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The rising cost of servicing public debt: challenges for fiscal policy in a crisis environment

Abstract

The study is devoted to the challenges for the fiscal policies of Central and Eastern European (CEE) countries, resulting from the strong growth of public debt and its servicing costs under the conditions of the pandemic and war shocks. The purpose of the study is to answer the questions: i) what factors caused the sharp increase in sovereign debt yields? ii) is there a correlation between the degree of implementation of sound economic governance (SEG) principles and the cost of servicing sovereign debt? ii) how strong was the response of the sovereign deficit and debt to the shocks caused by the pandemic and war in Ukraine? iii) does the rising cost of servicing debt threaten the sustainability of public finances? v) do the adopted SEG principles remain relevant during periods of shocks? The study covered the 6 largest economies in this part of Europe, i.e. Poland, Romania, the Czech Republic, Greece, Hungary, and Slovakia, but its results apply indirectly to many other countries. The results were confronted with a plan for reforming the EU's economic governance system in order to identify the fundamental challenges facing the countries studied in this context. On the basis of the study, recommendations were put forward for shaping the assumptions of the state debt management strategy and multi-year financial plans.

Keywords: sovereign bond yields, debt service cost, external shocks, monetary and fiscal factors, rating
JEL Classification: H630

Introduction

In recent years, the global economy, and with it the public finances of many countries, has experienced shocks unprecedented in recent history. The period of return to a path of relatively stable growth after the collapse caused by the financial and economic crisis of 2008–2012 ended with the advent of the COVID-19 pandemic. The pandemic affected the functioning of societies and their economies. The tightening of social relations, especially the prolonged lockdown, led to severe disruptions on both the demand and supply sides. The rescue from the drastic economic collapse was a strong increase in debt-financed public spending. There was a gradual improvement in the epidemic situation in 2021, but the upswing in optimism was not to last long. In February 2022. Russia invaded Ukraine, triggering a full-scale war. The economic repercussions of the war, including restrictions on the availability of energy, but also on many other products, especially agriculture ones, spread around the world. The situation of the countries of the central and eastern part of Europe was and is special in many respects, which is largely due to their geographic location. All the aforementioned phenomena have had a negative impact on the public finances of these countries. One of the symptoms of the profound changes in their financial processes is the strong increase in the yields on government bonds financing budget deficits and other sources of borrowing needs.

The study is devoted to the challenges for the fiscal policies of the Central and Eastern European (CEE) countries resulting from the strong growth of public debt and its servicing costs under the conditions of the pandemic and war shocks. The purpose of the study is to answer the questions: i) what factors caused the sharp increase in sovereign debt yields? ii) is there a correlation between the degree of implementation of sound economic governance (SEG) principles and the cost of servicing sovereign debt? ii) how strong was the response of the sovereign deficit and debt to the shocks caused by the pandemic and war in Ukraine? iii) does the rising cost of servicing debt threaten the sustainability of public finances? v) do the adopted SEG principles remain relevant during periods of shocks?

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A review of the literature on factors affecting sovereign bond yields

From a theoretical point of view, the yield on government bonds issued by a given sovereign consists of the lowest possible yield on bonds issued by any sovereign at a given time (the *benchmark* yield) and a premium (expressed as a spread over the benchmark value) for the additional risk associated with purchasing a given debt instrument. The identification of the risk factors affecting this premium and their interpretation has been the subject of numerous empirical studies over the years, in which some consensus has finally been reached. These factors can be divided into two groups, the first of which is related to the phenomena occurring in individual countries raising loan funds (and therefore referred to as *internal*), while the second is a reflection of broader processes occurring with varying intensity throughout the global economy (which are *external* to the specific situation of individual countries).

Within the first group, there are two major categories of risk:

- credit risk, reflecting a country's creditworthiness as a debtor, which in turn is the product of a number of economic, political, and institutional factors;
- liquidity risk, reflecting the speed and ease with which debt instruments held can be disposed of, assuming no impact of (relatively few) transactions on the price of the instrument [Haugh et al., 2009, p. 6; Codogno et al., 2003, pp. 506- – 07].

The spread can be influenced by various additional factors, such as countries' regulations on capital income taxation and restrictions on capital trading with foreign countries [Codogno et al., 2003, p. 509], or rules governing the publication of particular information, particularly macroeconomic data and plans for economic policy changes [Attinasi et al., 2009, p. 9].

Of the numerous external categories, which include the level of interest rates set by central banks (and the Fed in particular), the global economic outlook (especially the prospects for economic growth in the US), or the spread of negative phenomena (contagion), a relatively high weight is given to the propensity (or aversion) to take risks by investors operating in a wide variety of markets (this is, therefore, the so-called global, or international, risk aversion). The difference between the yield on corporate bonds (with a given rating) and the yield on government bonds is usually taken as its rough measure. If the bonds are denominated in a local currency, the exchange rate risk associated with expectations of exchange rate movements is also relevant. Any comparisons of the spreads of government bonds issued by non-eurozone countries must, therefore, take into account a certain measure of (in particular, expected) exchange rate risk. An ideal measure of expected exchange rate movements should be based on a comparison of returns on financial assets with the same characteristics but denominated in a currency other than the euro [Favero et al., 1997, p. 959].

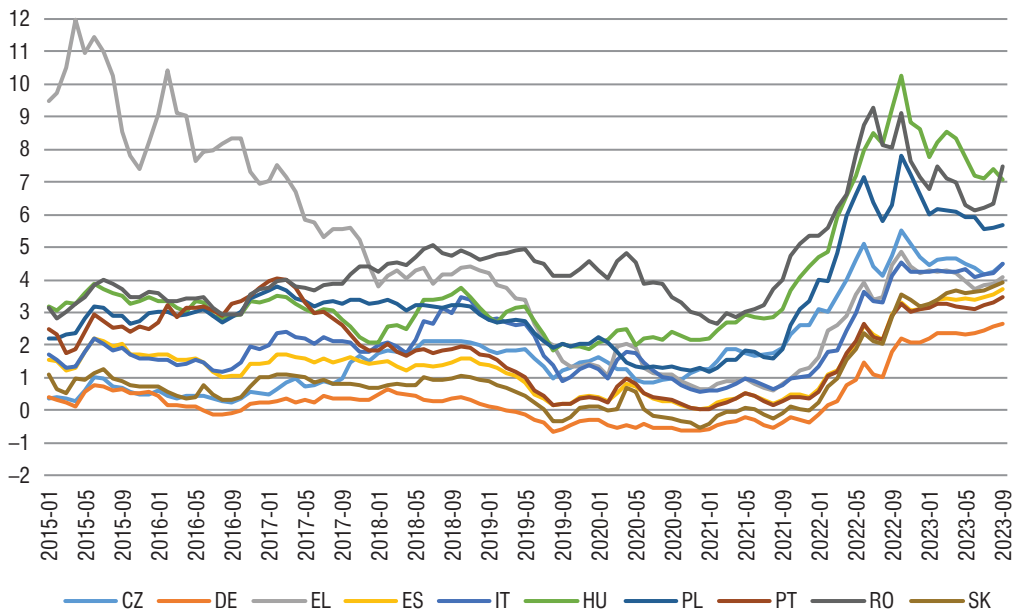
Analyses of the relationship between yields and spreads on government bonds and various measures of credit risk are the dominant stream of research on the determinants of public debt service costs. Alesina et al. [1992] found an insignificant relationship between the level

and changes in government debt and the yield on that debt. Lemmen and Goodhart [1999] observed a positive relationship between an increase in the public debt-to-GDP ratio and inflation volatility and debt profitability, and a negative relationship in the case of the rate of inflation and the income potential of the public sector. Lonning [2000] noted the dominant importance of the rating but did not question the influence exerted by other factors seen as directly reflecting some aspects of creditworthiness. Bernoth et al. [2004] found the importance of the debt service burden, as measured by the ratio of debt service expenditures to total government revenues, and the much lesser importance of 'regulatory' ratios of public sector debt and deficit to GDP. However, a study by Schuknecht et al. [2010] observed a multiple increase in the impact on public debt yields of changes in 'regulatory' fiscal relations during the financial crisis. Similar conclusions are drawn from a study by Afonso et al. [2015]. The existence of a significant relationship in the long term between the stability of public finances, as measured by selected indicators (the ratio of gross and net public debt to GDP, and the ratio of the primary and structural public sector result to GDP), and the yield on government bonds was confirmed in a study by Gruber and Kamin [2010]. Poghosyan [2012] found that in the short term, government bond yields may deviate from the 'long-term equilibrium' determined by the level of selected fiscal (public debt-to-GDP ratio) and macroeconomic (potential growth rate) indicators, as the level of money market interest rates, inflation, and real GDP growth are decisive; while the change in the ratio of the primary public sector result to GDP plays a limited role. Less attention is paid in the literature to liquidity and overall risk aversion. Consensus on the impact of the liquidity of a given market on the pricing of government bonds is much more difficult. Gomez-Puig [2006] found the importance of liquidity, as measured by the size of a country's government bond market, for debt pricing, noting that the importance of this factor increased after the introduction of the single currency. The research by Beber et al. [2009] indicates that while in normal market conditions credit risk assessment plays a primary role, in times of financial crises investors prioritize the liquidity of instruments over the credibility of the sovereign issuer. Attinasi et al. [2009] emphasized the importance of the influence exerted by both factors. On the other hand, the results of Codogno et al. [2003] and Geyer [2006] suggest the negligible importance of liquidity. Favero et al. [2010] found that liquidity, as measured by the size of the spread between buy and sell quotes on benchmark bonds, remains similar in eurozone countries, so its fluctuations have little impact on investors' expected yields. This is consistent with the theses formulated earlier by Bernoth et al. [2004]. The most extensive study of the phenomenon of general risk aversion as a factor in the variation of government bond spreads was conducted by Gacia-Herrero et al. [2006]. General risk aversion as a factor that amplifies the impact of credit risk factors (the importance of both groups of factors increases during a period of increasing general risk aversion) was clearly noted by Haugh et al. [2009], Attinasi et al. [2009]. Codogno et al. [2003]. Also Geyer et al. [2006] and Favero [2010] point to the importance of external factors as determinants of changes in spreads.

Selected stylized phenomena and processes[1]

Since the valuation of bonds issued by a sovereign depends on a number of factors, both country-specific and of a regional or global nature, the figures characterizing the countries studied were compared with analogous figures in a few selected Western European countries (Figure 1). Particularly relevant are the figures for Germany, as the only country retaining the highest rating throughout the study period. The choice of Italy, Spain, and Portugal was based on the comparability of their rating with the lowest rating achieved by some CEE countries.

