Analysis of Healthcare Expenditures in the Czech Republic

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Abstract: Healthcare expenditures play a key role in the social policy and economy of individual countries. There is increasing emphasis on the political economy aspects of health policy. Primarily due to the onset of the Covid-19 pandemic, it became clear that healthcare expenditures must be addressed comprehensively. Given that empirical findings on the relationship between gross domestic product and healthcare expenditures are diverse, an analysis will be performed for the Czech Republic. Correlation analysis and Spearman's correlation coefficient will be used to determine the independence of the investigated economic variables. The aim of the article is to perform a correlation analysis, which will verify how the change in one economic quantity affects the change of another investigated economic quantity. Correlation analysis showed that GDP has a very strong positive correlation with healthcare expenditures and a very strong negative correlation with the unemployment rate. The correlation between the unemployment rate and healthcare expenditures is negative. Through time series modeling and predictions, it was shown that in the period until 2024, we expect first a decrease and then a slight increase in healthcare spending.

1. Introduction

In 2019, the world was hit by the Covid-19 pandemic, which significantly affected healthcare expenses and other expenses of the state budgets of individual countries. This pandemic was reflected in basic macroeconomic indicators such as GDP, unemployment, and inflation.

When analyzing healthcare spending, it can be found that, for example, U.S. healthcare spending increased 9.7 percent to USD 4.1 trillion in 2020, a much faster pace than the 4.3 percent increase seen in 2019. The acceleration in 2020 was driven by a 36.0 percent increase in federal spending on healthcare, which was mainly affected by the COVID-19 pandemic. At the same time, the gross domestic product declined by 2.2 percent, and the share of the economy devoted to healthcare expenses increased to 19.7 percent. Another aspect of this situation is the growth of uninsured people in the US and significant shifts in the types of coverage (Hartman et al., 2022).

In 2019, Germany had the highest total expenditure of the EU countries, Germany, which exceeded 400 billion euros in 2019. The second was France with approximately 270 billion euros. The Czech Republic, with total expenditures of EUR 17.2 billion, took fourteenth place.

Luxembourg, Denmark, and Sweden had the highest total expenditure per capita. Expenditure per inhabitant exceeded 5,000 euros. The EU average was 3,102 euros per inhabitant, which is almost twice the expenditure per inhabitant in the Czech Republic (1,611 euros). In EU countries, healthcare financing is predominantly from public sources (social and health insurance systems and public budgets). The largest amount is spent in the Czech Republic, Luxembourg, Sweden, and Germany, while the least amount is spent on health care from public sources in Cyprus (58%) and Greece (60%) (Čermáková & Lojková, 2022).
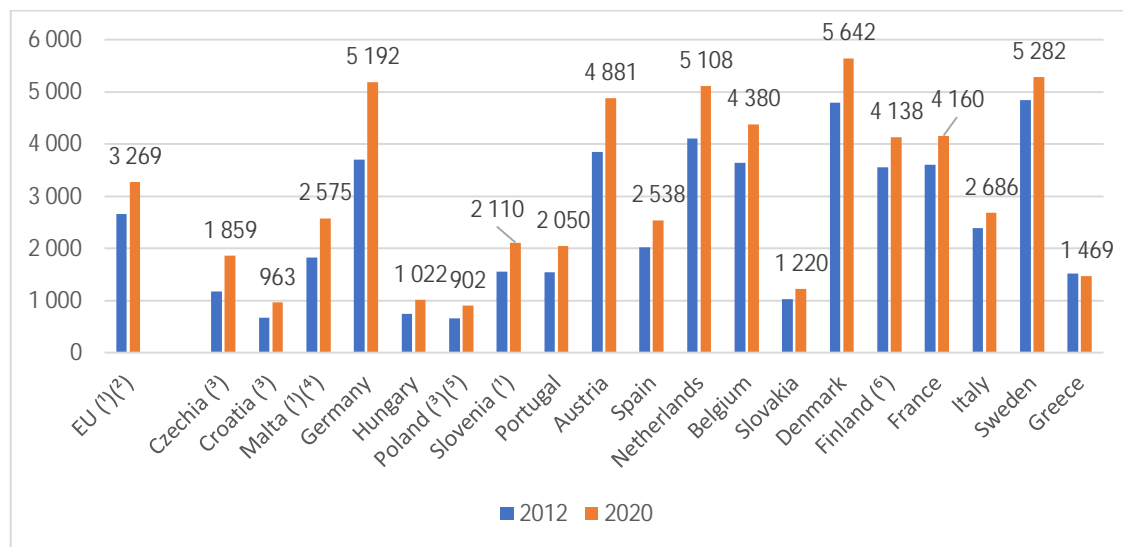

