



THE EVOLUTION OF PUBLIC DEBT, GROSS DOMESTIC PRODUCT AND INFLATION RATE IN POLAND IN 2015-2021

Aleksandra Lipka

Faculty of Economic Sciences
University of Warmia and Mazury in Olsztyn
e-mail: aleksandra.lipka2@student.uwm.edu.pl

Daria Nowacka

Faculty of Economic Sciences
University of Warmia and Mazury in Olsztyn
e-mail: darianowacka7@gmail.com

Andrzej Rzeszutek

Faculty of Economic Sciences
University of Warmia and Mazury in Olsztyn
ORCID: <https://orcid.org/0000-0002-7832-8634>
e-mail: andrzej.rzeszutek@uwm.edu.pl

JEL Classification: E62, H60, O47.

Key words: GDP, sovereign debt forecast, national budget forecasting, national budget, inflation.

Abstract

The research aimed to assess the amount of public debt, GDP, and inflation in Poland and to forecast it for the period 2022-2026. The amount of public debt in the years under study, and two macroeconomic measures, GDP and inflation, were analyzed.

The research was conducted based on data obtained from the Central Statistical Office, the Ministry of Finance, and Eurostat. One of the main research objectives of the study was to find a relationship between the level of GDP and public debt. To this end, vertical analysis of the acquired data was carried out and Pearson linear correlation coefficients were calculated. Another important aspect addressed in the study was the magnitude of average annual inflation rates, compared to the volume of public debt. To this end, the focus was on carrying out a vertical analysis of the variables that made it possible to find relationships between inflation and public debt. The focus

was also on examining the share of public debt in GDP for Poland related to selected EU member states. The analysis was carried out in three countries each with a high and low correlation of the indicator under study.

The analysis carried out allowed for the confirmation of the hypotheses put forward in this study that public debt is correlated with both GDP and the level of inflation in Poland. The estimated forecasts made it possible to conclude that the public debt will gradually increase over the next 5 years.

KSZTAŁTOWANIE SIĘ DŁUGU PUBLICZNEGO, PRODUKTU KRAJOWEGO BRUTTO ORAZ POZIOMU INFLACJI W POLSCE W LATACH 2015-2021

Aleksandra Lipka

Wydział Nauk Ekonomicznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

Daria Nowacka

Wydział Nauk Ekonomicznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

Andrzej Rzeszutek

Wydział Nauk Ekonomicznych
Uniwersytet Warmińsko-Mazurski w Olsztynie

Kody JEL: E62, H60, O47.

Słowa kluczowe: PKB, prognoza długu publicznego, prognoza budżetu państwa, budżet państwa, inflacja.

A b s t r a k t

Celem pracy było zbadanie zależności między poziomem długu publicznego w Polsce a wartością wybranych wskaźników makroekonomicznych, takich jak inflacja i PKB. Przeanalizowano wielkość państwowego długu publicznego, PKB i stopy inflacji, a także związek występujący między tymi kategoriami, sporządzono też prognozę badanych mierników na lata 2022-2026.

Badania przeprowadzono na podstawie danych uzyskanych z Głównego Urzędu Statystycznego, Ministerstwa Finansów oraz Eurostatu. Jednym z głównych celów badawczych było znalezienie związku między poziomem PKB a długiem publicznym. W tym celu przeprowadzono pionową analizę pozyskanych danych i obliczono współczynniki korelacji liniowej Pearsona. Innym ważnym aspektem poruszonym w badaniu była wielkość średniorocznych stóp inflacji w porównaniu z wielkością długu publicznego. W tym celu przeprowadzono pionową analizę tych zmiennych. W pracy skoncentrowano się również na zbadaniu udziału długu publicznego w PKB Polski w odniesieniu do wybranych krajów członkowskich UE. Analizę przeprowadzono w trzech krajach o wysokiej i niskiej korelacji badanego wskaźnika.

