
THE FORECASTING OF SALARIES IN EUROPEAN COUNTRIES IN TERMS
OF ECONOMIC SECURITY

Bartosz Kozicki¹, Aleksandra Tomaszewska², Paweł Jaśkiewicz³,
Stanisław Topolewski⁴, Paweł Lubiewski⁵

¹Military University of Technology, Warsaw, Poland

²University of Edinburgh, UK

³Military University of Technology, Warsaw, Poland

⁴University of Natural Sciences and Humanities in Siedlce, Poland

⁵WSB Academy in Dąbrowa Górnicza, Poland

E-mails: ¹bartosz.kozicki@wat.edu.pl; ²aleksandra.tomaszewska1405@gmail.com;
³pawel.jaskiewicz@wat.edu.pl; ⁴stanislaw.topolewski@uph.edu.pl; ⁵pawel.lubiewski@onet.eu

Received 16 June 2022; accepted 18 October 2022; published 30 December 2022

Abstract. The multidimensional comparative analysis and the forecasting of minimum salaries in 21 European countries were conducted in the study. The research began with the ranking of the data, the amount of salary rates taken as a basis, the rise expressed in euro and the values of dynamics indices on a constant base. Then the data was aggregated. The time series of the lowest salaries in 21 European countries was analyzed and evaluated. Thus, regularities were observed that were used to select the Holt-Winters' exponential smoothing method for the forecasting of these salaries. The obtained forecasts were analyzed and evaluated with the use of indices, such as forecasting errors.

Keywords: costs, salaries, COVID-19, multidimensional comparative analysis, economic security

Reference to this paper should be made as follows: Kozicki, B., Tomaszewska, A., Jaśkiewicz, P., Topolewski, S., Lubiewski, P. 2022. *Journal of Security and Sustainability Issues*, 12, 171-182. <https://doi.org/10.47459/jssi.2022.12.14>

JEL Classifications: C51, E31, E37, E64.

Additional disciplines:

1. Introduction

One of the key issues related to the maintenance of the economic security of countries is a continuous analysis, evaluation of indices describing the functioning of economies and, as a result, effective decision making. One of them is the minimum salaries in respective countries, expressed in the same unit of measurement (Euro).

The article presents the following research problem: Will the application of the time series analysis of the lowest salaries in 21 analyzed European countries allow for the selection of a method suitable for their forecasting for the future?

The aim of the study is an attempt to make a comparative analysis of the lowest salaries in 21 European countries and their forecasts for 2023.

For the research problem and the aim of the work, a research hypothesis was outlined: the analysis and evaluation of the time series of the lowest salaries in 21 analyzed European countries will allow the choice of the Holt-Winters' exponential smoothing method to forecast them for the future.

The article uses the following research methods: literature analysis, which concerned issues related to costs, forecasting and security, as well as data analysis, and the research techniques were used as part of it: multidimensional comparative analysis and forecasting. The study consists of an introduction, four substantive points, a summary and conclusions.

2. Analysis of the literature on the research subject

The analysis of the literature shows different interpretations of the term "cost". It comes from the Latin word *costare*, meaning to spend, to cost. It was only in the 20th century, as a result of technological development, when new methods of measuring profits became necessary, that this concept acquired a modern meaning (Twaróg, 2003, p. 15) and various interpretations of it arose.

One of them is found in the Accounting Act of September 29, 1994, where costs are interpreted as probable reductions in economic benefits in the reporting period, of a reliably determined value, as a decrease in the value of assets or an increase in the value of liabilities and provisions, which will lead to a reduction in own capital or an increase of its shortage in a way other than withdrawal of funds by shareholders or owners [Consolidated text of the Accounting Act, 1994).

J. Twaróg, on the other hand, interprets costs as one of the basic categories in accounting, illustrating the reduction of economic benefits of an economic organization over a period of time, which causes a decrease in the value of its assets and a decrease in its own capital or as deliberate spending of money resources related to the operations of the company (Twaróg, 2003, p. 53). On the other hand, B. Sadowska believes that the cost is the monetary consumption of fixed assets (machines, raw materials) and the strength of human resources in order to obtain a product or service (Sadowska, 2017, p. 53). In turn, Cz. Skowronek and Z. Sarjusz-Wolski defined costs as the consumption of labour, means and subjects of work expressed in money, financial expenses and other negative effects of extraordinary events that are caused by the flow of material goods (raw materials, materials, products, goods) in the enterprise and between enterprises, as well as the maintenance of stocks (Skowronek, Sarjusz-Wolski, 2008, p. 272). According to the authors of the article, a cost is a deliberate expenditure incurred in order to generate income.

One of the examples of costs is salaries included in the cost group by type. The study attempts to conduct a multidimensional analysis of salaries and their evaluation in terms of forecasting for the future. The study covered the lowest salaries in 21 European countries between 2018-2022.

The method of Holt – Winters' exponential smoothing was used for the forecasting (Zeliaś, Pawełek, Wanat, 2013, pp. 149-150; Mitkow, Tomaszewski, Kozicki, 2021, pp. 106-109). According to P. Dittmann et al. forecasting means predicting future events, and its aim is to reduce the risk in the decision-making process (Dittmann, Szabela-Pasierbińska, Dittmann, Szpulak, 2016, p. 15).

It was observed in the article that the amplitude of seasonal fluctuations grows dynamically and depends on the average level of the phenomenon, thus a multiplicative model was selected for the forecasting of retrospective data (Kot, Jakubowski, Sokołowski, 2011, p. 352). Multidimensional comparative analyzes were used to analyze the data as minimum salaries in 21 analyzed European countries.

Multidimensional analysis is a group of statistical methods that simultaneously analyze at least two variables describing each examined object (Łuniewska, 2006, p. 9). It allows for various comparisons of dependent variables in order to detect their essential properties (Panek, Zwierzchowski, 2013, p. 15). The analyzed research period covered the influence of random factors on respective economies of the world, based on the example of

the COVID-19 infectious disease.

