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The Study on Prerequisites for Operating Losses in the Airline Activity

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ABSTRACT

Methods for analyzing the economic activity of airlines and forecasting the prerequisites for bankruptcy of airlines is becoming an important task for development of the industry. In past years, there were examples of a sound negative experience related to bankruptcy of airlines. At the same time, the main volume indicators of the airlines concerned had got positive dynamics shortly before the bankruptcy and were considered by BCG matrix as evident «stars» in terms of growth in production volumes and in the share of the air transportation market.

In Russia that was the case of Sibir airlines which in 2007–2008 barely avoided bankruptcy, as well as of Transaero Airlines that has left the air transportation market forever. The first low-cost airlines, Skyexpress and Avianova, went bankrupt amid high growth in the number of passengers transported.

The task of the research was to create a model that allows to simulate the situation associated with the airline overcoming the so-called «second break-even point». To forecast the possible time period for the airline to receive an operating loss against the background of growing volume indicators, production and financial indicators of one of the leading Russian airlines were used.

The method of research is modelling of volume and financial indicators of the airline activity. The model is proposed to be built not on the study of future changes in the growth of volume and financial indicators, but on the study of dynamics of the rate of change of those indicators. The study is based on the fact that the dynamics of air transportation has a cyclical basis, which is invisible when directly analyzing changes in production and financial indicators, and which is on the contrary clearly visible when studying the dynamics of the rates of those indicators, which makes it possible to simulate a situation when the airline will have an operational loss in the future.

Keywords: *air transportation, civil aviation, volume indicator, financial indicators, operating losses, rate of change of indicators, forecasting model.*

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Background. The International Air Transport Association (IATA) has revealed that current trends in air transport suggest that the number of passengers could double and attain 8,2 billion in 2037 [1].

The latest update to the IATA twenty-year air travel forecast shows that a growing shift is moving eastward, which will become the industry's center of gravity and which is now in the midst of continued strong growth. Over the next two decades, the forecast provides for an aggregate annual growth rate (CAGR) of 3,5 % [1], which will lead to a doubling of the number of passengers compared to today's levels. From the report of Alexandre de Juniac, IATA Director General, at the latest IATA session, it is known that airlines are completing the year with profit for the tenth time in a row [1]. Meanwhile, the IATA has lowered its forecast for airline revenues in 2019, but expects improvements in 2020 [1].

So, this year airlines will earn $25,9 billion. This is below the June 2019 IATA forecast of $28 billion [1]. Although the jump of fuel prices was not as sharp as the experts of the association suggested, the growth in world GDP and trade was at that time lower than forecast.

According to A. de Juniac, this year will be «the bottom of the current economic cycle». In 2020, experts predict airline revenues of $29,3 billion [1][1].

[1] Data were provided at the moment of acceptance of the article. While the article was published the ICAO and IATA have considerably revised the forecast downward due to COVID-19 pandemic situation. – *ed. note.*

«The slowdown in economic growth, trade wars, geopolitical tensions and social unrest, all together create a harsher than expected business environment for air carriers», said Alexandre de Juniac, nevertheless, the industry managed to approach the new decade in the black, as restructuring and cost reduction continued to bring dividends» [1].

The objective of this article is to present tools for analyzing the economic situation at the example of one of the Russian airlines.