Figure 1. Current healthcare expenditure per inhabitant, 2012 and 2020 (Eurostat, 2022)

Current healthcare expenditure in the EU was 1,462,373 million euros in 2020. The highest total expenditure was in Germany at 431,805 million euros. France was again in second place with 281,065 million euros. The healthcare expenditure was 19,889 million euros in Czechia. Current healthcare expenditure in Germany and France was equivalent to 12.8% and 12.2% and in Czechia 9.2% of GDP. Health expenditures of the EU were 10.9% of Current healthcare expenditure in Germany and France was equivalent to 12.8% and 12.2% of the gross domestic product in 2020 (Eurostat, 2022).

Relative to population size and in euro terms, current healthcare expenditure in 2020 was highest among the EU Member States in Luxembourg (EUR 5,875 per inhabitant) and Denmark (EUR 5,642 per inhabitant). Furthermore, current health expenditure was higher than 5,000 Euros per inhabitant in Germany, Ireland, the Netherlands, and Sweden. Current expenditures were 1,859 Euros per inhabitant in the Czech Republic in 2020. The EU average was 3,269 per inhabitant in 2020 (see Figure 1) (Eurostat, 2022).

1.1. Current Healthcare Expenditures in the Czech Republic

In this article, we will focus on healthcare expenditures in the Czech Republic. The Czech Republic is a member of the EU and is a small open economy with 10.5 million inhabitants. More than 80% of total healthcare financing is covered by public financing. This includes mandatory public health insurance and public budgets with the former being the most important source of health financing in the country (Broulikova et al., 2020; Hedvicakova et

al., 2020; Hedvičáková & Pozdílková, 2019; Maci & Marešová, 2022). Healthcare expenditures here amounted to CZK 526.2 billion in 2020. Until 2019 (mainly since 2017), healthcare expenditures grew by an average of 8% annually. In 2020, there was an increase of 19.5% mainly due to the global Covid-19 pandemic. This increase was mainly due to higher spending from public sources. Payments from public health insurance increased by CZK 52 billion, and direct expenditures from the state budget and from the budgets of regions and municipalities increased by CZK 35 billion. In contrast, household spending fell in 2020 for the first time in the monitored period (Broulikova et al., 2020; Eurostat, 2022).

2. Methodology and Goals of the Paper

The article is based on primary and secondary sources. Data for subsequent analysis of basic macroeconomic indicators were obtained from publicly available databases, primarily Eurostat, World Health Organization, and the Czech Statistical Office, other from conferences, professional literature, information collected from the professional press, and workshops relating to the chosen subject. Predictions of individual indicators will be made on the basis of time series (Cerna et al., 2019; Hedvičáková & Pozdílková, 2018).

We will use correlation analysis and Spearman's correlation coefficient to determine the independence of the investigated economic variables. The goal of correlation analysis is to verify how much a change in one of the investigated quantities affects the change in another investigated quantity. That is, a positive correlation means that the growth of one quantity implies the growth of the other quantity, on the contrary, a negative correlation means that the growth of one quantity implies the decrease of the other quantity. Values roughly between -0.5 and 0.5 mean that the quantities are uncorrelated, i.e., mutually independent. The examined variables will be GDP per capita, the unemployment rate, and healthcare expenditures.

