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# ON THE STABILITY OF PUBLIC FINANCE IN AN AGE OF DEMOGRAPHIC CHANGES

# O STABILNOŚCI FINANSÓW PUBLICZNYCH W DOBIE ZMIAN DEMOGRAFICZNYCH

**Summary:** The aim is to determine whether it is possible to achieve a permanent surplus of the social security funds subsector balance to improve the balance of the general government sector. *Hypotheses*: it is possible to achieve a permanent surplus of the balance of the social security funds subsector in certain macroeconomic conditions; current systemic solutions do not affect the lasting improvement of the balance of social security funds subsector. *Model*: A linear congruent dynamic model. *Results*: The balance of the social security funds subsector may be positive and its impact on public finance, favourable. This balance determines the scope and type of system solutions used, but also discretionary decisions. However, the balance changes are not permanent.

**Keywords:** public finance, social security funds, demography.

**Streszczenie:** Celem badania jest ustalenie, czy możliwe jest uzyskanie trwałej nadwyżki salda sektora funduszy zabezpieczenia społecznego dla poprawy salda sektora finansów publicznych. Postawiono następujące hipotezy: możliwe jest uzyskanie trwałej nadwyżki salda sektora funduszy zabezpieczenia społecznego w określonych warunkach makroekonomicznych; obecne rozwiązania systemowe nie wpływają na trwałą poprawę salda funduszy zabezpieczenia społecznego. W badaniach zastosowano dynamiczny liniowy model zgodny. Stwierdzono, że saldo sektora funduszy zabezpieczenia społecznego może być dodatnie, a jego wpływ na stan finansów publicznych – korzystny. Saldo to determinuje zakres i rodzaj nie tylko stosowanych rozwiązań systemowych, ale także decyzji dyskrecjonalnych. Jednakże zmiany salda nie mają charakteru trwałego.

**Słowa kluczowe:** finanse publiczne, fundusze zabezpieczenia społecznego, demografia.

## 1. Introduction

The 21st century is a characteristic period for the Polish economy. At this time, the coincidence of adverse phenomena considered in the economic, financial and demographic sense can be observed. Starting from 2001, the Polish economy suffered from stagnation twice. This was accompanied by a negative budget balance in subsequent years as well as public debt which is steadily increasing,  and at the same time a deepening demographic crisis is observed. Starting from the 1980s the birth rate, which determines the demographic structure, is characterized not only by a constant downward trend, but also by a very low level (Central Statistical Office 2018a, p. 49). The problems are aggravated by the already unfavourable demographic structure, in which an increase in the number of people in post-working age is observed with a decrease in the number of people in working age (Central Statistical Office 2018b). The clear evidence of this is the unfavourable demographic burden indicator, which in 2017 was 24% in Poland, while a decade earlier, its level did not exceed 20%. In EU countries the same indicator is at the level of almost 30%.[1] The progressing ageing process of the population[2] and today the unfavourable ratio of the number of payers to persons receiving benefits (7.1:7.69, respectively) (*ZUS Annual Report*, 2017, p. 12) cause an increase in demand and the need to provide social security benefits and services now and in the future. The repeatedly observed economic slowdown, associated with lower budget revenues, and the so-called demographic changes, have subjected and will subject the social security system in Poland to a difficult test,  and although this system fulfils its function it has an impact on the government's finances.

Stable public finances are one of the most desirable features of modern times. Together with the stability of the market financial system, they determine the efficient functioning of the state, social well-being and economic development. Achieving financial stability after the fiscal crisis and in an age of demographic crisis has become a priority for public authorities in all European Community countries, including Poland. Given this, the need to preserve the financial stability of the state in the face of an ageing society is widely discussed in the world literature (Brede and Henn, 2019, pp. 176-194), both in the context of the need to monitor and search for effective solutions that favour it (Rama, 1999; Croce and Juan-Ramon, 2003), as well as in relation to measuring the risk of loss of public finance stability (Uryszek, 2019), and in terms of maintaining system security against repeated disruptions (Sabeeh Atiya and Aziz Al-Durai, 2019, p. 3).

Stability of public finance means the ability of the government to maintain the current level of expenditure in the long term in a way that does not pose a threat

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[1]  The demographic load indicator means the ratio of the number of people in post-working age to the number of people in working age.