Wyniki przeprowadzonej analizy pozwoliły na potwierdzenie postawionych hipotez, stanowiących, że dług publiczny jest skorelowany zarówno z PKB, jak i z poziomem inflacji w Polsce. Oszacowane prognozy pozwoliły stwierdzić, że dług publiczny będzie stopniowo wzrastał w ciągu najbliższych pięciu lat.

Introduction

It is difficult to determine the direct reasons for the significant increase in public debt in recent years because the literature on the subject indicates the complex nature of the process of accumulation of public debt over a long period. Undoubtedly, the method of calculating the debt and including it in the statistics as the actual value is of key importance in determining it, due to the complex scope of legal regulations regarding this issue. However, when taking into account the level of debt, i.e. determining the size of public debt, special emphasis was placed on taking into account the actual debt, disregarding the significant level of potential and hidden debt (Tobera, 2019, p. 314).

In the 1990s, the issue of public debt was already raised, mainly regarding countries that were undergoing political transformation, including Poland (Połomka & Zaleska, 2015, p. 167). The increase in debt intensified especially during the COVID-19 pandemic, which reached Poland in 2020. Therefore, the question arises whether there is a relationship between public debt and macroeconomic indicators. As examples of macroeconomic factors, the level of inflation and GDP were selected. The research aimed to assess the GDP, the level of inflation, and the level of public debt in Poland.

Literature Review

Considerations on budget balance and state debt were systematized with the development of classical economics. According to Piątkowski (2020, p. 35-38), these views were based on the considerations of Adam Smith. Smith (2007, p. 343-605) touched on this topic in two books of his considerations. In Book IV, he touched upon the issues of fiscal policy, and in particular the issues of the tax system. Book V, on the other hand, described issues related to public debt. Smith's views contained in it testify to a deep analysis of this phenomenon and the reference of a given phenomenon to the economic situation of the time. He showed two approaches, on the one hand, as a supporter of the multi-market approach, Smith negatively assessed the budget deficit of both monarchies and republics. Smith based his conclusions on the experience of other countries that had financial problems as a result of debt. Tax increases, corruption of money, revolutions, and state insolvency were some of the main factors in the consequences of debt. It could also lead to the collapse of financial systems. From a different point of view, Smith presented an analysis of the occurrence of budget deficits and their effects. As one of the main factors determining changes in the perception of debt, he indicates the transformation of economies from natural to commodity ones. The appearance of luxury goods caused a change in the behavior of the rulers. They stopped focusing on the hoarding of wealth and began

to surround themselves with luxury goods, which contributed to a significant increase in the demand for financial resources. As a result of changes in the development of the economy and the financial sector, it caused the then rulers to incur debt and thus lost their financial stability. The loans that were granted to them did not reduce the purchasing power of merchants, but increased it, which significantly contributed to the development of the market economy. Thus, according to Smith, the loans mentioned above are undesirable elements in a market economy, but they are inevitable in a market economy (Smith, 2007, p. 343-605). Another representative of classical economics is David Ricardo, who pointed out that government spending harmed the efficiency of the economy. He argued that spending reduces capital accumulation. In his theory, he questions the existence of the public finance sector and is in favor of financing expenses from imposed taxes. He also created a theory in which he justifies that public debt has no real impact on economic processes. It assumed that together with the increase in state debt, the increase in household savings would increase. However, Ricardo's theory aroused much controversy in connection with the theory of the infinite horizon (Moździerz, 2008, p. 1-35). The views of the classics enjoyed great popularity and recognition for many years. However, over time, under the influence of wars, they ceased to describe the present economic situation. The changes taking place required the verification of classical views. The introduction of Keynes' views caused rapid changes. They were introduced during the Great Depression, and Keynes showed an opposite view of the economy. He focused his main attention on the fact that it is not the supply that generates demand, but that demand is primary. He also noted that it is the lack of demand in the economy that is the main factor in the creation of unemployment and recession in the economy. He also drew attention to the fact that entrepreneurs in times of crisis are unfavorably inclined to take risks related to investing. Thus, Keynes proposed that government spending should supplement global demand since maintaining effective demand in the economy is more important than maintaining budget balance. In his theory, Keynes also explained that in times of economic downturn, a negative balance is a neutral phenomenon (Keynes, 2003, p. 119, 220). Keynesian ideas were put into practice for the first time during the Great Depression. Economists did not agree on the validity of this theory, but it is worth noting that in the first period, according to Keynesian principles, the level of public debt was low and its negative effects were not felt (Moździerz, 2008, p. 1-35). Both mainstream economic theories only partially explain the consequences of the use of public debt. In practice, both approaches were used, but the experience gained in this way did not determine the advantage of one of them (Piątkowski, 2020, p. 40).