3. Results

Data from the Czech Statistical Office is available for the years 2008 to 2020 for Health care expenditures. Health expenditures and their development will be analyzed. Subsequently, healthcare expenditures will be compared with the development of other economic indicators – GDP and the unemployment rate.

The following Table 1 shows the data for the examined indicators:

Table 1. The macroeconomic indicators in the Czech Republic from 2008 to 2020 (Czech Statistical Office, 2023a; 2023b)

Year	2008	2009	2010	2011	2012	2013
GDP per capita	387,630	376,907	379,650	387,011	389,076	394,151
Unemployment rate	4.4	6.7	7.3	6.7	7.0	7.0
Health expenditures	264.5	301.5	334.5	338.5	342.8	346.6

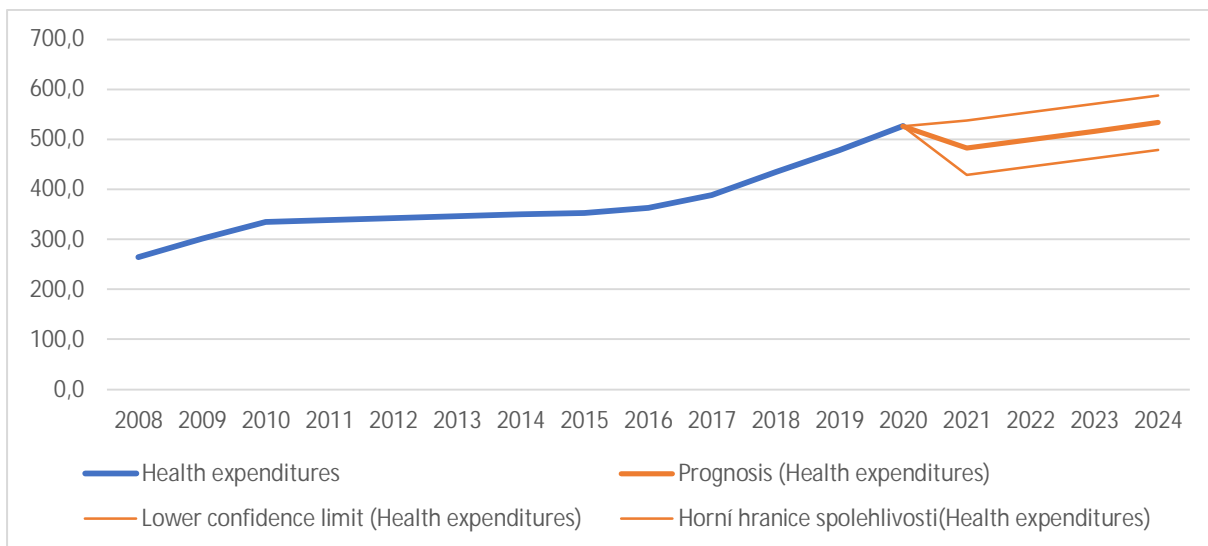| 2014	2015	2016	2017	2018	2019	2020
412,908	438,718	454,022	482,622	509,180	542,818	533,556
6.1	5.0	4.0	2.9	2.2	2.0	2.6
350.4	353.3	363.4	388.2	434.1	477.7	526.2

Figure 2. The development and prediction of the healthcare expenditures in the Czech Republic, (Czech Statistical Office, 2023a)

Table 2. The development and prediction of the healthcare expenditures in the Czech Republic from 2019 (Czech Statistical Office, 2023a)

Year	Health expenditures	Prognosis	Lower confidence limit	Upper confidence limit
2019	477.7			
2020	526.2	526.2	526.2	526.2
2021		482.8	428.5	537.1
2022		499.6	445.3	553.9
2023		516.4	462.1	570.7
2024		533.2	478.9	587.5

In Figure 2 we can see the development, and prediction of the healthcare expenditures.