Figure 1. Sovereign bond yields

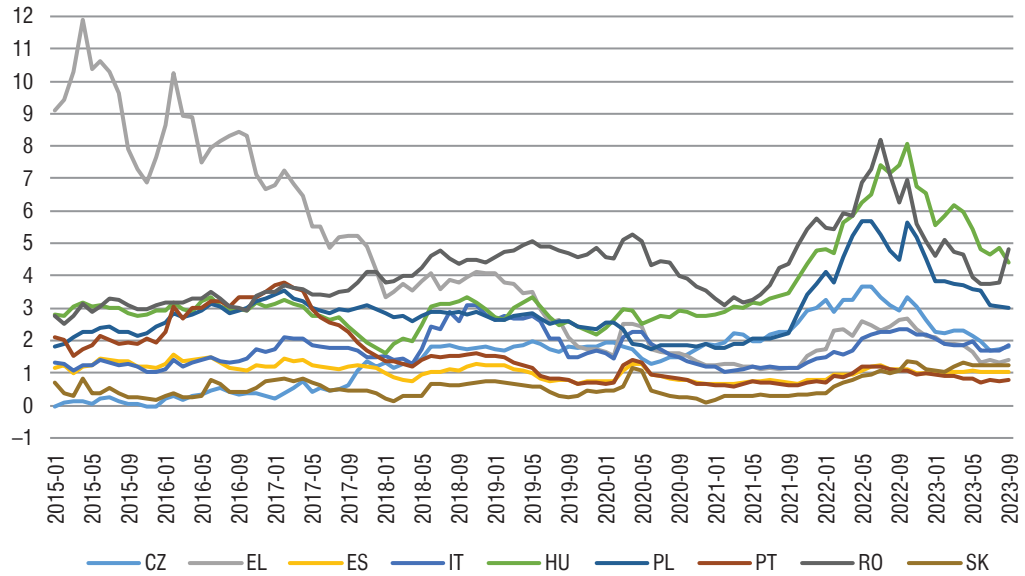


Source: own research.

An initial period of slight increases in late 2015 gave way to a phase of declines until German bonds reached a level oscillating around zero. 2017 and the first half of 2018 saw the return of a mild upward trend. However, already at the end of the year the trend reversed: from 04.2019 to the end of 2021 German bond yields were negative (especially in 08–09.2019 and the second half of 2020). In 2022, there was a steady increase in yields: in the case of Germany from –38 bps in 12.2021 to 209 bps in 12.2022. While the trends shown were noticeable in most of the countries compared, in some of them they were characterized by particularly high intensity, resulting in significant changes in the spread (Figure 2).

[1] We use the term *stylized phenomena and processes* in the sense established by Kaldor (1978), p. 178.

Figure 2. Spread against German sovereign bonds

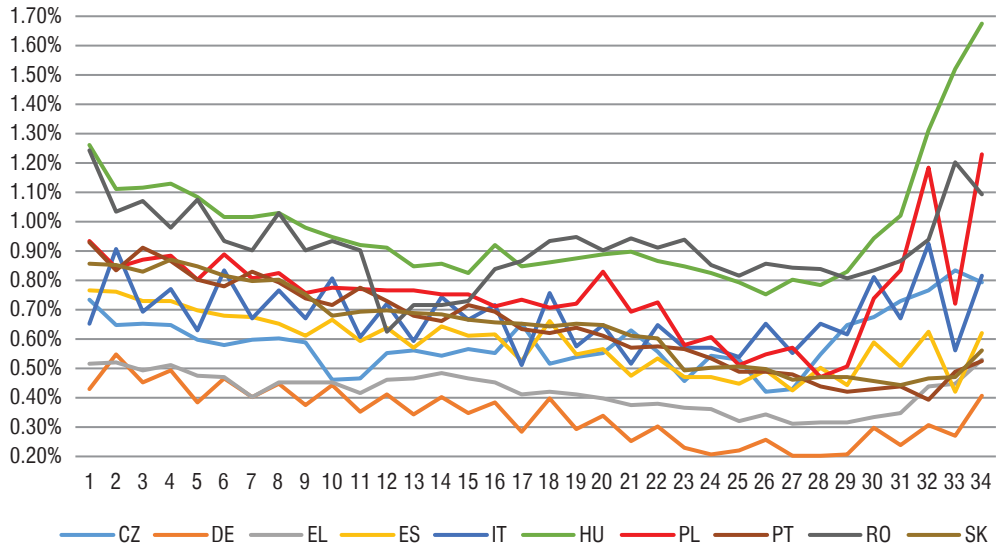


Source: own research.

Czech bond yields initially did not circulate with the German benchmark, but in 2017–2019 they steadily rose to 200 bps. In the run-up to the pandemic, the spreads of Hungarian bonds (strong declines in 2017 and increases the following year) and Romanian bonds (strong increases especially in 2017 and 2018) fluctuated strongly. Also noteworthy are the declines in the Portuguese bond spread in 2017 and the increases in the Italian bond spread in 2018. From the beginning of 2021, there was an increase in the spread in all the compared countries, but the intensity of this process varies. In Poland, it increased from 176 bps (02.2021) to 563 bps (10.2022), in the Czech Republic from 155 bps (10. 2020) to 367 (06. 2022), in Romania from 310 bps (02. 2021) to 818 (07. 2022), in Hungary from 280 bps (01. 2021) to 806 (10.2022). In Slovakia, a significant change in the spread can be spoken of only against the backdrop of volumes specific to the country's bonds: it increased from 10 bps (12. 2020) to 136 bps (12.2022 r.). The spread of Italian and Greek bonds increased by 130 bps, respectively, during this time (from 104 in 02. 2021 to 234 in 10. 2022) and by 158 bps (from 110 bps in 06.2021 to 268 bps in 10. 2022). More discrete increases occurred in Spain (from 67 bps in 03.2021 to 123 bps in 07. 2022) and Portugal (from 60 bps in 10. 2021 to 119 bps in 05. 2022).

Thus, an analysis of the changes in government bond yields from 01.2015 leads to the identification of several sub-periods: an initial period of slight increases, which gave way to a phase of declines at the end of 2015 until reaching a level close to zero in the case of German bonds; the return of a mild upward trend lasting until the end of 2018; a widespread decline in yields lasting until the second half of 2021; and strong increases at the end of 2021 and in 2022.