[2]  It is expected that in 2016-2080, the percentage of people aged 80 or older in the EU population will more than double from 5.4% to 12.7% (Chancellery of the Senate, 2018, p. 26).

to the solvency of the state (European Semester, 2019, p. 1, 11). At the same time it is necessary to fulfil all obligations, including those related to social security, which means all interventions of public or private entities aimed at reducing the burden arising from specific risks or needs (Mossuti and Assero, 2012).[3] Nowadays new knowledge is needed in the field of solutions that will ensure the implementation of social security policy at a level acceptable to the public and at the same time will not lead to a situation when maintaining stable state finances and fulfilling social security obligations will become competitive.

The aim is to determine whether it is possible to achieve a permanent surplus of the social security funds subsector balance to improve the balance of the general government sector. In the first part, in the context of considerations on the competitiveness of objectives, the essence of the sustainability of public finance and social security is explained. The second part presents the research methodology. The third part contains an assessment of the development and impact of the social security sector balance on the general government sector balance. The fourth part concerns the factors determining the financial situation of the social security funds subsector. The fifth part presents the results of empirical research and final conclusions.

## 2. Research methodology

The subject of the study is the balance of the social security funds subsector. The macroeconomic environment as well as the adopted system solutions affect this balance. To examine the impact of the macroeconomic environment on this balance, the following variables were selected: total population, pre-working age population, working age population, post-working age population, gross domestic product, revenues of non-financial enterprises, total non-tax revenues, total tax revenues.

The basic objective of the study is to determine whether it is possible to achieve a permanent surplus of the social security funds subsector balance to improve the balance of the general government sector.

The partial goals are:

1: assessment of the social security sector balance,

2: determining the impact of selected factors on the balance of the social security sector,

3: determining if and what systemic changes may improve the balance of social security funds subsector in the future.

Formulated hypotheses:

• it is possible to achieve a permanent surplus of the balance of the social security funds subsector in certain macroeconomic conditions,

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[3] Sickness/healthcare, disability, old age, death of breadwinner, family/children, unemployment, housing needs, other aspects of social exclusion.

- current systemic solutions do not affect the lasting improvement of the balance of social security funds subsector.

A linear congruent dynamic model (Kośko, Osińska, and Stempińska, 2007, pp. 325-348; Kufel, 2007, pp. 98-101) was used in the research. The research period comprises the years 2000-2018. Information from legal provisions, domestic and foreign literature on the subject, reports of the Supreme Audit Office and Social Insurance Institution, as well as statistical data of the Central Statistical Office and the Ministry of Finance were used.

## 3. Public finance and balance of the social security funds subsector

The General Government sector (GG) is an important link in the national financial system (Alińska, 2016, p. 2) as it co-creates the basis for the socio-economic development of the country. The public finance can be assessed by the amount and development of the general government sector balance. The high informative value of this balance is due to the fact that internationally it is the basis for assessing compliance with the fiscal criteria of nominal convergence. In the case of domestic conditions, compared to the growing economy and regardless of changes in the economic growth rate, this balance remains almost invariably negative. This is an immanent feature of the Polish economy. Figure 1 presents the development of the general government balance and GDP.

The balance of the general government sector is composed of the balance of the central government subsector, the balance of the local government subsector and the balance of the social security funds subsector. Each of the balances ultimately determines the financial situation of the state. Figure 2 presents the balances of the subsectors constituting the general government sector.

