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Assessment of the air transportation market in the economies of newly independent states and forecast of its development

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Abstract

The air transportation market in the newly independent states is a dynamically developing sector that significantly influences economic growth and the integration of these countries into the global economy. The aim of this study is to assess the relationship between air transportation indicators and economic indicators, including GDP per capita. A comparative analysis was conducted across three periods: pre-pandemic (2016–2019), during the COVID-19 pandemic (2020–2021), and post-pandemic (2022–2024), using correlation and regression analysis, as well as the ARIMA time series forecasting model. A strong correlation (over 85%) was identified between passenger and cargo air transportation volumes and GDP per capita, while the regression model ($R^2 = 0.962$, $p < 0.01$) confirmed the statistical significance of these variables in explaining economic performance. Forecasts up to 2028 indicate growth in air transportation volumes and improvements in socio-economic indicators. The results confirm the role of air transport as an indicator of economic development, providing a basis for developing strategies to optimize transportation policy and promote sustainable economic growth in the region under study.

Keywords: Air transportation, cargo transportation, GDP, newly independent states, passenger air transportation.

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1. Introduction

The group of Newly Independent States (NIS) that emerged after the collapse of the Soviet Union has undergone a complex path of economic transformation. These countries face unique challenges in the process of integration into the global economy. In addition to similar economic conditions of development due to their historical background, these states share a common geographical vector, forming, in fact, a new geo-economic region.

Under the current conditions of globalization and the transformation of economic relations, understanding the relationship between the development of air transportation and economic growth becomes critical for making managerial decisions at the state level. This necessitates a comprehensive analysis of the current state and prospects of air transportation market development, taking into account its impact on macroeconomic indicators.

In recent decades, air transport has become one of the key drivers of globalization, providing not only speed and accessibility of international transport but also stimulating economic activity through the development of supply chains, tourism, and business links. For the Newly Independent States (NIS), the development of the aviation sector is of particular importance as it helps to overcome geographical isolation, attract foreign investment, and enhance trade integration.

Despite the obvious importance of air transport for economic growth, the quantitative impact of this sector on macroeconomic performance remains poorly understood, especially in the context of the NIS.

Modern economic challenges require the scientific community not only to analyze the current state of the air transportation market, but also to forecast its development, taking into account possible risks and opportunities both at the level of individual companies and states as a whole. This requires a comprehensive approach that includes both statistical analysis and modeling of future trends in the industry's development.

Thus, the study of the air transportation market and its relationship with economic development is an urgent scientific task, the solution of which can be the basis for optimizing transport policy and stimulating economic growth in the NIS. This, in turn, will contribute to increasing the competitiveness of the region as a whole and improving the quality of life for the population of individual countries.

2. Literature Review and Problem Statement

In the context of globalization and defragmentation of production, the air transport market plays an important role in the development of developing economies. The timeliness and quality of air transportation market assessment allow investors to allocate investments more wisely and countries to effectively shape their development strategy.

Using Kazakhstan as an example, Zhardemkyzy and Serikkazhina [1] study new trends in the development of air transportation. Kazakhstan aspires to become the largest business and transit hub of Central Asia, which implies the involvement of the world's largest companies in the development of transport corridors and multimodal transportation markets, including the creation of an international aviation hub. The possibilities of integration are studied, including joining these international documents, which will be an important factor for increasing transit cargo transportation through Kazakhstan. At the same time, the article does not provide an economic assessment of possible changes in the aviation industry market.

Another article, Ivashchuk [2], discusses the application of the analysis method using graph theory to identify critical points in the air networks of Ukraine, Turkey and Moldova. As a result of the analysis, it can be said that the air networks of each of the studied countries are sufficiently developed, which creates favorable conditions for economic development and increased international trade. The author correctly notes that Ukraine has great potential in air transportation, which should be realized as soon as the airspace is opened.

The paper by Rai and Raju [3] studies the causal relationship between air transportation and the economic performance of high-income countries. A long-run relationship between air transport infrastructure, GDP, and trade openness in 20 countries is found. However, the study is limited to a sample of high-GDP countries, and the findings may not be confirmed when scaled up.

The sustainability of the air cargo network is analyzed in Xu et al. [4]. The factors of air cargo transportation sustainability are studied, and ways to improve it are proposed. At the same time, the study does not provide details of indicators by country.

