UDC 656.2:334 https://doi.org/10.31713/ve320246
JEL: O18, R410, M110

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ANTI-CRISIS MANAGEMENT APPROACHES AND RISK FACTOR ANALYSIS IN RAILWAY TRANSPORT

The rail transport system has several advantages that make this type of transport unique and critical significant. However, due to the manifestation of crisis elements, this type of transport can be engulfed in a large-scale crisis. To prevent crisis risks, clear anti-crisis management is needed, based on the analysis of the current situation in the industry and the dynamics of recent years. Anti-crisis management in the rail transportation system can be both direct and indirect. An exception is the system of passenger transportation by rail in Romania, where there was an increase in passenger transportation by rail by 19.2% with a GDP growth of 43%. The quantitative and qualitative reasons for such phenomena are considered and the authors offer their vision of a system of anti-crisis measures in both freight and passenger rail transportation.

Keywords: Anti-crisis management; railway transport; transportation; regression; gross domestic product.

Introduction. The efficiency of railway transport is closely dependent on the factors of the external economic environment, while being influenced by the internal state of the management system of this type of transport. A stable management climate is important for railway transport, which makes anti-crisis management measures particularly relevant. The most relevant issue in the field of anti-crisis management is the prevention of crisis phenomena, which is possible with the timely identification and management of risks. Qualitative characteristics of

the risk management system and quantitative indicators of the railway transport system together form the basis of analysis in the crisis management system. To improve the effectiveness of crisis management, timely analysis is necessary, which is the element presented in this study. Crisis phenomena in the economy occur regularly, and their causes are economic problems and problems arising in various areas of human activity. Problems of this nature can include political changes, natural and man-made disasters, and epidemics. The COVID-19 pandemic was a vivid example of the emergence of crisis in many spheres of economic activity, and the railway transport industry was no exception.

Regardless of the geographical location of the country, the level of development of railway communications, and the skills of managers in crisis management, this crisis has emerged, and the process of eliminating the consequences of the crisis in railway transport, both freight and passenger, is underway. As rail freight and passenger transport are often treated separately, research lacks a clear view of the issues that were at the heart of the crisis. Often, the risks arising in railway transport are explained by the peculiarities of railway infrastructure, and insufficient attention is paid to crisis management measures. In this article, railway transport is examined in a comprehensive way for countries with different geographical locations and different levels of economic development, which complements earlier studies by experts in both freight and passenger transport.

Analysis of recent research and publications. To interpret the nature of the emergence of a crisis, many scholars study the nature of the emergence of a crisis. In their studies, Olofsson (Olofsson & Zinn, 2018) and Harvey (Harvey, et al., 2021) note that in order to track the starting point of a crisis, risks arise, for the location of which it is necessary to systematically analyze economic processes using available indicators [1; 2]. Researchers such as Ashby (2022) and Kasperson (2017) point to the nature of the emergence of a crisis as errors made in management, give relevant examples in their studies and assess the risk of a crisis as a set of actions or inactions of managers [3; 4]. Blunden & Thirlwell (2022) in his study of the nature of crises sees the inadequacy of information and communication products that allow identifying risks at early stages. Zahidi (2024) considers the risks of the emergence of crisis phenomena in specific economic processes as consequences of global risks [5; 6]. In general, all researchers agree that a crisis can be predicted, identified and

prevented in a timely manner.

The risks of crisis phenomena as accompanying economic development are considered by Beghetto & Corazza (2019) and Siebert (Siebert, 2018), who provide historical examples of identifying and eliminating crisis phenomena in the process of evolution of economic doctrine. Chkhaidze et al. (2023) notes that no modern economic activity is free from the risk of crisis [7; 8].

Fiorito et al. (2022) and Tsounin & Vlachvei (2021), when studying the methodology of analyzing economic processes and phenomena, focus their attention on the primary definition of indicators indicating the likelihood of the manifestation of prerequisites for the emergence of crisis phenomena [9; 10]. For the constructed mathematical models, Trachenko et al. (2021) defines indicators characterizing the risk of a crisis, and Doumeingts & Browne (2016) adds elements of crisis probability detection technologies [11; 12].

