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ARITHMETIC OF SOVEREIGN DEBT CRISIS IN EUROPE AND CHALLENGES AHEAD

ARYTMETYKA KRYZYSU ZADŁUŻENIA W EUROPIE A WYZWANIA NA PRZYSZŁOŚĆ

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Abstract: Sovereign debt crisis in the euro zone put in the spotlight the issue of restoring the balance in the public finances of indebted countries and recovered their capacity to borrow again on financial markets. Restoring fiscal balance will be in the coming years a difficult task mainly due to poor economic outlook in most EU countries. Moreover, the attempts to accelerate economic growth by means of an active fiscal policy will be limited by high level of public debt and efforts on fiscal consolidation in the most indebted countries. In the long term, the fiscal consolidation process will be hindered due to unfavorable demographic trends and resulting growth in age-related spending. The purpose of this article is to show the arithmetic course and consequences of the sovereign debt crisis in Europe as well as the challenges related to aging process the old continent's population is going to face in medium and long-term.

Keywords: sovereign debt crisis, public debt, fiscal consolidation, ageing of population.

Streszczenie: Kryzys zadłużenia suwerennego w strefie euro umieścił w centrum uwagi kwestię przywracania równowagi w finansach publicznych w krajach zadłużonych i odzyskania przez nie zdolności do ponownego pożyczania na rynkach finansowych. Przywrócenie równowagi fiskalnej będzie w najbliższych latach zadaniem trudnym, głównie z powodu słabych perspektyw wzrostu gospodarczego w większości krajów UE. Ponadto wysiłki mające na celu przyspieszenie wzrostu gospodarczego za pomocą środków aktywnej polityki fiskalnej będą ograniczone przez wysoki poziom zadłużenia publicznego, a także prowadzoną konsolidację fiskalną w krajach najbardziej zadłużonych. W dłuższej perspektywie proces konsolidacji fiskalnej będzie dodatkowo utrudniony ze względu na niekorzystne tendencje demograficzne i wynikający z nich wzrost wydatków związanych ze starzeniem się społeczeństw. Celem niniejszego artykułu jest arytmetyczne pokazanie przebiegu i konsekwencji kryzysu zadłużenia suwerennego w Europie oraz wyzwań związanych z procesem starzenia się ludności starego kontynentu w średniej i długiej perspektywie.

Słowa kluczowe: kryzys zadłużenia suwerennego, dług publiczny, konsolidacja fiskalna, starzenie się społeczeństwa.

1. Introduction

The deficit and public debt have been so widely present for many years in modern economies that the phenomena of budget balanced and the absence of debt becomes something peculiar. The growing deficit of public finance and resulting accumulation of public debt constitute a problem in the economy that is inextricably linked to the conduct of fiscal policy. This problem returned again, in a drastic form, when last financial crisis led to rapid deepening of budget deficits and jumping growth of public debt in relation to GDP. However, the global financial and economic crisis was neither the only nor major cause of profound deterioration in public finances in Europe. It was caused mainly by irresponsible fiscal policies pursued by governments before the crisis for purposes other than stabilizing the economy.

The levels of debt and deficit in many countries exceeded acceptable limits, recorded in the Treaty on the Functioning of the European Union (TFUE) and in the Stability and Growth Pact (SGP). Further deepening of the fiscal imbalances, caused by crisis, led the most indebted countries on the brink of bankruptcy.

Restoring fiscal balance will be in the coming years a difficult task mainly due to poor economic outlook in most EU countries. These weak prospects for economic growth are associated with both high levels of private sector debt and persistently high level of unemployment. In turn, the attempts to accelerate economic growth by means of an active fiscal policy will be limited by high level of public debt and efforts on fiscal consolidation in the most indebted countries. In the long term, the fiscal consolidation process will be hindered due to unfavorable demographic trends and the burden on public finances imposed by scarce social security systems.

The purpose of this article is to show the arithmetic course and consequences of the sovereign debt crisis in Europe as well as the challenges related to aging process the old continent's population is going to face in medium and long term.

2. Fiscal picture in Europe

The recent development of budget deficits and public debt has become a significant policy problem in most industrialized countries. This is not surprising as markets and the public attach great importance on a reasonably low and stable ratio of government debt to GDP. They tend to interpret a high and still growing debt ratio as a signal of endangering the fiscal sustainability or even looming public insolvency. Keeping the debt ratio below an upper bound to reassure economic agents is well founded, as an ever increasing debt ratio would eventually result in a fiscal debt crisis and default – either outright or through inflation or other means.