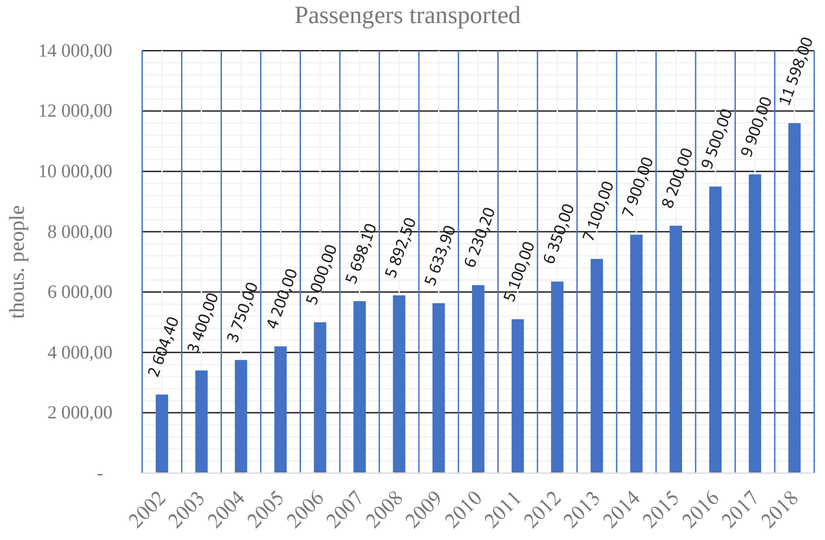
Results.

Volume and financial indicators of an airline's activity are used for the analysis, as a time function:

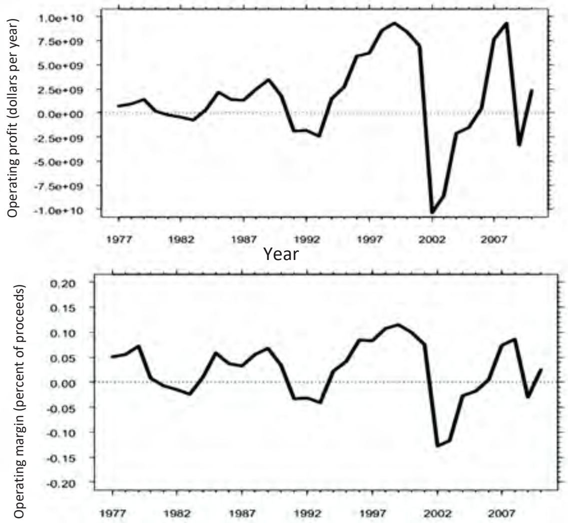
$$y = f(t). \quad (1)$$

The volume indicator will be the number of passengers transported (Pic. 1).

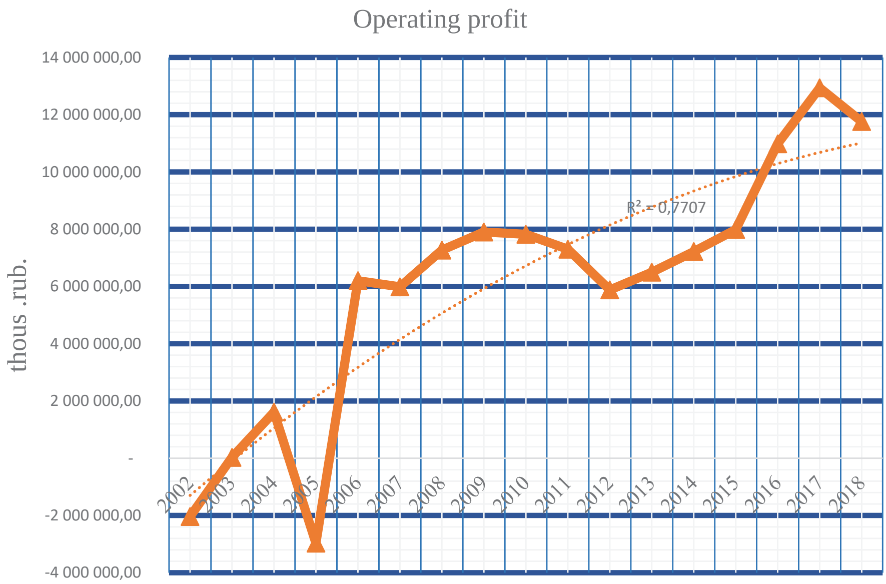
The change in the volume indicator has a slightly pronounced cyclicality. There was an increase in the indicator rate until 2010, then there was a decrease and a growth again. The cyclicality of the volume indicator can have a significant impact on airline's financial performance. But the graph in Pic. 1 shows that the airline is developing successfully and there are no special threats of loss of profit. The task posed in the article is that it is necessary to develop a model for preventing dangerous movement of an air carrier towards operating losses. In the works analyzing the financial indicators of US airlines, we can see a clear cyclicality of such an indicator as operating profit (Pic. 2) [2].