The book [5] studies the development of the air transportation market. Different models of airline development are considered: low-cost and traditional. However, the comparison is qualitative, based on subjective assessments.

The study by Sun et al. [6] analyzes the methods of airlines competing with each other. The authors emphasize the importance of a balanced approach to the formation of competitive advantages. Intensive competition in the air transportation market stimulates the reduction of tariffs and improvement of service quality, which increases the availability of air travel for the population, promotes the inflow of foreign tourists, and activates investments in the modernization of aviation infrastructure. However, it should be noted that the study lacks a quantitative assessment of the impact of airlines' competitive strategies on macroeconomic indicators.

The assessment of the impact of air and rail transportation on inbound and outbound tourism is presented in Hussain [7]. The results showed that air and rail transportation, including trade openness, have a positive impact on inbound and outbound tourism in the long run. However, the paper does not provide an assessment of the impact of separate air transportation on tourism, in addition, the study perimeter includes only countries participating in the «One Belt, One Road» initiative.

The prospects for the development of the aviation sector in the African market are analyzed in the book [8]. It is stated that the development of the African aviation sector has had a significant impact on the inflow of investment into the economy, opportunities in the labor market, as well as gave national governments the opportunity to generate revenue through taxes. However, it should be understood that African economies are unique: they are characterized by various national peculiarities that can also influence changes in economic performance.

The article Santos et al. [9] analyzes the impact of the COVID-19 pandemic on the demand for air transportation. Regression analysis revealed an important pattern: countries with a high level of social integration (availability of air transportation for different segments of the population, development of a regional aviation network) experienced a more stable growth in demand for air services. However, the authors do not take into account that economic factors, such as inflation rates and household incomes, also play a significant role in shaping demand for air transportation.

A study of the economic feasibility of air mobility development is presented in another paper [10]. It discusses ways to improve the air transportation system, such as autonomous driving technologies, and studies the economic aspects of the introduction of such technologies. At the same time, the impact of such technologies on macroeconomic indicators is not analyzed.

The assessment of the role of aeropolitics in the integration of regional aviation markets of the Association of Southeast Asian Nations is presented in the article [11]. The impact of the aviation industry on the economies of various countries is studied. At the same time, the analysis of economic factors of integration and the assessment of the aviation industry are not presented in the article.

Quality assessment of air transportation projects using the analytic hierarchy process is studied in Alharasees and Kale [12]. The complex aviation environment requires dynamic systems for evaluating air transport performance: a three-level hierarchical model of air transport service quality is proposed, including 4 main criteria, 15 sub-criteria of the first level, and 12 sub-criteria of the second level. However, for a full-fledged assessment, it is also necessary to take into account the influence of external factors such as economic conditions, inflation rate and cost of resources.

The study by Zhou [13] presents an extensive analysis of competition and development in the aviation industry with special emphasis on strategic development. The result of the SWOT analysis is presented: strengths and weaknesses, opportunities and threats, with a focus on budget and medium-budget airlines in the current market conditions. It is proven that the competitive environment directly affects the tariff policy of airlines, which affects the affordability of air transportation for the population and, consequently, the passenger traffic indicators. The study is based on the analysis of developed countries, the results may change if the sample is expanded.

The recovery of the aviation market after the pandemic, using China as an example, is presented in the study by Czerny et al. [14]. It is stated that China's domestic aviation market recovered by about 80% in two months after the pandemic was brought under control, while the recovery of external flights took much longer. However, the article does not analyze the impact of the air transportation market on the country's economy.

The impact of tourism on the aviation sector of the economy is presented in Avram [15]. In the EU over the last decade, airlines have introduced fixed fares that have made many cities affordable tourist destinations. The market of low-cost transportation has changed the tourism industry and influenced the revenues of the aviation sector. However, the article does not sufficiently explore the impact of low fares on the EU economy.

The paper by Balsalobre-Lorente et al. [16] studies the asymmetric impact of air transport on economic growth using Spain as an example. The empirical results showed that air transport, urbanization process and social globalization have a positive and significant impact on economic growth, while the use of renewable energy sources reduces economic growth due to the predominance of fossil sources in the energy balance. It is important to note that as air transportation increases, the pressure on infrastructure and the environment also increases, which may have a negative impact on economic performance. But this assumption needs to be verified.