The global financial and economic crisis has fully revealed the risks of over-indebted countries, whose cause was, inter alia, the maintenance of structural deficits for many years. An unavoidable aftermath of the crisis was a rapid deepening of budget deficits and jumping growth of debt-to-GDP ratio.

Primary fiscal balance is the best available proxy for the overall fiscal picture within government's control. The primary balance consists of government revenue less spending excluding the debt cost servicing. It is the most accurate reflection of the government's fiscal policy decisions.

The global financial crisis resulted in the most pronounced and pervasive peacetime worsening of the primary fiscal balance, with the average primary fiscal deficits in 2008–2009 larger than at any other point in history aside from the world wars [Mauro et al. 2013]. In Europe, the overall fiscal position was not different. Figure 1 presents the government debt and primary fiscal balance in Europe both prior to the crisis and during the crisis years. The right axis corresponds to the fiscal primary balance.

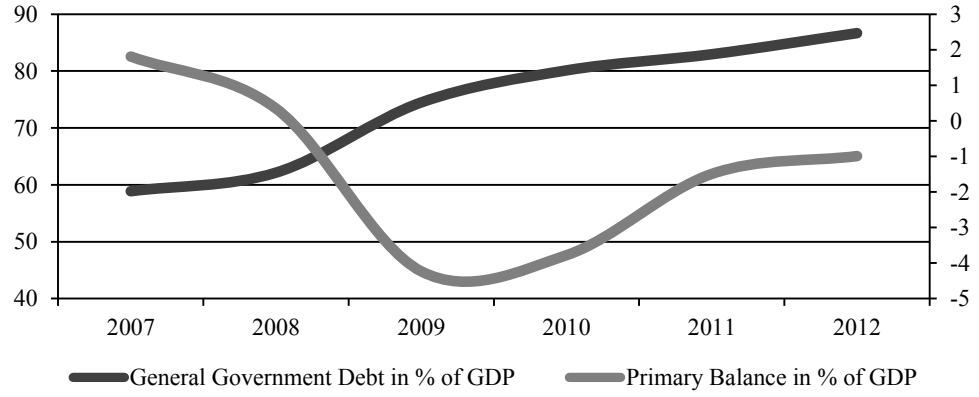

Figure 1. General government debt and primary balance in EU in % of GDP in years 2007–2012

Source: AMECO, the annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (DG ECFIN).

A significant deterioration in the primary balance was accompanied by a sharp rise in debt-to-GDP ratio. Only fiscal consolidation undertaken by governments led gradually to a slowdown in the growth of debt in relation to GDP.

3. Arithmetic of deficit-debt

Even though there is no formula that allows a clean additive decomposition of changes in the debt ratio into the most interesting underlying factors, such as interest rates, inflation, fiscal adjustment, etc., the following equation, however, comes close to it (based on [Escolano 2010]):

$$d_t - d_{t-1} = \frac{i_t}{1+y_t} d_{t-1} - \frac{y_t}{1+y_t} d_{t-1} + p_t, \quad (1)$$

where: d_t – debt at the end of period t, as a ratio to GDP at t.

d_{t-1} – debt at the end of period $t-1$, as a ratio to GDP at $t-1$.

i_t – nominal interest rate in period t; paid in period t on the debt stock outstanding at the end of $t-1$.

y_t – nominal GDP growth rate between $t-1$ and t.

p_t – primary fiscal deficit in t, as a ratio to GDP at t.

This equation indicates that the change in the debt ratio equals the impact of interest (positive) and nominal GDP growth (negative), plus the contribution of the primary deficit. After simplification:[1]

$$d_t - d_{t-1} = p_t + d_{t-1}\left[\frac{it - yt}{1 + yt}\right]. \tag{2}$$

The equation (1) shows that the change in debt-to-GDP ratio is a sum of primary fiscal deficit and so-called snow ball effect which expresses the combined effect of the interest rate of government bonds and the growth rate of nominal GDP on debt--to-GDP ratio. Maintaining a constant debt-to-GDP ratio requires that left side of equation [1] must equal zero. The condition to stabilize the debt-to-GDP ratio at a specified debt level is to ensure that:

$$-p_t = d_{t-1}\left[\frac{i_t - y_t}{1 + y_t}\right]. \tag{3}$$

Equation (2) indicates that the condition for stability of the debt-to-GDP ratio requires that the relation of primary deficit to GDP equals the snow ball effect. Indeed, the public debt does not grow, if the primary deficit is compensated by the surplus of growth of nominal GDP above the average nominal interest of debt. In other words, the debt ratio will increase indefinitely if nominal interest rate exceeds the growth rate of nominal GDP, unless the primary budget is in sufficient surplus to compensate for that. Very often, in order to stop the process of increasing debt, not only a primary balance shall be achieved, but also a primary surplus. This is the case many European countries are experiencing now. Hence, crucial for the debt dynamic is a sign of expression $(i - y)$.