Since transport links are very important for preventing risks in other sectors of the economy, researchers Dzemydiene et al. (2022) and Macioszek & Sierpinski (2019) note the importance of timely detection of crisis phenomena, as well as elimination of the consequences of the crisis in the transport sector [13; 14].

Despite the great attention to anti-crisis management in the transport sector, the area of formation of anti-crisis measures in the field of rail transportation has been poorly studied. In the post-pandemic period, no studies have been conducted on the impact of quantitative indicators of railway passenger and freight transportation on the main macroeconomic indicators, that is, anti-crisis measures in railway transport have been studied locally, without generalizations at the country level.

Objective. This study aims to form an idea of the possibilities of anti-crisis management in the field of railway transport both in the management system of passenger and freight transportation. The consequences of the crisis caused by the COVID-19 pandemic and ways to eliminate risks are considered. Linear regression is used as a quantitative indicator to identify the dependence of the gross domestic product of countries on the performance indicators of railway transportation. Qualitative characteristics of the impact on the capacity of railways are also considered. The study is based on the statistical monitoring of passenger and freight transportation by rail in the USA, Germany, and Romania from 2014 to 2023.

Results. To conduct the study, countries with different levels of development and with traditionally established different levels of

approach to anti-crisis management were selected. The countries selected were the United States of America, Germany, and Romania. The selection was made based on the principle of decreasing the length of railway lines. The study was conducted for the freight transportation by rail sector and the passenger transportation sector [15–17]. As a dependent variable in all studies, such a macroeconomic indicator as gross domestic product was chosen, since this indicator allows us to assess the dynamics of economic processes. Regression equations obtained by the least squares method were studied. The applied package EViews12 was used as a research tool.

Let's consider freight transportation by rail. As an independent variable for all three countries under study, the number of goods transported by rail during the year for the period from 2014 to 2023 was chosen. When considering the dependence on the gross domestic product of countries such as the United States, Germany, and Romania, decreasing regression equations were obtained, which means that the crisis phenomena in the railway freight transport system are much deeper than those caused by the COVID-19 pandemic. Figures 1–3 show the corresponding regression equations.

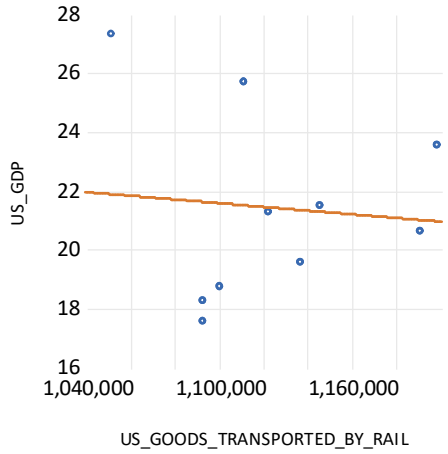

Figure 1. US GDP as a function of the amount of goods transported by rail

Source: compiled by the authors

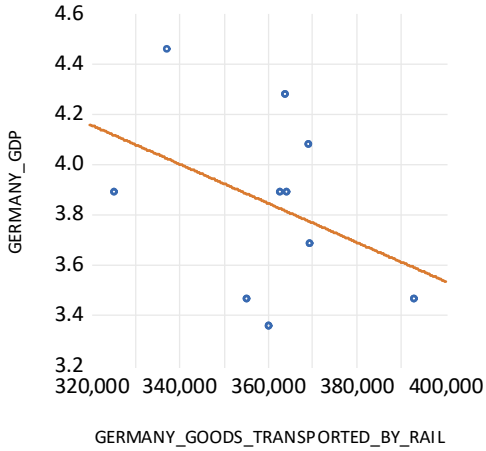

Figure 2. Germany's GDP as a function of the volume of freight transported by rail

