“Economic growth: macroeconomic effects of Public Borrowings at the global level”

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ECONOMIC GROWTH: MACROECONOMIC EFFECTS OF PUBLIC BORROWINGS AT THE GLOBAL LEVEL

Abstract

The study examines the peculiarities of the impact of public debt on the economic growth of states. The aim of the study was to analyze and identify the determinants of the impact of government borrowing on economic growth. The following research methods have been applied: analysis and synthesis of data and theoretical work, comparative analysis, statistical, correlation, cluster and discriminant analysis. According to the results of the survey, it is established that the growth of government borrowing can have both a negative and a positive effect on the economy, provided that it implements as the share of government debt to GDP, does not exceed 60% and is implemented in the form of financial investments (golden rule of public finance). The state's deficit is allowed provided that state assets grow; current income from investment fully covers current expenses. The results of clusterization allowed to allocate 3 groups of states: states that demonstrated the economic downturn; states characterized by slow economic growth; states that were characterized by high level of economic growth. The first group of states (the countries with economic downturn) observed a negative high level of government debt and GDP. The results showed the low level of domestic borrowing development in low and middle income countries, which in developed countries allows governments to finance the investment projects on the basis of local loans (municipal bonds, infrastructure bonds, mainly medium and long-term), increase the debt burden in terms of economic recession.

Keywords government debt, GDP, foreign and domestic borrowing, IMF loans, bonds

JEL Classification G18

INTRODUCTION

The transformational changes in the economies of the EU, America, Asia, and Africa connected with the achievement of the goals of sustainable development in a context of slowing economic growth and financial crises have led to a shift in approaches to managing goverment debt towards the development of the domestic borrowing market. Debt policy is aimed at stimulating and attracting domestic loans in the form of municipal bonds, medium and long-term infrastructure bonds and, at the same time, reducing foreign loans, which have a negative impact on economic growth. In this case, it is important that when placing bonds, the advantage is given to long-term borrowings in the national currency that are held on the domestic market.

1. LITERATURE REVIEW

The dependence and connection of economic growth on goverment debt is the object of research by many scientists. It is proved that the volume of public borrowings at a certain level propels economic growth, but after reaching and exceeding the threshold, it negatively affects it.

According to Buchanan (1964), a public debt is defined as an obligation of a government to make payments of specified amount to holders of the debt instrument. State debt serves as a short-term and long-term instrument for attracting financial resources, which the government must return in due time. Those future payments include interest plus principal payments (Buchanan, 1964; Bondarchuk, 2013).

Public debt can be classified according to various features: by the provider of cash resources, by the terms of debt obtaining (short-term – for 1-2 years, medium – for 5-6 years, and long-term – for more than 5-6 years). The criteria of debt classification also include: influence on the state economy, and the structure of debt. Short-term debts exist for solving current problems, whereas long-term ones operate for capital investments and large-scale state projects (Aybarç, 2019; Açba, 1994; Corina, 2013; Erdem, 2016; Bekar, 2018).

In the opinion of Aybarç (2019) and other scholars, public debt is divided into external and internal. As for external debt, in order to ensure economic growth, such debts should be returned at the expense of interest on profits. When investing in production, external debt positively affects the state's economy (Aybarç, 2019; Anning, Ofori, & Affum, 2016; Kopits, 2001).

Aybarç (2019) stated that debts can also be divided into debts for development and forced debts. Forced debts are received in case of emergency or when crisis situations occur (severe economic downturn, social and political instability, war, etc.). Getting compulsory debt is more risky than getting a voluntary one (Aybarç, 2019; Anning, Ofori, & Affum, 2016; Kopits, 2001).

The general public debt is a debt borrowed by the state from external and internal sources (Akram, 2011). The involvement of the public sector is a central government debt. In case the country is a federation, public debt is defined as the sum of debts of all territorial units, national and external debt (Reznikova & Yevlanova, 2015).

The study conducted by Mihaiu (2014), analyzes the trends and relations between the countries of the European Union (EU-27) in the period 2008–2012 and reveals the relationship between the level of goverment debt and economic growth in order to determine the directions of the impact and consequences of the growth of goverment debt. The analysis revealed a feedback link between goverment debt and public investment, in particular, the increase in goverment debt did not provide incentives for the growth of public investment, but, conversely, their volume declined significantly. In excess of goverment debt of 60% of GDP, there is a feedback link between this indicator and economic growth. To this level (60% of GDP), the connection between these indicators is not significant (Mihaiu, 2014; IMF Data Mapper, n.d.b).

However, today the level of goverment debt of the economies of the EU countries has long exceeded the Maastricht criterion (60% of GDP). In addition, most of them do not provide short-term stability (Checherita & Rother, 2010). Tomasz's (2015) study on long-term sustainability and stability suggests generating an excess of government budgets by some EU countries in the long run. In 9 of the 15 countries under study, the amount of discounted primary residues was highly positive. Such countries seek to ensure sustainability, so the policy is aimed at achieving it in the long run (Tomasz, 2015; Alejandro & Jacobo, 2017).