Figure 2 and Table 2 show the forecast until 2024. It predicts first a decrease and then a slight increase of the investigated quantity.

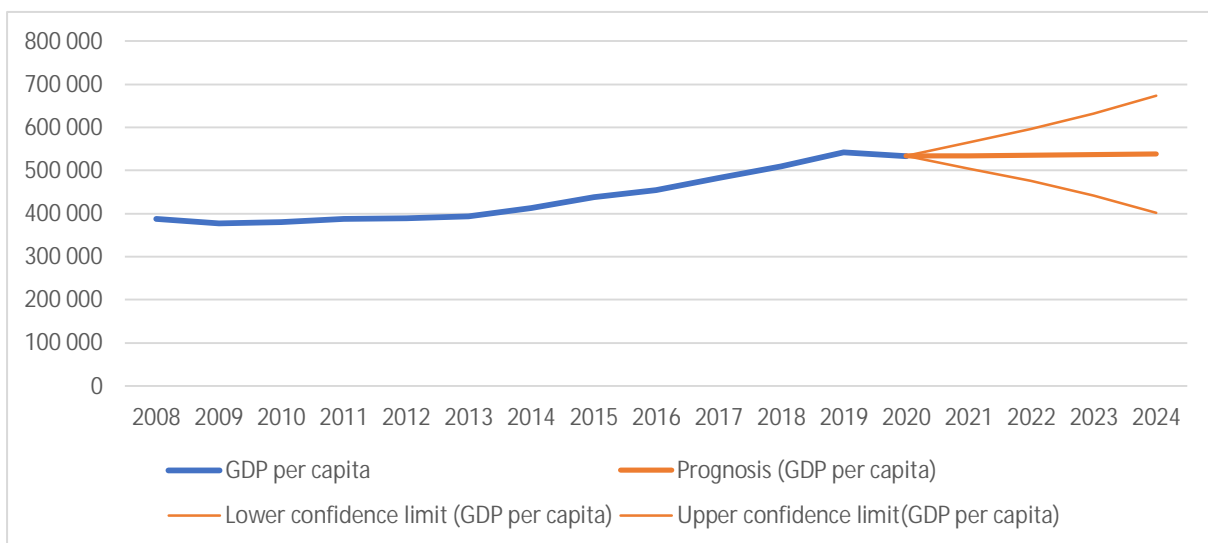In the following Figure 3 we can see the development and prediction of GDP per capita.

Figure 3. The development and prediction of GDP per capita in the Czech Republic, (Czech Statistical Office, 2023a)

Table 3. The development and prediction of GDP per capita in the Czech Republic from 2019 (Czech Statistical Office, 2023a)

Year	GDP per capita	Prognosis	Lower confidence limit	Upper confidence limit
2019	542,818			
2020	533,556	533,556	533,556	533,556
2021		534,698	504,917	564,479
2022		535,757	475,809	595,705
2023		536,817	441,322	632,311
2024		537,876	402,015	673,738

Figure 3 and Table 3 show the forecast until 2024. It predicts almost stagnation of the studied variable in the studied period.