Source: compiled by the authors

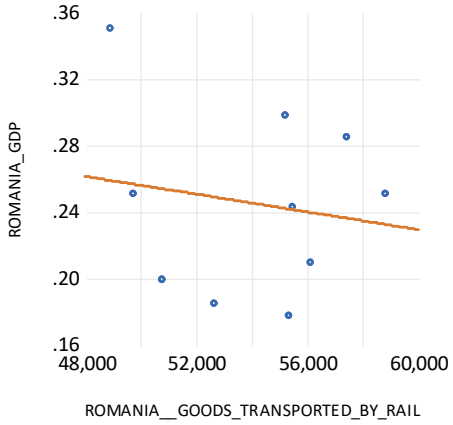

Figure 3. Romania's GDP depending on the volume of freight transported by rail

Source: compiled by the authors

It should be noted that when studying the general trend of freight transportation, for the specified period the largest absolute decrease in freight turnover was recorded in Germany (8%), and in the USA and Romania this decrease was 3.8%. Thus, the general trend towards a decrease in freight transportation by rail indicates the need to develop a unified system of anti-crisis measures for the general increase in the attractiveness of freight transportation by rail [18].

When examining passenger transportation by rail, it was found that for the USA the dependence of the gross domestic product on the number of miles traveled by passengers on trains is a decreasing function, just as in Germany the dependence on the gross domestic product on the number of passengers transported by rail. Figures 4 and 5 show the graphs of the dependence of the gross domestic product of these countries on the indicators characterizing passenger traffic by rail [19].

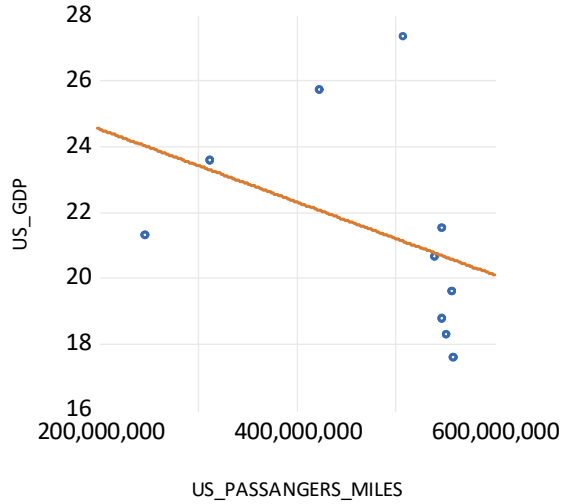

Figure 4. US GDP versus the number of miles by rail passengers
Source: compiled by the authors

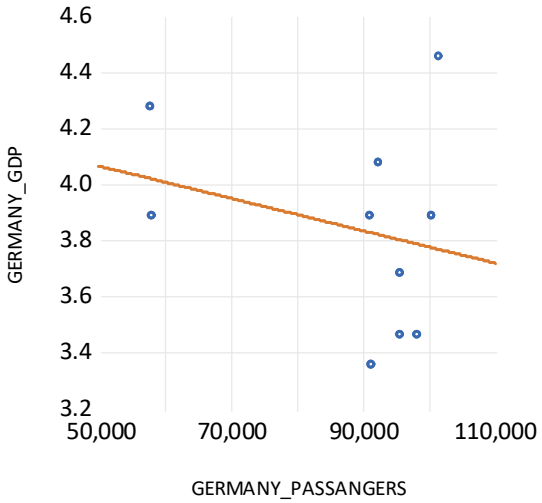

Figure 5. Germany's GDP depending on the number of rail passengers
Source: compiled by the authors

Since the US is characterized by a 10.08% decrease in passenger traffic by rail, the dependence demonstrating a decrease in GDP on the number of miles traveled is natural and requires innovative solutions to eliminate the crisis in this industry.