The fiscal position of the state varies depending on the period of analysis adopted. It is observed that the negative balance of the general government sector is characterized by a higher average level starting from 2010. However, it is favourable to gradually decrease it starting from 2014, as observed in particular in the period 2017-2018. This result was due to the high positive balance of the social security funds subsector and a small surplus in the local government sub-sector. It is also characteristic that in the second decade, the impact of the balance of the social security funds subsector on the general government (GG) balance is favourable. However, there is a fundamental difference between the surpluses that occurred in 2005-2008 and 2017-2018. For the first sub-period, the surplus in the social security funds subsector remained much longer than in the second sub-period. The relationship between the economic situation and the balance of the social security funds subsector cannot be denied. It seems that the rate of GDP growth is crucial in this case. Yet the positive balance of the social security funds subsector in 2017-2018 was the result of not only favourable economic conditions, but also, if not mainly,
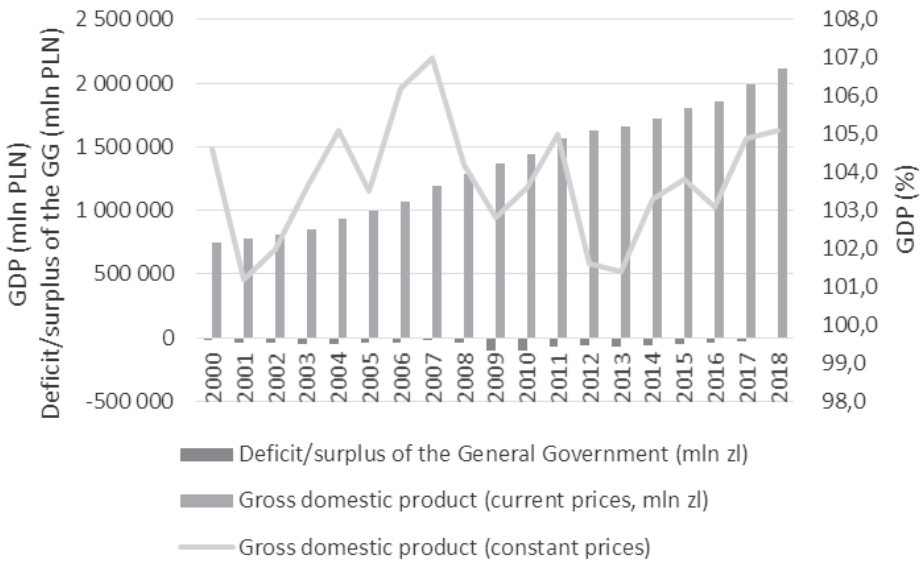
**Fig. 1.** Development of the General Government balance and GDP, 2000-2018

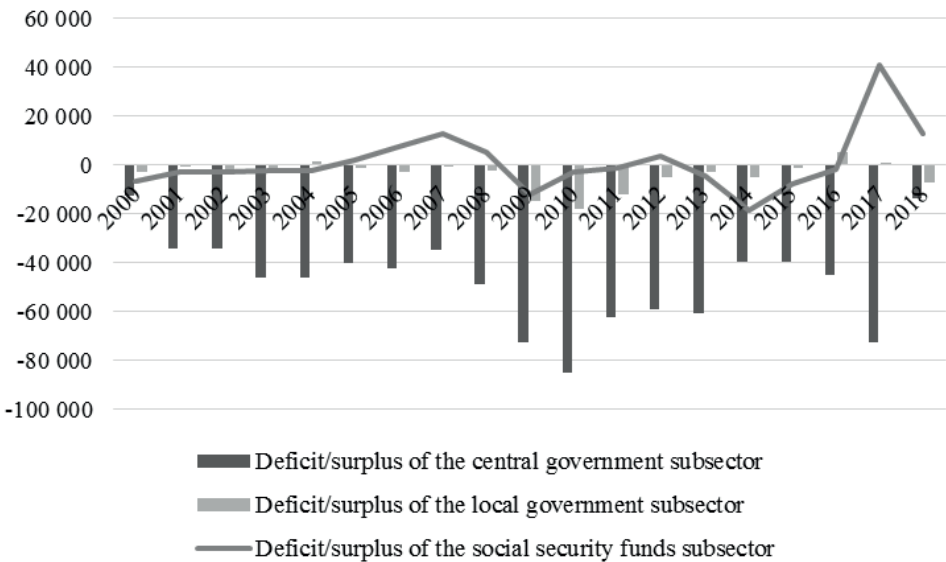Source: authors' own elaboration based on Central Statistical Office data.



**Fig. 2.** The balance of subsectors, 2000-2018

Source: authors' own elaboration based on Ministry of Finance data.

ad hoc measures. During this period, loans granted from the state budget to the social insurance fund were cancelled, over PLN 6 billion was transferred from Open Pension Funds to the account of the social insurance fund. The fund's higher revenues resulted from a good situation on the securities market, which resulted in the high value of OFE accounting units. Revenues of this fund also came from the high level of default interest paid by payers on late payment of social security contributions, the return of unduly collected benefits and a prolongation fee. The positive result was also affected by an increase in tax revenues, as well as a strong increase in non-tax revenues, which amounted to approximately 9.2% (in real terms 7.0%), i.e. revenues from social and health insurance contributions constituting almost 60% of consolidated non-tax revenues of the sector. According to ZUS data, the coverage of expenses with revenues from contributions and their derivatives reached the level of 78.5% in 2017 and was record-breaking in terms of the high values of this indicator.

