ARTYKUŁY

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LONG-TERM PUBLIC DEBT PROJECTIONS AND GOVERNMENT BOND YIELDS: PANEL ANALYSIS FOR THE EU

ABSTRACT

Long-term bond yields should reflect macroeconomic expectations related to different variables, including fiscal policy performance. In this paper we use a unique data set of long-term public debt projections prepared by the European Commission to examine whether they influence market pricing of government debt in the European Union (EU) economies. We find that while current debt burdens and, in particular, primary balance affect the government bond yields, the markets pay less attention to long-term debt projections. It would suggest that either the EC debt projections do not coincide with debt expectations of financial market agents or that financial markets, given uncertainty of forecasts prepared in such horizon, are myopic and focus on currently observed phenomena. We also show that the impact of long-term debt projections on government bond yield spreads is stronger in the new EU member states that joined EU after 2004 than in the remaining EU economies.

Keywords: sovereign yields, government debt projections, European Union, panel data

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1. INTRODUCTION

Sovereign credit risk is an important driver of sovereign bond yields. If sustainability of public finances is in question, the markets may demand more compensation for buying government debt. The assessment of fiscal sustainability should involve evaluation of the expected path of future primary balances and debt. However, while it may be relatively easy to produce short-term forecasts of government deficits and debt developments, based on current fiscal policy stance and actions, it is more difficult to predict government debt in the longer-term horizon, in particular taking into account demographic factors and uncertainty related to future pensions, health care and long-term care expenditures.

Analysis of fiscal sustainability is of great importance nowadays, in particular in European economies. The recent increase of government debt, following the global financial crisis and subsequent euro debt crisis, led to substantial increase of the government bond yield spreads vis-à-vis German bunds. Moreover, ageing populations in many European countries impose a risk of further deterioration of fiscal situation, despite current attempts of governments to restrict fiscal policy. If the markets were forward-looking and concerned about fiscal sustainability, they should try to take these developments into account while pricing the government debt. Empirical studies, including those for European countries (Codogno et al., 2003; Schuknecht et al., 2009; Afonso, 2010; Bernoth et al., 2012; Maltritz, 2012; Caggiano and Greco, 2012), demonstrate that fiscal variables are important determinants of long-term government bond yields.

In the standard approach government bond yields are assumed to depend on current debt and deficit. However, some researchers emphasize the need to use expected instead of actual data, since the decisions of investors, especially long-term investors, are likely to depend more on their assessment of future developments than on currently observed phenomena. For the European Union (EU) countries, expected values of deficits and debts, taken from the European Commission Forecasts, were used inter alia in Barrios et al. (2009), Attinasi et al. (2009), Favero and Missale (2011) and Afonso et al. (2015). The results show significant impact of expected future fiscal stance on government bond yields. These studies, however, use short-term European Commission Forecasts, which are published biannually for two years ahead, so they do not include predicted future obligations of governments.

The purpose of our study is to verify if financial markets, while pricing credit risk in European countries, take into account long-term factors that can significantly influence fiscal situation in the future. Our study contributes to empirical literature by using long-term projections of government debt, calculated by the European Commission and capturing estimated costs of population ageing, in explaining sovereign bond spreads. To our knowledge it is the first attempt to test if long-term fiscal prospects exert influence on pricing government debt in the EU economies. A failure to do so may suggest two interpretations: either that the financial markets are myopic, or that the EC debt projections are not credible.

Modelling government bond yield spreads we control for other possible determinants of long-term rates, such as the real GDP per capita, the current fiscal stance measured by the primary balance, the global risk aversion of investors, liquidity of the debt markets and economic policy uncertainty. We compare the results with analogous estimates that replace EC long-term debt projections with short-term debt forecast consistent with the hypothesis of rational expectations.

The study is organised in the following way. Section 2 introduces the model used to empirically test the impact of long-term fiscal projections on bond yields in European economies as well as presents data. Section 3 discusses the way, in which the model is estimated and discusses estimation results. The final section concludes.