4. Impact of public debt on economic growth and the level of interest rates

Many empirical studies show that a certain level of debt beyond a given threshold has negative consequences on the economy and policy making. The relationship between government debt and economic growth is insignificant for debt ratios below

[1] It was assumed that the impact of so-called stock-flow adjustment factor equals zero in this equation.

a given threshold, but above it the average growth rate starts to fall rapidly [Reinhart, Rogoff 2010].[2] For example, C. Reinhart and K. Rogoff [2009] placed the threshold at which public debt is associated with lower contemporaneous growth at about 90% of GDP for both advanced and emerging economies.[3] Other studies [Reinhart, Reinhart, Rogoff 2012] with alternative methodologies and samples yield similar estimates.[4]

Based on recent sovereign debt crisis and earlier episodes, it can be seen that a high level of debt can reduce a room for country's ability to deal with shocks to interest rates. The shock to cost of servicing the debt in a country with higher public debt will be more significant than for countries with a lower public debt. For instance, in countries where government debt exceeds 100% of GDP, a relatively small rise of 10 basis points in cost of debt servicing increases government outlays by more than 0.1% of GDP annually [European Commission 2009, p. 70].

A high level of debt is also likely to lead to the threshold effects, whereby once the debt reaches a certain level, its further increase will push interest rates even higher. This increase might hinder to continue encouraging markets to buy government bonds and might lead to the effect of crowding out private investment. In addition, higher spending on public debt service is usually leading either to worsening of public spending structure (cuts in public investment take place mainly instead of social services) or to higher taxes which hamper the economic growth [Rzońca, Varoudakis 2007].

Overall, the explosion of public debt increases the vulnerability of economy to the crisis of confidence from the side of financial markets. An increasing public debt undermines the credibility of the country, leads to a lower rating and ultimately to increase in the cost of debt servicing along with even threatening to fall into the debt trap. Current situation in EU confirms the results of those empirical studies. Figure 2 shows that at the end of 2012 in six countries the debt-to-GDP ratio exceeded the threshold of 90% of GDP. Three of those countries (Greece, Portugal, Ireland) were included in the program of financial assistance and Italy had significant problems in maintaining current liquidity. Moreover, against the whole EU, economies of those countries experienced much deeper recession (–2% vs. –0.1% of GDP) in 2012. This confirms that exceeding a certain threshold has a negative impact on economic growth.

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[2] It is essential to mention here that the article Growth in a Time of Debt has met with fierce criticism recently. Other economists, taking the same data and using the same method of analysis, could not come to the same conclusions. See e.g. [Herndon, Ash, Pollin 2013; Krugman 2013].

[3] External debt for emerging markets has a lower threshold of 60%.

[4] It is important to add that a critical threshold for debt level depends on individual position of particular country including such factors as the share of foreign debt in total debt, the average maturity of debt, the value of the assets held by general government, country's demographic structure but also on the phase of the business cycle and the risk aversion of investors. See e.g. [Eichengreen et al. 2011].

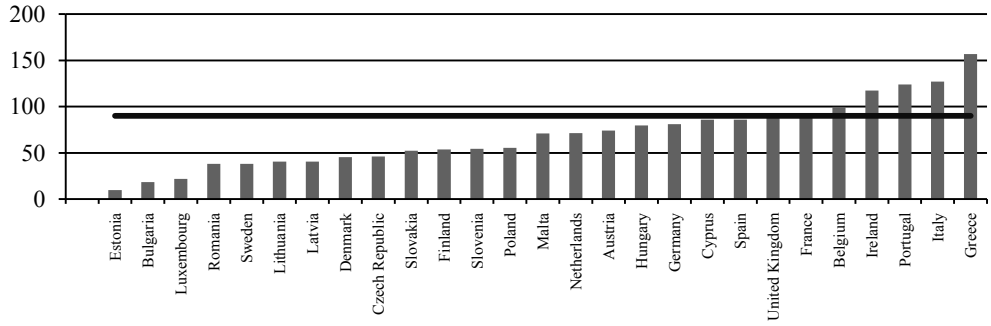

Figure 2. Public debt in EU in % of GDP in 2012

Source: AMECO database, European Commission.