It can therefore be assumed that the financial surplus in the social security funds subsector will be subject to economic fluctuations, hence the need to look for solutions that would permanently improve the balance of the insurance sector.

## 4. Factors affecting the financial independence of the social security funds subsector

The social security funds subsector in Poland consists of special-purpose funds, which are included in the general government sector (The Act, 2009). Social security funds subsector related to social insurance and state social tasks constitute almost one-third of all funds operating in Poland.[4] This sector includes: Social Insurance Fund, Pension Fund, Demographic Reserve Fund, National Health Fund (NFZ), Labour Fund, Contribution Fund, Motivation Fund, Administrative Fund, Prevention and Rehabilitation Fund, Bridging Pension Fund and Social Insurance Institution. Annual revenues of the social security funds subsector, i.e. funds related to social insurance and funds related to social tasks, exceed the amount of PLN 280 billion and constitute 32% of revenues of the general government sector and almost 98% of revenues of all funds operating in the Polish public sector; as much as 93% of this amount is implemented by funds related to social security, similarly as in the case of costs that amount to over PLN 268 billion and constitute one-third of general government sector expenditure and almost 99% of costs incurred by funds in Poland (Ministry of Finance, 2018).

However, the most important role in the social security system is played by two funds due to the amount of financial resources at their disposal, but also the goals they pursue. These are: the Social Insurance Fund (hereinafter: SIF) and

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[4] Insurance-related funds are: SIF, PF, Prevention and Rehabilitation Fund, Administrative Fund, Bridging Pension Fund. And funds related to state social tasks: Labor Fund, PFRON, FGŚP.

the Pension Fund (hereinafter: PF).[5] The balance of the social security sector is affected in particular by the financial situation of the SIF. The revenues of this fund in 2018 amounted to PLN 238.5 billion. This accounted for 61% of the state budget expenditure (Ministry of finance, 2018). In essence, the main source of financing for these funds is receipts from insurance premiums. In 2018, SIF receipts from insurance premiums constituted 75% of this fund's revenues. However for many years there was a continuing tendency of not covering the fund's expenditure with premiums. The ratio of expenditure coverage with premium income in 2018 amounted to 78.6% and was the highest since 2001. In the last decade it has been at an average annual level of 66.5% (Social Insurance Institution, 2018, p. 2). Therefore the fund is also subsidized from the state budget, which accounts for 15% of the fund's total revenues, and an interest-free loan. In the case of FER, revenues from farmers' contributions generally constituted a small share and in 2018 their amount only allowed to cover the costs of this fund. Thus the payment of benefits is financed primarily with a subsidy from the state budget. In the same year it accounted for almost 85% of the fund's revenues. The total amount of subsidies transferred to these funds in 2018 amounted to over PLN 53 billion (Ministry of Finance, 2018).

The financial independence of the social security funds subsector, understood as the state of funds necessary to cover current and future expenses, is determined by many factors. Invariably these are primarily the economic situation and the demographic situation of the country, which determine the amount of revenues from contributions and expenses incurred for the payment of benefits. The financial situation of the social security funds subsector is also shaped by the adopted system solutions. These include the existence of funds that are additional to the basic (SIF, PF) sources of financing social security expenditure. These are, for example, the Demographic Reserve Fund[6] or the Bridging Pension Fund.[7] Reliefs in the repayment of non-tax liabilities are another example of such solutions, which cause the funds to be postponed or the funds to be given up with possible revenues. They give the right to contribution payers, for example, to divide the payment into instalments, postpone the payment of the contribution, as well as to abolish debt (Act of…, 1997; Act of.., 2012). The latest available data shows that as of 2017, the total debt due to unpaid social security contributions amounted to PLN 21 billion (ZUS Annual Report, 2017, p. 19), and in addition:

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[5]  The main task of SIF is the payment of long-term benefits (pensions) and other one-off benefits (e.g. sickness, maternity and funeral benefits). The main task of PF is to finance benefits for farmers, e.g. pension insurance, accident insurance, etc.

[6]  This fund was established in 2002 to balance future expenditure on pensions for the post-war generation and subsequent years after 2020. The fund is financed with part of the proceeds from the privatization of State Treasury assets.