Figure 3. Debt service cost ratio

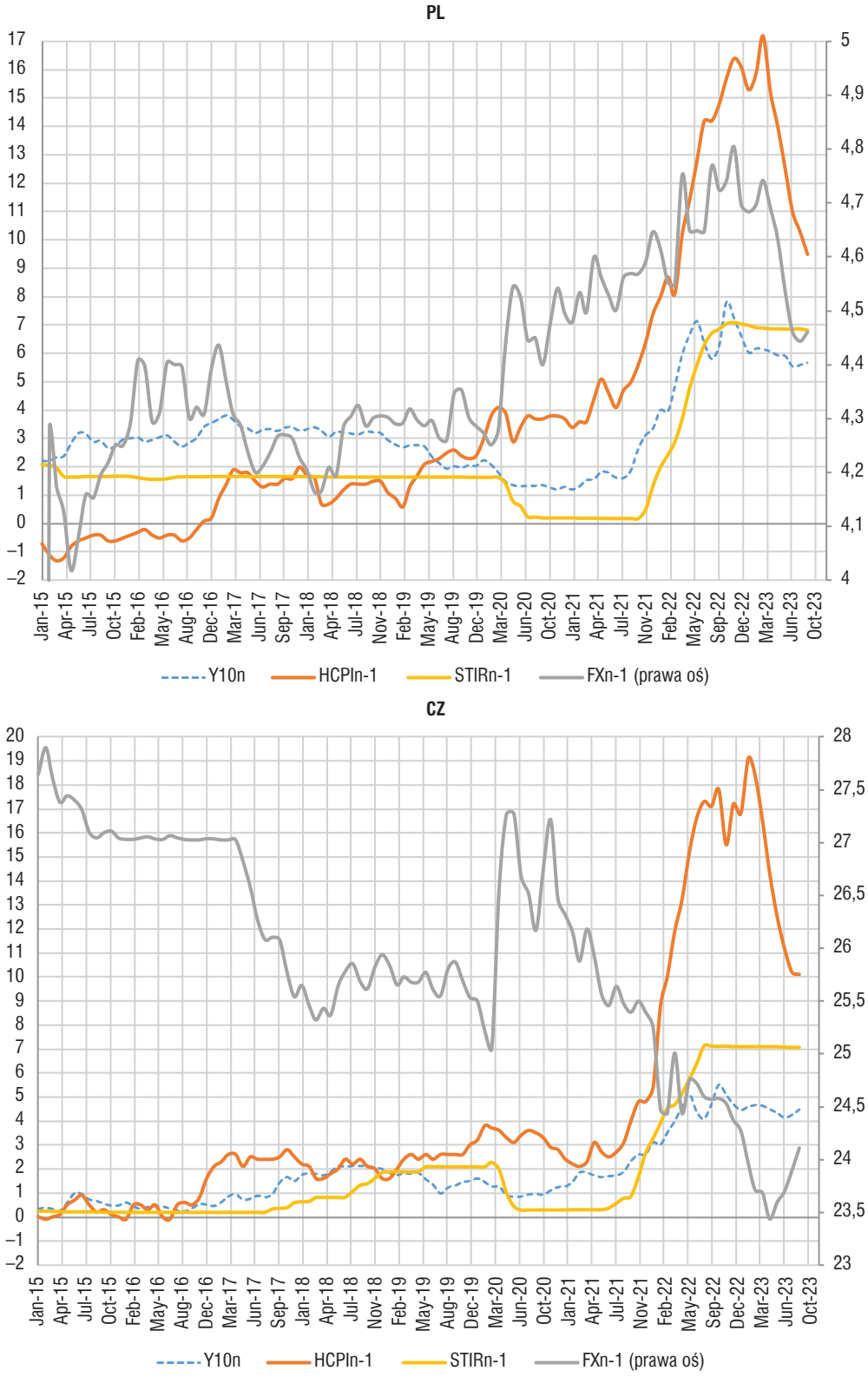


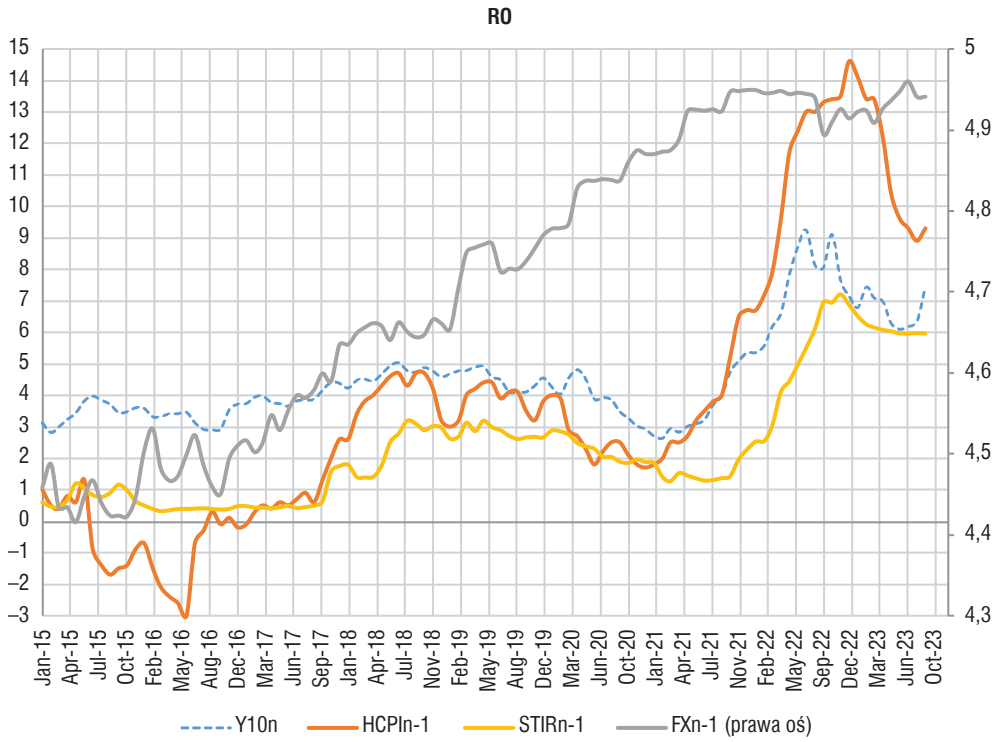
Source: own research.

Changes in government bond yields caused changes in refinancing costs. In most cases, this ultimately translated into changes in the size of debt service costs. As a rough measure of these costs, the ratio of interest expenses in a given quarter (D.41) to the amount of debt at the end of the previous quarter was used (debt service cost ratio – Figure 3). Although for most of the period under review debt service costs generally showed a downward trend, in 2022–2023 some countries saw a spectacular increase in these costs. In Poland, the value of interest in Q1. 2021 amounted to 0.51% of the debt at the end of the previous quarter, while in Q4 2022 and Q2 2023 it reached 1.2% of the debt. In the Czech Republic, the debt service ratio declined from 0.74% in the first quarter of the study period to 0.42% in Q2 2021, before returning to its original level in Q3 2022. In Romania, the phenomenon of rising debt service costs occurred with less intensity (the debt service ratio rose from 0.81% in Q1. 2021 to 1.2% two years later), while in Hungary it occurred with greater intensity (from 0.75% in Q2 2021 to 1.67% in Q2 2023). The nominal value of the difference between the reported figures of the ratio related to the volume of debt at the end of Q2. 2023 amounted to: in Poland 1.39% of GDP in this quarter, in the Czech Republic 0.64%, in Romania 0.75%, in Hungary as much as 2.61%. Thus, there was a clear reversal of the downward trend in 2022.

To illustrate the relationship between government bond yields and economic variables specific to each economy, changes in yields in each of the countries studied were presented against two groups of quantities: monetary (exchange rate, inflation, money market interest rate) and fiscal (public debt to GDP, public deficit to GDP, public net savings to GDP). The comparison of monetary quantities (Figure 4) was made using a one-month time shift, i.e. the average bond yield in month n was compared with the average exchange rate, inflation (year-on-year), and the average money market interest rate (for a term of 1 m) from month n-1.

Figure 4. Changes in Y10 versus monetary factors

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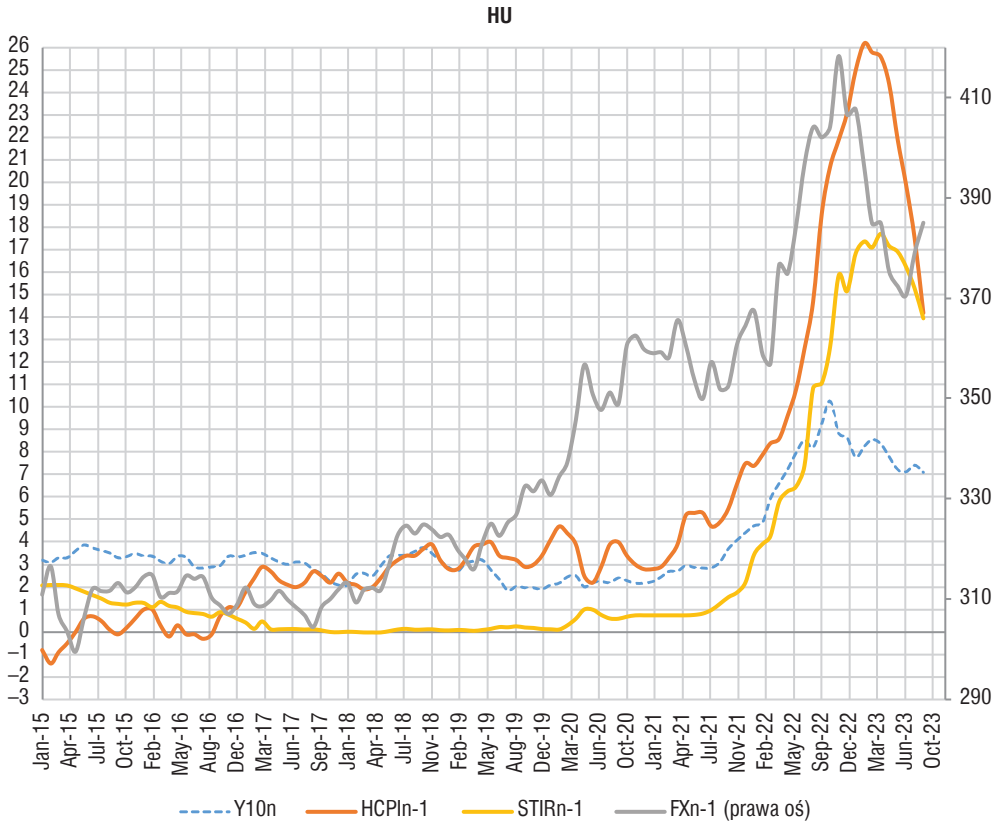
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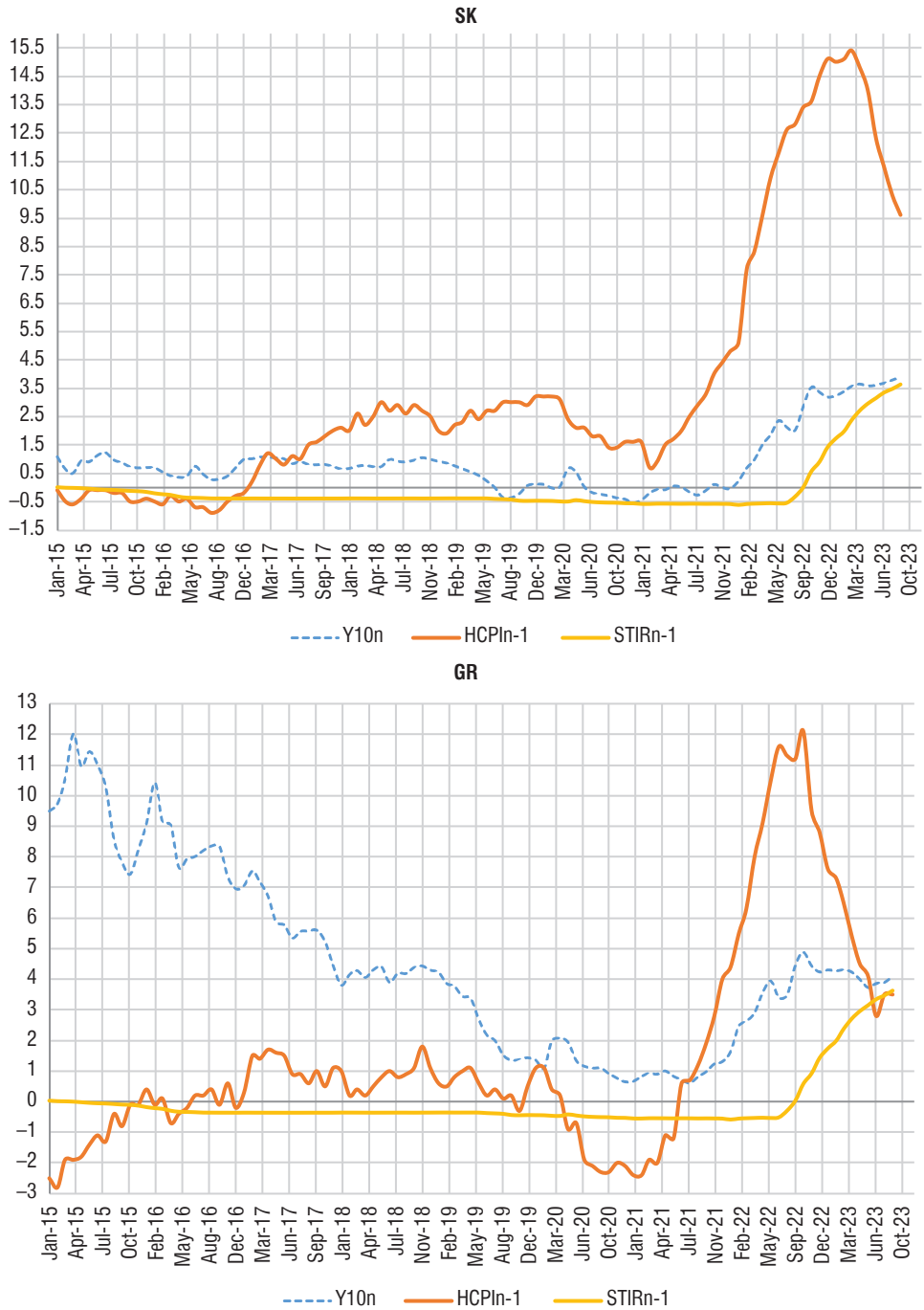


Source: own research.

Among the analyzed quantities, there is a strong relationship between money market interest rates and bond yields. Exceptionally regularly, changes in short-term rates were accompanied by changes in yields on 10-year government bonds in Romania, with bond yields usually 250–350 bps higher in the 2015–2018 period, and 100–200 bps higher thereafter (it was

only in the last months of 2022 that the two rates leveled off). In Hungary, too, the yield on the 10-year government bond remained consistently higher than the short-term rate until mid-2022, and the difference was in principle comparable to that in Romania. Noteworthy, however, are the significant fluctuations in bond yields between the beginning of 2017 and March 2020. (in the range of 1.8% to 3.7%), during which the money market rate was close to zero. The sustained strong growth of the short-term rate from late 2021 led to the existence of a negative difference between the short-term rate and bond yields, which in the last months of 2022 was 600–700 bps, and in the first half of 2023 exceeded 900 bps. In the Czech Republic, the negative difference between the short-term rate and the yield on 10-year bonds occurred throughout 2019 and the first few months of 2020. The phenomenon returned starting from 12.2021, and by the end of 2022 it reached dimensions of more than 200 bps. In terms of the phenomena studied in Poland, what is noteworthy is the fluctuation of government bond yields (in the range of 2% to 3.7%) in the period from the beginning of 2015 until the outbreak of the pandemic in April 2020, in which the short-term rate remained at 1.6%–1.65%. As in Romania, Poland did not experience a negative differential between government bond yields and the short-term rate, although the rates remained at similar levels from mid-2022.