Figure 3 indicates that there is a statistically significant, negative correlation between the level of debt and the rate of economic growth in the EU in 2012: increase in debt-to-GDP ratio by 10 pp. was associated with an average fall of GDP growth rate by 0.45 pp.

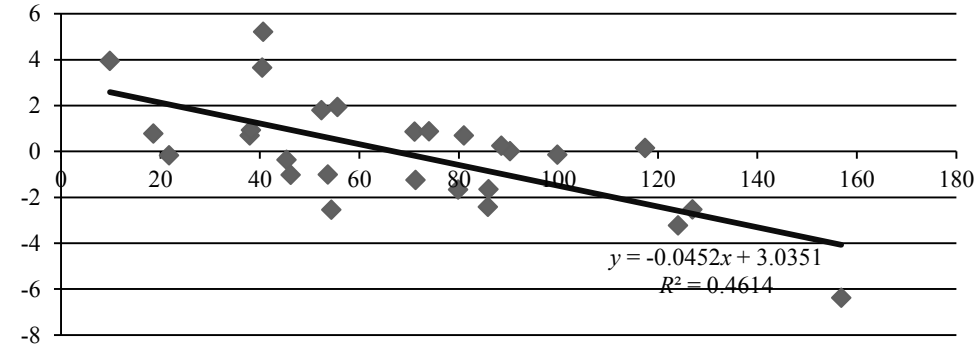

Figure 3. Public debt (in % GDP) and economic growth rate (%) in EU in 2012

Source: own calculations based on AMECO database, European Commission.

In turn, the impact of high level of public debt on interest rates of government bonds was revealed at the beginning of 2008 when the investors had started to differentiate countries in terms of level of debt and other factors.[5] Figure 4 shows that prior to the financial crisis there was no relationship between the level of debt and the level of interest rates of government bonds.

[5] Such as: lack of mutual guarantees of public debt and no automatic mechanism for pooled risk within the Monetary Union.

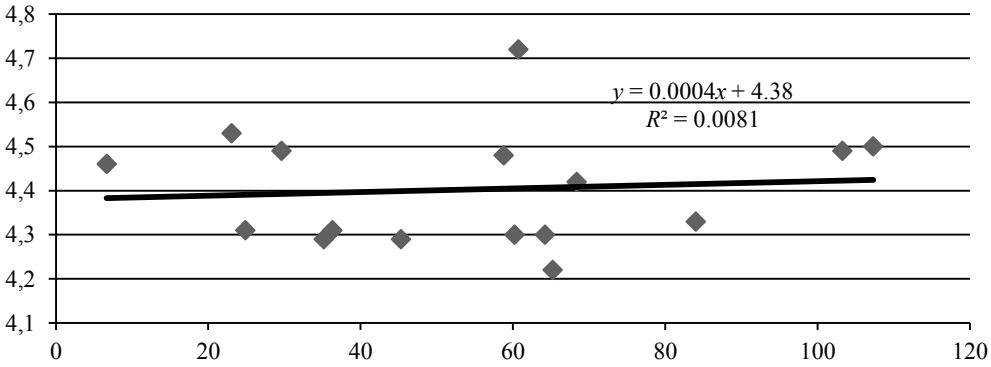

Figure 4. Public debt (% of GDP) and level of interest rates of government bonds (%) in euro area in 2007

Source: own calculations based on AMECO database, European Commission.

Since that time, the interest rates of government bonds have differentiated and the above mentioned relationship got significant. Figure 5 illustrates the relationship between the level of debt and the level of interest rates of government bonds in euro area[6] in 2012. The figure shows that there is a statistically significant and positive relationship between those variables: increase in debt-to-GDP ratio by 1 pp. was associated with an average increase in the level of interest rates of government bonds by about 10 basis points.