Pic. 1. The number of passengers transported [based on the results of the airline's operation].



Pic. 2. Operating profit and operating margin of the US aviation industry (profit/proceeds) (terminology of the original text remained) [2].

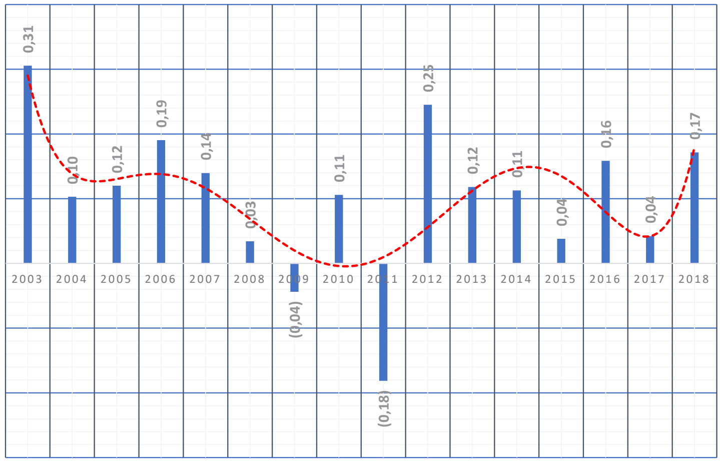


Pic. 3. Dynamics of operating profit of the airline under analysis (graph compiled by the author).

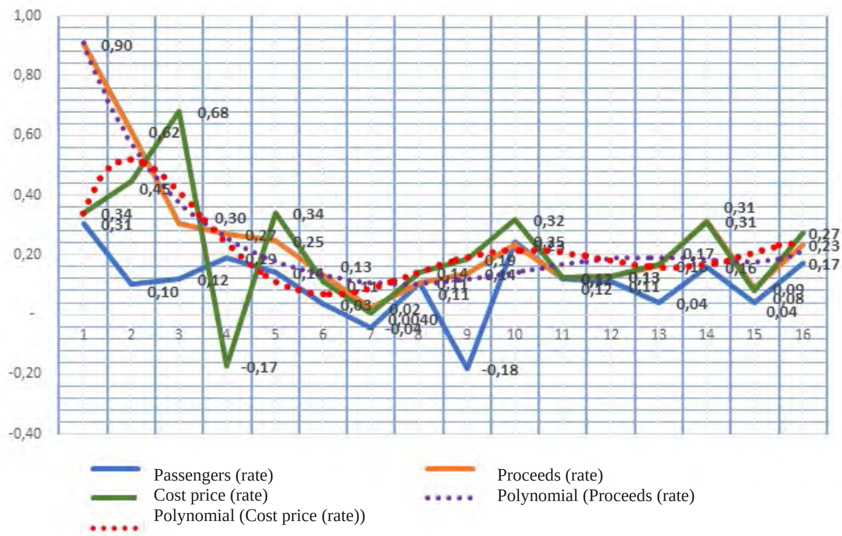
The graph of changes in operating profit for the airline under study does not show obvious cyclicality; one can see steady growth with periods of deceleration and acceleration (Pic. 3).

Therefore, it will not be sufficiently substantiated to forecast future losses of the airline, using only the dynamics of changes in operating profit. The greatest reliability of approximation of the polynomial trend is 0,77. But the use of a polynomial trend forecast for forecasting, as practice shows, is associated with calculation errors, especially since the trend at the end of the analyzed period has a negative dynamics, which will determine the overall forecast dynamics in the future.

The world practices of analyzing the production activities of airlines show that the cyclical nature of the indicators takes place, that is, there are periods of recovery and periods of decline in the economy of the industry. The statement of Alexandre de Juniac about the «bottom of the current economic cycle» has already been quoted [1]. In the analyzed



Pic. 4. Dynamics of rate of volume indicator (graph compiled by the author).