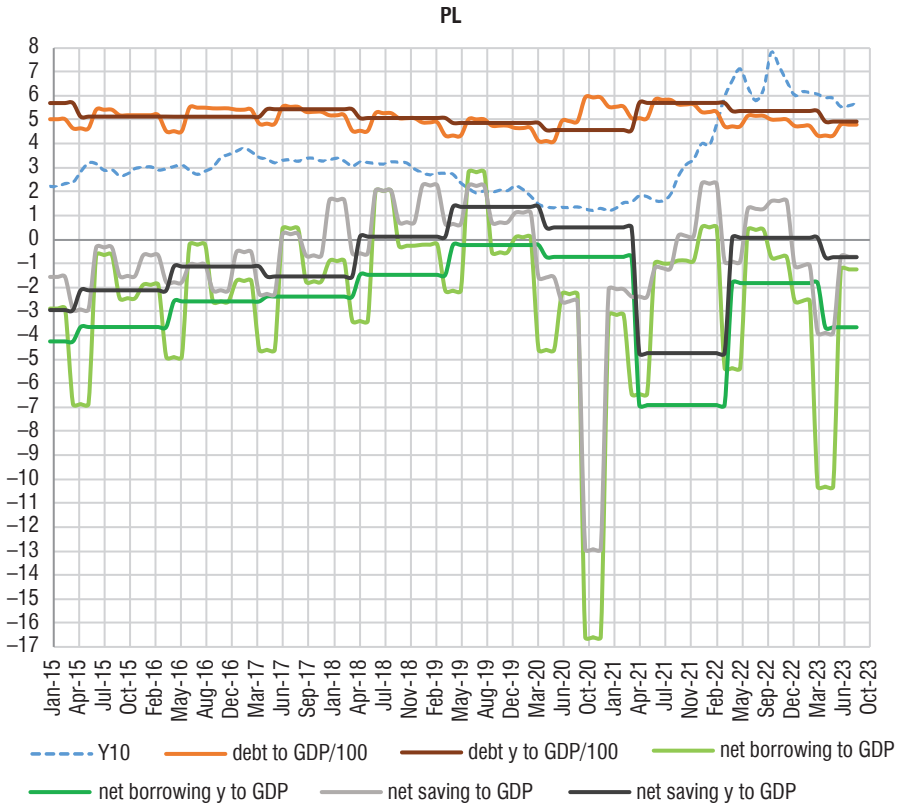
In each of the non-eurozone countries studied, the increase in the short-term rate from mid-2021 was accompanied by an increase in inflation, exceptionally strong in the Czech Republic and Hungary. In both of these countries, the inflation rate (year-on-year) surpassed 23% at the end of 2022 (however, while in the Czech Republic the short-term rate stabilized at 7%, in Hungary it exceeded 17%). The data for the period from the beginning of 2015 to mid-2021 indicate that there is no direct relationship between the inflation rate and bond yields, as long as the rate is either within or only slightly above the inflation target. Particularly symptomatic in this regard is the development of the volumes in question in Poland in 2015 and 2016 (slight deflation with bond yields oscillating around 3%) and in Romania from mid-2015 to the end of the following year (bond yields close to 3.5% with deflation reaching 2.5% in some months). It is also worth noting that in the Czech Republic, the inflation rate was well above the 10-year bond yield as early as the end of 2016. The lack of connection between inflation and government bond yields is noticeably evident in the cases of Slovakia and Greece. In the former of these countries, inflation has been less than one percentage point lower than Romania's for most of the period studied (including from February 2022); the average Romanian bond yield from 2015 to mid-2021 was 3.89%, while the yield on Slovak bonds was 0.52%. As of late 2022, inflation in Greece remained significantly lower than in Slovakia (between 5 and 9.5 percentage points), while government bond yields remained significantly higher.

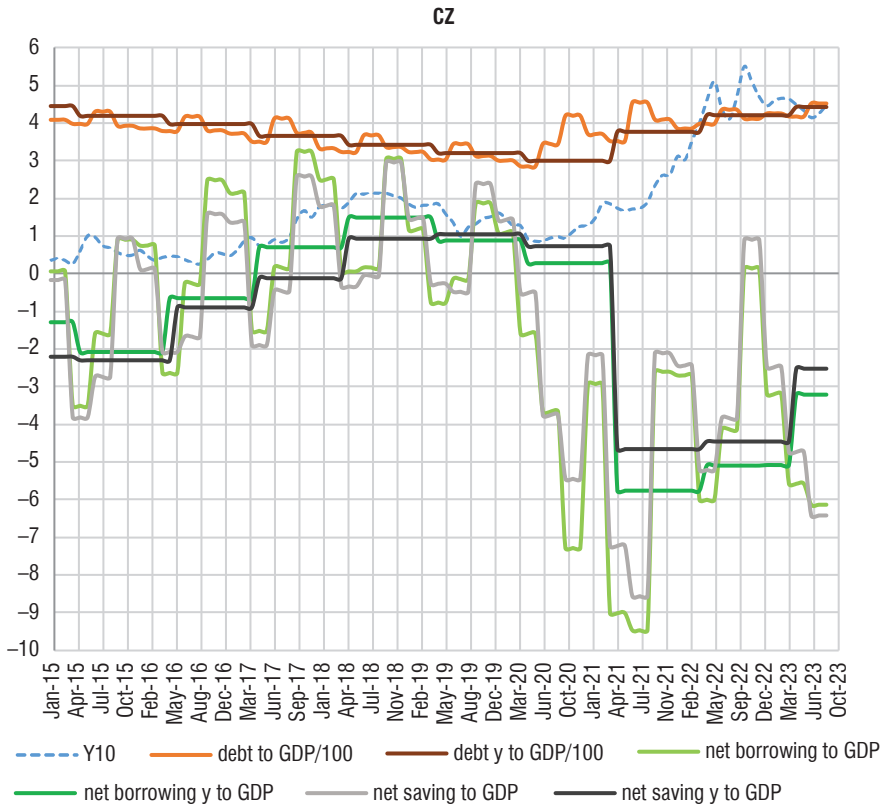
It is also difficult to observe a systematic relationship between any of the figures compared and the exchange rate (in countries outside the eurozone). In particular, the data presented do not allow us to consider changes in interest rates as one of the main factors of exchange rate changes. Attention is drawn, for example, to the rather strong depreciation of the zloty in the few months following 04.2015, with stable purchasing power and short-term interest

rates and a declining EURIBOR, as well as to the moderate increase in the Czech koruna exchange rate from the end of 2020 onwards, despite inflation significantly exceeding the money market interest rate in the Czech Republic. Overall, however, exchange rate changes in all the countries studied were shallower than potential changes due to interest rate differentials (according to the rate parity theory).

The significant changes in government bond yields during periods of relative stability in monetary magnitudes, as well as differences in the rate of these changes in 2022 and 2023 that cannot be explained by monetary factors, prompted a search for the determinants of bond yields among the magnitudes that are central to perceptions of credit risk, i.e., the identification of links between government bond yields and fiscal variables. With reference to the variables studied in the literature and rating methodologies, the analysis was based on the ratios of public debt, public deficit, and public sector net savings to GDP. Since these quantities (in addition to GDP) are reported with a lag, an appropriate time lag due to Eurostat's data publication calendar was applied. For fiscal quarterly volumes, bond yields in month n starting quarter q and the following 2 months w were matched with data from the quarter ending in month n-4; for annual volumes, the impact of data announced for year n-1 was assumed to begin in May of the following year (Figure 5).