Thus, it can be concluded that the development of the air transportation market may have a positive impact on the economies of various countries. The science emphasizes the importance of timely assessment of air transportation market development, on the basis of which it is possible to form effective development strategies both at the level of airlines and at the level of countries. However, economic and mathematical evidence of the relationship between the economic indicators of countries' development and the efficiency of air transportation is rarely provided, and we have not found any evidence at all for the group of newly independent states. For a more accurate analysis, it is necessary to integrate comparative and mathematical research methods. Therefore, this paper will focus on the comparative analysis of the dynamics of air transportation indicators and the economic and mathematical evaluation of the degree of influence of air transportation on the economic indicators of the newly independent states.

3. The Aim and Objectives of the Study

The purpose of the study is to assess the air transportation market in the economy of newly independent states and forecast its development.

In order to achieve this goal, the following objectives are addressed:

- Conduct a comparative analysis of air transportation and economic development indicators of the NIS;
- Determine whether there is a correlation between changes in air transportation indicators and changes in economic indicators in the NIS.
- To form a forecast of changes in air transportation indicators and economic development of the NIS.

4. Materials and Methods of the Study

The following methods are used in this study: classification, generalization, comparative statistical and correlation analysis, variance, regression analysis, and the ARIMA model for time series forecasting.

The study period is 2016–2024 for comparative, correlation and regression analysis of indicators. For forecasting, the sample was extended to 2010 to better account for seasonal factors and improve the quality of the ARIMA model.

The sample of countries is defined by the NIS: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Uzbekistan, Ukraine, Estonia, Latvia and Lithuania.

The following coefficients are used to assess the quality of regression models:

Coefficient of determination (R^2) – shows what proportion of the variation in the dependent variable is explained by the independent variables.

Durbin-Watson (DW) – checks for the presence of autocorrelation of residuals (how much the model errors depend on each other).

The Python pmdarima library, auto_arima method with forecast_time_series function, was used to fit the parameters of the forecasting model.

The following indicators are used for analysis: air passenger traffic (mln. people), air freight traffic (bln. $), flights (th. pcs.), GDP per capita (th. $), unemployment (%), annual inflation (%), share of middle class (% of population), tourist flow (mln. people).

The information and empirical base of the study is represented by statistical and analytical reports: ICAO Data, IATA Economics, OAG Aviation, World Bank, UNWTO.

Data processing was performed using Python in the Jupiter notebook environment.

5. Practical Analysis of Air Transportation Market Development in the Newly Independent States

5.1. Comparative Analysis of Air Transportation Performance and Economic Development of the Newly Independent States

For the convenience of calculations, we introduce the following variables:

Air Transportation Indicators:

PSG – passenger traffic (mln people);

FRT – volume of air cargo transportation (bln $);

FLT – flights (thousand pieces).

Economic performance of countries:

GDP – GDP per capita ($ ths.);

UNM – unemployment (%);

INF – annual inflation (%);

MCL – share of the middle class (%);

TRS – tourists (mln. people).

First of all, let us analyze the dynamics of changes in the indicators for 2016–2024 in the context of the countries selected for the study. Table 1 presents the change in the main indicators for the period from 2016 to 2024.

Table 1.
Change in air transportation and economic development indicators for the NIS for 2016–2024.