According to Piątkowski (2020, p. 47), the first of the potential sources of the impact of public debt on the level of inflation is the impact of the risk of insolvency of the public finance sector on the price level. In the event of a risk, there is a likelihood of an increase in market interest rates and an increase in tax burdens.

An increase in interest rates results in a significant increase in the cost of obtaining funds to cover the deficit, and thus it is felt by the entire economy. The financial market is based mainly on reputation and the decline in trust in the state translates into the perception of the economy as a whole. Thus, the increase in the price of money is expressed by the market interest rate. Such a situation causes an increase in the costs of economic activity and has an impact on the increase in the level of prices. As another factor influencing public debt, Piątkowski (2020, p. 48) distinguishes the currency risk related to foreign debt. Sudden drops in the value of a currency strongly affect the current price level. It is worth emphasizing, however, that in the case of developing countries such as Poland, the exchange rate depends mainly on the inflow and outflow of foreign capital, stock exchange investments and treasury bonds. The presence of high foreign debt entails two main phenomena. Firstly, it is necessary to offer a high-interest rate on bonds, which leads to an inflow of capital resulting in the strengthening of the national currency, thus contributing to lowering the level of inflation (applies to countries with a floating exchange rate). On the other hand, in the case of countries with a fixed exchange rate, there will be an increase in the supply of the domestic currency, which will lead to an increase in inflation. The increase in demand for foreign currencies and the decline in investor confidence contribute to the weakening of the domestic currency. According to Piątkowski, inflationary pressure may cause a rapid increase in the level of inflation (the price of many products, including fuel, is strongly dependent on the level of the exchange rate). This can be seen in the example of countries where currency crises occurred. It shows that this mechanism is very common in this case. It is also worth noting that inflation is a complex phenomenon influenced by several factors. The process of impact of public debt on inflation and the economy as a whole differs depending on the phase of the economic cycle in which they are incurred. In a period of rapid growth in the economy, inflationary pressure is strong, so the pressure caused by debt is additionally strengthened.

The impact of public debt on economic growth after the aftermath of the financial crisis has become a topic of consideration for many economists. The significant increase in budget burdens prompted reflection on whether the safe level of debt, ensuring a constant pace of economic growth, has already been exceeded. The main variables differentiating the impact of public debt on GDP growth include the share of debt in GDP, the level of economic development of the country, and the occurrence of debt crises in the earlier period (Karmela, 2019, p. 74-95). In his research, Karmela (2019, p. 74-95) assuming that the current level of GDP per capita growth should not affect the lagged level of the public debt ratio, limited the problem of reverse causality. The ratio of public debt to GDP in the previous year was correlated with its value in the current year and as such a variable to some extent limits the problem of endogeneity. He noted that the method of eliminating these two problems has not yet been

developed, which, however, does not raise doubts of some researchers (cf. e.g. Reinhart, Reinhart & Rogoff, 2012). Karmela (2019, p. 74-95) also indicated that the estimation results of the models presented by him may indicate a non-linear relationship between economic growth and the size of public debt. The analysis carried out by Karmela (2019, p. 74-95) proved that high public debt is correlated with low economic growth.

Research Methods

State public debt (PDP) is an indicator of public finance sector debt, determining the number of liabilities incurred by individual units of the sector on the financial market (including the banking market). Therefore, this indicator takes into account the consolidation process, i.e. the elimination of mutual liabilities within the sector (e.g. the value of loans granted from the state budget to local governments, loans to the Social Insurance Fund or treasury securities held in the portfolios of public finance sector units is not taken into account) (Marchewka-Bartkowiak, 2022).