Figure 5. Changes in Y10 versus fiscal factors fiscal volumes

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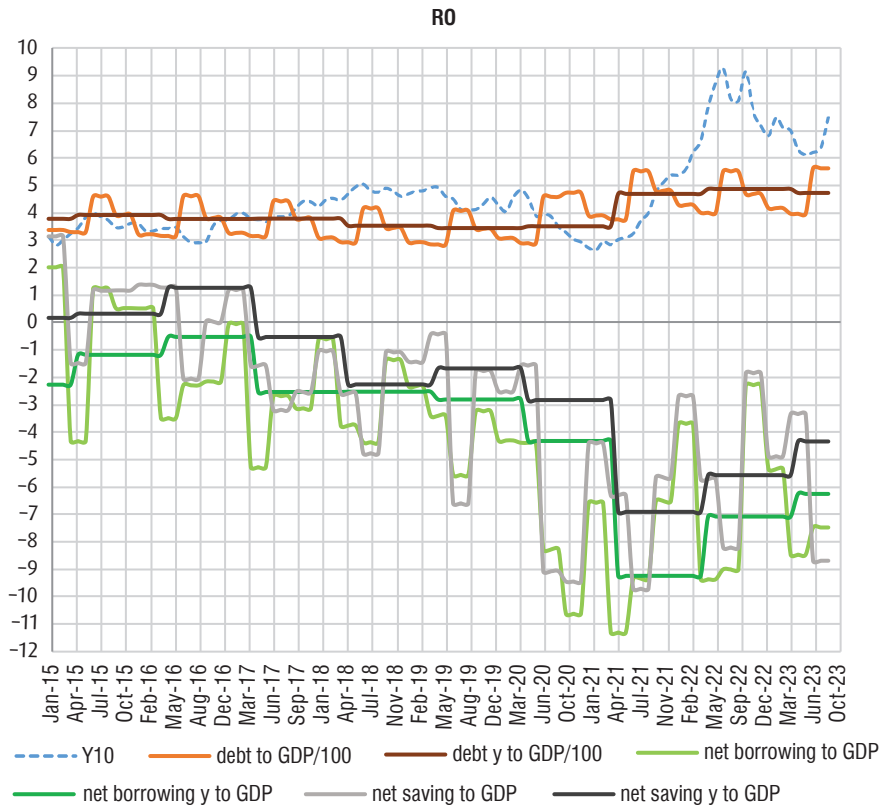
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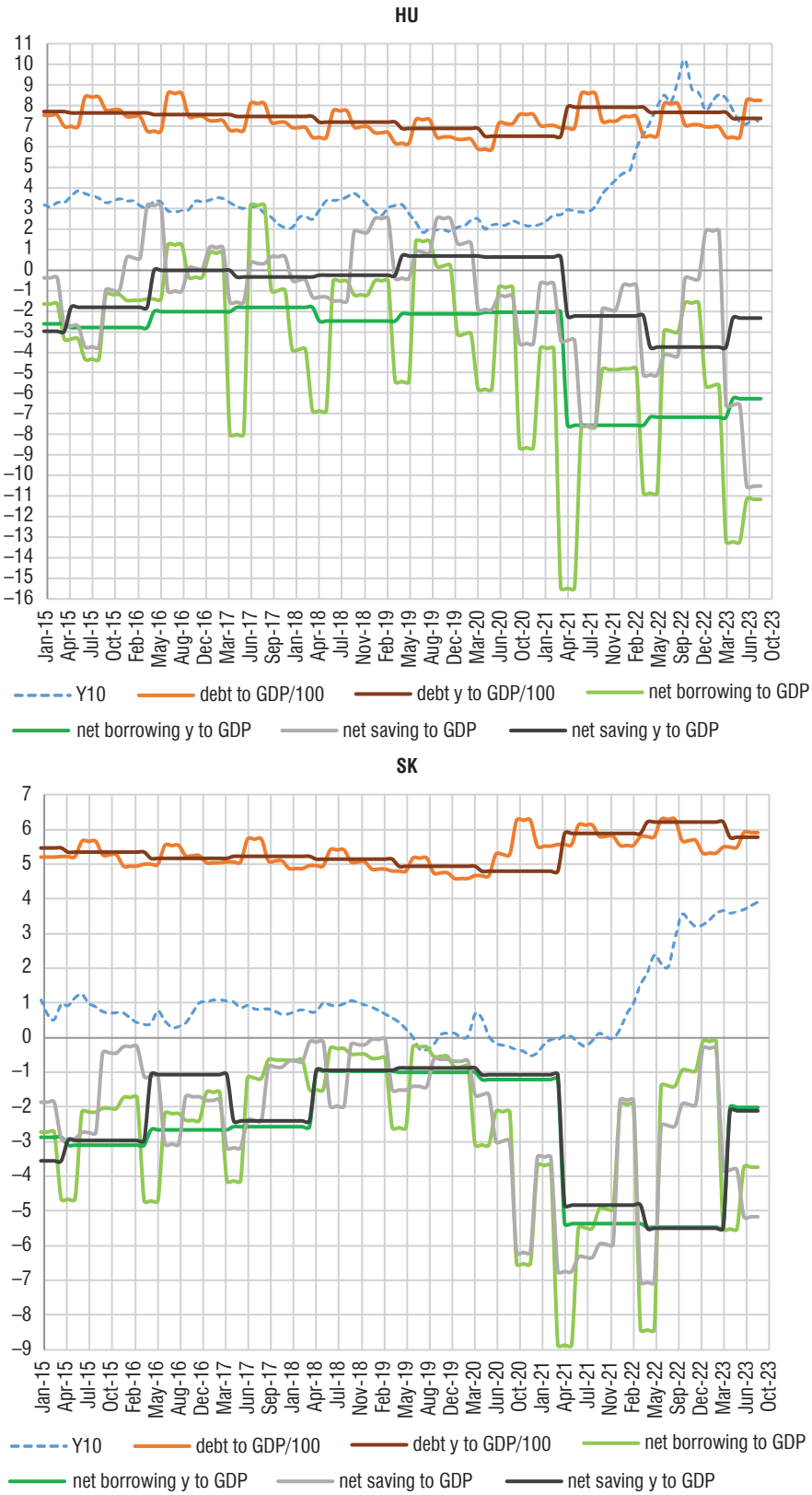
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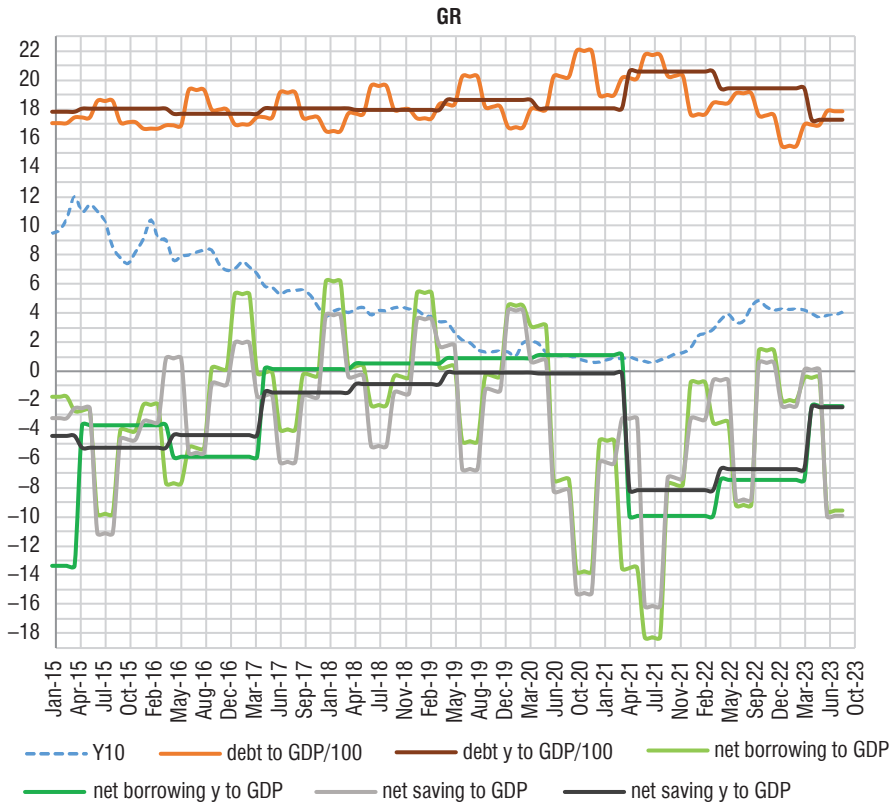
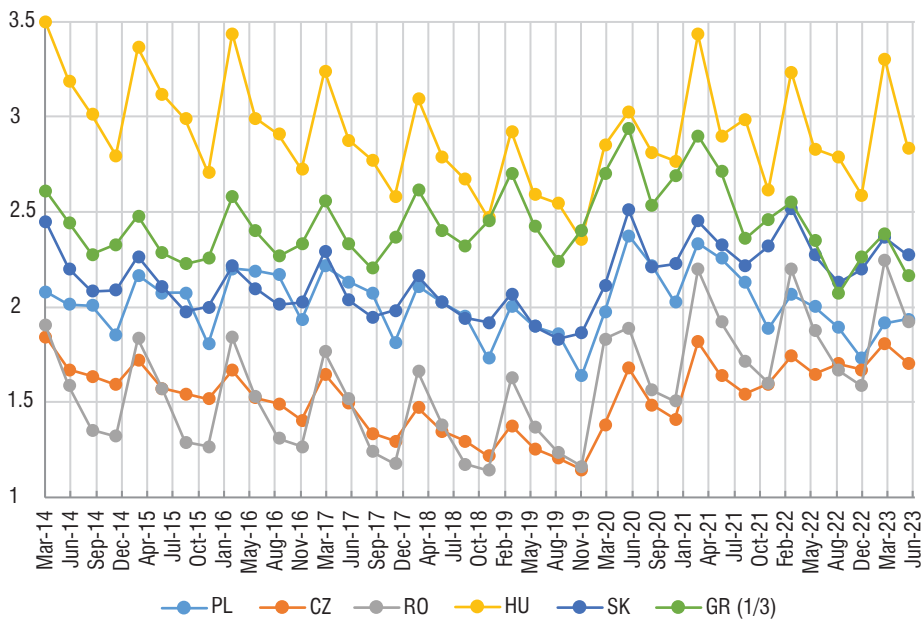


Source: own research.

Figure 6. The cyclical nature of quarterly public debt-to-GDP ratios

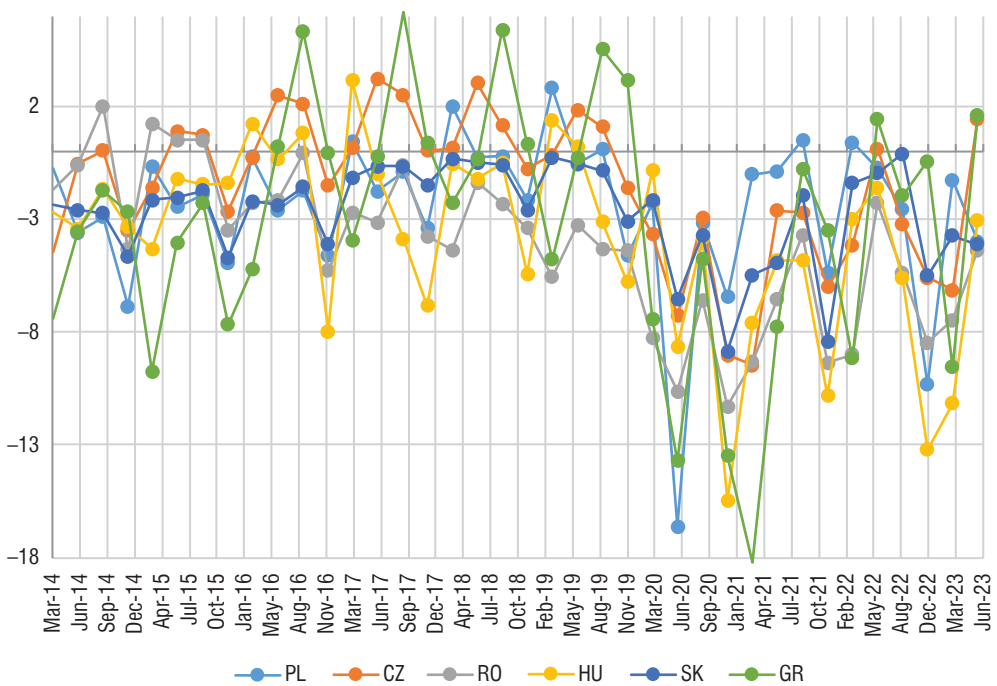


Source: own research.

The data presented indicate the low usefulness of analyses based on quarterly quantities. The dynamics of some of these quantities is characterized by a noticeable cyclicality that seems to be due to the cyclicality of phenomena initiated by financial management processes within the fiscal year. In several of the countries studied (Poland, the Czech Republic, Romania, and Hungary), the public debt-to-GDP ratio declines regularly in the subsequent three quarters that make up the 12-month periods, with the cycle coinciding with the calendar year. In other countries (Slovakia and Greece), the ratio decreases in the second and third quarters of the calendar year, only to increase slightly in the last quarter. The year 2020 (the first year of the pandemic) was exceptional in this regard, with the debt-to-GDP ratio reaching its highest figures in the 2nd quarter in all the countries studied. The amplitude of quarterly fluctuations is noteworthy: in Poland and Hungary the value of the difference reaches 20% of the value of the maximum ratio on average, in Slovakia and the Czech Republic it is slightly smaller, but in Romania it is 30%.