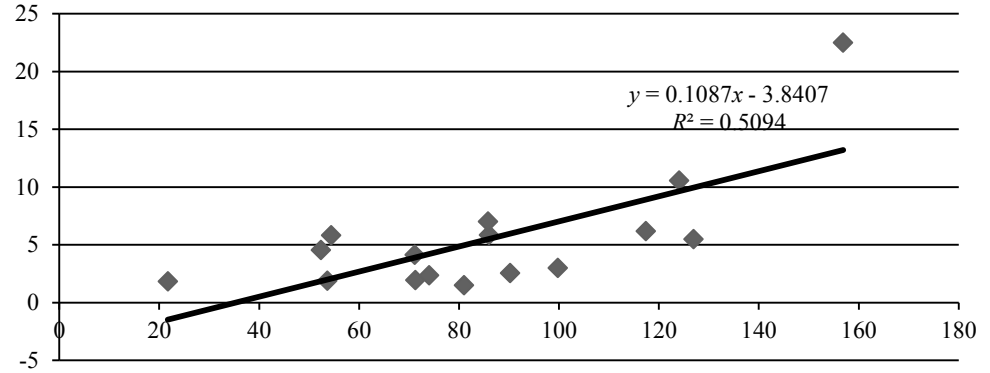

Figure 5. Public debt (% of GDP) and level of interest rates of government bonds (%) in euro area in 2012

Source: own calculation based on AMECO database, European Commission.

[6] On purpose, this and later analysis is limited to euro area countries in order to eliminate a significant influence of factors as independent monetary and exchange rate policies on level of interest rates of government bonds. United Kingdom and Spain are good examples to illustrate that. In 2012, the average interest rates of long-term government bonds in Spain equaled 5.9% but in UK only 1.7% despite even higher debt-to-GDP. However, UK is not a member of euro area and conducts an independent monetary policy.

After having investigated the correlation between the level of debt and the rate of economic growth in the EU but also the level of interest rates of government bonds it is important to consider the impact of debt level on both the expression $(i - y)$ and the level of primary deficit sufficient for stabilizing the debt-to-GDP ratio at a given level in accordance with equation (2). In this equation, the expression $(i - y)$ is regarded as a constant parameter which implies a linear correlation between the deficit and the debt.

However, a deeper analysis of this equation but – first of all – the experience of recent sovereign debt crisis and other similar episodes suggest that actual correlation may be rather non-linear and may be of accelerating character, at least above a certain level of debt. This means that the values of parameters i and y are not constant and independent of values of parameters d and p but they follow the changes of debt-to--GDP ratio [Rosati 2013]. In particular, the recent sovereign debt crisis proves that for high debt-to-GDP ratios, the value of i starts to increase, whereas the value of y starts to fall. As a result, the expression $(i - y)$ becomes positive and greater in absolute terms. This, in turn, requires maintaining not only a primary balance but also a primary surplus sufficient to stabilize the debt-to-GDP ratio. Figure 6 shows the relationship between the level of debt and size of expression $(i - y)$ for EA countries.

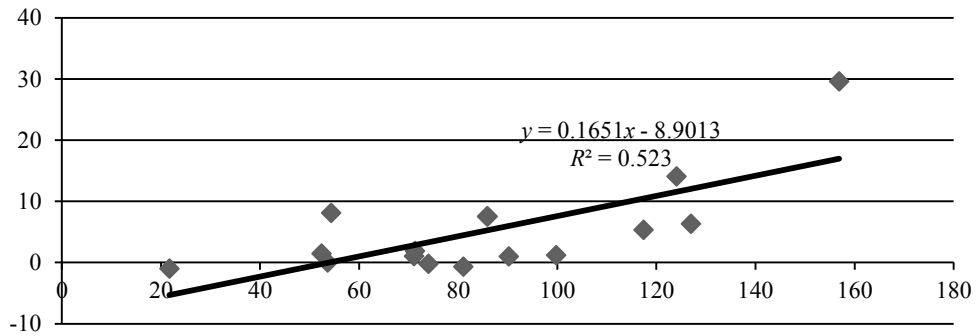

Figure 6. Public debt (% of GDP) and size of expression $(i - y)$ in the euro area in 2012

Source: own calculations based on AMECO database, European Commission.

Based on Figure 6, there is a statistically significant and positive relationship between analysed variables: increase in debt-to-GDP ratio by 10 pp. is associated with faster increase in size of expression $(i - y)$. For debt-to-GDP ratio in range 60–90% of GDP the value of expression $(i - y)$ increases from –0.7 to 7.5, whereas level of debt achieves 160% of GDP, the value of $(i - y)$ grows already to 29.6 indicating that the correlation is of non-linear character.

A rapid growth in the value of expression $(i - y)$ constitutes an evidence that a country in which the debt-to-GDP ratio reaches a high value, sooner or later encounters a limit, beyond which servicing the debt becomes unmanageable. In

accordance with equation (2) the primary balance should be in such a high surplus to compensate for the size of expression $(i - y)$ that from socio-political reasons this seems generally impossible. Furthermore, gaining the political support for a prolonged period of adjustment becomes highly challenging, particularly in a cyclical adverse conditions and when additional efforts are required to address extra costs as e.g. age related costs. Therefore, history shows clearly that under such circumstances governments often decide to accuse debt service and ask for financial assistance to international organizations. Recent example of Greece is a glaring evidence here.