The inflation rate can be defined as an indicator of the increase in the prices of goods and services in the economy. Thus, it informs us about the average price increase in the market. The consequence of inflation is a decrease in the purchasing power of money, and thus a decrease in its value (for the same amount of money we can buy fewer goods and services).

Gross domestic product (GDP) is a measure reflecting the economic situation in the economy. It is the most commonly used measure, even though it is widely criticized because it does not properly reflect the level of wealth in the country and the level of wealth of the average citizen, it indicates the strength of the economy in the world.

Hypothesis 1: The rate of inflation increases with the increase in public debt.

Hypothesis 2: There is a relationship between public debt and GDP.

The empirical analysis focused on verifying the coexistence of the phenomenon of high GDP and the level of inflation and public debt, as well as on observing and determining whether there is a cause-and-effect relationship between these phenomena. For this purpose, the Pearson linear correlation coefficient and the vertical analysis of the results were calculated. It is worth noting, however, that there are many limitations to the study of the relationships between these variables, and unfortunately, economists do not agree on how to do it (Kamela, 2019, p. 74). Based on the forecast determined using the trend line, an analysis was carried out regarding the size of the debt for the years 2022-2026.

The study analyzed data obtained from the Ministry of Finance, the Central Statistical Office, Eurostat, and literature on the subject, both domestic and foreign.

Research Results

The research hypothesized H1 that the inflation rate increases with the public debt. The level of public debt and inflation in Poland for the years 2015-2021 are presented in Figure 1. It can be seen that the value of inflation in the analyzed period fluctuates while maintaining an upward trend. In 2015 and 2016, we could note the phenomenon of deflation in Poland. The values for the analyzed years were respectively -0.9% and -0.6%. The level of public debt for 2015 was PLN 877,275.5 million, while in 2016, the debt amounted to PLN 965,201.5 million. Thus, it can be seen that along with the increase in public debt, the level of inflation increased by 0.3 percentage points per year. Public debt in 2016 increased by 10.02% compared to the previous year. In 2017, the level of inflation in Poland increased sharply compared to the previous year. The average annual inflation for Poland in 2017 was 2%, i.e. it increased by 2.6 percentage points compared to the previous year. The amount of public debt in 2017 recorded a decrease in value compared to 2016, the debt for 2017 amounted to PLN 961,836.3 million, which was a decrease of 0.34% compared to 2016.

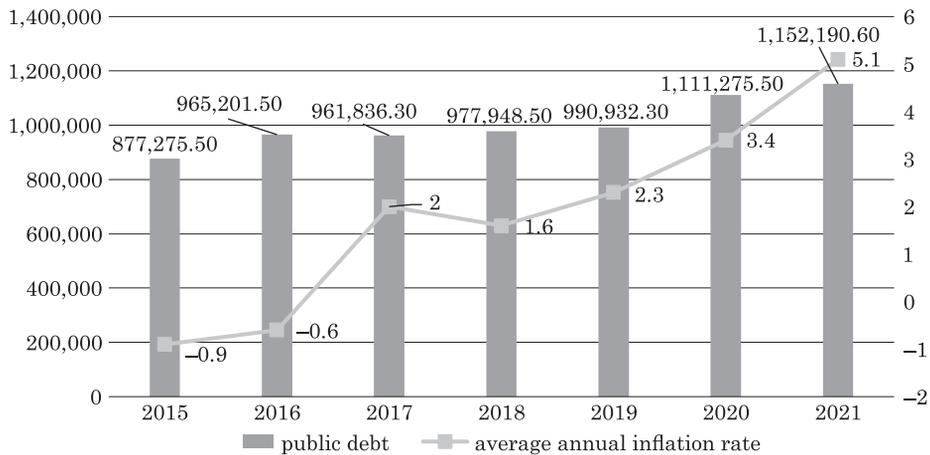


Fig. 1. Comparison of average annual inflation rates to the size of public debt in Poland in 2015-2021
Source: based on data from the Ministry of Finance and Statistics Poland.