Tomasz (2015) proves the transformation of the economies of the EU countries and their gradual convergence in the path of growth based on innovation. In order to implement an innovative model of economic growth, productivity and innovation, in particular, the introduction of advanced technologies and products, are essential. In some EU countries, deep economic instability has been observed over the past 10 years. Generally, goverment debt is formed at the expense of external sources of borrowing. In addition to external loans, foreign direct investment and the size of the population are significantly affected by economic growth. Simionescu, Dobeš, Brezina, and Gaal (2016) proved that both FDI and population are more important determinants of GDP than goverment debt (Tomasz, 2015; Yiew & Lau, 2018; Simionescu, Dobeš, Brezina, & Gaal, 2016).

In work of Szarowská (2017), it is proved that state expenditures on innovations, which are involved with the help of public debt, lead to economic growth. Enhancing the potential of the economy

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(a larger proportion of skilled human resources and higher intensity of investment) indicates a positive effect of government borrowing, although in the case of investments, it is only partial. This study confirms that there is a tendency for a combination of direct government funding at the expense of national sources and lending sources, as well as indirect state financing instruments that ultimately serve as an incentive for economic growth (Szarowská, 2017; Yiew & Lau, 2018).

Thus, in a number of analyzed papers, the positive effect of government borrowing on economic growth has been proved in the conditions of effective management and directing of borrowed resources on innovations and R&D, observance of the optimal level of goverment debt.

Pegkas (2018) argues and proves the negative influence of goverment debt and population growth on economic growth. In addition, the study has shown that there is a time gap between economic growth and the volume of goverment debt (Pegkas, 2018).

Spilioti and Vamvoukas (2015) prove the positive and statistically significant impact of debt on GDP growth. The author proves that in the case of a state debt level of 80-100% of GDP, public debt significantly and negatively affects the economy of the state and may cause irreversible economic consequences. At the same time, the negative impact of public debt begins to manifest itself when the debt is more than 70% of GDP (Checherita & Rother, 2010; Simionescu, Dobeš, Brezina, & Gaal, 2016).

Alejandro and Jacobo (2017) examining the impact of goverment debt on GDP in 16 Latin American countries, in particular, in Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela over a period of about fifty years (1960–2015), revealed short-term effects of the debt on GDP growth, which is positive.

In addition to the impact of government debt as well as the debt on economic growth, scientists have shown the impact of GDP growth on reducing default risk and debt relief (Pustovoit, 2017). International loans serve as a source of profits for international financial institutions, and therefore provide for the fulfillment of the terms of a loan agreement, which in recent years envisage implementation of measures within the framework of sustainable development (Reznikova & Yevlanova, 2015). Reznikova (2016) argues that debt influences economic growth through the following channels of influence: interest rates, exchange rate, government spending, fiscal revenues and capital flows. Melnyk (2017) argues about the accelerated pace of international integration of the country in terms of increasing external loans, but at the same time negative impact on the inefficient use of loans, which leads to the payment of a significant amount of national income for repayment of loans.

According to Kellermann (2007), government borrowings from countries, including the European Union, may be made for public investment. Special turnover of capital costs indicates the "golden rule of public finance" borrowing. According to this fiscal rule, a state deficit is permissible if accompanied by an increase in assets so that the position of the net assets of the state does not deteriorate. At the same time, the expenses for debt servicing should be covered by current receipts, and in case of debt investment, the country is allowed to have debt (Kellermann, 2007; Picarelli, Vanlaer, & Marneffe, 2019).

According to researchers, the golden rule of using public debt says that the use of public debt financing for production projects stimulates growth in output and productivity (Kellermann, 2007).

Kopits (2001) believes that the golden rule can be considered a fiscal rule, focused on economic growth, which avoids an excessive burden on the state budget.

It can be concluded that the use of public debt can have a positive and negative effect on the state's economy (Muley, 2018; Dudchenko, 2012).

2. METODOLOGY

To investigate the effects of goverment debt on economic growth data from the World Bank for countries with different income levels, IMF data for different time periods are used. The method of comparative analysis of indicators of government debt,

GDP per capita, IMF loans volumes and volumes of issued bonds in different regions of the world and in different countries is used. For analysis, 79 countries from different regions of the world have been selected. The information sources that served as the theoretical basis for the study were the latest articles and publications of scientists who studied the problem of the impact of government borrowing on the level of economic growth in 2006–2018. The method of statistical, correlation, cluster and discriminant analysis is used to distinguish the main trends and the impact of borrowing on economic growth. For grouping of countries by level of economic growth and goverment debt, the canonical discriminant functions were built. The calculation of discriminant functions was carried out using the static statistical analysis package STATISTICA 10 (Kim, Muller, Klekka, et al., 1989; Farrar & Glauber, 1964).

3. RESULTS AND DISCUSSION

Developed countries are characterized by the highest maintenance costs and growing need for financing a budget deficit. This dynamics may be due to soft monetary policy and leads to low profitability on government bonds (Kellermann, 2007; Koblyk, 2014; Kopits, 2001). Thus, the profitability of Japanese government bonds is less than 1%. It can also be noted that the strongest and most economically developed countries are characterized by the highest levels of indebtedness. Such a trend may lead to a slowdown in economic growth. The extremely high level of debt in Italy is due to the low level of labor productivity, which results in slow growth of GDP, low investment in the leading industries of the economy (Mihaiu, 2014; Reznikova & Yevlanova, 2015).