For Germany, during the period under study, there was an increase in passenger turnover by 10.3%, but at the same time, there is a negative dynamic in the dependence of GDP on passenger turnover, which indicates a decrease in the role of passenger rail transportation in the country's economy as a whole. Such results were obtained due to an increase in the number of passengers using rail transport regularly to cover short distances [20].

However, for Romania, the dependence of the gross domestic product on the number of passengers carried by rail was revealed to be an increasing function, as illustrated in Figure 6.

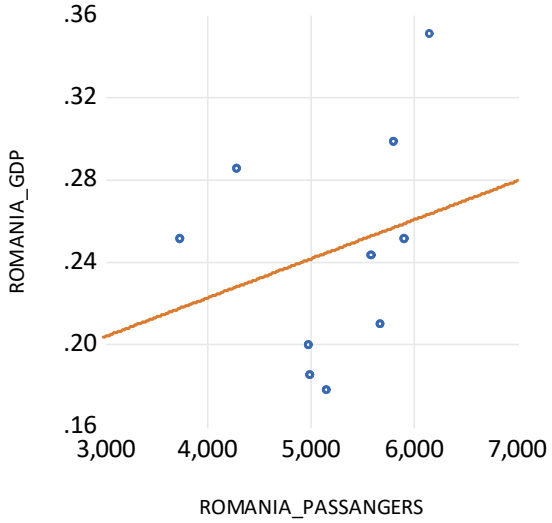

Figure 6. Romania's GDP depending on the number of rail passengers
Source: compiled by the authors

The explanation for this nature is the high level of absolute GDP growth, which for the UK was 43.1% over the preservation period, unlike other countries, since for the USA this value was 35.6% over the preservation period, and for Germany only 12.8%. In addition to GDP growth in the UK in the current period, there was an increase in passenger turnover on rail transport, which was 19.2%. Such an increase in passenger turnover is the beginning of a comprehensive anti-crisis program aimed at developing the tourism industry. As a result, the tourism development program is widely operating, within the framework of which each employee working in the public sector or a private company participating in the program has the opportunity to receive tourist services in the external tourism market during the year. Thanks to the freely provided marketing services of data, users often choose rail transport for visiting tourist destinations, which is more environmentally friendly than road transport. If necessary, tourists rent out cars during their trips. Thus, the system of anti-crisis measures in one industry led to the creation of conditions for overcoming the crisis in the corresponding industry. An example of such a symbiosis of anti-crisis measures can be implemented in any other conditions, taking into account the specific situation.

Conclusions. Railway communication has traditionally played an important role in the development of the economy of countries in general and their regions in particular. Recently, there has been a

decline in interest in the implementation of transportation of both freight and passengers by rail. However, this trend is not rational, it requires specialists to develop and implement a system of anti-crisis measures that will revive rail transportation. A study of the dependence of gross domestic product on the amount of transported goods showed that in all selected countries, from 2014 to 2023, there was a decline in freight traffic by rail. The largest decline was observed in Germany and amounted to 8%, in the USA and Romania this figure was 3.8%. The decline in Germany is because in recent years the government has not taken measures to stimulate anti-crisis measures in the system of freight transportation by rail, but at the same time some government acts were aimed at regulating road freight transportation. The disproportion in attention to different modes of transport has led to the emergence of crisis phenomena in the rail freight system. The decrease in attention to rail transport in Germany is also caused by the lack of incentives for small and medium-sized businesses to use this mode of transport due to the lack of regulation of environmental requirements for freight transport.

In the United States and Romania, the decline in rail freight volumes is the result of untimely anti-crisis management on the part of carriers, since several logistics chains were lost during the pandemic and their restoration was not carried out on time. In general, the freight transportation system requires anti-crisis measures aimed at forming an adapted system of loading and unloading service points, since the decline in the attractiveness of rail transport among consumers of transport services is caused by the fact that the railway infrastructure cannot deliver goods directly to the customer. To eliminate this phenomenon, which can provoke a wider range of crisis phenomena? It is necessary to include rail carriers in the system of integrating the logistics space of both individual territories and more global logistics entities. The ability to use rail transport for the delivery of complete cargo will not only increase cargo turnover but also improve the environmental friendliness of cargo delivery by reducing harmful emissions when delivering the same goods by road.

