, a linear trend is used, when necessary, when it provides a significantly higher value of the R^2 approximation criterion.

At the sixth stage, using retrospective data (stages 1–2), the final calculation of forecast values based on data from previous periods is performed.

So, in accordance with the proposed conceptual approach to modeling of financial indicators of urban electric transport enterprises (Fig. 3), the forecasted profit volumes of urban electric transport enterprises have been determined, which will allow developing recommendations for managers of UET enterprises.

Fig. 4 presents the trend for determining the profit of UET enterprises with the best result according to the criterion of the reliability of R^2 approximation.

Table 2 presents the results of the modeling – determination of the forecast values of the UET enterprises profit for 2025–2026. Thus, retrospective (2019–2023) and prospective – forecasted values (2025–2026) of the profits of urban electric transport enterprises have been formed. They are shown in Fig. 5 (information for 2024 is missing).

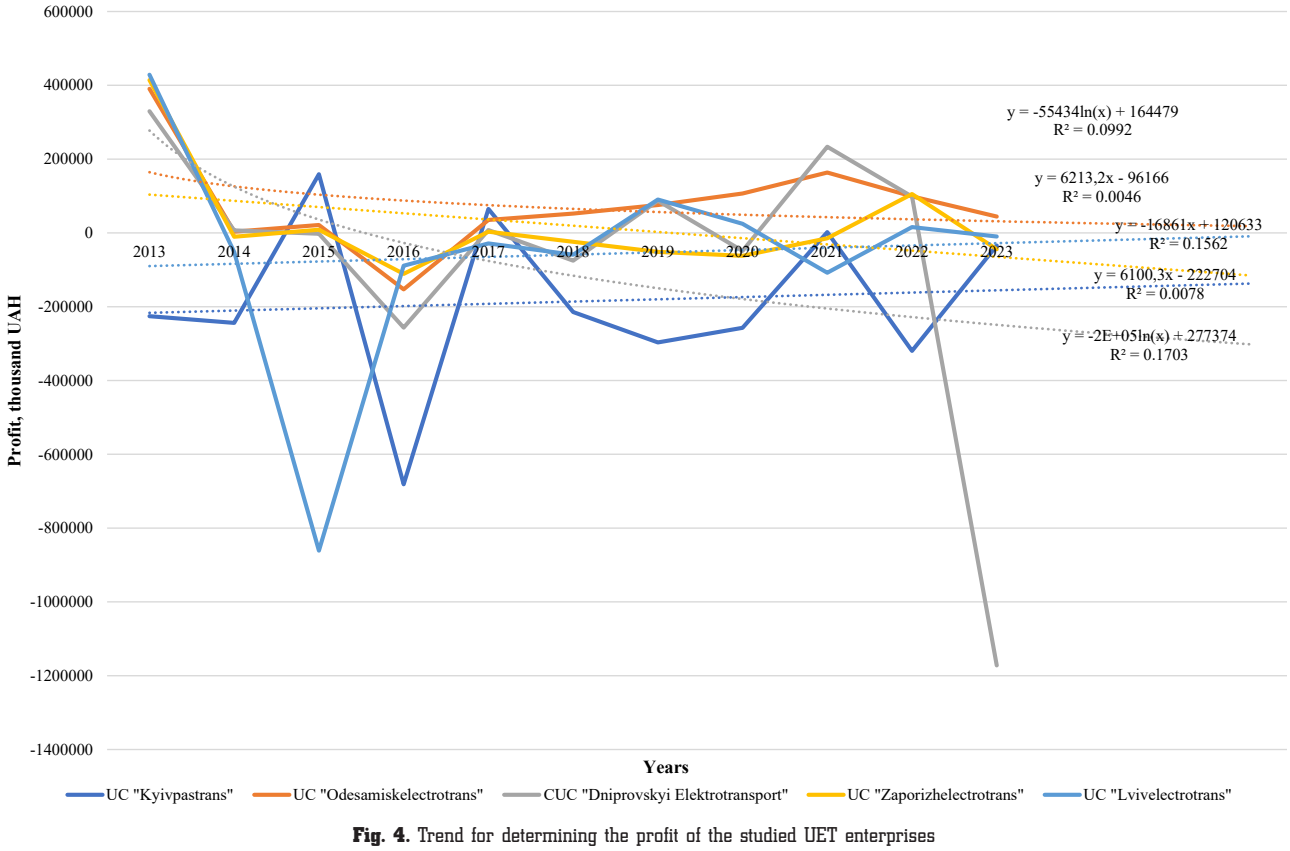

Fig. 4. Trend for determining the profit of the studied UET enterprises

Table 2

Results of the modeling of the UET enterprises profit

Enterprise	Equation	R^2	Trend
UC "Kyivpastrans"	$y=6100,3x-222704$	0.0078	Linear
UC "Odesamiskelectrotrans"	$y=-55434\ln(x)+164479$	0.0992	Logarithmic
CUC "Dniprovskyi electrotransport"	$y=-2E+05\ln(x)+277374$	0.1703	Logarithmic
UC "Zaporizhelectrotrans"	$y=-16861x+120633$	0.1562	Linear
UC "Lvivelectrotrans"	$y=6213,2x-96166$	0.0046	Linear