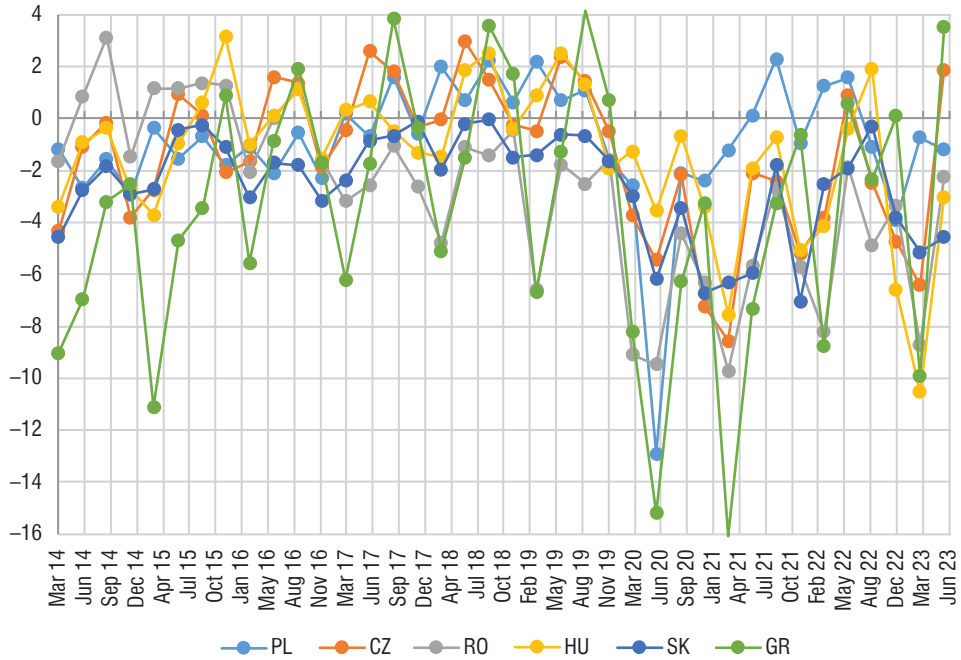
In the case of the ratio of deficit and net savings to GDP, there is a lack of any regularity in the changes from quarter to quarter. However, the spreads of differences in neighbouring quarters are noteworthy (Figures 7 and 8). For example, in 2015, the smallest and largest values of the ratio of quarterly deficits to quarterly GDP were –4.91% and 0.65% in Poland, – 2.64% and 0.9% in the Czech Republic, – 3.49% and 1.23% in Romania, – 1.19% and –4.32% in Hungary, – 4.7% and –1.72% in Slovakia, and –9.78% and –0.66% in Greece. Equally strong differences are characteristic of the ratio of public sector net savings to GDP.

Figure 7. Quarterly ratio of sector net borrowing to GDP



Source: own research.

Figure 8



Source: own research.

Therefore, since it is reasonable to assume that markets primarily rely on information about annual phenomena (processes), it is important to be very careful about identifying potential relationships between these figures and bond yields and to focus on trends rather than changes over a period of weeks or months.

A preliminary analysis of the collected information indicates the controversial thesis that fiscal volumes are of significant importance for the valuation of Treasury bonds. In some cases, there is some degree of expected relationship between the trend of changes in bond yields and changes in the net savings ratio. Such a relationship was present, among others, in Poland in relation to changes in the years 2017–2019 and in Greece in the period 2015–2020. On the other hand, in the Czech Republic, the improvement in this ratio in 2016–2017 was accompanied by a gradual increase in bond yields, and a significant decrease in the relations in Slovakia in 2016 did not result in a decrease in the valuation of Slovak bonds. In all the countries studied, especially in Poland and the Czech Republic, the values (and changes) of the net savings to GDP ratio are related to the values (and changes) of the ratio of public sector result to GDP. The observations on the impact of the net savings ratio on bond yields are, therefore, also valid with regard to the sector's performance ratio. With regard to the value and dynamics of the public debt-to-GDP ratio, it is important to note significant differences in the level of their magnitude in individual countries. In 2013 this level, which affected the markets from May 2014 (according to the time shift applied), was the lowest in Romania and the Czech Republic (37.8% and 44.4%, respectively), acceptable in Slovakia and Poland

(54.7% and 57.1%, respectively), above the regulatory threshold in Hungary (77.2%), and well above in Greece (178.2%). While the ratio remained stable in Greece until 2019, Greek bond yields fell from 10.4% in February 2016 to 1.3% – 1.4% in the final months of 2019. On the other hand, the gradual decline of the debt ratio in the Czech Republic (to 30% in 2019) was accompanied by a steady increase in bond yields in 2017 and 2018.

The analysis of fiscal values is an important element of the assessment of the credit risk of the state (sovereign) as a debtor, but in the methodologies of credit rating agencies it is one of many stages of such an assessment. Therefore, it is impossible not to take into account the rating when examining the factors affecting the yield on Treasury bonds, obviously taking into account possible differences in the risk assessment carried out by individual service providers. For the purposes of graphical presentation, the rating scale is expressed in numerical scores, presented in Table 1.

Table 1. Numerical rating score

Liczba	Moody's	S&P	Fitch	liczba	Moody's	S&P	Fitch
5	Aa3	AA–	AA	0	Baa2	BBB	BBB
4	A1	A+	A+	–1	Baa3	BBB–	BBB–
3	A2	A	A	–2	Ba1	BB+	BB+
2	A3	A–	A–	–3	Ba2	BB	BB
1	Baa1	BBB+	BBB+	–4	Ba3	BB–	BB–

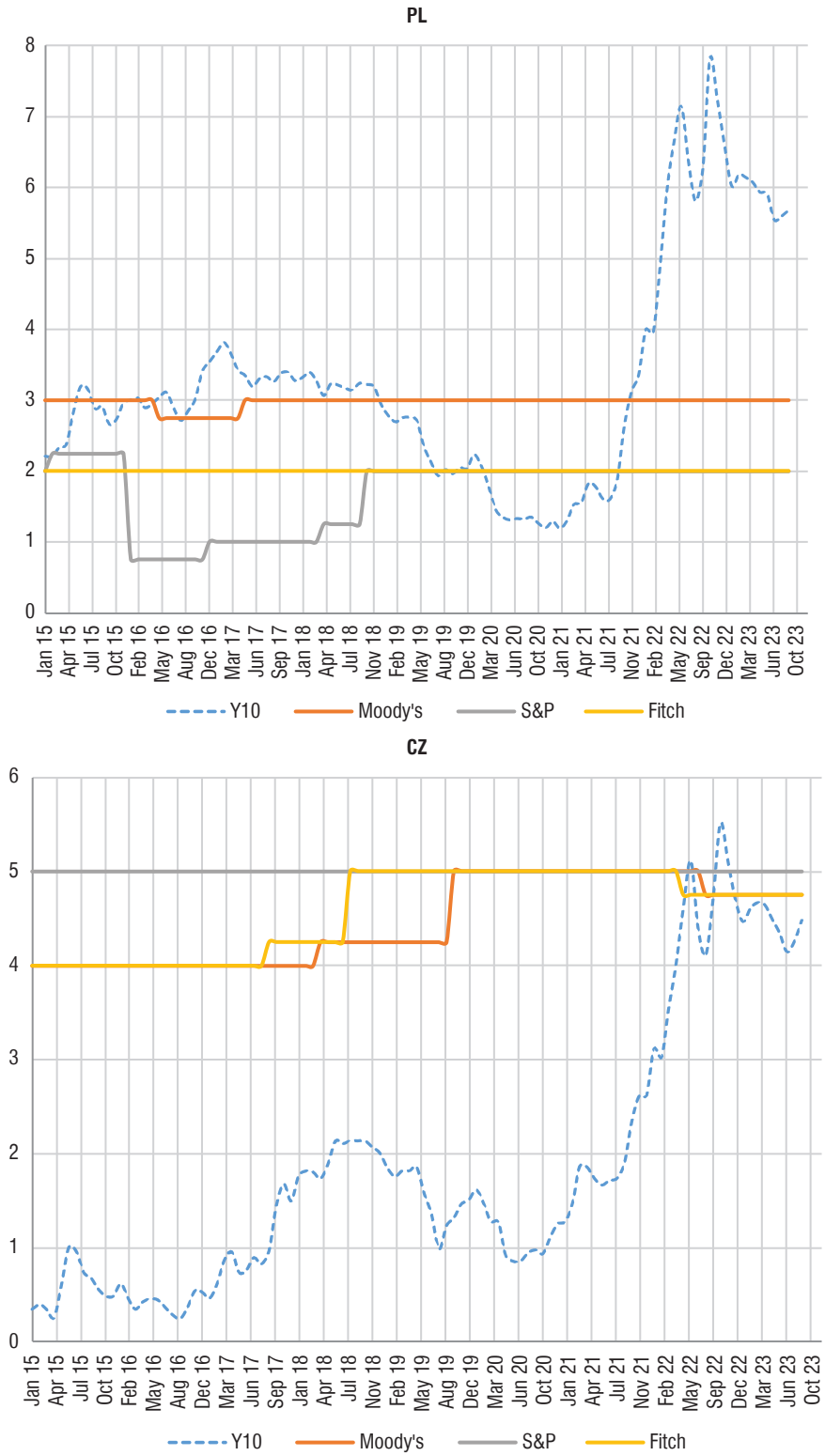
* For a positive outlook, the number was increased by 0.25, while for a negative outlook it was decreased by 0.25.
Source: own research.