Passenger transportation during the pandemic in all the countries studied showed a decrease in the number of passenger transportation in 2020 by at least 2 times compared to 2019, in 2021 there was an increase, but insignificant. In general, during the study period in the United States, there was a decrease in the number of miles that were covered by passengers by 10%. One of the ways of an innovative anti-

crisis approach in this case may be the development of tourist programs in which passenger rail transportation will play a key role. To attract the attention of passengers to the possibilities of traveling by rail, special tourist routes can be developed that will be served by high-comfort trains containing cars of various contents, including the entertainment industry. Such tourist trains can be used for team building since they can provide opportunities for intellectual recreation with visits to historical and natural attractions in the bus accessibility zone along the route of such tourist trains. In general, passenger rail transportation has significant potential, however, as research results show, it requires a comprehensive anti-crisis approach in the management system of both this type of activity and related industries.

Rail transportation, due to its environmental friendliness, has an undoubted priority over road transportation. The study showed that the industry requires intervention to prevent the risk of a large-scale crisis in the industry. Anti-crisis measures in the rail communication system have both a material aspect, such as creating additional opportunities for loading and unloading operations, and a communicative aspect since the information field does not contain sufficient information about the advantages of rail transport, as a result of which the demand for rail transportation falls, both in the freight and passenger transportation systems. The presented study is an example of compensating for information deficiency in the field of rail transportation.

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АНТИКРИЗОВІ ПІДХОДИ ДО УПРАВЛІННЯ ТА АНАЛІЗ ФАКТОРІВ РИЗИКУ НА ЗАЛІЗНИЧНОМУ ТРАНСПОРТІ

Система залізничного транспорту має ряд переваг, які роблять цей

вид транспорту унікальним і критично значущим. Однак через прояв кризових елементів цей вид транспорту може бути охоплений масштабною кризою. Для запобігання кризовим ризикам необхідне чітке антикризове управління, засноване на аналізі поточної ситуації в галузі та динаміки останніх років. Антикризове управління в системі залізничного транспорту може бути як прямим, так і непрямим. У представленому дослідженні досліджено системи вантажних і пасажирських перевезень залізницею в США, Німеччині та Румунії. Як показало дослідження, у всіх цих країнах відбулося зниження обсягів вантажних перевезень за період з 2014 по 2023 роки з 3,8% до 8%. У США також спостерігалося зниження пасажиропотоку на 10%, що означає необхідність масштабних антикризових заходів. Оскільки створена інфраструктура для надання послуг залізничних перевезень є дуже дорогою, навіть незначне зниження рентабельності залізниць може призвести до кризи. Запобігти кризовим явищам можна як прямо, так і опосередковано, але головним є наявність позитивного впливу на основні макроекономічні показники. В якості такого макроекономічного показника в цьому дослідженні було обрано валовий внутрішній продукт, вплив на динаміку якого розглядався як з боку вантажних, так і з боку пасажирських залізничних перевезень. Встановлено, що в більшості випадків отримані рівняння регресії є спадними функціями, що свідчить про наявність кризових явищ у галузі залізничних перевезень на різних континентах. Винятком є система пасажирських перевезень залізницею в Румунії, де спостерігалося зростання пасажирських перевезень залізницею на 19,2% при зростанні ВВП на 43%. Розглянуто кількісні та якісні причини таких явищ та запропоновано авторське бачення системи антикризових заходів як у вантажних, так і в пасажирських залізничних перевезеннях.

Ключові слова: антикризове управління; залізничний транспорт; перевезення; регресія; валовий внутрішній продукт.

Отримано: 10 вересня 2024 року
Прорецензовано: 15 вересня 2024 року
Прийнято до друку: 27 вересня 2024 року