[7]  The Fund has existed since 2010 and was created to finance bridging pensions due to persons performing work in special conditions or of a special nature and meeting specific requirements.

- in 2016, unpaid social security contributions were executed, which totalled over PLN 11 billion. Collected claims exceeded PLN 1 billion. At the same time, nearly 48 thousand instalments were concluded and 1.6 thousand payment dates were postponed. Redeemed contributions and additional fees amounted to PLN 115 million,[8] and PLN 7.5 thousand applications were submitted for the redemption of contributions under the abolition act (Act, 2012). In the conducted proceedings 22 thousand decisions were issued to write off receivables worth PLN 218 million (*ZUS Annual Report* 2016, p. 38);
- in 2017 more than 51.3 thousand instalment schemes were concluded for the amount of PLN 1.84 billion. 1,864 contributions payment dates were postponed for PLN 117.8 million and the amount of forced recovery of unpaid social security contributions amounted to PLN 4 billion. PLN 1.17 billion was recovered. Over PLN 64 million in receivables from social security contributions were written off. Due to the limitation period, PLN 2.2 billion of social security contributions were written off (*ZUS Annual Report 2017*, p. 20).

The amount of resources available to the funds is also influenced by other systemic solutions, i.e. retirement privileges, parental supplementary benefits, teacher compensation benefits. From the insured person's point of view, they are a favourable solution. From the authorities' perspective, however, they constitute a kind of burden that obliges them to pay funds to the insured. Innovative solutions in the form of e.g. the e-office platform are also important for the financial situation of the funds. From the financial point of view, digitization is beneficial because it reduces the operating costs of these funds.

## 5. Results of empirical research

In order to examine the impact of the economic and demographic situation on the balance of the social security funds subsector, the following variables were used:

1) endogenous process:

$Y_t$ – value of the deficit/surplus of the social security funds subsector (in PLN million) in year $t$,

2) exogenous processes:

- demographic situation:

  $D_{1t}$ – total population (in thousands) in year $t$,
  $D_{2t}$ – the number of people in pre-working age (in thousands) in year $t$,
  $D_{3t}$ – the number of people of working age (in thousands) in year $t$,
  $D_{4t}$ – the number of people in post-working age (in thousands) in year $t$,
- economic situation:

  $K_{1t}$ – value of gross domestic product (current prices; in PLN million) in year $t$,

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[8] Within this amount: PLN 8.1 million was redeemed on the basis of systemic acts and PLN 106.8 million on the basis of separate legal acts, including abolition law.

$K_{2t}$ – value of revenues of non-financial enterprises (in PLN million) in year $t$,
$P_{1t}$ – total value of non-tax revenues (in PLN million) in year $t$,
$P_{2t}$ – total tax revenues (in PLN million) in year $t$.

A linear congruent dynamic model was used to describe the relationships between time series. When building this model, information on the internal structure of the processes being analysed is taken into account. Therefore, for each time series, a trend was identified and the autoregression order and the degree of integration were determined. The strength of the linear correlation between the considered variables was also tested. Based on the results of examining the internal structure of the processes under consideration and taking into account the length of the research period, a full linear congruent dynamic model was built. Then the full model was reduced. For this purpose, the stepwise backward method was used. The explanatory variables at which the standing parameters were statistically insignificant (at the significance level of 0.10) were removed from the model. Finally, the model presented in Table 1 was obtained.

**Table 1.** Results of the estimation of the linear congruent dynamic model

| Variable | Parameter estimation | Parameter estimation error | Value of $t$-Student statistics | $p$-value |
|---|---|---|---|---|
| Const | 921,560.0000 | 251,828.0000 | 3.6595 | 0.0044 |
| $t^2$ | −1,171.3200 | 476.5640 | −2.4578 | 0.0338 |
| $t^3$ | 100.2380 | 16.5831 | 6.0446 | 0.0001 |
| $D_{4,t-1}$ | −177.9020 | 44.2072 | −4.0243 | 0.0024 |
| $K_{2t}$ | 0.0805 | 0.0166 | 4.8439 | 0.0007 |
| $Y_{t-3}$ | −0.5715 | 0.2784 | −2.0531 | 0.0672 |

Source: authors' own calculation using the GRETL program.