It can therefore be seen that 2017 was the only year among those surveyed to record such a sharp increase in inflation and a decrease in the value of public debt compared to the previous year. Inflation in 2018 was at the level of 1.6%, at the same time recording a decrease of 0.4 percentage points compared to 2017. In 2018, the country's debt amounted to PLN 977,948.5 million, which resulted in an increase in the debt volume compared to 2017 by 1.7%. Since 2018, the size of public debt has shown an upward trend, the same situation can be observed

in the average annual inflation value in Poland. Therefore, it can be concluded that the H1 hypothesis put forward in the study has been confirmed, because in the analyzed period the level of inflation increases along with the public debt. This was also confirmed by Piątkowski (2020, p. 190) in his book. He focused on four potential ways in which public debt affects inflation. The first one was the risk of insolvency in the public finance sector. His analysis showed that in Poland in the years 2001-2018, the risk of insolvency of the public finance sector, despite periodic fluctuations, decreased. This included, among others, the fact that the ratio of public debt to GDP was growing, but did not exceed 60% of GDP. The second direction of the impact of public debt on the level of inflation associated with currency risk. The analysis carried out showed that in the analyzed period this impact decreased, although in periods of economic downturn the debt parameters affecting the currency risk significantly deteriorated. The third way of influencing the level of inflation identified by Piątkowski (2020, p. 190) was its impact on the crowding-out effect. In his research, he showed that public debt did not increase the crowding-out effect. This effect occurs but is not the result of public sector activity. The fourth identified relationship between public debt and the level of inflation was related to the risk of debt monetization. An analysis by Piątkowski (2020, p.190) showed that Polish public debt carries this risk. At the same time, however, forecasts indicate that the impact of debt on inflation will increase in periods of economic downturn, and its strength will depend on the degree of deterioration of the public finance balance. Therefore, the issue of the impact of debt on the level of inflation will also be relevant in the future. Research conducted by Piątkowski (2020, p. 44-60) indicated a moderate and decreasing impact of public debt on inflation processes, but at the same time on the occurrence of risk factors in the future. Research conducted in the future, taking into account the rapidly growing inflation, may be particularly interesting.

The research hypothesized H2 that there is a relationship between public debt and GDP. The size of the level of public debt and GDP in Poland for the years 2015-2021 are presented in Figure 2. It can be seen that the value of GDP in Poland for the analyzed period maintained an upward trend, similarly, in the case of the size of public debt, the values also show an upward trend.

There is a certain relationship between GDP and the size of public debt. The only exception, in the analyzed period, in which the increase in the size of GDP was not accompanied by an increase in the size of public debt, was 2017. To determine the relationship between the size of public debt and GDP in Poland, in the period under study (2015-2021) the correlation between the given values was examined. For this purpose, the Pearson linear correlation coefficient was used, the purpose of which was to determine the linear relationship between the given variables. By definition, the correlation coefficient is in the range of (-1.1). In the case of the analysis of the coefficient for variables such as GDP and public