This infectious disease was first observed in Wuhan, China at the end of 2019 (Zhu et al., 2020). It was a threat to human the kind and showed a tendency to spread rapidly. This led to the situation that on March 11, 2020, the World Health Organization recognized COVID-19 as a global pandemic (Satomi et al., 2020). This, in turn, meant that respective countries of the world began to introduce numerous restrictions aimed at counteracting the disease. One effect was a slowdown in the passenger air transport sector. The number of transported passengers decreased significantly (Periokaite, Dobrovolskiene, 2021; Kostiuk et al., 2021; Stajniak, Kozicki, Wenerska, 2022).

As a result, the global demand for crude oil decreased, which had an impact on its price (Luisetto, Fiazza, Latiy-shev, 2020). Low prices per barrel of crude oil on the market until December 2020 threatened the economic security of countries and global organizations, including the amount of the lowest salaries paid in respective European countries and, thus, economic security in a broader sense.

Safety in literature is interpreted as a state that gives a sense of certainty and a guarantee of its maintenance and a chance for improvement (Szubrycht, 2006, p. 87; Al Mazrouei, Khalid, Davidson, 2020). According to M. Jurgilewicz “the universal security context perceived in the individual aspect allows to draw attention to feelings formulated by individuals, which include, apart from objectively perceptible elements, also subjective sensations conditioning the state of safety or danger” (Jurgilewicz, 2020, p. 869). Security is interdisciplinary and utilitarian, as it is a means to achieve other values, including such as: life, health, property (Szmyd, 2000, p. 48). One of the many types of security is an economic one. It is associated with certainty of the survival and development of the economic system of the country and international economic organizations, along with the instruments guaranteeing the maintenance of their appropriate international position in social relations and the assumed standard of living for citizens (Nurzyńska, 2016, p. 22; Khalatur et al., 2022).

The analysis of the literature shows that in 2020 there was a decrease in minimum salaries in Europe, while from 2021 there was a slight increase in them (Jurczak, 2022; Average and minimum salaries in Europe..., as of October 6, 2022). The authors of the study decided to conduct a multi-dimensional analysis of the lowest salaries in 21 European countries, and then forecast them for the future.

The next substantive point will be devoted to a multidimensional comparative analysis of the lowest salaries in European countries.

3. Multidimensional comparative analysis of the lowest salaries in European countries

The study began with the outline of the data on minimum salaries in Euro in 21 European countries from the first half of 2018 to the first half of 2022 in Figure 1.

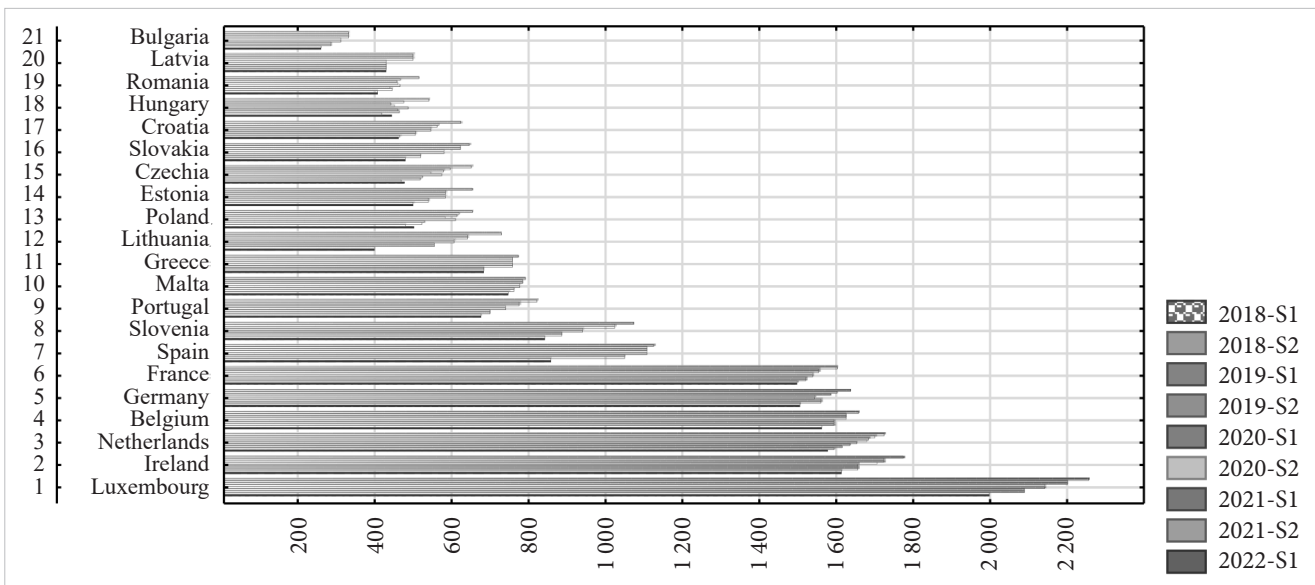


Figure 1. Categorized bar chart of data on minimum salaries in Euro in 21 European countries half-yearly (S1, S2), from the first half of the year (S1) 2018 to the first half of the year (S1) 2022 (the data were ranked from the highest to the lowest salaries in the first half of 2022)

Source: own study based on data obtained from the website: <https://ec.europa.eu/> accessed on 4.10.2022

The analysis of the data compiled in Figure 1 shows that in all 21 analyzed European countries, from the first half of 2018 to the first half of 2022, there was an increase in the minimum salaries in Euro. In some of the analyzed countries, a slowdown in salary rise can also be observed during the outbreak of the COVID-19 contagious disease. The highest median of minimum salaries was noted in Luxembourg with a result of € 2142. Ireland came second with a median of minimum salary of € 1656. On the other hand, the third place in the ranking with the median of the minimum salaries was taken by the Netherlands, where the salary oscillated around € 1654. Poland is in 13th place with a median of minimum salary of € 569. Bulgaria took the last 21st place in the ranking, where the most common level of the lowest salary is € 302.