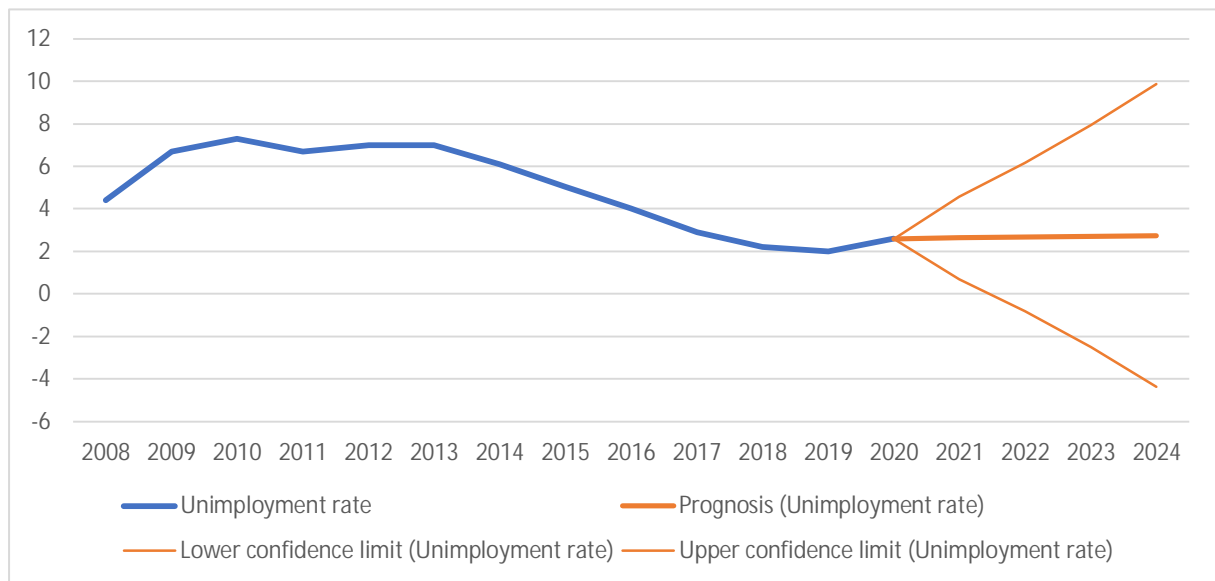In the following Figure 4 we can see the development and prediction of the unemployment rate.

Figure 4. The development and prediction of unemployment rate in the Czech Republic (Czech Statistical Office, 2023a)

Table 4. The development and prediction of unemployment rate in the Czech Republic from 2019 (Czech Statistical Office, 2023a)

Year	Unemployment rate	Prognosis	Lower confidence limit	Upper confidence limit
2019	2			
2020	2.6	2.6	2.60	2.60
2021		2.635222176	0.69	4.58
2022		2.672695143	-0.82	6.17
2023		2.71016811	-2.51	7.93
2024		2.747641078	-4.37	9.87

From Figure 4 and Table 4, you can see the forecast until 2024. It predicts almost stagnation of the studied quantity with a slight growth at the end of the studied period.

Correlation analysis and correlation table

The goal of the following analysis is to verify how much a change in one of the investigated quantities affects the change in another investigated quantity.

The following Table 5 shows the correlations between all investigated variables:

Table 5. Correlations between unemployment rate, Health expenditures and GDP per capita

	Unemployment rate	Health expenditures	GDP per capita
Unemployment rate	1.000000	-0.711353	-0.924302
Health expenditures	-0.711353	1.000000	0.913980
GDP per capita	-0.924302	0.913980	1.000000