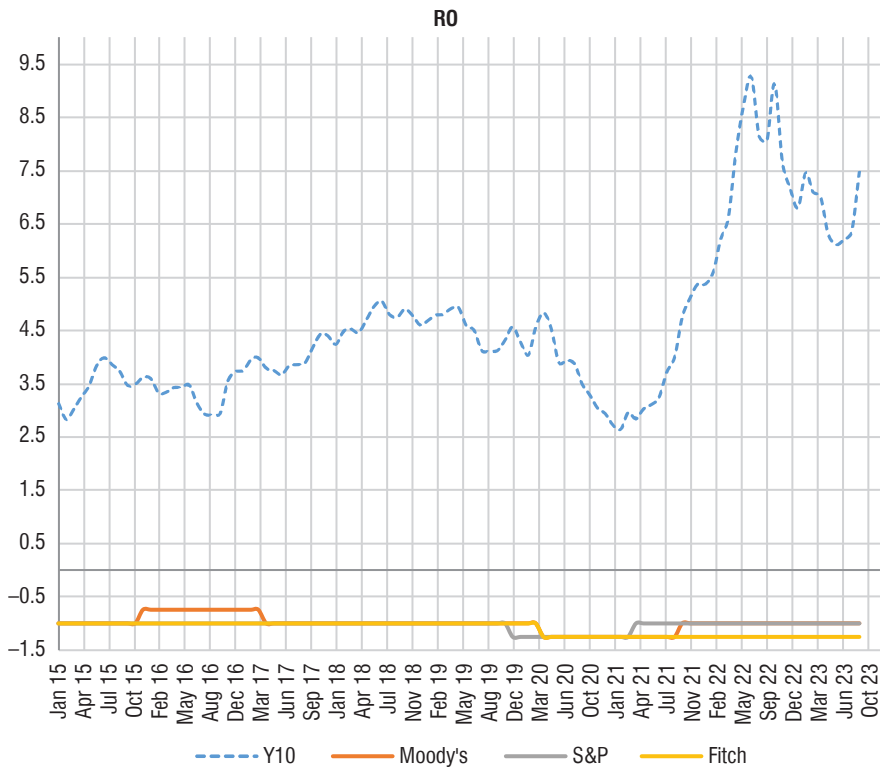
The numerical score (rating) was compared with the yield on government bonds (Figure 9), without using a time shift in this case.

Greece is the most spectacular case that leads to the formulation of general theses regarding the relationship between the examined figures, and the content of the most general thesis of this type is the existence of a link between the improvement of the rating and the gradual decline in bond yields. Although this observation, if treated as a simplification, is not inaccurate, it is hard not to notice that during the period of a very low rating in 2016, bond yields had a clearly declining trend. On the other hand, it is worth noting that Greek bond yields rose in the first quarter of 2015 with all agencies downgrading their ratings, and that yields fell in the middle of 2015, which was accompanied by an upgrade by S&P.

Greek bond yields in 2018 roughly corresponded to those of Romanian and Hungarian bonds, with Greek bonds rated a few notches lower (and, depending on the agency, corresponding to highly speculative or speculative stocks). With the exception of Greece, there is no clear link between rating changes and changes in government bond yields. In particular, the systematic improvement of Hungary's rating in 2015–2016 was not accompanied by a noticeable decrease in government bond yields. It is also difficult to link the increase in yields on Polish bonds at the end of 2016 with the downgrade by S&P at the beginning of this year.

Figure 9. Changes in Y10 versus the rating

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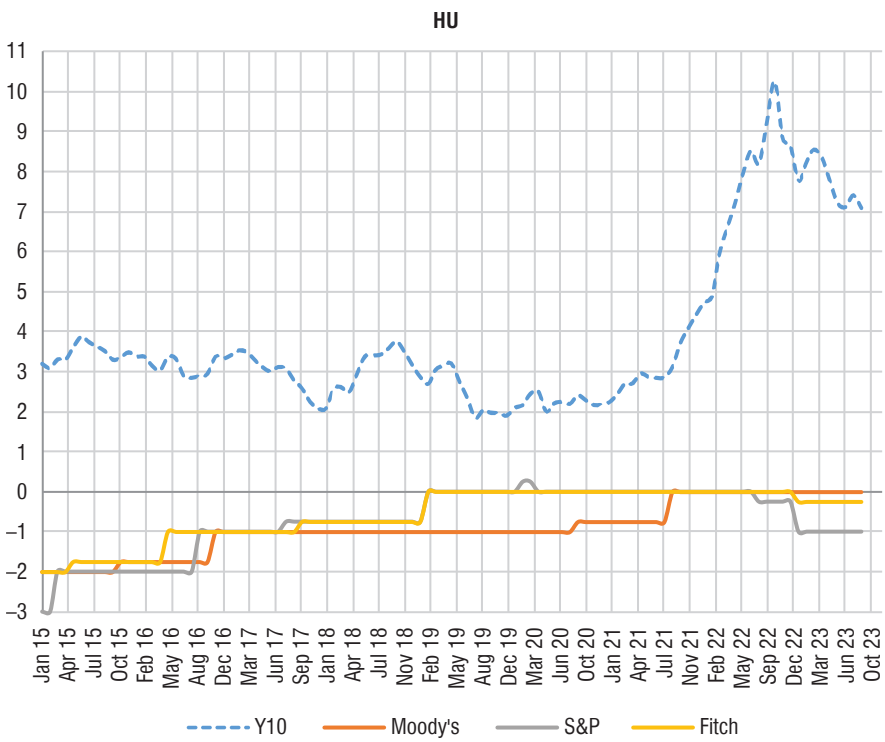
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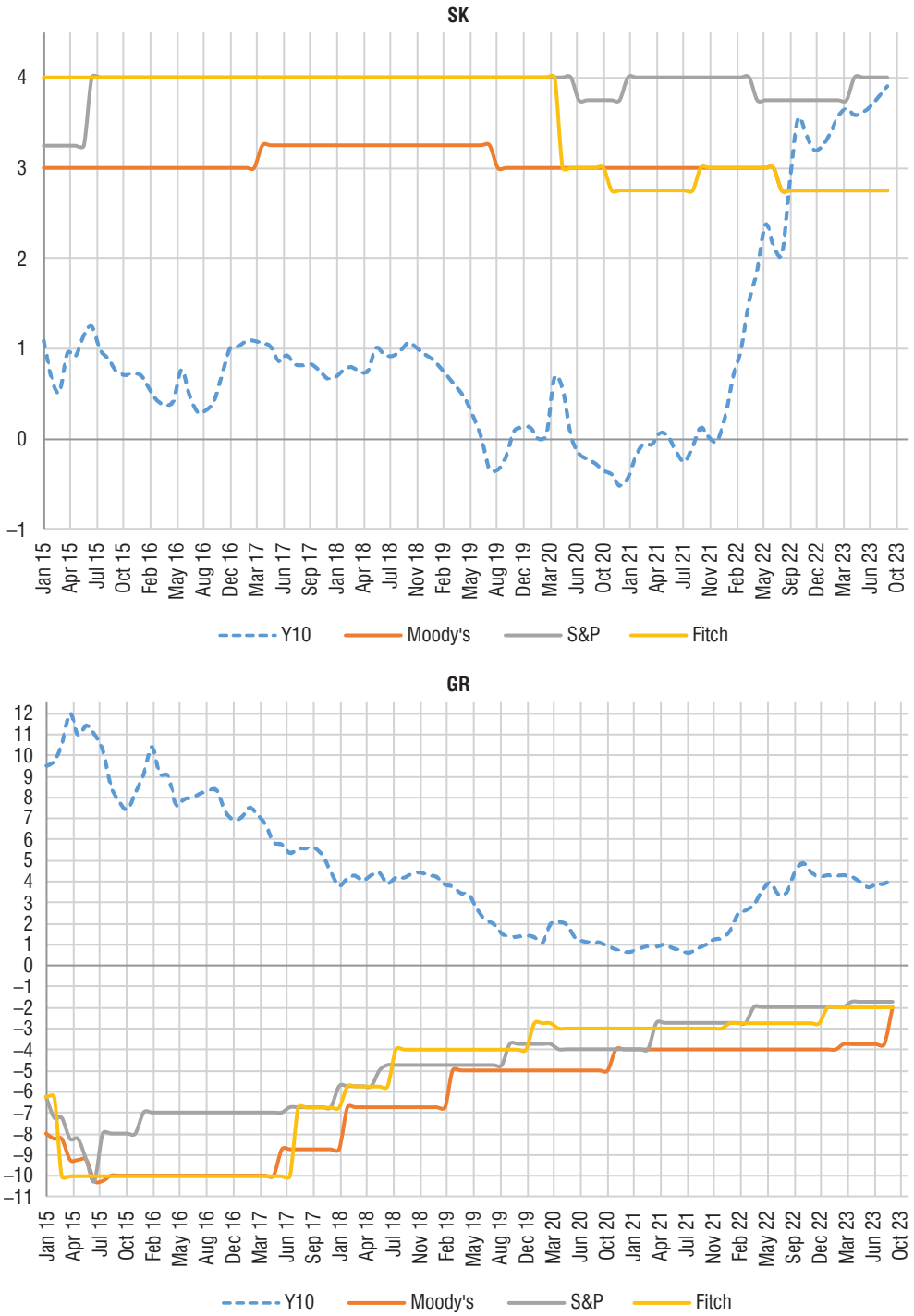

Source: own research.

The effect of individual factors on bond yields of Central and Eastern European countries: multiple regression

The aim of the study is to determine the relationship between the yield (actual servicing cost) of long-term Treasury bonds (explanatory variable) and selected factors that theoretically should (or may) have an impact on the yield (explanatory variables). The sovereign bond yield vector includes the average monthly yields of 10-year bonds issued by individual countries in national currency, i.e. the values that Protocol 13 to the TFEU defines as one of the convergence criteria. The selection of factors determining the level of bond yields was made on the basis of theoretical assumptions based on the cited references. Therefore, the factors that may have an impact on the profitability of public debt include: general phenomena concerning the value of a given currency, fundamental macroeconomic figures, the degree of regularity of fiscal policy, liquidity of the secondary bond market, general risk aversion. In addition, for the period that began with Russia's aggression against Ukraine, the study is intended to identify the impact on debt yields of a specific element of risk aversion resulting from the perception of CEE countries as subject to a particular risk of occurrence (spread) of various negative consequences of the ongoing war in their neighbourhood. Since the aim of the study is primarily to determine the possible variation in the occurrence of these relationships in each of them, a regression study was carried out for each country according to the following model:

$$Y10_t = \beta_0 + \beta_{STIR} * STIR_{t-1} + \beta_{FX} * FX_{t-1} + \beta_{GD} * GD/PKB_{y-1} + \beta_R * R_t + {}_{BaaY10} *$$
$$* BaaY10_{t-1} + \beta_L * L_{y-1} + \beta_{UKR} * UKR + \varepsilon_t,$$

where:
$Y10_t$ – yield on 10-year Treasury bonds in a given month,
$STIR_{t-1}$ – short-term interest rate in the previous month,
FX_{t-1} – average exchange rate in the previous month,
GD/PKB_{y-1} – the ratio of public debt to GDP in the previous year (in accordance with the time shift adopted in the study),
$BaaY10_{t-1}$ – measure of overall risk aversion in the previous month,
R – rating (average of numerical score),
L – liquidity of sovereign bond market,
UKR – indicator of the impact of aggression against Ukraine with values of 1 in 03–09 2023 and 0 in the remaining months of 2023.