Then, for research purposes, data on the difference of the lowest salaries in 21 respective European countries under consideration between the first half of 2022 and 2018 was compiled in Figure 2. The obtained results were ranked from the highest to the lowest values.

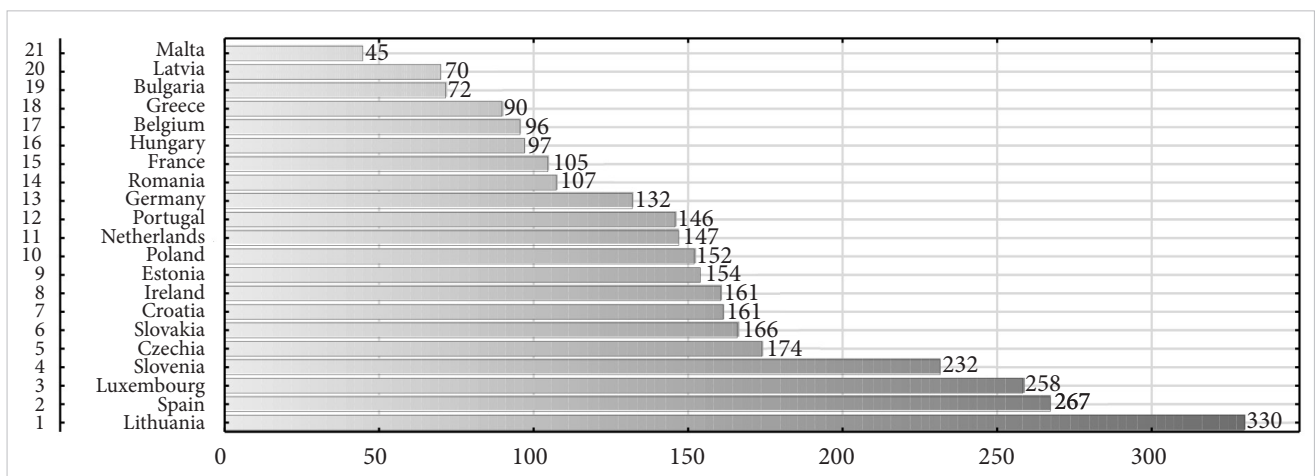


Figure 2. Bar chart of the difference in data on minimum salaries in Euro in 21 European countries between the first half of 2022 and 2018 (the data were ranked from the largest to the smallest difference obtained)

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4. 10.2022]

The analysis shows that the highest increase in salaries in 21 respective European countries under consideration between the first half of 2022 and 2018 was in Lithuania and amounted to € 330. Spain was second in the ranking with an increase in salaries increase in the analyzed period by € 267. Luxembourg came third, with a salary increase of € 258. Poland was in the tenth place in the ranking with an increase in salaries in the analyzed period by € 152. Malta was lowest in the ranking, with a minimum salary increase of € 45.

Then, for data analysis, the dynamics indices on a constant base were used and the percentage of increase in minimum salaries was examined, comparing the first half of 2018 with the first half of 2022 in 21 analyzed European countries.

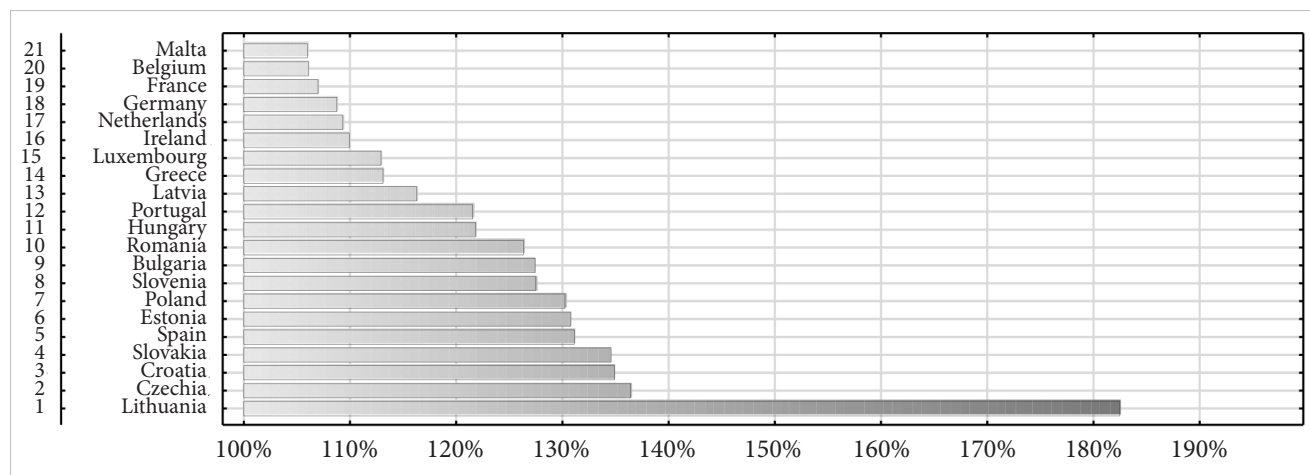


Figure 3. Bar chart of dynamics indices on a constant base of data on minimum salaries in Euro in 21 European countries in the first half of 2022 (constant - data on minimum salaries in Euro in 21 European countries in the first half of 2018) (data were ranked from the largest to the smallest values of the obtained indices from the constant basis)

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

Research shows that the largest percentage increase in salaries in each of the 21 European countries considered between the first half of 2018 and the first half of 2022 was in Lithuania - an increase of 82,5%. The Czech Republic was second with an increase in minimum salaries by 36,4%. Croatia comes third with an increase in minimum salaries by 34,9%. Poland was seventh with an increase in salaries by 30,24%. The last place in the ranking was taken by Malta with an increase in salaries by 5,98% in the period under consideration.