Country	Год	PSG	FLT	GDP	UNM	INF	MCL	TRS	FRT
Azerbaijan	2016	4.0	38.5	6500.0	5.1	12.4	36.0	2.5	0.2
	2024	3.1	18.5	5950.0	5.8	4.5	28.0	2.4	0.3
Armenia	2016	2.1	15.5	3800.0	18.0	1.4	28.0	1.3	0.1
	2024	2.5	15.2	7250.0	12.5	3.8	35.0	2.2	0.2
Belarus	2016	2.5	28.0	7200.0	1.0	10.6	26.0	1.0	0.5
	2024	4.0	38.0	7200.0	3.8	9.0	30.0	3.2	0.5
Georgia	2016	2.5	16.5	4600.0	11.7	2.1	35.0	3.6	0.3
	2024	5.8	35.0	7650.0	17.8	3.2	45.0	7.5	0.5
Kazakhstan	2016	10.5	53.0	11500.0	5.0	8.5	41.0	6.0	0.6
	2024	8.5	65.0	12500.0	4.7	7.5	40.0	9.2	0.9
Kyrgyzstan	2016	1.7	12.0	1150.0	7.3	0.4	19.0	1.6	0.1
	2024	2.7	18.0	1750.0	7.2	8.0	27.0	2.5	0.2
Latvia	2016	6.3	65.5	16800.0	9.6	0.1	52.0	3.0	0.4
	2024	8.0	85.0	23500.0	6.3	3.5	65.0	4.5	0.7
Lithuania	2016	5.6	58.5	17400.0	7.9	0.7	54.0	3.2	0.5
	2024	7.5	80.0	24500.0	5.8	4.0	68.0	5.0	0.8
Moldova	2016	0.6	7.2	2350.0	4.9	6.4	29.0	0.4	2.3
	2024	1.8	12.5	5800.0	4.5	10.5	25.0	0.8	0.1
Tajikistan	2016	1.7	15.0	1100.0	2.9	5.9	16.0	0.8	0.1
	2024	1.8	12.0	1250.0	8.0	7.8	20.0	1.5	0.2
Turkmenistan	2016	2.7	27.0	6800.0	2.6	8.0	29.0	0.9	0.3
	2024	2.0	15.0	8500.0	4.0	12.0	15.0	0.5	0.4
Uzbekistan	2016	3.3	24.5	2400.0	6.5	8,0	32.0	2.1	0.3
	2024	5.2	40.0	4200.0	7.5	8.5	45.0	4.8	0.5
Ukraina	2016	9,0	45.0	3000.0	8.8	13.9	23.0	13.0	0.5
	2024	0.5	5.0	2500.0	18.5	15.0	25.0	6.8	0.1
Estonia	2016	2.4	27.5	20800.0	6.8	0.5	57.0	3.4	0.3

	2024	3.2	40.0	28500.0	5.3	4.2	70.0	4.5	0.6

Analyzing the data presented in Table 1, it can be seen that the growth of passenger traffic (PSG) and air freight traffic (FRT) in most countries coincides with an increase in economic indicators such as GDP per capita (GDP) and the share of the middle class (MCL). It should be kept in mind that increases in economic indicators are usually associated with increases in domestic output. In the context of globalization, this indicates that the development of the aviation industry can contribute to the improvement of the economic situation in the country, as well as to the increase in domestic production. An important component here is the marginality of the air transportation business and its competitiveness.

For a more detailed analysis, let us group the data and analyze its change over the period 2016–2024. The grouping takes into account the indicators of Ukraine, as the growth of the air transportation market in neighboring countries is also related to the redistribution of Ukrainian traffic to neighboring countries.

The dynamics of changes in the indicators for 2016–2024 are shown in Table 2.

Table 2.
Change in NIS summary indicators for 2016–2024.

Indicators	2016	2017	2018	2019	2020	2021	2022	2023	2024
PSG	54.9	58.9	63.5	68.1	34.4	44.9	50.2	59.7	61.1
FLT	433.7	464.2	501.0	537.1	278.2	376.5	459.5	522.0	516.2
GDP	4980.8	5297.2	5661.6	6048.2	5324.0	5825.7	5802.0	6401.3	6574.9
UNM	6.6	6.4	6.1	6.0	7.3	6.8	10.9	8.7	9.6
INF	9.1	10.3	8.8	7.8	7.1	9.3	15.0	10.1	8.8
MCL	29.6	31.3	33.0	34.5	31.5	33.0	32.7	35.0	33.9
TRS	42.8	46.2	50.2	54.2	25.7	35.5	37.0	45.8	55.4
FRT	6.4	6.9	7.6	8.2	5.8	6.9	7.6	8.4	6.1

By analyzing the indicators in Table 2, we can see a positive trend in the change of indicators during the period 2016–2019, which indicates the development of both the air transportation market and the economy in the NIS. Meanwhile, during the pandemic period of 2020–2021, there was a decline in both air transportation and economic development indicators. In the post-pandemic period (2022–2024), there is an increase in both economic development and air transportation indicators in the NIS. However, in terms of air transportation, the figures from 2019 have not yet been achieved.

Thus, we can form a hypothesis that a positive change in air transportation performance has an impact on the economic performance of the country.