The causes of Greece's high indebtedness are the agro-industrial economy that suffers from bureaucracy and the social sector. In addition, the main reasons include low value added, ineffective fiscal policies, high levels of corruption, which is also observed in Ukraine (Vakhnenko, 2005). Among the European countries, Ukraine is characterized by the lowest level of debt: in 1995, the debt amounted to 8.43 billion dollars, while for example in Italy – EUR 1.07 trillion, in France – EUR 696.3 billion, in Greece – EUR 100.1 billion, in Belgium – EUR 287.9 billion (general government debt). It is obvious that the GDP of these countries also significantly exceeds the volume of Ukraine's GDP, accordingly the co-level of borrowings of Ukraine and the EU countries with the largest volume of debt is practically the same (Checherita & Rother, 2010; Mihaiu, 2014; The World Bank, n.d.b; IMF Data Mapper, n.d.a) (Figure 1, Table 1).

The research results coincide with the findings of some studies which determined that the government debt within 60% (Mihaiu, 2014) (some studies indicate that for particular countries this value might rise up to 64-71%)(Alejandro & Jacobo, 2017) has a positive effect on economic growth, and the indicator exceeding this level adversely affects the economic growth of states. The value of government debt above 70% (whereas research evidences about 90-100%) is negatively influences economic growth (Alejandro & Jacobo, 2017; Spilioti & Vamvoukas, 2015).

However, in Africa, we observe low GDP per capita and compliance with the normative value of government debt. In the Middle East, government debt not exceed 50% of GDP and economic growth in the GDP per capita in Africa. An exception is also

Source: IMF Data Mapper (n.d.a, n.d.b).

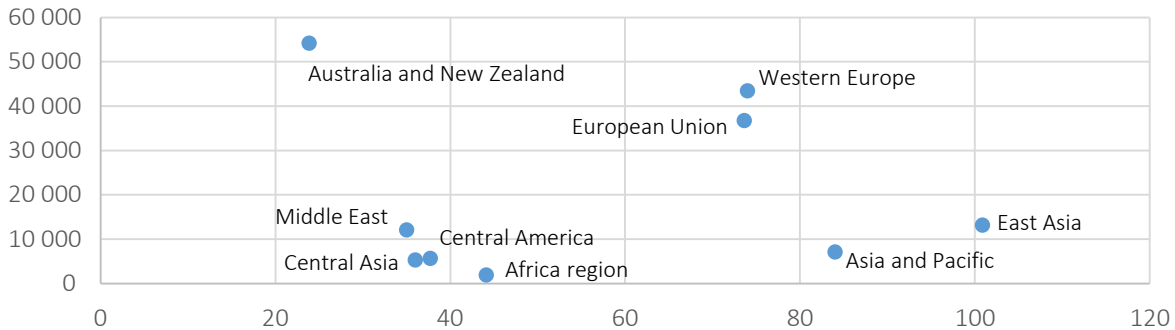

Figure 1. Average GDP per capita and average general goverment debt to GDP in 2002–2018

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Table 1. The average govermnent debt (% of GDP) and GDP per capita in the regions of the world in 2002–2018

Source: IMF Data Mapper (n.d.a, n.d.b).

Region	Total government debt, % of GDP		GDP per capita, USD/person	
	2018	Average value 2002–2018	2018	Average value 2002–2018
Africa (region)	55	44.12	1,888.227	1,690.89
Asia and Pacific	80.7	84.65	7,092.483	4,902.72
Australia and New Zealand	39.2	23.84	54,220.458	46,193.51
Central America	41	37.77	5,649.183	3,761.73
Central Asia and the Caucasus	30.2	36.08	5,288.974	5,241.89
East Asia	93.1	100.86	13,148.454	8,649.03
Eastern Europe	33.6	29.64	10,880.401	8,878.30
Europe	74	67.22	29,453.571	25,942.22
Middle East (region)	39.4	35.15	12,057.454	9,457.92
North Africa	66.6	59.90	3,325.866	3,130.40
North America	101.9	83.13	47,748.636	39,019.55
Pacific Islands	38	33.23	2,810.571	2,242.10
South America	71.2	57.41	8,510.637	7,610.34
South Asia	66.9	70.17	1,946.76	1,215.63
Western Europe	81.7	73.98	43,446.571	39,437.94
ASEAN-5	40.1	41.18	4,249.131	2,949.71
Developed economies	102.8	90.40	47,978.537	40,902.02
New and emerging Asian countries	51.3	43.02	5,307.61	2,958.22
Developing European countries	43.5	44.58	10,607.969	9,161.74
New markets and developing countries	50.4	42.28	5,241.87	3,658.09
Eurozone	84.4	79.19	40,237.117	35,860.16
European Union	81.4	73.63	36,736.21	32,689.85
Latin America and the Caribbean	65	52.57	8,394.884	7,497.56
Most developed economies (G7)	116.9	102.12	50,912.267	43,838.40
Middle East and North Africa	43.5	36.96	6,738.719	5,634.67
Middle East, North Africa, Afghanistan and Pakistan	45.9	39.09	4,927.101	4,085.18
Other developed economies	41	36.89	43,286.119	34,312.14

advanced economies, government debt of 116.9% of GDP and GDP per capita – USD 50,912.267/person in 2018 (an average, of USD 43,838.40/person). To overcome the problem, the negative impact of external debt on growth developed countries have begun to actively develop the domestic debt market (Szarowská, 2017; Kellermann, 2007; IMF Data Mapper, n.d.b; The World Bank, n.d.c, n.d.d).