Then, for research purposes, a comparative analysis of the dynamics indices on a constant base for two periods was conducted (Figure 4): the first and second half of 2020 in 21 respective European countries, where the minimum salary in respective European countries in the first half of 2018 was constant.

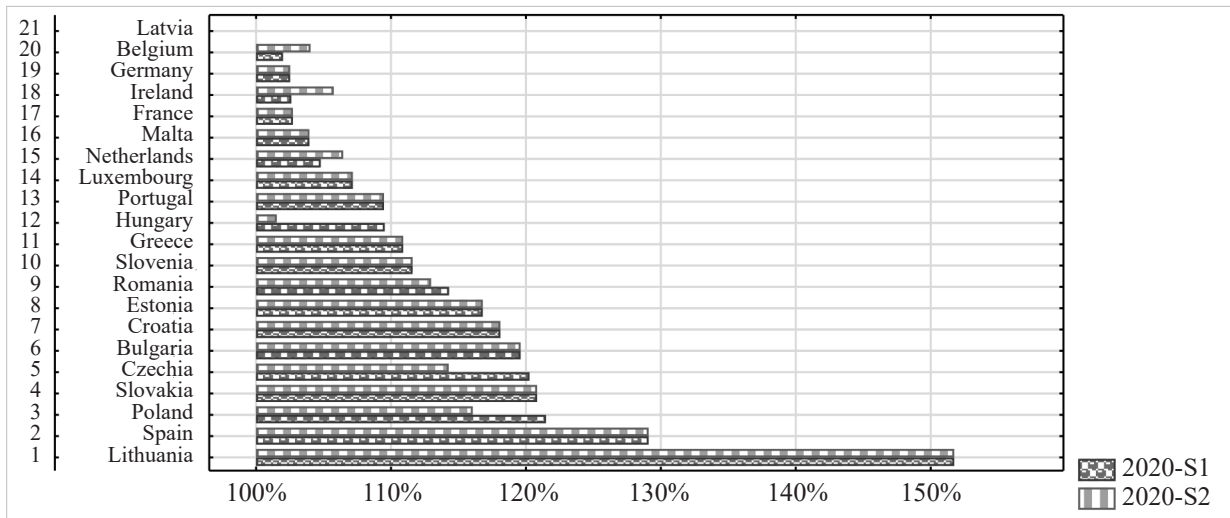


Figure 4. Bar chart of dynamics indices on a constant base of data on minimum salaries in Euro in 21 European countries in the first and second half of 2020 (constant - data on minimum salaries in Euro in 21 European countries in the first half of 2018) - data were ranked from the highest to the lowest values of the obtained indices from the constant base

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The data in Figure 4 shows that in the period of the COVID-19 pandemic in the second half of 2020, compared to the first half of the year, there was a decrease in minimum salaries in the three European countries under consideration: Ireland, the Netherlands and Belgium. On the other hand, four other European countries (Hungary, the Czech Republic, Poland and Romania) recorded an increase in minimum salaries in the analyzed period. In the remaining 14 countries, the minimum salaries were at the same level in the two half-years of 2020.

The next stage of the research is an attempt to forecast minimum salaries in 21 European countries under consideration for the period from the second half of 2022 to the second half of 2023.

3. Analysis of the time series of lowest salaries in European countries

The first stage of the forecasting attempt was to aggregate data on salaries in each of 21 European countries and compile them on the line chart in Figure 5.

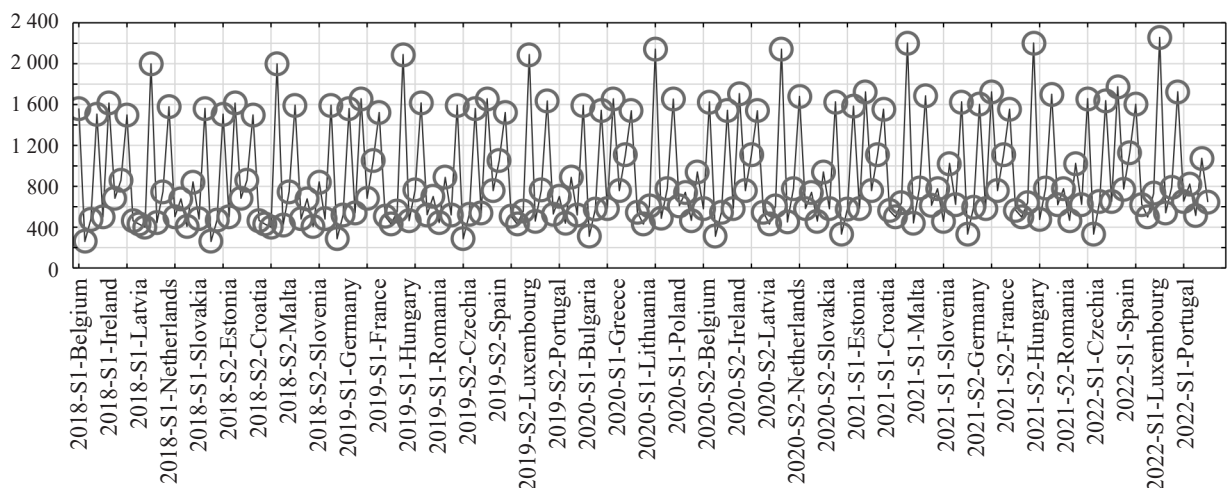


Figure 5. Line chart of data on minimum salaries in Euro in 21 respective European countries from the first half of 2018 to the first half of 2022 (descriptions of labels on the X axis are listed as every fifth position)

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The observations of the data in Figure 5 show that in respective 21 European countries, from the first half of 2018 to the first half of 2022, there was a growing tendency in minimum salaries, as well as the phenomenon of repetition in dynamic terms. This observation became the premise for a box plot chart concerning the considered primary data in order to detect outliers and extreme values.