5. Sovereign debt crisis in light of challenges related to ageing of European population

The challenges of reducing debt in the EU themselves are compounded by unfavorable demographic trends due to low fertility rates, steady increases in life expectancy and the retirement of the baby-boom generation. Ageing of the European population is going not only to mark social economic consequences but will also constitute a significant burden for government budgets in the future, endangering the medium and long-term sustainability of public finance.

For instance, a dramatic increase in both total and old age dependency rates is expected to materialize in the period of 2060. In the EU 27 the ratio of inactive population aged 65+ as percentage of the employed (aged 20–64) is projected to increase from 40 in 2010 to 74 in 2060. Those changes are only enhanced by the increase in life expectancy and the fall in fertility rates. At the EU 27 level, the life expectancy at birth for women is projected to increase from 82.5 years in 2010 to 89.1 by 2060, while for men it is set to increase from 76.7 years to 84.6. On the other hand, the fertility rate (births per woman) is projected to increase from 1.6 to only 1.7, so to the level much below the natural replacement rate of 2.1 (births per woman) [European Commission 2012].

The ageing of the population has both direct (increase in age-related expenditures) and indirect (decline in potential GDP as a result of a reduction in labor supply) impact on public finances. An ageing population increases government expenditures in the provision of age-related transfers and services. In the projections of the European Commission[7] four age-related items are projected: expenditures on public pensions (depending on the number of pensioners and average life expectancy on retirement), healthcare expenditures (depending on the way the health sector is organized and the split of costs between government, patients and private institutions), long term care expenditures (depending on the "quality" of ageing and support from the government) and education expenditures (they fall along with ageing of society – decreasing share of young people in total population). Table 1 shows projected age-related expenditure for EU in horizon 2010–2060 in % of GDP.

[7] See the methodology in [European Commission 2012].

Table 1. Projected age-related expenditure for the EU, 2010–2060, percentage points of GDP

Pensions			Health care			Long-term care			Education		
Level	Change		Level	Change		Level	Change		Level	Change	
2010	2010–2020	2010–2060	2010	2010–2020	2010–2060	2010	2010–2020	2010–2060	2010	2010–2020	2010–2060
11.3	–0.1	1.5	7.1	0.3	1.1	1.8	0.2	1.5	4.6	–0.3	–0.1

Source: [European Commission 2012, p. 40].

Overall, the ageing population is expected to have a significant impact on the economic growth and leads to significant pressures on public spending. Needless to say, it will be challenging for the Member States to maintain sound and sustainable public finances in the medium and long term. Apart from the prompt necessity of carrying out a traditional fiscal consolidation, this will require a credible strategy of entitlements reforms (pensions, health care, long-term care) to address the expected growth in age-related spending.

6. Conclusions

The markets and the public attach great importance on a reasonably low and stable ratio of government debt to GDP. They tend to interpret a high and growing debt ratio as a signal of endangering the fiscal sustainability or even looming public insolvency. Analysis carried out in the article confirms that relationship. The standard model of dynamics of the deficit-debt does not take into account the feedback between the level of debt and the rate of growth of GDP and the level of interest rates on government bonds.

However, the sovereign debt crisis in Europe provides strong evidence that the higher the debt-to-GDP ratio, the lower the rate of growth and higher level of interest rates on government bonds. A major role in this respect plays sovereign risk default that runs through two channels [Rosati 2013]: First of all, through higher borrowing costs for the private sector because of lower expected rates of return on investment (due to higher taxes in the future) and through the credit crunch for private sector due to deterioration of the financial condition of banks. As a result, an increase in debt-to-GDP ratio leads to worsening of an expression $(i - y)$ and constitutes an evidence for non-linear and accelerating character of relationship reflected in equation (2), at least above a certain level of debt.

The process of growing out of debt in Europe and the recovery of the most indebted countries capacity to borrow again on financial markets will be hindered not only by relatively poor economic outlook and efforts of fiscal consolidation. The challenges of reducing debt themselves in EU will be compounded by unfavorable demographic trends due to low fertility rates, steady increases in life expectancy and the retirement of the baby-boom generation. Progressive ageing of European

population is going not only to mark social economic consequences but will also constitute a significant burden for government budgets in the future, endangering the medium and long-term sustainability of public finance.

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