To finance the state budget deficit, governments use the financial resources of international financial institutions, among which the IMF and the World Bank are leading. Thus, according to the World Bank, the increase in credit financing began in the 1980s, gradually slowed down in the 1990s. From 1998 to 2003–2004, IMF financing reached its maximum, and from 2004 to 2007, countries with different levels of income reduced external borrowings at the expense of the IRF, while the financial crisis caused the need for financing from the IMF (IMF Data Mapper, n.d.b; The World Bank, n.d.c, n.d.d; Alejandro & Jacobo, 2017).

This explains the negative connection between exceeding the normative value of the ratio of goverment debt to GDP and economic growth. During financial crises, credit resources are used to finance current problems, and the stagnation of economic activity does not contribute to GDP growth. It is worth noting that in low-income countries, lending volumes fluctuated within the range from USD 0.04 million to USD 9.96 million, and the average value was USD 4.08 million during 1970–2017. In countries with higher than average income, we observe a moderate increase in lending, with an average value of USD 29.79 million, with a peak of lending in 2010 amounting to USD 82.48 million to finance measures to overcome the effects of the financial crisis (IMF Data Mapper, n.d.b; The World Bank, n.d.c, n.d.d; Pegkas, 2018; Buchanan, 1964) (see Appendix A).

4. DISCUSSION

In connection with the complication of international relations, the impact of the global economic crisis has affected the state of foreign finance, led to an increase in budget deficit and absolute amount of goverment debt. Limited own resources, ineffective use of loans, violation of the maturity of debt obligations on the background of aggravation of negative crisis and post-crisis trends have led to a significant increase in the volume of world debt. The deterioration of the debt market is characterized by developed countries and developing countries. The negative impact of the debt crisis on the state of national economies, the increasing tension in the sovereign debt markets of the euro zone, and the weakness of the world economy increase the risks of deteriorating situation in the future. At present, the economy of most countries of the world is characterized by the presence of a large goverment debt. The governments of developed and developing countries attract financial resources from the financial markets through government borrowing to finance growing budget expenditures, and cover budget deficits. The large size and rapid growth of goverment debt in most countries attach importance to the development of approaches to regulating the functioning of the domestic market of long-term government borrowing markets in Europe (Dudchenko, 2012).

Since the end of 2009, the European Union has suffered from the current debt crisis (Albanesi et al., 2017; Bayoumi, 2017; Martin & Philippon, 2017). The governments of the EU countries have been pursuing fiscal consolidation policies, which have led to higher levels of taxation and reduced costs. However, such measures have led to the effect of lowering economic growth in the short term, which has further raised the level of debt; between 2007 and 2015, the average public debt to GDP increased by 66.66% in the European Union. Some countries have suffered even more dramatic increases in public debt (Portugal, Italy, Ireland, Greece and Spain) and increased debt ratios to GDP by 86.52% (Picarelli, Vanlaer, & Marneffe, 2019).

At the same time, the level of public debt in Europe has jumped, public investment has fallen. This decline in public investment is rather mysterious given the very adaptive monetary policy of the European Central Bank (ECB) over the past years (Albanesi et al., 2017; Bayoumi, 2017; Martin & Philippon, 2017; Picarelli, Vanlaer, & Marneffe, 2019).

The rapid growth of debt service costs in the countries of Europe and Central Asia is due to the predominance of long-term debt obligations and the financing of current expenditures and the deficit of the state budget. At the same time, the cost of servicing Ukraine's debt exceeds the significantly average cost of both European and Asian countries, due to the reduction of the share of short-term loans.

In the EU, the level of goverment debt relative to GDP has crossed over 60% for a relatively long time. Due to the high level of debt burden, the EU has developed a new debt policy for preventing adverse events for member states (Dudchenko, 2012; Mihaiu, 2014; Picarelli, Vanlaer, & Marneffe, 2019).

The capacity of the domestic bond market shows the ratio of the total value of issued government securities and gross domestic product. Thus, the markets of Argentina, Hong Kong, where the ratio is below 10%; in China, Korea and Mexico its value is about 20%. At the same time, the EU countries such as the Czech Republic, Germany, Hungary, Poland, Spain, Sweden, Switzerland, Great Britain are characterized by a ratio of 1/3 to 2/3 relative to GDP. In Italy, the volume of government securities market is slightly less than GDP (92.4%), and in Japan it even significantly exceeds its volume (142.2%) (Stakhovich & Ryzhavskaya, 2006).