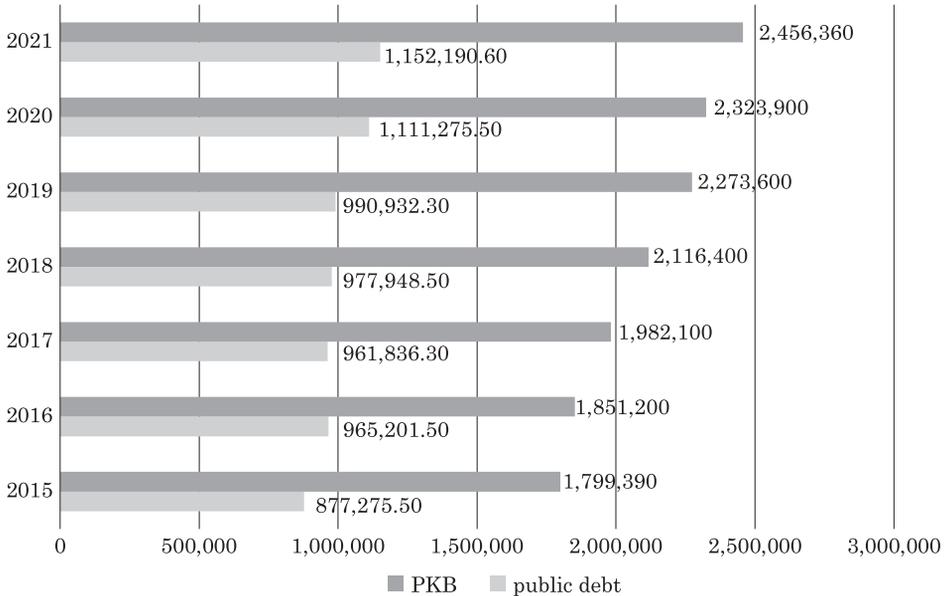


Fig. 2. Comparison of GDP to public debt (PLN million) in 2015-2021

Source: based on data from Statistics Poland and the Ministry of Finance.

debt, the value of the Pearson coefficient was at the level of 0.897. For the Pearson linear correlation, the greater the absolute value of the coefficient, the stronger the relationship between the examined variables. Thus, the analyzed coefficient of $0.897 < 1$ shows a large positive linear relationship between the size of public debt and GDP in the analyzed period.

To sum up, the H1 hypothesis put forward in the study can be confirmed that there is a relationship between public debt and the size of GDP.

To ensure sustainable development, it is necessary to ensure financial stability in the European Union by maintaining a reasonable share of public debt in GDP. Therefore, according to the Treaty on the Functioning of the European Union, public debt should not exceed 60% of GDP. As a result of Karmela's calculations (2019, pp. 74-95), he obtained theoretical threshold values for the maximum ratio of public debt to GDP per capita ranging between 67.3% and 77%.

Figure 3 shows the forecast of the share of public debt in the GDP by setting the trend line for the next 5 years.

The highest value can be observed in 2020, where the share of public debt in GDP amounted to 57.1%, which oscillated around the maximum allowable share of public debt in GDP amounting to 60%. The smallest share can be observed in 2019, where this value is 45.6%. Based on the forecast calculated using the trend line, it can be seen that the share of public debt in GDP over the years 2022-2026 will fluctuate around 60%, but will not exceed the maximum allowable.

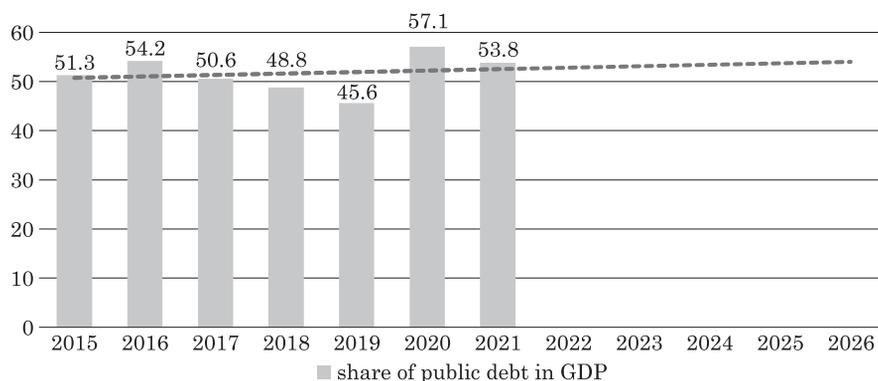


Fig. 3. Forecast on the share of public debt in % of GDP for 2022-2026 in Poland, determined using a trend line

Source: based on Eurostat data.