2. MODEL AND DATA

Our analysis covers 21 European countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Ireland, Spain, France, Italy, Luxembourg, Hungary, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, and UK, in the period 2000–2016 (for long-term debt projections – 2005–2016).[1] Analysing spreads of long-term government bond yields in the above economies *vis-à-vis* German government bond yields, treated by investors as benchmark bonds with zero risk, we try to capture various sources of risk reflected in spreads, i.e. default risk, liquidity risk and international risk. Following specifications used in the empirical literature (e.g. Gosh et al., 2013, Afonso et al., 2015, Paniagua et al., 2017) we estimate different versions of the following general equation:

$$r_{i,t} = \beta_0 + \beta_1 y_{i,t}^{pc} + \beta_2 pb_{i,t} + \beta_3 d_{i,t} + \beta_4 d_{i,t}^f + \beta_5 liq_{i,t} + \beta_6 vix_t + \beta_7 epu_{i,t} + \gamma_i + \varepsilon_{i,t}$$

where r_i denotes spreads of long-term government bond yields in country i vis-a-vis German bonds, liq_i denotes liquidity in country i, proxied by the share of a country's long-term debt in the total long-term debt in the EU, while *vix* is the VIX index, measuring global risk aversion. The remaining explanatory variables are expressed as deviations from their levels in German economy and include: y_i^{pc} – the logarithm of real GDP per capita, pb_i – the primary balance (as percent of GDP), d_i – general government debt (as percent of GDP), d_i^f – the 10-year ahead projection of the general government debt (as percent of GDP), epu_i – the Economic Policy Uncertainty (EPU) index (Baker et al., 2015)[2]. Finally, γ_i stands for fixed-effects in country i.

We use EC debt projections for a 10-year horizon (or close to it), consistent with 10-year maturity of government bonds. Such horizon allows incorporating the impact of population ageing on public finances and is not too long to be

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[1] We do not consider Germany due to the fact that all the estimations for other economies we use have German economy variables as the benchmark. In addition, we eliminated Lithuania and Latvia from the sample for statistical reasons (unsatisfactory properties of residuals).

[2] EPUI is available for several European economies, including Germany, Italy, United Kingdom, France, Spain, Netherlands, Sweden and Ireland. For all remaining countries we use the index calculated for Europe as a whole.

associated with very high uncertainty. The projections are published in Fiscal Sustainability Reports of the European Commission every three years. For the aims of the study we use long-term fiscal projections from four most recent reports (EC, 2006, 2009, 2012, 2015).[3] Since the frequency of their publication is low, we use linear interpolation to obtain yearly data.

We consider debt projections calculated according to the baseline scenario, defined as a no-fiscal policy change scenario. It is based on the Commission forecasts two years ahead and for the remaining period of the forecasting horizon it assumes that fiscal policy will remain unchanged relative to the last year of the short-term Commission forecast. Other underlying macroeconomic assumptions, concerning real GDP growth, inflation and real interest rates, are consistent with long-run convergence assumptions of the Economic Policy Committee.[4] The important feature of the EC debt projections is that they include information on the estimated costs of population ageing such as pensions, costs of long-term care and health care. These costs may create significant burden for public finances in the future, but are not trivial to be predicted. The European Commission estimates them on the basis of detailed data provided by EU member states. In the case of market participants, assessing these costs is almost impossible, because the gathering of adequate data is difficult and time-consuming. Therefore, the EC long-term debt projections potentially contain very useful and unique information about implicit liabilities of governments connected with population ageing and as such should be taken into account by financial market participants in the assessment of ability of governments to pay their debts in the future.

Data on long-term government bond yields are taken from the European Central Bank and are expressed as yearly averages of monthly data. The source of data on real GDP per capita, primary balance (% of GDP) and general government debt (% of GDP) is Eurostat. Primary balance is calculated as the sum of budget balance and interest payments of the general government sector. Data on long-term debt securities used for the calculation of the liquidity measure also come from Eurostat. The VIX index, reflecting market expectations of near-term volatility conveyed by stock index option prices, is used as a measure of global risk aversion. The source of data is the Chicago Board Options Exchange. The data is quarterly, so we calculate yearly averages.