5.2. Determining the Relationship between Changes in air Transportation Indicators and Changes in Economic Indicators in the NIS

To test the hypothesis that there is a relationship between air transportation indicators and economic indicators of the NIS, correlation analysis was used and the correlation matrix shown in Table 3 was compiled.

Table 3.
Correlation matrix for air transportation and economic indicators of the NIS.

Indicators	PGS	FLT	FRT	TRS	GPD	UMN	INF	MCL
PGS	1.00	0.96	0.96	0.96	0.90	0.16	0.00	0.42
FLT	0.96	1.00	0.90	0.92	0.87	0.11	0.21	0.55
FRT	0.96	0.90	1.00	0.41	0.85	0.00	0.33	0.63
TRS	0.96	0.92	0.41	1.00	0.49	–0.10	–0.11	0.44
GPD	0.90	0.87	0.85	0.49	1.00	0.49	0.06	0.92
UMN	–0.16	0.11	0.00	–0.10	0.49	1.00	0.68	0.28
INF	0.00	0.21	0.33	–0.11	0.06	0.68	1.00	0.01
MCL	0.42	0.55	0.63	0.44	0.92	0.28	0.01	1.00

Correlation analysis confirms the hypothesis formed by the results of comparative analysis. The matrix shows that the correlation between air transportation indicators and GDP per capita is more than 85%.

To test the significance of the impact of air transportation indicators on GDP per capita, we make a regression model of the following form:

$$GPD = const + \beta_1 PGS + \beta_2 FLT + \beta_3 FRT \quad (1)$$

where:

$\beta_1, \beta_2, \beta_3$ – coefficients for the independent variables;

PGS, FLT, FRT– dependent variables;

const – free term of the regression equation, which shows the value of the dependent variable if the other variables are equal to zero.

The parameters of the generated regression equation are summarized in Table 4.

Table 4.
Parameters of the regression equation.

Indicators	coef	std	err	t	P > |t|	[0,025 0,975]
const	–2985.9284	1142.184	–2.614	0.026	–5530.873	–440.984
PGS	–263.6264	56.456	–4.670	0.001	–389.418	–137.835
FLT	23.5653	8.453	2.788	0.019	4.732	42.399
FRT	3822.4744	437.848	8.730	0.005	2846.889	4798.060

Analysis of the data in Table 4 shows that the variables «air passenger traffic» (million people) and «air cargo traffic» (billion $) are statistically significant ($p < 0.01$) for the estimation of GDP per capita in the NIS. The variable «number of flights» is not statistically significant ($p = 0.019$), although its value is close to the threshold level of significance. This may indicate that the number of flights, although not strictly statistically significant, may still have an impact on economic performance, but the impact is not strong enough to be confirmed.

The descriptive statistics of the constructed regression model are summarized in Table 5.

Table 5.
Descriptive statistics for the regression model.

Indicator	Significance
R-squared	0.962
Omnibus	3.704
Durbin-Watson	2.177
F-statistic	84.36

Based on the statistics presented in Table 5, it can be concluded that the explanatory power of the model is high as the R-squared value is 0.962. The F-statistic is 84.36, indicating that the model is statistically significant overall. The Durbin-Watson criterion of 2.177 is within the range, indicating that there is no autocorrelation of the model residuals, which is a positive sign for regression analysis. The Omnibus value is 3.704 and may indicate the normality of the distribution of the residuals.

Thus, as a result of the conducted correlation and regression analysis, we can confirm the hypothesis that changes in air transportation indicators have an impact on the economic performance of the country.

5.3. Forecast of Changes in Air Transportation and Economic Indicators in the NIS

To form the forecast, we will use the ARIMA time series planning method with automatic selection of parameters: p – p-order of autoregression, d-order of integration, and q-order of moving average, for each of the selected groups of countries based on minimization of AIC or BIC. The market forecast for 2025–2028 is summarized in Table 6.

Table 6.
Forecast of air transportation indicators by NIS to 2028.

Indicators	2019	2020	2021	2022	2023	2024	2025*	2026*	2027*	2028*
FRT	8.2	5.8	6.9	7.6	8.4	6.1	8.1	8.3	8.5	8.7
PSG	68.1	34.4	44.9	50.2	59.7	61.1	63.7	64.8	66.0	67.1
FLT	537.1	278.2	376.5	459.5	522.0	516.2	550.3	565.8	581.3	596.8
GDP	6048	5324	5825	5802	6401	6574	6608	6793	6978	7164
UNM	6.0	7.3	6.8	10.9	8.7	9.6	8.6	8.8	9.0	9.2
INF	7.8	7.1	9.3	15.0	10.1	8.8	11.0	11.1	11.2	11.4
MCL	34.5	31.5	33.0	32.7	35.0	33.9	35.8	36.6	37.3	38.1

Note: * – forecast values.