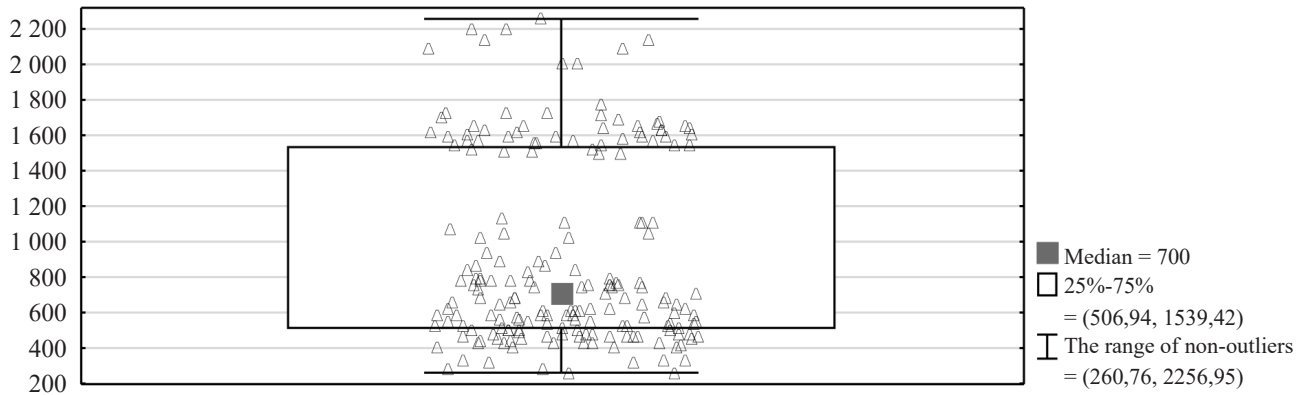


Figure 6. Box plot chart of data on minimum salaries in Euro in 21 respective European countries from the first half of 2018 to the first half of 2022

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The data compiled in Figure 6 show the absence of outliers and extremes in the considered time series of data on minimum salaries in 21 European countries half-yearly. The median of the analyzed data was € 700.

Then, it was decided to investigate the existence of dependencies in the respective delays of the analyzed time series. For this purpose: autocorrelation (Figure 7) and partial autocorrelation (Figure 8) were used.

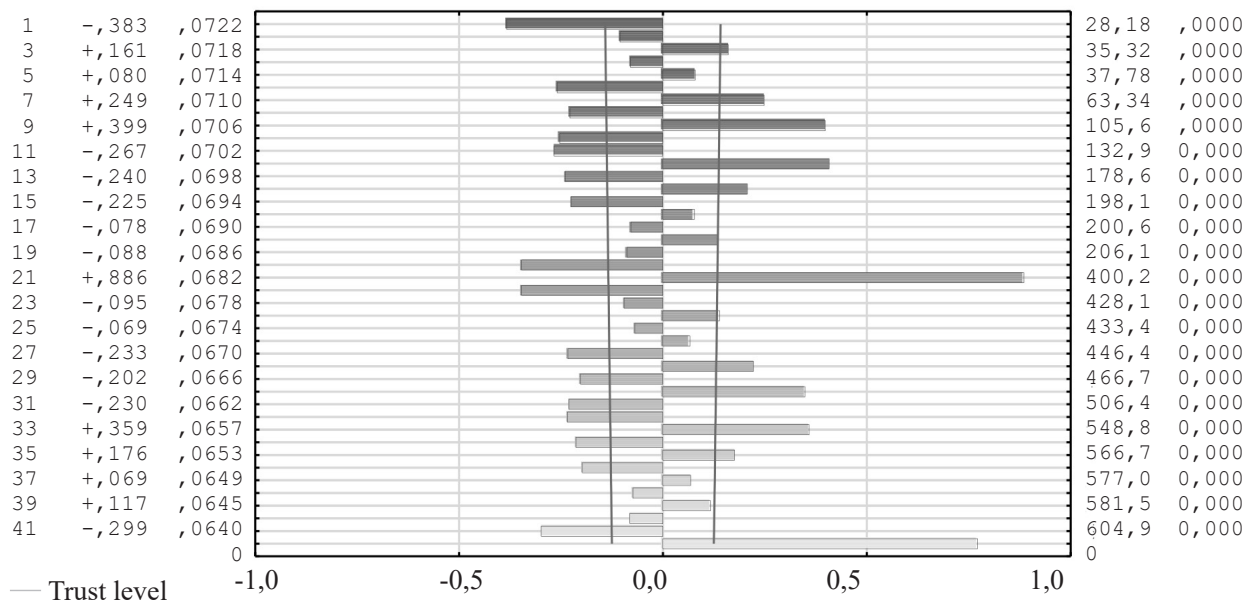


Figure 7. Autocorrelation of data on minimum salaries in Euro in 21 respective European countries from the first half of 2018 to the first half of 2022

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The applied autocorrelation (Figure 7) indicates the existence of a relationship in the delays of the considered time series. The series is non-stationary.