The study of trends and modern processes of development of domestic government debt securities in the countries – the largest issuers, as well as the identification of these trends by researchers (Bondarchuk, 2013; IMF Data Mapper, n.d.a, n.d.b; The World Bank, n.d.b, n.d.c, n.d.d) showed the following:

- today, in some countries, a large concentration of government securities in the total value of securities, in particular debt, can be traced. The undoubted leaders in the value of public debt securities, for example, were the United States and Japan in 2012 (USD 13,743.9

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billion and USD 12,021.4 billion), practically 5 times less than United Kingdom, Italy, France, Germany, Spain (OECD Data, n.d.);

- in many developed countries, in recent years, the level of public debt is increasing, due to the need for their further dynamic economic growth. For example, in 2009–2012, a significant increase in debt was recorded in Japan (about USD 3,504 billion), in the United States (about USD 3,500 billion), as well as in European countries (United Kingdom, Greece). In addition, since 2014, there has been an increase in the volume of bond issue in the EU countries, while in Ukraine the issuance of bonds in the public and private sectors grew rapidly (OECD Data, 2009–2012; Koblyk, 2014);

- maintaining a significant state share among the national issuers of the leading countries. Government securities are the main instrument of government borrowing, which enables them to attract significant financial resources on acceptable terms. They become an effective tool that not only helps to cover cash gaps and finance the state budget deficit, but also has a significant impact on the investment processes in the country;

- a significant orientation of governments for borrowing. Thus, the share of liabilities in government debt securities is increasing, and in some countries of the world, it exceeds 50% (for example, in 2012 in Italy – 56.42%, in 2014 – 132%, in France in 2012 – 90%, and in 2014–2016 at 97%, in Greece in 2012 – 160%, in 2014–2016 – at the level of 180%, in Belgium in 2012 – 104%, in 2014–2016 at 106%) (The World Bank, n.d.a; Koblyk, 2014);

- accumulation of the volume of government securities into GDP against the backdrop of increasing goverment debt. Thus, the total volumes of debt load of the sovereign sector of the developed countries of the world show a tendency of growth. In particular, volumes of government securities in 2012 in relation to the same indicator in 2011 increased in, France – by USD 114.5 billion, in Italy – by USD 82.1 billion, Belgium – by USD 15.3 billion. While the volume of government securities in 2016 relative to the same indicator in 2015 increased in, France – by USD 49.8 billion, Italy – by USD 45.1 billion, Belgium – by USD 12.3 billion (Koblyk, 2014; OECD Data, n.d.).

Thus, summing up the characteristics of the long-term domestic government borrowing market in the countries, it should be noted that this market includes two segments: state long-term borrowings and a system of long-term municipal borrowings. At the same time, an important system of domestic debt policy is an extensive and already traditional system of municipal borrowings, which is carried out within the framework of state guarantees and allows solving problems of infrastructure development of territorial communities, reducing the burden on the state budget and strengthening the financial autonomy of local budgets.

According to some scholars, the level of public debt and economic development of states may also depend on established rules of state-public interaction, traditions of state borrowing, which have historically formed the maturity of economic and social development (Holovatyi, 2015).

Separately, it is worth highlighting the use of public debt in the form of investment. The researchers Picarelli, Vanlaer, and Marneffe (2019), have proven that investment investment in public debt contributes to economic growth and neutralizes the negative effects of debt obligations. The above-mentioned benefits of public investment are also reflected in the "Europe 2020" (European Commission, 2010), the 10-year strategy proposed by the European Commission for the promotion of the economy of the EU as it promotes "public funding for R&D", investment in education and training at all levels and key investments in infrastructure in the cross-border area, energy sector, construction of transport networks, environmentalization of the economy (Picarelli, Vanlaer, & Marneffe, 2019).

To construct a mathematical model, the method of discriminant analysis is chosen.

For the study, a sample of 79 countries and indicators of the level of goverment debt in % of GDP

(foreign debt stocks (% of GNI), gross capital formation or investments in % (annual growth, gross capital formation (annual % growth), gross savings in% (annual growth, gross savings (% of GNI) and as the dependent variable, the annual GDP growth in % (GDP growth, annual %) was selected as the dependent variable. In order to streamline the research objects in a relatively homogeneous aggregate, they were divided into 3 groups by the level of economic growth using the method of standard cluster analysis:

1) the first group includes countries that in 2017 demonstrated a recession. According to the World Bank, the economic downturn was observed at an average of –0.218%, in particular, the maximum value was –9.53% in the Dominican Republic (The World Bank, n.d.b);

2) the second group of countries includes countries characterized by "catching up" or slow economic growth ranging from 0.001% to 3%. The data indicate that in a sample of 79 countries, 24 were characterized by a slow economic growth of an average of 0.53% (The World Bank, n.d.b);

3) the third group of countries included countries that characterized the level of economic growth above 3.001%. Of 79 countries, 53 countries were characterized by economic growth above a certain level, with an average of 3.57% in this group and a maximum of 10.60% in Guinea. It should also be noted that in Asia there was a surging economic growth: Indonesia – 5.07%, Cambodia – 7.10%, Vietnam – 6.81%, Nepal – 7.91%, India – 6.68%, Bangladesh – 7.28%, Mongolia – 5.30%. The same tendencies are typical for the countries of Africa, some countries of Eastern Europe (The World Bank, n.d.b).