Pic. 5. Dynamics of rate of volume and financial indicators (graph compiled by the author).

company, the cyclical nature of the dynamics of the volume indicator is absent. But the study of the dynamics, that is, the rate of change of the indicator, can be continued and it is possible to consider the derivative of speed, acceleration, or rate of change of the indicator (Pic. 4).

The graph shows a clear cyclical, periodic changes in the pace of passenger transportation. The period of indicator change is 6–7 years, a change in the amplitude of the fluctuation of the indicator can also be noted. The average annual growth rate calculated by formula 2 is 9,18 %:

$$CAGR(t_0, t_n) = \left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{1}{t_n - t_0}} - 1, \qquad (2)$$

where $V(t_0)$ is the initial value of the parameter;

$V(t_n)$ is the final value of the parameter;

$t_n - t_0$ indicate number of years.

The first parameter, the change in the rate of the indicator, can be considered a parameter for making an idea of the future results of production activities. Along with the volume indicator, one should consider the dynamics of financial indicators (Pic. 5).

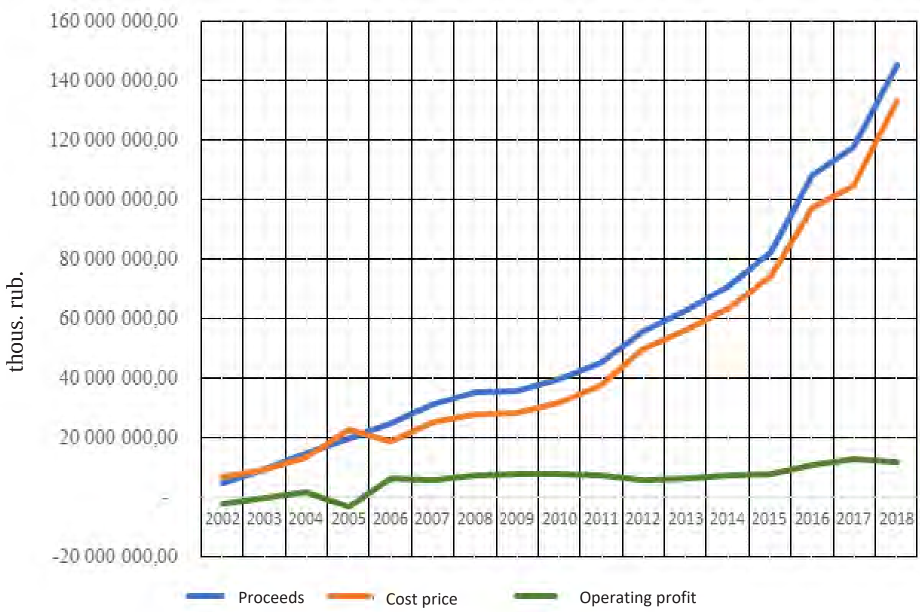
The diagram shows that the rate of change in financial indicators is cyclical in nature, which may indicate a high degree of correlation between volume and financial indicators (Table 1).

Studying the values of the rate of change of financial indicators, it can be noted that in general, the financial success indicators of the airline are at a level that ensures operating profit (Pic. 6).

Table 1

Correlation values of volume and financial indicators (author's calculation)

	Passengers	Proceeds
Passengers	1	
Proceeds	0,981084962	1
Cost price	0,971206513	0,997498666



Pic. 6. Dynamics of changes in financial indicators (graph compiled by the author).

However, according to the graph of changes in the rates of financial indicators, it is worth noting that the rate of the cost of air transportation services in certain periods exceeds the rate of proceeds, which may lead to operational loss in the future. The alignment of the position that allows to make a profit occurs only due to an increase in the cost of air transportation. The approximate value of the tariff for transportation can be obtained by calculating the value of proceeds per passenger. The average annual rate of change in proceeds is CAGR = 0,73 (73 %), and cost price CAGR = 0,71 (71 %). This shows that transportation prices and costs are at about the same pace. This is underlined by the fact that the airline is not worried about cost reduction, and the rising costs are covered by rising transportation prices (Pic. 7).