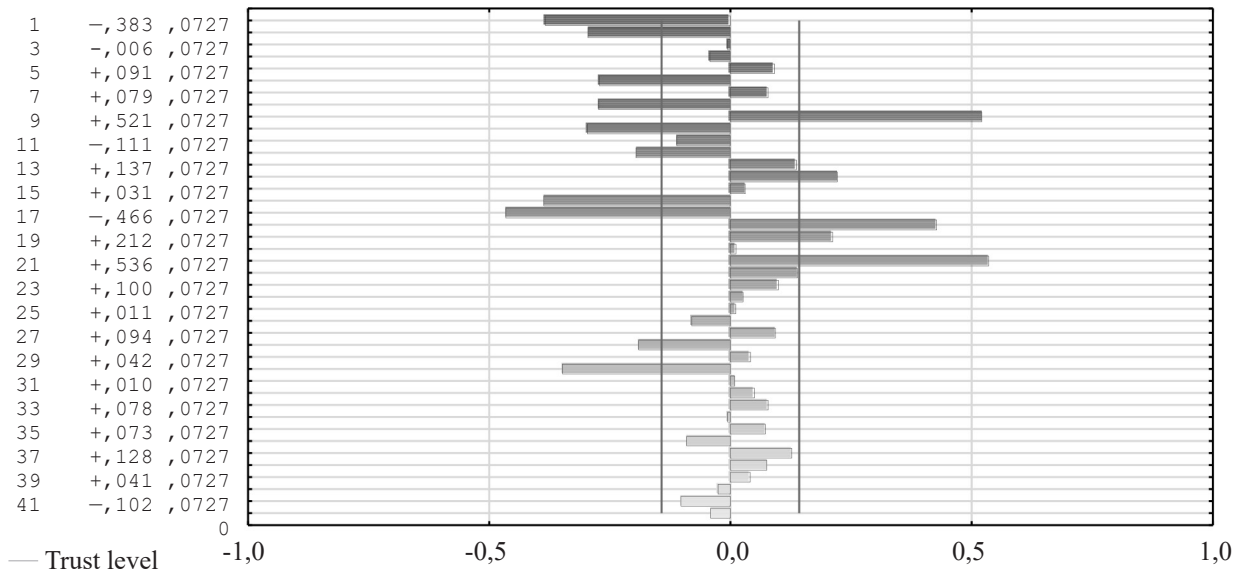


Figure 8. Partial autocorrelation of data on minimum salaries in Euro in 21 respective European countries from the first half of 2018 to the first half of 2022

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4 October 2022]

Partial autocorrelation confirms the non-stationarity of the time series and the existence of dependencies in the remainder of the analyzed time series.

4. The forecasting of the lowest salaries in European countries

Time series analyzes make it possible to observe the repeatability in the delays of the considered time series every 21 periods, as well as the slightly visible rising trend phenomenon.

This became a premise for the application of a multiplicative model to forecast the considered retrospective data using the Holt – Winters’ method. The forecasting results are summarized in Figure 9.

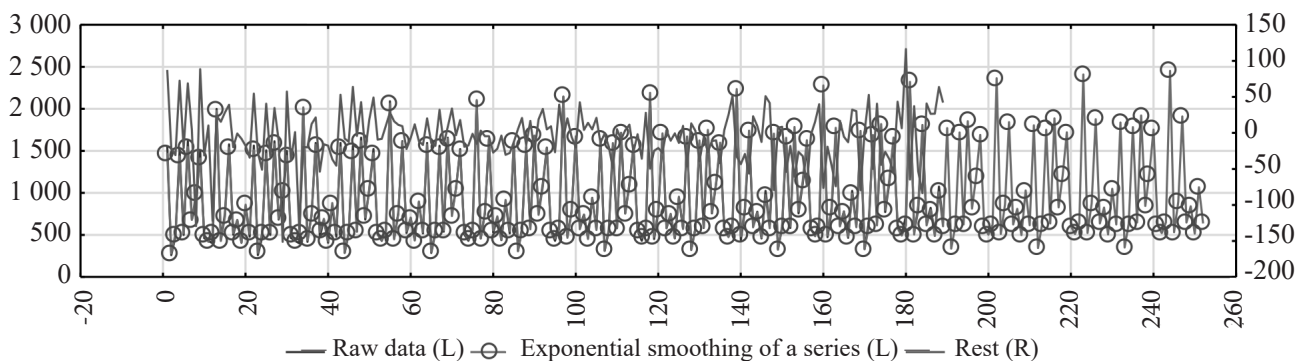


Figure 9. Forecasting of minimum salaries in Euro in 21 respective European countries for the period from the second half of 2022 to the second half of 2023 (63 cases in total)

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The forecasting presented in Figure 9 shows that the obtained forecasts maintain the tendencies visible in the considered retrospective data as repeatability and an increasing trend.

Then, the analysis of the remaining forecasts was conducted. The results are summarized in Table 1.

Table 1. Analysis of forecasting errors made with the Holt-Winters' method

Indices	Result
Mean error	-5,35
Mean absolute error	29,42
Mean absolute percentage error	3,73

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The mean absolute percentage error was 3,73%. It can also be seen that the mean error was -5,35 and the mean absolute error was 29,42. Thus, it can be assumed that the forecasts made are very good.

Table 2 below shows the value of the obtained forecasts.

Table 2. Forecasts of minimum salaries in 21 European countries obtained after with the application of the Holt-Winters' method