To solve the problem of classification of countries by the level of economic growth and goverment debt, canonical discriminatory and classification functions are used in the theory of discriminant analysis. By its very nature, discriminatory analysis is a statistical method that allows you to study the differences between two or more groups of objects for several variables at a time. In our case, the objects are countries with different levels of economic growth, and variables are the level of goverment debt, the volume of savings and investments in the country.

The construction of the model contains following phases of discriminant analysis: the phase of output of discriminant functions and the phase of grouping objects (countries) in accordance with the obtained values of discrimination functions.

As a grouping variable, a group of countries favored the level of economic growth (1 – economic decline, 2 – overtaking or slow economic growth, 3 – ahead of economic growth), and as independent - gross investment, gross savings and the level of goverment debt. To select meaningful variables, the forward stepwise – step by step with inclusion method was selected, which allows assessing the significance of the contribution of each of the indicators to the model.

The classification matrix enables to determine the reliability of the quality of the discriminative mathematical model, which reflects the correctness of the presence of observations in each group. In the 1st group of countries, according to the level of economic growth and the volume of goverment debt, 0.0% of the correct classification, in the 2nd group – 12.5%, in the 3rd – 96.23% (see Table 2, Table 3, Appendices B-E).

The observation will be applied to the group for which the calculated value of the classification

Table 2. Results of stepwise discriminant analysis

Source: Calculated by the author Summary of Stepwise Analysis (Spreadsheet1).

Indicators	Step	*F* to	df 1	df 2	*p*-level	No. of	Lambda	*F*-value	df 1	df 2	*p*-level
Gross capital formation (annual % growth) – (E)	1	2.836	2	76	0.064	1.000	0.930	2.836	2	76	0.064
Gross savings (% of GNI) – (E)	2	1.925	2	75	0.152	2.000	0.885	2.360	4	150	0.055
External debt stocks (% of GNI) – (E)	3	1.004	2	74	0.371	3.000	0.861	1.905	6	148	0.083

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Table 3. Classification of discriminant models

Source: Calculated by the author Classification Functions; grouping: Group (Spreadsheet1).

Indicators	Group of countries 1	Group of countries 2	Group of countries 3
Gross capital formation (annual % growth)	–0,99027	–0,30926	0,177410
Gross savings (% of GNI)	0,17953	–0,35518	0,154059
External debt stocks (% of GNI)	–0,93229	–0,08634	0,074280
Constant	–4,59400	–1,30018	–0,427455

function is higher. As a result, the following classification discriminant models were obtained:

For the 1st group of countries:

$$f_1 = -4.59 - 0.99GCF + 0.17GS - 0.93DS. \quad (1)$$

For the 2nd group of countries:

$$f_2 = -1.30 - 0.31GCF - 0.36GS - 0.08DS. \quad (2)$$

For the 3rd group of countries:

$$f_3 = -0.43 + 0.18GCF + 0.15GS + 0.07DS. \quad (3)$$

The results allow concluding on the impact of gross investment, savings and the level of goverment debt on economic growth. Thus, countries where the economic downturn was observed are characterized by a negative high level of government debt and GDP, and the accumulation of gross capital also does not stimulate economic growth. Countries in the second group with slow economic growth are characterized by the negative influence of all factors on economic growth, that is, available capital is not a factor in increasing GDP ahead of the pace, available savings and the volume of goverment debt also do not provide a faster pace of economic growth. However, in third group of countries, the positive influence of the investigated factors on the prevailing rates of economic growth is observed. Such conclusions can be confirmed by numerous studies on the threshold of goverement debt to GDP of the country (within 60%, higher values negatively affect economic growth). Thus, according to the classification results, according to the classification results (see Appendix H and Figure 1), the countries in which the level of government debt does not exceed 60% of the GNP is attributed to the third group of countries.

In the period of protracted economic growth, there is a positive correlation between goverment debt and economic development of the country. In times of economic recession, slow economic development and financial crises, goverment debt, even in the presence of accumulated gross capital and savings, do not provide a positive effect on the country's economic development.

Source: Calculated by the authors.