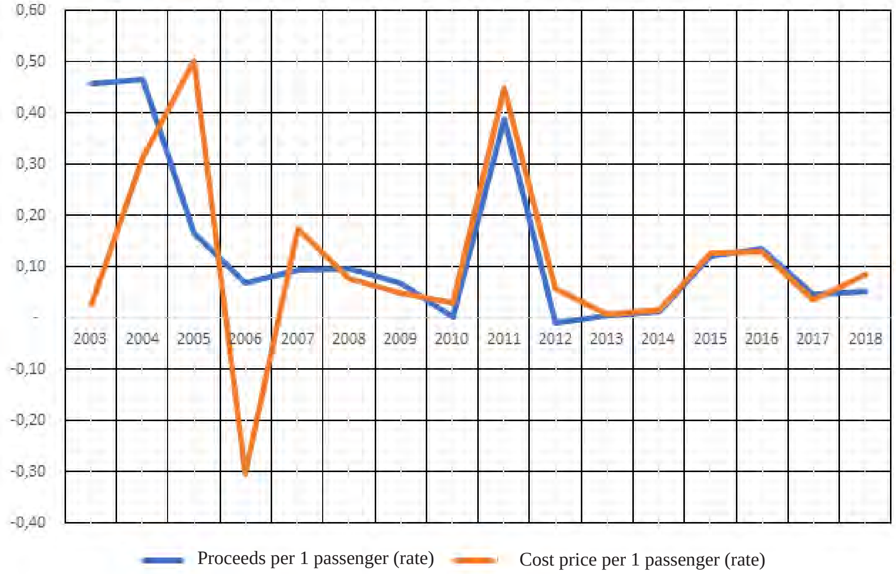
The diagram shows that the rate of change in cost price in certain periods is higher than the rate of change in proceeds.

The analysis performed at this stage shows that the airline undergoes a constant threat of operating losses. An endless increase in transportation prices is impossible, since it is directly related to the purchasing power of the population, which depends on the level of per capita income. The dynamics of per capita income in Russian Federation is presented in Pic. 8.

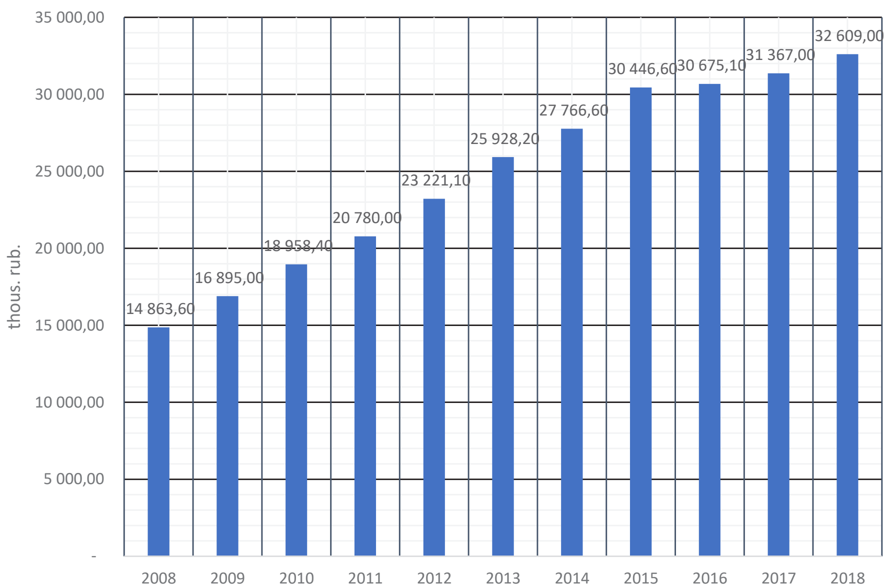
If the average annual growth rate (CAGR) of this indicator is calculated, then in the study period it is equal to 0,07 (7 %). The average annual growth rate of proceeds in the same period, from 2008 to 2018, was 0,14 (14 %), and the average annual growth rate of cost price was 0,15 (15 %). Consequently, the growth rate of the cost of transportation is twice as high as the growth rate of the average per capita income of the country's population, which will lead to damping of demand for air transportation, which probably is growing only due to frequent-flying business passengers and charter flights, as well as passengers using their savings or bank loans.