No.	Year-half-year-country	Salary	No.	Year-half-year-country	Salary
1	2022-S2-Belgium	1770,723	33	2023-S1-Lithuania	636,584
2	2022-S2-Bulgaria	337,915	34	2023-S1-Luxembourg	2408,414
3	2022-S2-Czechia	610,309	35	2023-S1-Hungary	523,470
4	2022-S2-Germany	1719,744	36	2023-S1-Malta	876,984
5	2022-S2-Estonia	625,060	37	2023-S1-Netherlands	1876,083
6	2022-S2-Ireland	1852,988	38	2023-S1-Poland	636,820
7	2022-S2-Greece	814,652	39	2023-S1-Portugal	825,636
8	2022-S2-Spain	1184,196	40	2023-S1-Romania	506,818
9	2022-S2-France	1690,057	41	2023-S1-Slovenia	1048,351
10	2022-S2-Croatia	591,369	42	2023-S1-Slovakia	626,378
11	2022-S2-Latvia	502,851	43	2023-S2-Belgium	1836,382
12	2022-S2-Lithuania	625,106	44	2023-S2-Bulgaria	350,434
13	2022-S2-Luxembourg	2365,026	45	2023-S2-Czechia	632,899
14	2022-S2-Hungary	514,048	46	2023-S2-Germany	1783,344
15	2022-S2-Malta	861,212	47	2023-S2-Estonia	648,156
16	2022-S2-Netherlands	1842,372	48	2023-S2-Ireland	1921,395
17	2022-S2-Poland	625,387	49	2023-S2-Greece	844,701
18	2022-S2-Portugal	810,825	50	2023-S2-Spain	1227,837
19	2022-S2-Romania	497,734	51	2023-S2-France	1752,285
20	2022-S2-Slovenia	1029,578	52	2023-S2-Croatia	613,124
21	2022-S2-Slovakia	615,170	53	2023-S2-Latvia	521,333
22	2023-S1-Belgium	1803,553	54	2023-S2-Lithuania	648,062
23	2023-S1-Bulgaria	344,174	55	2023-S2-Luxembourg	2451,802
24	2023-S1-Czechia	621,604	56	2023-S2-Hungary	532,892
25	2023-S1-Germany	1751,544	57	2023-S2-Malta	892,756
26	2023-S1-Estonia	636,608	58	2023-S2-Netherlands	1909,794
27	2023-S1-Ireland	1887,191	59	2023-S2-Poland	648,254
28	2023-S1-Greece	829,676	60	2023-S2-Portugal	840,446
29	2023-S1-Spain	1206,017	61	2023-S2-Romania	515,902
30	2023-S1-France	1721,171	62	2023-S2-Slovenia	1067,125
31	2023-S1-Croatia	602,246	63	2023-S2-Slovakia	637,585
32	2023-S1-Latvia	512,092			

Source: own study based on data obtained from the website: <https://ec.europa.eu/> [as of 4.10.2022]

The compiled forecasts show that the arithmetic mean of minimum salaries in S2 2022 in the 21 analyzed European countries will amount to € 1023, in S1 2023 it will increase to € 1042, and in S2 2023 it will again increase to € 1061. The highest salaries will be in Luxembourg and their arithmetic mean from S1 2022 to S2 2023 will be € 2408.

5. Summary and conclusions

The conducted research indicates the detection of a growing trend of the lowest salaries in 21 analyzed European countries between 2018-2022. There has also been a decline in salary levels in several countries at the time of the outbreak of the COVID-19 contagious disease. The highest minimum salaries were observed in Luxembourg with a median of € 2142. Ireland was second in the ranking with a median of €1656, while the third was the Netherlands, where the salary was around € 1654. Bulgaria was in the last 21st place in the ranking, with € 302 being the most common lowest salary.

Considering the highest increase in salaries in 21 respective European countries considered between the first half of 2018 and 2022, it was observed that it was in Lithuania and amounted to € 330. Spain was second in the ranking with an increase of € 267. Luxembourg came third, with a salary increase of € 258. Malta was lowest in the ranking, with a minimum salary increase of € 45.

The highest percentage increase in salaries in each of the 21 European countries under consideration between the first half of 2018 and the first half of 2022 was in Lithuania and amounted to 82,5%. The Czech Republic was second with 36,4%. Croatia came third with a 34,9% increase in the minimum salary. The last place in the ranking was taken by Malta with an increase in salaries by 5,98% in the period under consideration.

During the outbreak of the COVID-19 pandemic in the second half of 2022, a decrease in minimum salaries was observed in Ireland, the Netherlands and Belgium. In contrast, four other European countries (Hungary, the Czech Republic, Poland and Romania) recorded an increase. In the remaining fourteen European countries, the minimum salaries were at the same level in both half-years of 2020.

The time series of the lowest salaries in the 21 analyzed European countries developed in the article showed two trends: seasonality and an upward trend. This was confirmed by the use of autocorrelation and partial autocorrelation. In the analyzed series, no outliers and extreme values were observed. The Holt – Winters' exponential smoothing method was used to forecast the investigated data.

The obtained forecasts indicate that the growing trend of minimum salaries in respective European countries under consideration is maintained, and the detailed results are presented in Table 2. The arithmetic mean of minimum salaries S2 in 2022 will be € 1023 in the 21 analyzed European countries, in S1 2023 it will increase to € 1042, and in S2 2023 will increase again to the level of € 1061.

The obtained research results, such as forecasts, observed regularities like repeatability (series) and an increasing trend are important in terms of ensuring/maintaining the economic security of respective countries. Higher salaries contribute to the increase in economic growth through the possibility of making buy and sell transactions at a higher level, as well as the number of investments in a broader sense.

References:

- Al Mazrouei, M, Khalid, K, Davidson, R. 2020. Development and validation of a safety climate scale for United Arab Emirates oil and gas industries to enhance the process safety performance. *Entrepreneurship and Sustainability Issues*, 7(4), 2863-2882. [http://doi.org/10.9770/jesi.2020.7.4\(19\)](http://doi.org/10.9770/jesi.2020.7.4(19))
- Dittmann, P., Szabela-Pasierbińska, E., Dittmann, I., Szpulak, A. 2016. *Prognozowanie w zarządzaniu sprzedażą i finansami przedsiębiorstwa (Forecasting in sales management and company finances)*, wydanie II zmienione i uzupełnione, wyd. GAB Media.
- Jurszak, K. 2022. Wynagrodzenia w górę. Wzrost w kolejnych latach będzie rekordowy (Salaries go up. The growth in the coming years

will be record-breaking), <https://www.money.pl/gospodarka/wynagrodzenia-w-gore-wzrost-w-kolejnych-latach-bedzie-rekordowy-6728424219183968a.html>, 6.10.2022.