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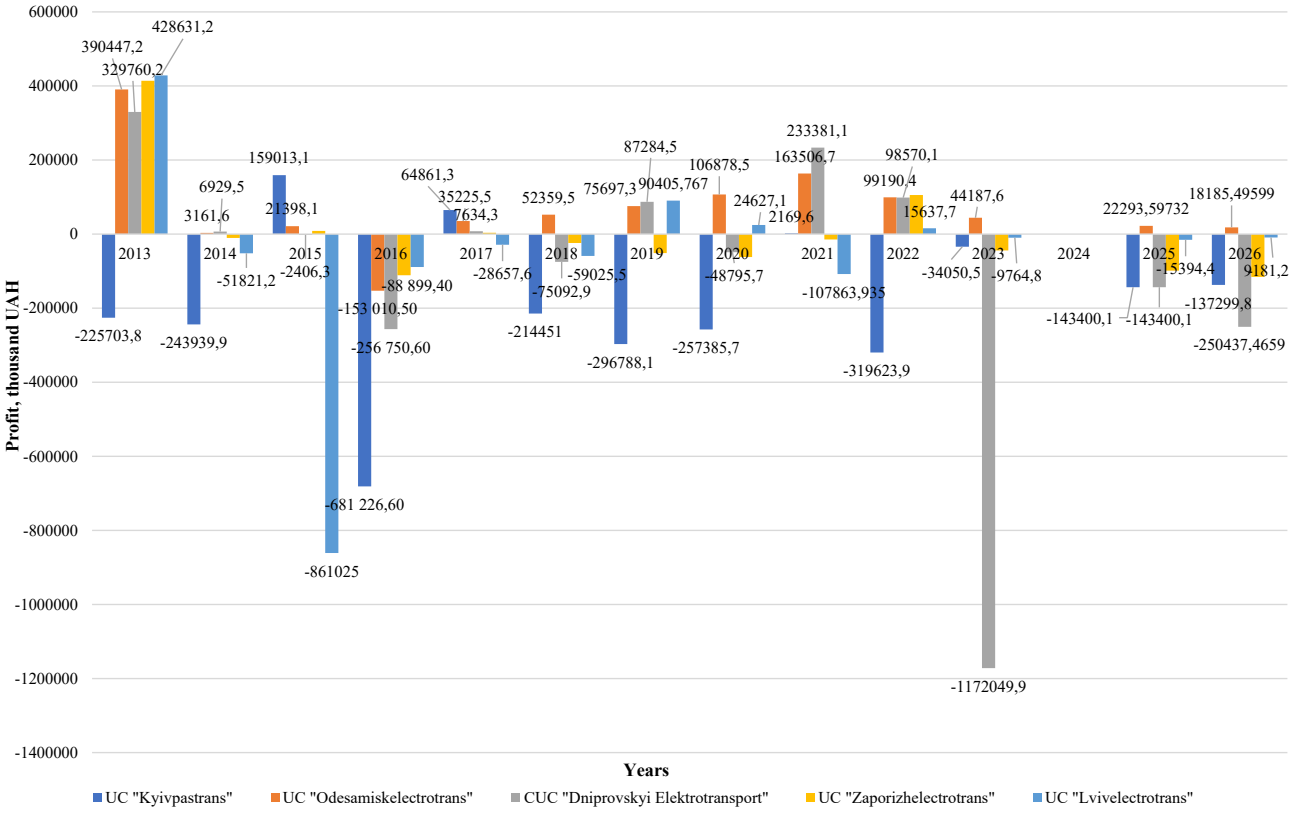

Fig. 5. Retrospective and forecasted values of UET enterprise profit

3.3. Analysis of the forecast values of financial indicators (profit) of UET enterprises and the formation of recommendations for ensuring the effective use of financial resources for the restoration and development of UET enterprises

The forecast values obtained for 2025 and 2026 indicate a deterioration in the financial indicators of UET enterprises in the near future. Especially, for the enterprises of the CUC "Dniprovskyi Elektrotransport", where the forecast losses in 2026 should amount to 6261 thousand USD (at the exchange rate of the US dollar/Ukrainian hryvnia at the current level), the CU "Zaporizhelectrotrans", where the forecast losses in 2026 are 2886 thousand USD and the CU "Lvivelectrotrans", where the forecast losses in 2026 are 230 thousand USD. This indicates the need for significant changes in the management strategy of enterprises or external conditions that may hinder their financial stability. Only the CU "Odesmiskelektrotrans" with the right management decisions can maintain profit, but it is also expected to significantly reduce this indicator in 2026 – to 455 thousand USD.