Modelling of a break-even point will allow determining the limit beyond which the airline will not make a profit.

«Break-even point is the volume of production and sales of products at which costs



Pic. 7. Rate of change in proceeds and cost price per one passenger (graph compiled by the author).



Pic. 8. Average per capita income of the population of the Russian Federation [4].

will be offset by income, and the company begins to make a profit in production and sale of each subsequent unit of production» [5].

Break-even point calculation can be performed analytically in monetary terms. This value is usually called the profitability threshold (PRT):

$$BEPm = \frac{TFC}{KMR}, \quad (3)$$

where TFC are fixed costs;

KMR is margin profit rate:

$$KMR = \frac{MR}{TR}, \quad (4)$$

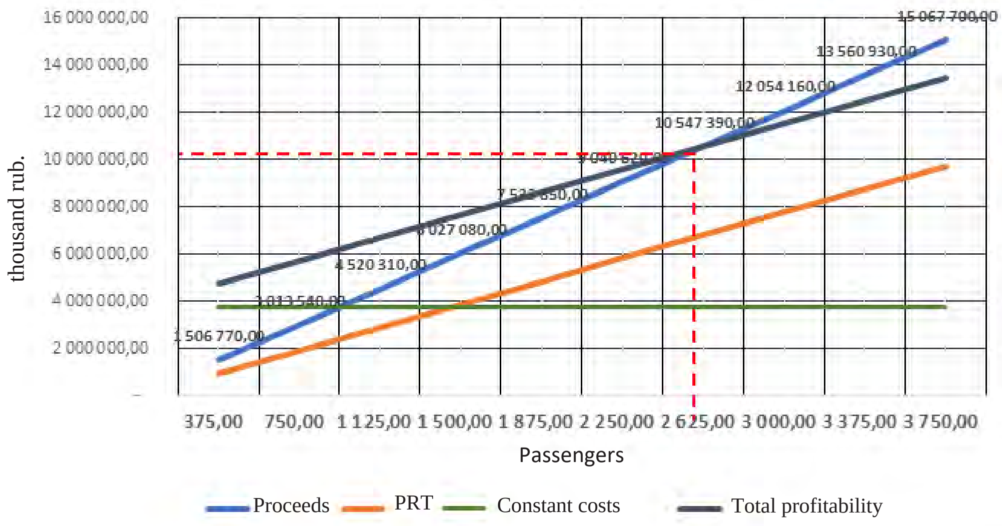
where MR is margin profit;

TP are proceeds.

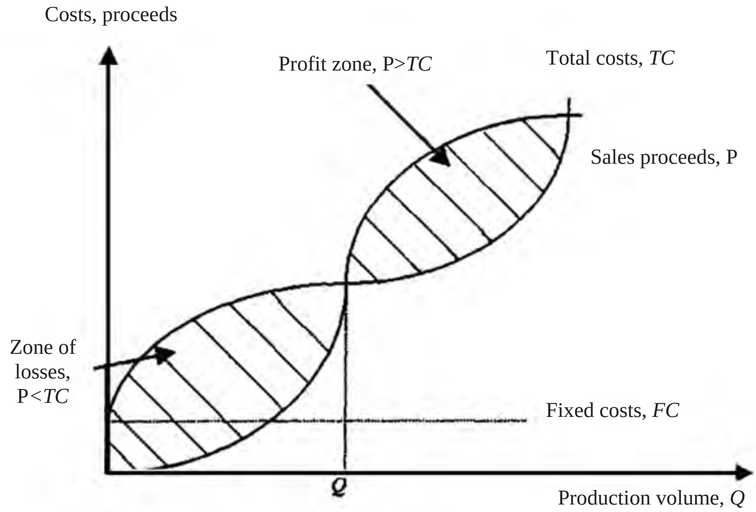
$$MR = TR - TVC, \quad (5)$$

where TVC are variable costs.