Jurgilewicz, M. 2020. Legal safety of the Republic of Poland. *Journal of Security and Sustainability Issues*, 9(3) [https://doi.org/10.9770/jssi.2020.9.3\(12\)](https://doi.org/10.9770/jssi.2020.9.3(12))

Khalatur, S., Pavlova, H., Vasilieva, L., Karamushka, Danileviča, A. 2022. Innovation management as basis of digitalization trends and security of financial sector. *Entrepreneurship and Sustainability Issues*, 9(4), 56-76. [http://doi.org/10.9770/jesi.2022.9.4\(3\)](http://doi.org/10.9770/jesi.2022.9.4(3))

Kostiuk, Y., Kohútová, V., Straková, J., Koleda, N. 2021. Added value in the transport sector during COVID-19 pandemic: a comparison of the EU countries. *Entrepreneurship and Sustainability Issues*, 9(2), 303-315. [http://doi.org/10.9770/jesi.2021.9.2\(20\)](http://doi.org/10.9770/jesi.2021.9.2(20))

Kot, S.M., Jakubowski, J., Sokołowski, A. 2011. *Statystyka*, Difin SA, Warszawa.

Luisetto, M., Fiazza, C., Latsyshev, O.Y. 2020. Short communication COVID-19 Pandemic and the Management Strategy for Business and Economy indexed by #Harvard University Library, #Washington State University Library, IMA Academy Research Centre.

Łuniewska, M., Tarczyński, W. 2006. *Metody wielowymiarowej analizy porównawczej na rynku kapitałowym (Methods of multidimensional comparative analysis on the capital market)*, Wydawnictwo Naukowe PWN, Warszawa.

Mitkow, Sz., Tomaszewski, J., Kozicki, B. 2021. *Bezpieczeństwo militarne a potencjał osobowy Sił Zbrojnych RP (Military security and the personnel potential of the Polish Armed Force)*, Wojskowa Akademia Techniczna, Warszawa.

Nurzyńska, A. 2016. *Bezpieczeństwo usług w międzynarodowym transporcie lotniczym przewozów pasażerskich (Security of services in international passenger air transport)*, Wydawnictwo Naukowe SOPHIA, Katowice.

Panek, T., Zwierzchowski, J. 2013. *Statystyczne metody wielowymiarowej analizy porównawczej (Statistical methods of multivariate comparative analysis). Teoria i zastosowanie*, Oficyna Wydawnicza Szkoły Głównej Handlowej w Warszawie, Warszawa.

Periokaite, P., Dobrovolskiene, N. 2021. The impact of COVID-19 on the financial performance: a case study of the Lithuanian transport sector. *Insights into Regional Development*, 3(4), 34-50. [http://doi.org/10.9770/IRD.2021.3.4\(3\)](http://doi.org/10.9770/IRD.2021.3.4(3))

Sadowska B. 2017. *Rachunek kosztów logistycznych w przedsiębiorstwie (Accounting of logistic costs in the enterprise)*, wyd. CeDeWu, wydanie I, Warszawa.

Satomi, E. et al. 2020. Alocação justa de recursos de saúde escassos diante da pandemia de COVID-19. *Considerações éticas, Einstein, São Paulo*, 18(2), 1-5. https://doi.org/10.31744/einstein_journal/2020AE5775

Skowronek, Cz., Sarjusz-Wolski, Z. 2008. *Logistyka przedsiębiorstw (Enterprise logistics)*, wyd. PWE, Warszawa.

Stajniak, M., Kozicki, B., Wenerska, B. 2022. The Number of Passengers Transported by Air in the World and the Impact of the COVID-19 Pandemic on Air Passenger Transport in the USA in Terms of Economic Security. *European Research Studies Journal*, XXV(2B), 173-183. <https://doi.org/10.35808/ersj/2951>

Szmyd, J. 2000. *Bezpieczeństwo jako wartość, refleksja aksjologiczna i etyczna (Security as a value, axiological and ethical reflection)*, [w:] *Zarządzanie bezpieczeństwem*, red. P. Tyrała, Wydawnictwo Profesjonalnej Szkoły Biznesu, Kraków.

Szubrycht, T. 2006. *Współczesne aspekty bezpieczeństwa (Contemporary aspects of security)*. *Zeszyty Naukowe AMW*, 4(167).

Tekst jednolity ustawy o rachunkowości z dnia 29 września 1994 roku (Consolidated text of the Accounting Act of September 29, 1994)

Twaróg, J. 2003. *Koszty logistyki przedsiębiorstw (Enterprise logistics costs)*, Wydawnictwo Biblioteka Logistyka, Poznań.

Zeliaś, A., Pawełek, B., Wanat, S. 2013. *Prognozowanie ekonomiczne (Economic forecasting)*, Wydawnictwo Naukowe PWN, Warszawa.

Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J. et al. 2020. A Novel Coronavirus from Patients with Pneumonia in China. *New England Journal of Medicine*, 382, 727-733. <https://doi.org/10.1056/NEJMoa2001017>

Średnie i minimalne wynagrodzenia w Europie: poziomy wynagrodzeń w krajach UE i niektórych innych krajach świata, tabele wynagrodzeń na 2022 r., strona Biznes, praca i życie w Niemczech po polsku (Average and minimum wages in Europe: wage levels in EU countries and some other countries of the world, salary tables for 2022, the page Business, work and life in Germany in Polish), <https://ru-geld.de/pl/salary/europe.html>, 6.10.2022.

Bartosz KOZICKI - Military University of Technology, PL. Research interests: national security, internal security.
ORCID ID: 0000-0001-6089-952x.

Aleksandra TOMASZEWSKA - University of Edinburgh, Edinburgh, UK. Research interests: international security.
ORCID ID: 0000-0002-1084-064X

Paweł JAŚKIEWICZ - Military University of Technology, PL. Research interests: national security, internal security.
ORCID ID: 0000-0002-8863-6948.

Stanisław TOPOLEWSKI – University of Natural Sciences and Humanities in Siedlce, PL. Research interests: national security, internal security.
ORCID ID: 0000-0001-8268-3754.

Paweł LUBIEWSKI – WSB Academy in Dąbrowa Górnicza, PL. Research interests: internal security.
ORCID ID: 0000-0001-5149-7908.