Table 6 shows that the forecast for 2028 indicates a positive growth trend in all indicators characterizing air transportation in the NIS. This can be attributed to the recovery from the COVID-19 pandemic, increased availability of air transportation, and economic growth. The ARIMA method with automatic parameter selection provides reliable forecasts that take into account historical data and trends. The increase in passenger traffic and transportation volumes in the countries under study indicates the recovery and development of the aviation market in the future. At the same time, regarding the economic indicators of the NIS, attention should be paid to the upward trend of inflation growth, which has developed in recent years.

6. Discussion of the Results of the Analysis and Assessment of the Prospects for the Development of the Air Transportation Market in the Newly Independent States

Analyzing the data presented in Table 1, it can be seen that compared to 2016, in 2024, most countries will see an increase in passenger traffic, air freight traffic and the number of flights performed. This confirms the growing interest in air transportation, the increasing availability of air transportation for the population and the development of the aviation market. However, in some countries a decrease in some air transportation indicators can be substituted: Azerbaijan (PSG, FLT), Armenia (PSG), Kazakhstan (PSG), Moldova (FLT), Ukraine (PSG, FLT), Turkmenistan (PSG, FLT).

It is worth noting the positive dynamics of changes in air transportation indicators, accompanied by the growth of economic indicators. In most countries, the following can be observed: growth of GDP per capita, the unemployment rate remains stable or decreases, the inflation rate fluctuated but generally remained at an acceptable level, and growth of the middle class. In countries with declining air transportation indicators, a decline in economic indicators can also be observed: Azerbaijan (GDP, MCL), Armenia (UMN, INF), Kazakhstan (UMN), Moldova (UMN, INF, MCL), Ukraine (GDP, INF), Turkmenistan (INF).

The number of travelers (TRS) also increased in most countries, confirming the growing interest in travel and therefore in air travel. The number of tourists (TRS) has also increased in most countries, which confirms the growing interest in traveling and, consequently, in air travel.

Table 2 presents the detailed evolution of the NIS summary indicators from 2016 to 2024. From the dynamics obtained, it can be seen that indicators in the pre-pandemic period (2016–2019) had positive dynamics, during the pandemic (2020–2021) there was a widespread decline caused by the restrictions imposed, after the pandemic (2022–2024) there is a recovery of indicators, with the 2019 level not being reached for some indicators (passenger traffic, number of flights, share of middle class, and number of tourists).

Similar dynamics are observed for the indicators of economic development of the NIS, which allows us to form a hypothesis that a positive change in air transport indicators has an impact on the country's economic indicators. The analysis of dynamics shows that the growth of air transport indicators in most cases preceded the improvement of economic indicators with a lag of 1–2 years. Correlation and regression analyses were performed to test this hypothesis.

The result of the correlation analysis is shown in Table 3. It can be seen that air transport indicators have very high correlation coefficients (more than 90%) between them - this shows the relationship between the growth of passenger traffic with the increase in the number of flights and the volume of air freight traffic. It can also be seen that air transport indicators have quite high correlation coefficients with economic indicators; the highest correlation is observed with the GDP per capita indicator and ranges from 81 to 90 % for different indicators.

Regression analysis was performed to determine the significance of the impact of air transport indicators on the GDP per capita indicator. The results of regression analysis for different markets are shown in Table 4. The following variables have a statistically significant impact on GDP per capita: PGS ($p = 0.001$) and FRT ($p = 0.005$).

The results of the regression analysis, shown in Table 5, demonstrate the high reliability of the constructed model. The coefficient of determination, $R^2 = 0.962$, indicates that the model explains 96.2 % of the variation of the dependent variable. The F-criterion value of 84.36 confirms the adequacy of the model as a whole and the statistical significance of the regression. The Durbin-Watson test (DW = 2.177) indicates that there is no autocorrelation in the residuals of the model, which meets the requirements of the least squares method. The Omnibus index (3.704) does not exceed the critical values, which allows us not to reject the hypothesis of normal distribution of the residuals. The obtained statistical characteristics confirm the high explanatory power of the model and the statistical significance of the results.