The break-even point in physical terms in the described model is the number of passengers transported, which is calculated by the formula:



Pic. 9. Break-even point graph (graph compiled by the author).



Pic. 10. Graphical representation of the nonlinear dependence of indicators of income and expenses with an increase in production volume [3].

$$\text{BEPpt} = \frac{\text{TFC}}{P - \text{AVC}}, \quad (6)$$

where P are proceeds per passenger;

AVC are variable costs per passenger.

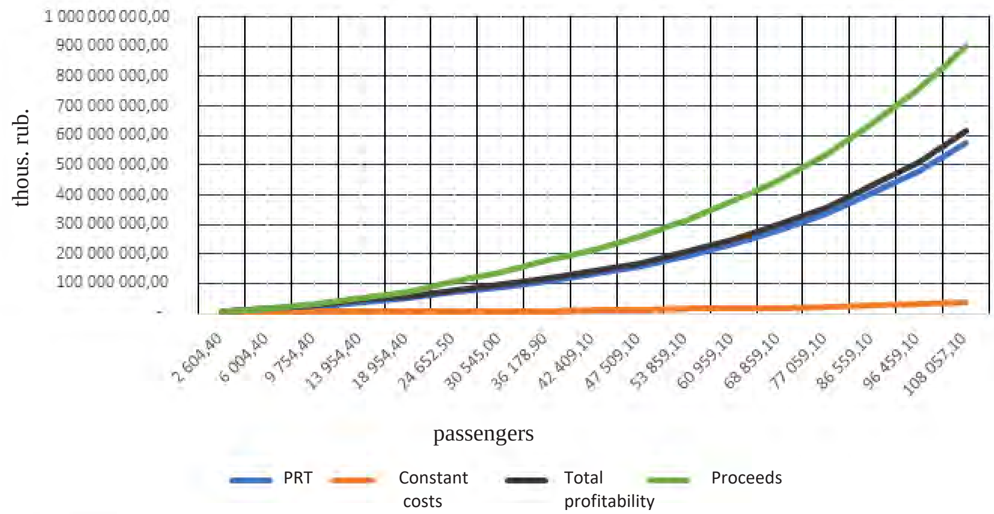
In relation to the airline under study – BEPm = 10556387 thousand rubles, BEPpt = 2627 thousand passengers. Graphically, the calculation results are also confirmed (Pic. 9).

On the graph, all indicators have a linear dependence, but as mentioned earlier, this is unrealistic, especially when building a graph for the future periods. The indicators on the break-even point graph take on a non-linear form (Pic. 10). From a logical point of view, such a behaviour of the analyzed indicators is quite real and justified.

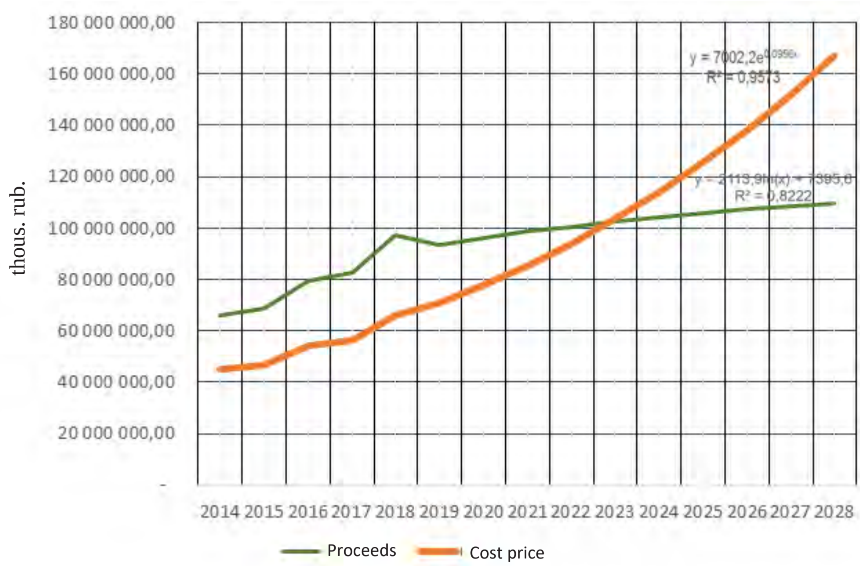
The convex graph of proceeds can be described by the logarithmic function $y = ln(x)$, and the concave graph of expenses can be described by the exponential function $y = e^x$.