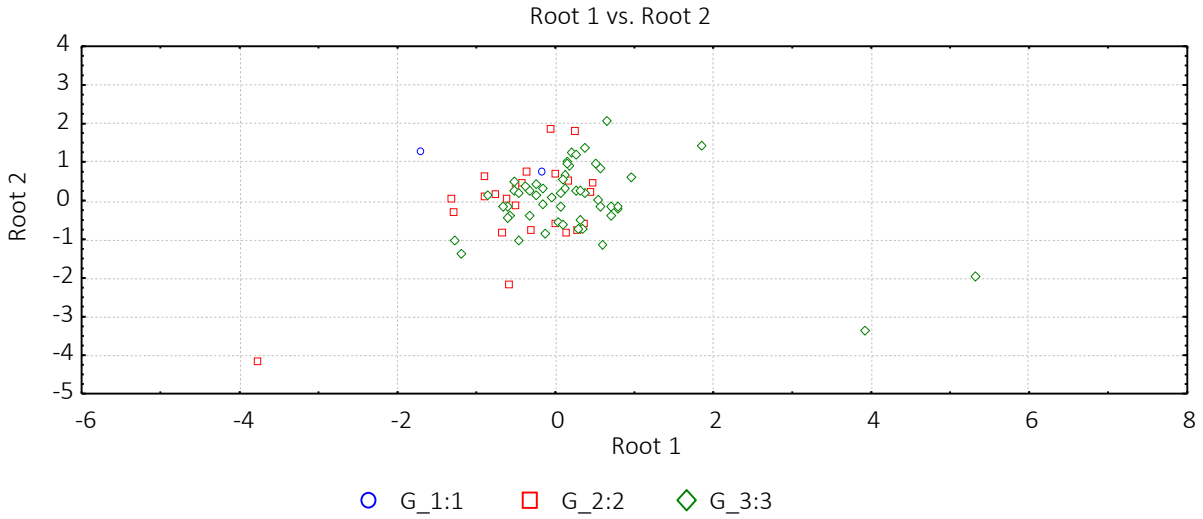

Figure 2. The results of grouping countries by the level of economic growth

CONCLUSION

The increase in the level of debt load has a negative impact on economic growth, especially in the long run, when payments for repayment and debt servicing increase. In this regard, in many developed countries in recent years, the domestic borrowing market has significantly developed. Developed countries are characterized by high degree of development of the market of government borrowings, which manifests itself in the issuance of various types of securities, high level of their profitability and interest of the private sector in investing in debt instruments. During financial crises, credit resources are used to finance current problems, and the stagnation of economic activity does not contribute to GDP growth. The low level of development of internal borrowing in low and middle income countries, which in developed countries allows governments to finance investment projects at the expense of local loans (municipal, infrastructure bonds, mainly medium and long-term), increase the debt burden in terms of economic recession and an increase in the volume of borrowed resources at the expense of international financial institutions.

The results of the construction of discriminatory models indicate the positive impact of goverment debt on economic development only under the conditions of "advanced pace" of economic growth, in a high level of demand for loan capital. At the same time, the positive impact is marked by an annual GDP growth rate of more than 3%, in which case the goverment debt does not exceed the threshold of 60% of GDP. Goverment debt management envisages, first of all, the stabilization of the macroeconomic situation, the financing of the budget deficit, structural transformations, the development of an economy capable of functioning in conditions of integration and globalization, social, economic and environmental development.

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APPENDIX A

Table A1. Dynamics of external and internal loans in different countries / regions of the world in 2007–2017, million

Source: The World Bank (n.d.a).

Country/region	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Amount of loans granted by IMF, million											
East Asia and the Pacific	1.61	1.52	18.71	18.39	18.30	18.27	18.22	17.07	16.36	15.87	16.93
Europe and Central Asia	23.89	29.29	54.17	62.27	61.08	53.05	37.23	28.08	29.90	29.90	31.71
Low income countries	3.57	4.22	9.96	8.86	9.14	9.49	9.72	9.40	9.17	9.04	9.68
Countries with lower than average income	12.02	19.32	51.84	57.58	58.53	54.27	45.64	43.60	48.15	51.32	58.39
Countries with low and middle income	39.75	48.51	139.46	148.92	148.96	140.64	122.92	108.75	108.77	110.42	120.69
Middle income countries	36.18	44.29	129.50	140.06	139.82	131.15	113.20	99.35	99.59	101.38	111.00
Middle East and North Africa	1.49	1.36	8.41	8.26	8.18	8.65	9.45	10.33	10.72	13.12	16.77
Turkey	7.34	8.70	9.64	7.28	4.52	2.51	1.65	1.55	1.48	1.44	1.53
Ukraine	2.50	6.73	13.03	16.26	16.21	12.79	7.19	7.61	12.49	13.08	14.00
Countries with higher than average income	24.16	24.97	77.66	82.48	81.29	76.88	67.56	55.75	51.44	50.07	52.61
State and volume of bonds publicly or privately placed guaranteed by the state, million											
East Asia and the Pacific	51.35	53.97	60.99	72.51	83.82	134.05	146.97	182.61	205.72	221.90	278.94
Europe and Central Asia	84.91	78.19	76.15	88.19	101.96	142.35	172.31	167.49	165.37	184.23	221.35
Low income countries	0.17	0.15	0.34	0.31	0.60	0.59	1.83	3.24	3.17	3.15	4.79
Countries with lower than average income	61.74	63.97	76.67	92.31	102.62	146.49	165.91	222.00	252.03	262.15	334.94
Countries with low and middle income	377.70	378.34	387.85	453.68	515.28	677.26	751.73	862.23	919.91	974.64	1171.18
Middle income countries	377.53	378.19	387.51	453.37	514.68	676.67	749.90	859.00	916.73	971.49	1166.39
Middle East and North Africa	24.54	23.87	23.80	26.79	25.94	31.48	39.12	39.11	42.96	44.28	56.28
South Asia	7.88	7.67	12.67	18.25	21.07	29.56	28.71	62.36	73.21	68.95	100.70
Sub-Saharan Africa	18.02	18.30	22.88	34.73	41.74	59.21	61.83	70.01	75.82	79.53	104.54
Turkey	41.03	40.61	42.43	45.77	47.02	52.45	58.43	62.69	64.24	67.14	74.49
Ukraine	8.46	8.03	6.11	9.06	11.77	14.20	20.61	20.34	19.35	20.64	22.07
Countries with higher than average income	315.79	314.23	310.84	361.06	412.06	530.19	583.99	637.00	664.70	709.34	831.45

APPENDIX B

Table B1. Results of constructing a discriminant model

Source: Calculated by the author.