Summary

The problem of the growing public debt is a phenomenon that we have been struggling with for a long time not only in Poland but in the world. Debt is not something new, but the factors that make up its size can change, and thus its level constantly changes. The size of public debt in Poland in the period under review showed an upward trend, excluding 2017 when a decrease in the size of debt by 0.6% compared to the previous year can be observed. As one of the reasons for this phenomenon, a decrease in the foreign value of public debt was specified, the amount of which consists of debt incurred on account of securities, also incurred on account of loans and credits, and other debt of the public finance sector. In each of the above mentioned areas, a decrease in value was recorded compared to the previous year.

As a result of the research, it was found that with the increase in the level of state debt, the size of GDP increased. For the size of public debt in Poland, the forecast determined using the trend line has also been calculated for the years 2022-2026. Based on the data obtained, it can be seen that the value of public debt will increase. According to the presented forecast, Poland's debt in 2023 may reach PLN 1,200,000 million, while in 2026 it may fluctuate around PLN 1,400,000 million. Therefore, based on the data obtained, one can predict an increase in state debt in the coming years.

The size of public debt was also presented relative to the rate of inflation occurring in Poland in particular years of the analyzed period. Inflation in Poland in 2015-2021 fluctuated while maintaining an upward trend. In the analyzed period, an exception was noted in which the inflation rate decreased compared to the previous year, i.e. 2018. In the analyzed year, the value of average annual

inflation decreased by 0.4 percentage points compared to the previous year. The size of public debt in the analyzed period also showed an upward trend, excluding the above-mentioned year 2017. Thus, based on the analysis carried out, the relationship between the increasing public debt and the inflation rate in Poland can be seen. In light of the conducted research, further questions arise about the future in the event of such a huge inflation jump in 2022. This may be a contribution to further research.

Based on the conducted research, it can be concluded that the hypotheses have been confirmed. Therefore, it is necessary to constantly control the indicators and review the national rules limiting the amount of public debt in terms of their effectiveness, efficiency, and impact on the economy.

Translated by Andrzej Rzeszutek

References

- Karmela, Z. (2019). Wpływ zadłużenia publicznego na dynamikę wzrostu gospodarczego w krajach Europy Środkowo-Wschodniej. *Ekonomia Międzynarodowa*, 26, 74-95. <http://dx.doi.org/10.18778/2082-4440.26.01>
- Keynes, J.M. (2003). *Ogólna teoria zatrudnienie, procentu i pieniądza*. Warszawa: Wydawnictwo Naukowe PWN.
- Marchewka-Bartkowiak, K. (2022). *Państwowy dług publiczny (dług sektora finansów publicznych)*. Sejm Rzeczypospolitej Polskiej. Leksykon budżetowy. Retrieved from <https://www.sejm.gov.pl/sejm8.nsf/BASLeksykon.xsp?id=0995CC707B643F7DC1257A6200388390&litera=P> (28.11.2022).
- Moździerz, A. (2009). *Nierównowaga finansów publicznych*. Warszawa: PWE.
- Piątkowski, P. (2020). *Dług publiczny a procesy inflacyjne w Polsce*. Białystok: Wydawnictwo Uniwersytetu w Białymstoku.
- Połomka, J., & Zalewska, M. (2015). Dług publiczny w Polsce – instytucjonalne możliwości jego redukcji. *Optimum. Studia Ekonomiczne*, 1(73), 167. <http://dx.doi.org/10.15290/ose.2015.01.73.14>
- Reinhart, C., Reinhart, V., & Rogoff, K. (2012). Public Debt Overhangs: Advanced – Economy Episodes Since 1800. *Journal of Economic Perspectives*, 26(3), 69-86. <http://dx.doi.org/10.1257/jep.26.3.69>
- Smith, A. (2007). *Badania nad naturą i przyczynami bogactwa narodów*. Warszawa: Wydawnictwo Naukowe PWN.
- Tobera, P. (2019). Problem istnienia ryzyka zobowiązań potencjalnych i długu ukrytego w finansach publicznych na wybranych przykładach. *Studia Prawno-Ekonomiczne*, 110, 314. <http://dx.doi.org/10.26485/SPE/2019/110/17>