For all the countries, a statistically significant result was obtained for the short-term interest rate. The study clearly confirms the dominant importance of this factor in the formation of yields on government bonds in Poland, Romania, Slovakia, and Hungary. In the Czech Republic, it plays a slightly smaller role, but it has a much greater impact than any other factor. It is relatively less important in Greece, although it is the most important factor here as well.

The level of the exchange rate of the national currency seems to have a significant impact on the yields on government bonds in Romania, while in the Czech Republic this impact is paradoxically negative. The significant impact of the underlying fiscal factor, i.e. the public debt-to-GDP ratio, was confirmed in Romania, Poland, and Hungary. Inconclusive results were obtained with regard to the rating: the results for Slovakia, the Czech Republic, and Romania suggest that financial markets are not guided by the perception of credit risk when valuing sovereign bonds. It is worth noting the impact of the war in Ukraine on the yields of government bonds in Slovakia, Romania, Greece, and Hungary.

Table 2. Description of the variables with their expected impact

Variable	Standard	Source	Expected impact
$Y10_t$	Yield on 10-year Treasury bonds in month t	Eurostat database	
FX_{t-1}	Exchange rate of the national currency against the euro in month t–1	Eurostat database	+
$STIR_{t-1}$	Short-term (1 m) interest rate in month t–1	Eurostat database	+
GD/PKB_{y-1}	General government debt-to-GDP ratio in the preceding year (in line with the time shift)	Eurostat database	+
R_t	Rating	Eurostat database	-
$BaaY10_{t-1}$	Moody's Baa Corporate Bond Spread on 10-Year U.S. Treasury Bonds	Federal Reserve Economic Data	+
L_{y-1}	Share of the domestic long-term government bond market in the European market in the year preceding the year of month t	Eurostat database	–

Source: own research

Public debt and the proposed new European Union economic governance framework

The European Commission's proposed economic governance reform is a response to the significant increase in public debt resulting from increased debt issuance, due to the need to stabilize and rebuild the economies of EU member states during and after the COVID-19 pandemic, as well as to the increase in defense spending deemed necessary after Russia's attack on Ukraine in March 2022. An important regularity in this regard was the emergence of serious asymmetric effects. The reform framework announced is also an attempt to make necessary transformational spending (increasing environmental protection, digitization, socioeconomic resilience, cohesion, energy independence) more coherent from the point of view of its impact on the economies of member states and the EU as a whole.

The reform aims to restore greater importance to the debt and fiscal deficit reference criteria, the fulfillment of which is to be a long-term objective of member states, while assuming that assessments of their actions in this regard will be made in the context of the fiscal policy framework set in general by the Council (ECOFIN) and concretized in EU-derived CSRs (country-specific recommendations) and the National Medium-term Fiscal-Structural Plans reflecting them. Thus, the reform clearly implies increasing the differentiation of approaches by:

(a) maintaining the fundamental fiscal rules on the main convergence/stabilization indicators of public debt and budget deficit;
(b) taking into account debt diversification in the agreed measures, including diversification that reflects the different structural contexts in which public debt has accumulated and the effects of that debt;
(c) moving away from a rigid debt reduction framework (i.e. a requirement for a 1/20 reduction per year) and replacing it with a risk-based approach, the primary goal of which is to identify debt reduction requirements that allow the debt to be serviced properly (from a macroeconomic balance perspective);
(d) linking debt reduction programmes to the implementation of reforms that consolidate public sector finances and to the implementation of publicly financed investments.

Under the envisaged planning coordination framework, member states would have to agree with the Commission on debt reduction commitments with a minimum 4-year perspective. Revision of the plan during this period would be possible only if objective new circumstances arose that resulted in the inability to implement the intentions in their original form.

Key to the coordination would be the state's internally financed level of its net primary spending (referred to as the *single operating indicator*, SOI). The SOI determines the level of public sector expenditures net of discretionary revenue measures, interest payment expenditures, and cyclical unemployment expenditures.

The national path of SOI changes would have to vouch for the reduction of public debt in the long term. Medium-term national plans would be assessed through a procedure essentially set out in the Stability and Growth Pact. In order to monitor them at the EU level, member states would submit annual progress reports (APRs). Thus, they would become part of multilateral surveillance within the meaning of Article 121 TFEU (as well as Article 126 TFEU) and those adopted thereunder. The second legal basis would have to serve one of the key mechanisms proposed in the Commission's communication, namely, to broaden the scope of the Excessive Deficit Procedure (EDP) in such a way that:
(a) it would be triggered when a country unlawfully deviates from the implementation of obligations based on the logic of the SOI (with some differentiation regarding whether the deviation would be in the form of a 'mild' or 'serious error');
(b) the catalog of sanctions provided for the EDP would be expanded to include additional ones – of a reputational nature.

The plan also envisages the establishment of a new instrument to correct state omissions in the implementation of SOI programmes by replacing the state-designed plan with one that would set a 'stricter path' for adjustment – presumably in some analogy to the existing transfer of powers from states to the Council in the event of non-implementation of recommendations under the MSP procedure (Article 121 TFEU). In this respect, however, the proposal is enigmatic. More concrete, on the other hand, is the idea of establishing a monitoring mechanism (with an important role envisaged for the European Fiscal Council) based on the assessment

of national reports (Alert Mechanism Report) and the identification of imbalances (which is part of the already existing Six Pack).

Summary

The early years of the period under review was the time of systematic improvement in the basic indicators characterizing public financial management in most of the countries covered by the analysis. Of particular note is the gradual reduction or even elimination of negative net savings of the public sector in Poland, the Czech Republic, Hungary, and Greece. Only in Romania did the net savings-to-GDP ratio worsen at the time, although its scale was relatively small. In the Czech Republic, Slovakia, and Greece, the size of net savings was essentially linked to the public sector result, while in the other countries, the difference between net savings and the sector result was due to the scale of public investment carried out. However, economic growth more than compensated for the negative impact of investment financing-related borrowing needs on the public debt-to-GDP ratio. These processes were generally accompanied by a low cost of using borrowing resources, although even then they varied significantly: higher in Romania, Hungary, and Poland than in the Czech Republic and Slovakia. Even in Greece – a country with a significantly worse, though improving, rating – government bond yields at the end of 2019 were no higher than in the Czech Republic.

The impact of the pandemic on the public finances of Central and Eastern European countries is difficult to overestimate; they responded primarily with spectacular 'current deficits' (negative net savings) reaching 5% of GDP in 2020, and even 7% and 8% of GDP in Romania and Greece. Only in Hungary was the scale of the public sector's 'current result' response to the first year of the pandemic relatively small. It is noteworthy that while in most of the countries studied the situation did not improve in 2021 (and in Hungary it worsened significantly), the 'current score' of the public sector in Poland returned to its equilibrium. In Hungary, Poland, and Romania, the importance of investment financing for generating the nominal deficit increased significantly during the pandemic period: in Hungary, the nominal deficit reached 7.5% of GDP in 2020 (with negative net savings of 2% of GDP; it remained at a similar level the following year), in Poland and Romania, investment financing needs accounted for about 1/3 of the public sector deficit in 2020. The effect of the 2020–2021 nominal deficits was an increase in the public debt-to-GDP ratio (measured by the difference in the ratio in 2021 and in 2019) exceeding 10 percentage points in all the countries studied, except Poland (reaching 14 points in Slovakia and Greece).

Paradoxically, yields on government bonds issued by all the countries surveyed were at record lows in 2020, and remained exceptionally low in Slovakia and Greece until the end of the following year. However, although the spread over German bond yields flattened everywhere, the relative differences in the cost of servicing government debt between countries remained significant. Between mid-2020 and mid-2021, Slovak bond yields averaged –0.2%,

Greek bond yields 0.9%, Czech bond yields 1.3%, Polish bond yields 1.4%, Hungarian bond yields 2.4%, and Romanian bond yields 3.2%. The magnitude of increases in government bond yields at the end of 2021 and in the following year also varied strongly. In the record October 2022, yields on Slovak bonds reached 3.6%, Greek bonds 4.4%, Czech bonds 5.5%, Polish bonds 7.8%, Romanian bonds 9.1%, and Hungarian bonds 10.3%.

An increase in government bond yields translates into an increase in the burden of debt service costs on public budgets, the greater the ratio of central government debt to GDP in a given country. A 1 percentage point increase in government bond yields translates into an approximate quarterly additional burden on the public sector with expenses of about 0.11–0.12% of annual GDP in the Czech Republic, Poland, and Romania, about 0.15% of annual GDP in Slovakia, about 0.18% in Hungary, and about 0.45% of GDP in Greece. Thus, if the observed levels of profitability in each country were to persist long enough, the additional (relative to the level in the 2nd half of 2020 and the 1st half of 2021) annual public sector spending on this account would be, as a share of GDP: in the Czech Republic 1.7%, in Romania and Slovakia 2.1%, in Poland 2.8%, in Hungary 4.6%, and in Greece 6.4%. In the latter two countries in particular, this could threaten the sustainability of public finances.

The regression analysis makes it possible to draw conclusions about the factors determining the yields on government bonds of individual countries and, consequently, the widespread decreases in yields in CEE countries in 2020 and the first half of 2021, followed by increases in late 2021 and 2022. Undoubtedly, in all the countries studied, the most important factor determining the level of government bond yields is the level of money market interest rates. Investors also seem to take into account, to some (small) extent, the health of public finances as measured by the ratio of public debt to GDP. However, the impact of this factor can only be analyzed in the long term, as the observed cycle of quarterly changes in the ratio of the nominal deficit and public debt to GDP makes it impossible to base investment decisions on quarterly figures. What is surprising, however, is the lack of noticeable importance of the rating as a co-determining factor in the differences in the levels of government bond yields of individual countries. Regarding exchange rate risk, the study indicates the validity of treating it as an independent variable (contrary to the theoretical assumption of effective interest rate parity) from the interest rate, while suggesting the lack of influence of the exchange rate on bond yields. Generalizing further, it can be said that in most of the countries surveyed, the war in Ukraine contributed to some extent to the rise in bond yields in the spring and summer of 2022. The survey also indicates that the stability of the public finance system, a component of which is the ability to finance borrowing needs at a reasonable cost, depends not only on the effects of fiscal policy (in terms of public sector net savings, deficit, and public debt), but also on factors of a monetary nature (and, above all, on the level of money market interest rates). Based on the results of the study, the following recommendations can be made:

- a holistic approach to economic policy treating various objectives (in particular, economic growth, stabilization of the purchasing power of money, and minimization of unemployment) in a balanced way is justified;

- in non-eurozone member countries, such an approach should involve simultaneous efforts to preserve or improve the fiscal position (without running an excessive budget deficit within the meaning of Article 126(6) TFEU) and to achieve a high degree of price stability (within the meaning of the first indent of Article 140(1) TFEU);
- the EU's existing legal SEG rules need to be made more flexible so that they can also be applied in periods of external shocks (without having to resort to 'general exit clauses').

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