We will also demonstrate the correlation between pairs of investigated economic variables graphically. In the following graphs, we can see the dependence of individual pairs of investigated quantities.
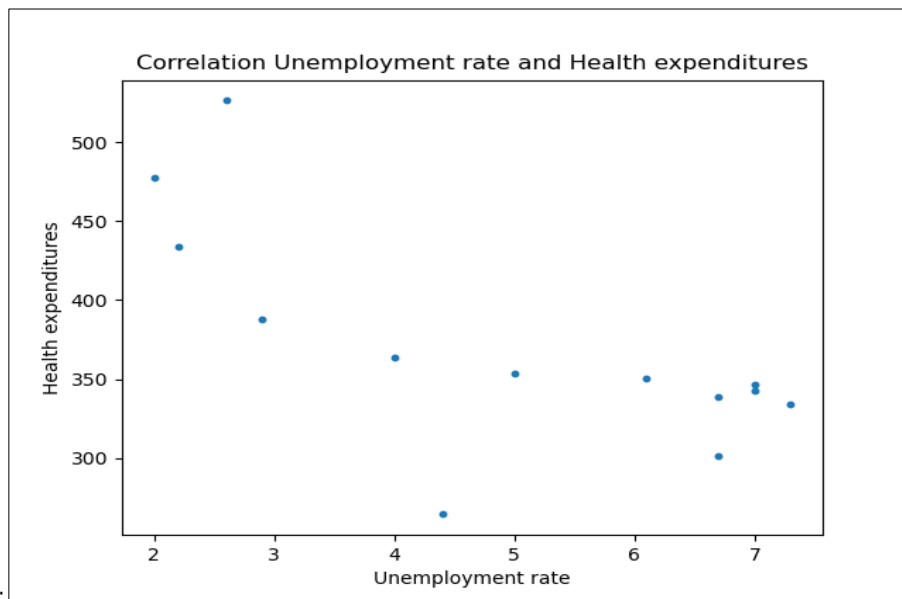

Figure 5. Correlation between unemployment rate and health expenditures

The correlation between the unemployment rate and health care spending is -0.711353, which indicates a negative correlation, which can also be seen from the previous Figure 5.
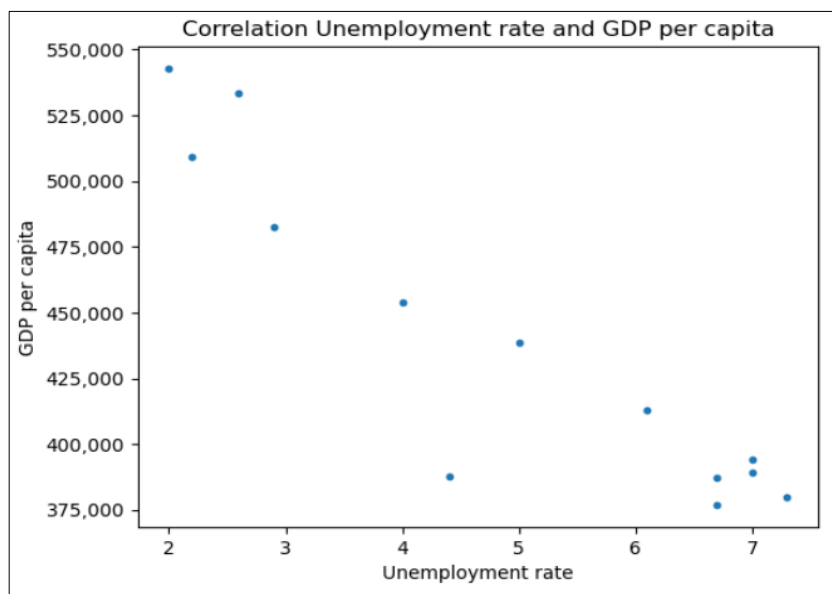