Therefore, we can assume that to model the nonlinearity of indicators, it suffices to describe their dynamics by the nonlinear functions given above. But this is not possible because while projecting indicators within the dynamics of several years, all indicators take a nonlinear form close to exponential (Pic. 11).

Therefore, it is necessary to lean on an indicator that initially has a linear change



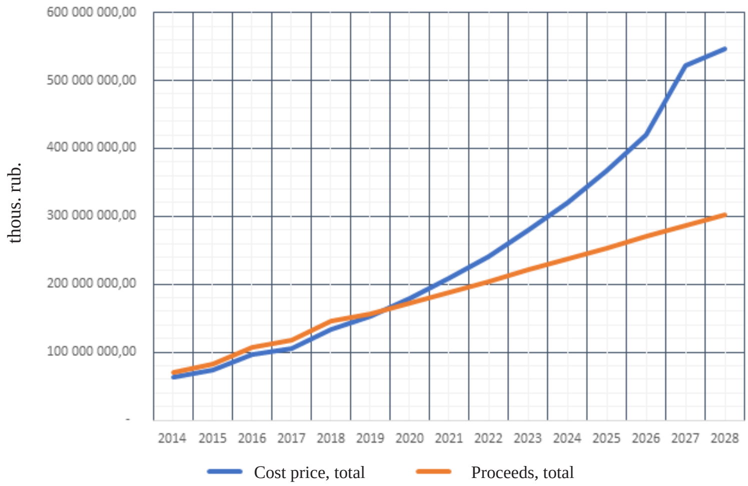
Pic. 11. Dynamics of changes in indicators in the future (graph compiled by the author).



Pic. 12. Forecast of changes in key financial indicators (graph compiled by the author).

function but to describe the changes in this indicator with a logarithmic and exponential formula. This indicator is the number of passengers transported. Having built a trend of exponential dependence, it is possible to forecast an increase in the number of passengers and, having the value of expenses per passenger, to model a change in cost price. Also, if we construct a logarithmic growth trend regarding the number of passengers and describe the change in proceeds with this formula, we get a model that forecasts the approximate number of years after which the airline will receive an operating loss (Pic. 12).

It is imperative to make a reservation that the construction of trends in relation to the number of passengers transported does not set the task to build an optimistic and pessimistic forecast for growth of this indicator but is only used to simulate the dynamics of proceeds and cost price indicators. It is due to the fact, mentioned above, that the growth rate of cost price is higher than the rate of change in proceeds. If we consider a model based on the dynamics of changes in such indicators as proceeds per passenger and cost per passenger, we will again set the change in proceeds by a logarithmic function, because the dynamics of



Pic. 13. Forecast of changes in key financial indicators (graph compiled by the author).

demand for transportation is damped. A change in the dynamics of cost price should be set by an exponential function, bearing in mind that the debt of the airline leads to non-linearity of costs. At the same time, keeping the dynamics of the number of passengers transported linear, the resulting model will forecast airline losses next year (Pic. 13).

Conclusion. Both models show the prerequisites for emergence of operating losses. At the same time, as the process is developing dynamically, the analysis of the financial result must be carried out constantly, and management decisions should be made on the basis of the existing prerequisites, such as the dynamics of the rates of indicators. The management decisions should be focused on implementation of measures to reduce the cost of air transportation services.

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