Model quality assessment:
Adjusted $R^2 = 0.8490$;

Test $F$ (significance of model parameters): $F(5, 10) = 17.8677$, $p$-value $= 0.0001$; the Doornik-Hansen test (normality of random component distribution): Chi--square(2) $= 2.450$, $p$-value $= 0.2937$;
the LM test (first-order autocorrelation of the random component): LMF $= 3.16327$, $p$-value $= 0.1090$.

Based on the results of the quality assessment of the model (Table 1), it can be concluded that the estimated model is well suited to empirical data. A graphical presentation of the estimated model is presented in Figure 3.
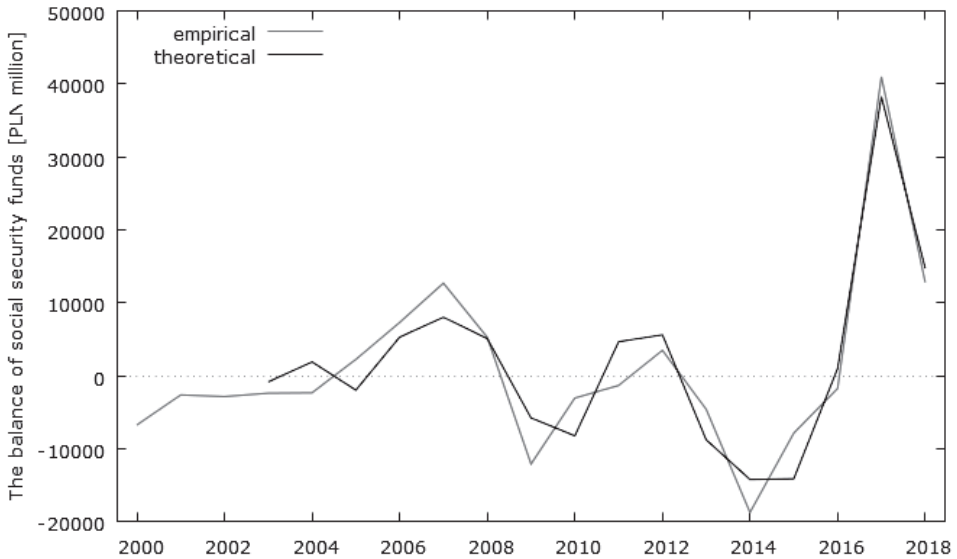
**Fig. 3.** Empirical value of the balance of social security funds and the theoretical values obtained based on the estimated model

Source: authors' own calculation using the GRETL program.

The conducted studies prove that in 2000-2018 the increase in the number of people in post-working age in the previous year ($D_{4,t-1}$) was associated on average with an increase in the deficit value (reduction of the surplus) of the social security funds subsector in the current year ($Y_t$), *ceteris paribus*. In addition, during the period considered, the increase in the value of revenues of non-financial enterprises (in PLN million) in a given year ($K_{2t}$) was associated on average with reduction in the deficit (increase in surplus) of the social security funds subsector ($Y_t$), *ceteris paribus*. If in year $t-3$ an increase in the surplus (deficit reduction) of the social security funds subsector was recorded (in PLN million; $Y_{t-3}$), then in year $t$ a reduction in surplus (increase in deficit) of the social security funds subsector (in PLN million; $Y_t$), *ceteris paribus* was observed.

Considering the results obtained, in the context of the hypotheses, it should be stated that under certain macroeconomic conditions the balance of the social security funds subsector may be positive and its impact on public finance, favourable.

With a high economic growth and with increasing revenues of enterprises, the negative balance of the social security funds subsector could be reduced. However, it should be treated with caution since other determinants such as the scope and type of system solutions have an impact on the balance of the social security funds subsector as well.

Summing up, it should be stated that in the examined conditions, obtaining a permanent surplus of the balance of the social security funds subsector is impossible.

## 6. Conclusion

The progressive change in the demographic structure of societies, already today obliges to care for the future of public finance. Without a sufficiently high primary surplus, the state finances may deteriorate significantly in the future. A high level of public debt – one of the measures and elements of long-term financial stability – can threaten it, regardless of long-term expenditure related to ageing of the society. The paths of maintaining a country's financial stability in the context of demographic changes can be and are diverse. Hence one of the elements that would allow maintaining public debt at an optimal level is maintaining a relatively high level of GDP growth. However, there is an extremely urgent need to take measures to increase the insurance awareness of Polish society, as well as to promote additional voluntary forms of retirement security.

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