Figure 6. Correlation between unemployment rate and GDP per capita

The correlation between the unemployment rate and GDP is -0.924302, which indicates a very strong negative correlation, which can also be seen from the previous Figure 6. Thus, the unemployment rate is negatively correlated with all other investigated variables, the strongest correlation is with GDP.
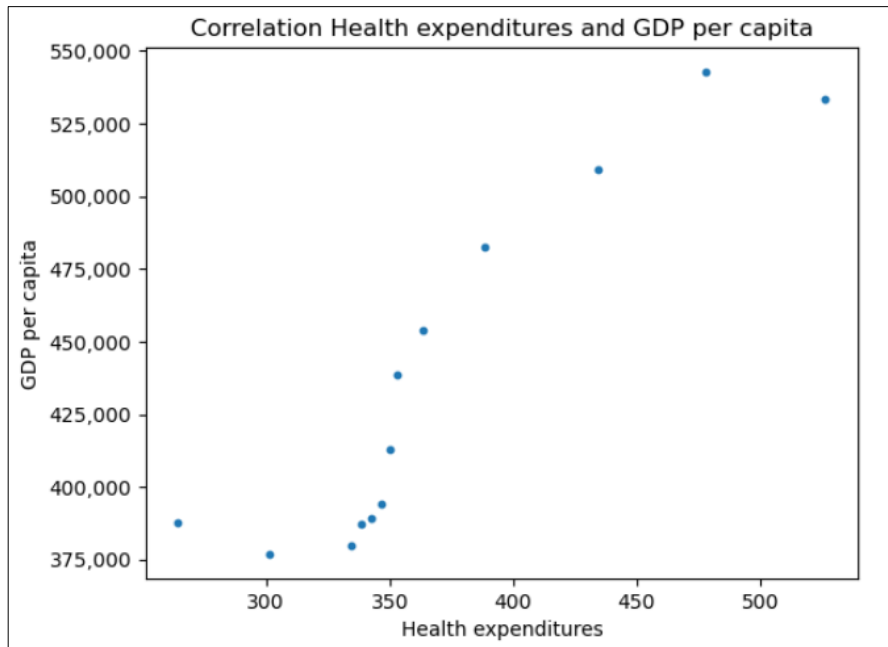

Figure 7. Correlation between health expenditures and GDP per capita

The correlation between health expenditure and GDP is 0.913980, which means a very strong positive correlation, as can be seen from Figure 7.

Thus, GDP has a very strong positive correlation with health care spending and a very strong negative correlation with the unemployment rate.

4. Discussion

Health expenditure is increasing substantially relative to gross domestic product (GDP) growth in almost all countries at all income levels (Mladenović et al., 2016). This increase in expenditure has become a major concern for governments and policymakers (Panopoulou & Pantelidis, 2012). Health expenditure has increased from 3% of global GDP in 1948 to 7.9% in 1997 (Self & Grabowski, 2003) to approximately 10% in 2014 (World Health Organization, 2016). Health expenditure is growing faster than GDP in numerous countries. (Rana et al., 2020). Currently, GDP growth is slower than health expenditures in many countries. This problem has been worsened by the Covid-19 pandemic, where healthcare expenditures have increased significantly. For example: The increase in healthcare expenditure directly related to the Covid-19 pandemic was equivalent to 2.0% of government health expenditure and 0.8 per thousand of gross domestic product (GDP) in Turkey in 2020 (Oksuz et al., 2021).

Hansen and Seo (2002) test the long-term relationship between real per-capita GDP and real per-capita healthcare expenditure in Japan. Tamakoshi and Hamori (2016) detect the presence of a threshold cointegrating relationship between the GDP and healthcare

expenditure. Further research may be focused on this long-term relationship in the Czech Republic.

5. Conclusions

By correlation analysis was shown, that GDP has a very strong positive correlation with healthcare spending and a very strong negative correlation with the unemployment rate. The correlation between the unemployment rate and healthcare expenditures is negative.

By time series modeling and predictions was shown, that prediction for healthcare expenditures is first a decrease and then a slight increase in the period until 2024.

Empirical findings on the relationship between healthcare expenses and gross domestic product (GDP) are diverse. (Rana et al., 2020)states that about 43 % of changes in the growth of global healthcare expenditure can be explained by economic growth. The study (Mladenović et al., 2016) also showed that an increase in healthcare expenditure is related to the level of income and economic growth of the country. Pandemic Covid-19 caused both the growth of healthcare expenditure and a decrease in GDP. Compared to commercial markets, individual governments are obliged to provide basic health care for free. Especially low-income countries and also a country with low GDP growth or high healthcare expenditure will have significant political and economic consequences (Král, 2022; Rana et al., 2020). According to the research (Bureš et al., 2016), it is also necessary to pay attention to the consequences of subjective perception of well-being and mental health, which will subsequently affect the use of health care.

Conflict of interest: none.

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