The main factors that may affect the situation and be the main reasons for the deterioration of financial indicators include:

– military operations;
– economic difficulties;
– reduced demand for services;
– lack of changes in tariff policy and changes in enterprise management;
– insufficient support from the state and local governments;
– lack of investment.

Therefore, the management of urban electric transport enterprises needs to immediately develop and implement preventive measures to prevent crisis situations in the current and forecasted periods. Since UET enterprises are the main type of urban transport, ensuring uninterrupted passenger movement in cities and affecting the efficiency of all urban mobility.

As for the prospects for the development of urban electric transport in Ukraine, it has every chance not only to survive this merciless war, not only to restore, but also to exceed its pre-war potential, provided that the positive trends of 2023 are maintained. The main criterion for its sustainable operation is sufficient funding from external sources.

Thus, the following recommendations are proposed to ensure the effective use of financial resources for the restoration and development of urban electric transport enterprises in Ukraine:

1. Cost optimization and improvement of management, including cost auditing and automation with the transition to modern digital tools.
2. Restructuring of financial policy, which involves revising tariff policy and improving the investment attraction strategy.
3. Development of infrastructure and renewal of rolling stock, which is a necessary condition for the modernization and renewal of the transport system of Ukrainian cities, as well as a complete revision and optimization of the route network.
4. Improving the efficiency of energy resources use, which involves investing in energy-efficient technologies and reducing electricity costs.
5. Review of personnel policy of enterprises, in particular, improving the system of advanced training of various categories of employees, organization and conduct of trainings, etc.
6. Establishing interaction with stakeholders, namely – cooperation with state, regional and local authorities, as well as with local and industry businesses and public organizations.

7. Development of public-private partnerships and partnerships with international organizations to attract investments (including from donor funds) to finance transport projects in the form of grants or soft loans for the development of energy-efficient technologies and "green" modes of transport.

The authors of the study formulated a number of recommendations for improving financial indicators and ensuring the effective use of financial resources for the restoration and development of urban electric transport enterprises. However, the question remains to what extent these recommendations can be universal for all UET enterprises without taking into account the specifics of each city of Ukraine. All the studied enterprises have different operating conditions, different levels of financing and different available resources for implementing changes. Therefore, it is important that the proposed measures are adapted to the real conditions, capabilities and needs of each specific enterprise. For example, recommendations for optimizing costs or restructuring financial policy may require a different approach for enterprises with different levels of debt, geographical location and specifics of working in war conditions. In addition, the issues of attracting investment, upgrading infrastructure and implementing energy-efficient technologies should be supported by realistic scenarios and specific measures for each of the UET enterprises. Therefore, it is necessary that each of the proposed areas be flexibly adapted to the individual characteristics and needs of each enterprise in order to ensure maximum efficiency and effectiveness of these measures in practice.

4. Conclusions

A study of financial indicators (income and expenses) of urban electric transport enterprises showed that the effectiveness of their activities largely depends on the ability to adapt to changing conditions, such as economic difficulties, military challenges and changes in demand for transport services. UET enterprises demonstrated a stable growth in costs, which is typical for an industry that requires significant capital investments in its development. It is proven that high costs require increased attention to controlling their implementation and increasing operational efficiency. It is substantiated that one of the key factors for maintaining the financial capacity of enterprises is stable growth in income, which largely depends on the scale of the city and demand for transport services. Therefore, in conditions of martial law, the need to optimize costs, search for new sources of income and effective management of financial resources remains important to ensure further development and preservation of the financial capacity of UET enterprises.

The study developed a conceptual approach to modeling the financial indicators of urban electric transport enterprises, which includes 6 main stages. It made it possible to determine the forecast values of the enterprises' profits for 2025–2026. The obtained forecast financial indicators of urban electric transport enterprises indicate a deterioration in the financial situation, in particular for such enterprises as CUC "Dniprovskyi Elektrotransport", CU "Zaporizhelectrotrans" and CU "Lvivelectrotrans". This indicates the need for significant changes in their management strategies and adaptation to changing conditions. At the same time, with optimal management decisions, CU "Odesamiskelectrotrans" can maintain profitability, albeit insignificant. This emphasizes the importance of developing preventive measures and further recommendations to prevent crisis situations and ensure the stable operation of UET enterprises, which are a critically important component of the entire urban infrastructure. It is proven that, given the development prospects, urban electric transport of Ukraine has the potential not only for restoration, but also for significant improvement of its indicators, provided that sufficient financing is received from external sources. To achieve these goals, it is necessary to implement comprehensive measures, including cost optimization, development of transport infrastructure, implementation of measures to improve the energy efficiency of passenger transportation. As well as constantly conduct advanced training of personnel and expand partnerships, which will undoubtedly ensure the sustainability and further development of the industry.

Conflict of interest

The authors declare that they have no conflict of interest regarding this study, including financial, personal, authorship or other, which could affect the study and its results presented in this article.

Financing

The study was conducted without financial support.

Data availability

The manuscript has no related data.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the presented work.

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