Discriminant function analysis summary (Spreadsheet 1) Step 3, *N* of vars in model: 3; Grouping: Group (3 grps) Wilks' Lambda: .86171 approx. *F* (6.148) = 1.9057 *p* < .0835						
Indicators	**Wilks&Apos**	**Partial**	***F*-remove**	***p*-level**	**Toler.**	**1-Toler.**
Gross capital formation (annual % growth)	0.922961	0.933632	2.630166	0.078796	0.999404	0.000596
Gross savings (% of GNI)	0.907228	0.949822	1.954652	0.148857	0.987050	0.012950
External debt stocks (% of GNI)	0.885090	0.973580	1.004057	0.371326	0.987029	0.012971

APPENDIX C

Table C1. Classification matrix of discriminant mathematical model

Source: Calculated by the author.

Classification Matrix (Spreadsheet1) Rows: Observed classifications Columns: Predicted classifications				
Countries	**Percent**	**G_1:1**	**G_2:2**	**G_3:3**
G_1:1	0.00000	0	1	1
G_2:2	12.50000	0	3	21
G_3:3	96.22642	0	2	51
Total	68.35443	0	6	73

APPENDIX D

Table D1. Test results of a discriminant model using criterion χ^2

Source: Calculated by the author.

Chi-square tests with successive roots removed (Spreadsheet 1)						
Groups	**Eigen**	**Canonicl**	**Wilks&Apos**	**Chi-Sqr.**	**df**	***p*-level**
0	0.124131	0.332301	0.861706	11.16310	6	0.083465
1	0.032343	0.177001	0.968671	2.38731	2	0.303112

APPENDIX E

Table E1. Value of coefficients for variables for canonical functions

Source: Calculated by the author.

Standardized coefficients (Spreadsheet 1) for canonical variables		
Indicators	**Root 1**	**Root 2**
Gross capital formation (annual % growth)	0.762722	–0.263093
Gross savings (% of GNI)	0.563414	0.709779
External debt stocks (% of GNI)	0.380011	–0.587696
Eigenval	0.124131	0.032343
Cum. Prop	0.793303	0.634500

APPENDIX H

Table H1. Grouping of countries by level of economic growth

Source: The World Bank (n.d.a, n.d.b, n.d.c, n.d.d).

Country name	External debt stocks (% of GNI)	Gross capital formation (annual % growth)	Gross savings (% of GNI)	GDP growth (annual %)
Bangladesh	18.10	10.15	33.79	7.28
Bolivia	35.69	15.85	16.25	4.20
China	14.01	4.89	47.13	6.90
Cameroon	30.31	4.23	18.58	3.55
Congo, Dem. Rep.	14.05	7.46	19.23	3.70
Costa Rica	47.52	–0.05	14.97	3.28
Dominican Republic	41.10	0.48	22.41	4.55
Egypt, Arab Rep.	35.89	11.32	10.12	4.18
Ethiopia	33.18	15.90	32.92	10.25
Ghana	48.12	3.71	21.44	8.14
Guinea	14.26	176.68	13.60	10.60
Honduras	40.65	6.26	22.48	4.79

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Table H1 (cont.). Grouping of countries by level of economic growth

Country name	External debt stocks (% of GNI)	Gross capital formation (annual % growth)	Gross savings (% of GNI)	GDP growth (annual %)
Indonesia	36.03	5.33	31.88	5.07
IDA only	30.22	11.47	26.01	5.79
India	19.76	9.58	31.07	6.68
Kenya	35.65	11.27	9.53	4.87
Cambodia	57.20	6.00	24.47	7.10
Sri Lanka	59.10	17.66	34.97	3.31
Morocco	46.46	3.96	29.59	4.09
Middle income	24.90	5.53	34.97	4.89
Malawi	35.06	30.02	10.50	4.00
Nepal	20.07	39.91	45.09	7.91
Pakistan	26.28	9.55	19.07	5.70
Philippines	19.38	9.38	36.40	6.68
Paraguay	57.03	18.85	24.79	5.21
Romania	53.05	7.53	21.64	7.26
Rwanda	37.36	6.48	13.48	6.06
South Asia	21.30	10.16	30.25	6.53
Sudan	20.26	2.77	14.33	4.28
Thailand	29.80	14.54	33.40	3.91
Turkey	54.13	10.68	25.81	7.44
Tanzania	35.37	19.53	23.71	7.10
Uganda	44.26	–0.46	20.57	3.86
Vietnam	48.81	8.45	25.63	6.81
Kosovo	33.31	5.65	22.73	4.23
Zimbabwe	59.08	4.20	–2.42	4.70