Thus, the results of correlation and regression analysis confirm the existence of a relationship between air traffic indicators and economic indicators of the countries.

In Table 6, using the ARIMA model, a forecast of the change in air traffic feeders in the NIS is generated. By analyzing the data, it can be seen that the projected values for all three variables – FRT (number of flights), PSG (air passenger traffic) and FLT (air freight traffic) show an overall increasing trend from 2023 to 2028. FRT is projected to increase from \$8.4 billion in 2023 to \$8.7 billion in 2028. Despite some fluctuations in previous years, a steady increase in the number of flights is expected, due to increased demand for air travel and improved infrastructure. The air passenger volume forecast shows air passenger traffic will increase from 61.1 million in 2024 to 67.1 million in 2028. This increase indicates a recovery and growing interest in air travel, possibly as a result of an improving economy and higher living standards.

The projected volume of flights also shows an increase, rising from 522.0 (ths) in 2023 to 596.8 (ths) in 2028. This confirms that not only will the number of flights and passengers increase, but also the total cost of air transport, which can be attributed to the rise in fares and improved service quality. The projected GDP per capita in 2028 is expected to average \$7164 for the NIS region. This indicates gradual economic growth and improvement in the standard of living of the NIS population. The unemployment rate will be 9.2%, indicating a slight deterioration from 2023. This can be attributed to the economic challenges faced by the NIS and Ukraine's forced social problems. Inflation from 2025 to 2028 may fluctuate between 11.1% and 11.4%, a rather high level that may negatively affect the purchasing power of the population and the overall economic climate. It is predicted that the share of the middle class will grow to 38.1%.

There is a similar study, Sun et al. [17], that examines the relationship between air travel and economic performance. It shows that the number of flights between countries correlates with the growth of the human development index, but does not correlate significantly with the potential demand for travel between countries. The advantage of our study is the use of a larger sample of indicators for analysis.

Another study, Law et al. [18], investigates the relationship between air transport performance and economic growth in Cambodia, Laos, Myanmar and Vietnam. It finds that there is a two-way causality between air transport and economic growth in the long run. The advantage of our study is to analyze a larger sample of countries and to apply the modern ARIMA forecasting method to estimate development prospects.

The difficulties of the study are due to the following:

- Differences in economic performance between countries;
- Possible autocorrelation indicates insufficient specification of the model, which requires adjustment in the research perspective;
- A High degree of correlation between indicators makes it difficult to understand causal relationships.

Limitations of the present study:

1. Limitation to the NIS countries. With a different sample of countries, there is a possibility of changes in the influence of the factors under study within the analysis of variance, which may cause a revision of the weights of the indicators used.

2. The forecast of air traffic and economic indicators of the countries is made on the basis of time series and does not take into account other influencing factors.

The disadvantages of the study are that it may not take into account some aspects, such as environmental factors and differences in the legislative framework.

7. Conclusions

1. A comparative analysis of air transport performance and various economic indicators in the newly independent states has been carried out. It was found that indicators in the pre-pandemic period (2016–2019) had a positive trend, during the pandemic (2020–2021) there was a widespread decline caused by the restrictions imposed, after the pandemic (2022–2024) there is a recovery of indicators, with the 2019 level often not reached.

2. Correlation analyses found relationships (over 85%) between air transport performance and GDP per capita in the newly independent states. Using regression analysis ($R^2 = 0.962$), it was found that the variables «volume of air passenger traffic» and «volume of air cargo traffic» are statistically significant ($p < 0.01$) for the estimation of GDP per capita. This indicates the relationship between the growth of air traffic volumes and the indicators of economic development of the newly independent states.

3. Using the ARIMA time series forecasting model, a forecast of air traffic indicators and economic indicators of the newly independent states was formed. The forecast shows that, based on the established trends, we can expect an increase in the following indicators by 2028: +43 % – volume of air freight traffic, +9.8 % –passenger traffic, +15.6 % – flights, +9 % – GDP per capita, -3.8 % – unemployment, +12.2 % – share of the middle class. At the same time, there is a risk of inflation rising to 11–11.4 % in the period 2025–2028.

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