To reflect economic policy uncertainty, among explanatory variables we include the Economic Policy Uncertainty Index (EPUI), proposed by Baker et al. (2015).[5] The EPU index reflects the frequency of articles in leading newspapers that contain the following triad: "economic" or "economy"; "uncertain" or "uncertainty"; and one or more terms related to economic policy.[6] The EPU index is available for a number of European economies, including Germany,

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[3] Earlier reports do not include projections for the new EU member states.
[4] For details see EC (2016).
[5] Source of the EPUI data: http://www.policyuncertainty.com/index.html.
[6] E.g. in the US they include the following words: "congress", "deficit", "Federal Reserve", "legislation", "regulation" or "White House".

Italy, United Kingdom, France, Spain, the Netherlands, Sweden and Ireland. There is also an additional index calculated for Europe as a whole, based on two leading newspapers in selected large economies.[7]

3. METHODS AND RESULTS

We estimate the equation (1) using panel fixed effects (FE) estimator with panel corrected standard errors to account for cross-sectional dependence. We test several different specifications of this relationship, from very simple ones, containing only three explanatory variables, i.e.: GDP per capita, primary balance and debt or debt projections, to more complex ones, in which we control for international risk (VIX), liquidity risk, economic policy uncertainty (EPU index) and possibly different impact of debt developments on bond yields in the new EU member states (NMS). The final specification is a robustness check where, instead of EC long-term debt projections, we use short-term (1-year-ahead) expected debt levels, assuming rational expectations of financial markets. This specification is estimated using panel Two Stage Least Squares (TSLS) method with fixed effects and 1–2 lags of explanatory variables as instruments.

The results presented in Table 1 suggest that the selected proxies for the default, liquidity and international risks are relevant in explaining spreads of government bond yields in European economies. Fiscal variables – including primary balance and public debt – seem important for long-term investors in assessing the default risk. It should be noted that the estimated impact of primary balance on spreads is statistically significant and similar across all the specifications. Moreover, in all the specifications spreads are affected more by a given change in the primary balance than by a analogous change in the public debt. It means that financial markets react more to recent policy decisions leading, *ceteris paribus*, to the increase of public debt than to its level itself.

As far as the role of long-term debt projections is considered, our results show that their impact on spreads is weak and not statistically significant. Only if we divide countries into old and new EU member states, the interaction of a dummy for NMS and the predicted indebtedness produces positive and significant results. It suggests that the markets respond stronger to projected long-term increase of debt in these countries relative to old EU member states.

Higher levels of GDP per capita lead to compression of spreads, which implies that in wealthier economies the impact of fiscal variables on spreads is compensated by the effects of higher degree of economic development. On the other hand, in the new EU member states, characterized by relatively low levels of GDP-per-capita, the costs of more expansionary fiscal policy are not compensated with wealth effects. On top of that, sensitivity of government bond yield spreads

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[7] Those are: "Le Monde" and "Le Figaro" for France, "Handelsblatt" and "Frankfurter Allgemeine Zeitung" for Germany, "Corriere Della Sera" and "La Repubblica" for Italy, "El Mundo" and "El Pais" for Spain, and "The Times" of London and "Financial Times" for the United Kingdom.

Table 1. Estimation results

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Constant	0.214 (0.331)	−0.011 (0.381)	0.835* (0.482)	−0.031 (0.539)	0.303 (0.569)	−0.097 (0.571)	0.894 (1.217)
GDP per capita	−3.040*** (0.876)	−2.927*** (1.066)	−2.279*** (0.876)	−3.097** (1.211)	−2.629** (1.202)	−3.449*** (1.247)	−0.192 (2.328)
Primary balance	−0.089*** (0.018)	−0.082*** (0.023)	−0.087*** (0.018)	−0.073*** (0.025)	−0.081*** (0.024)	−0.081*** (0.024)	−0.150*** (0.053)
Public debt	0.020*** (0.006)		0.028*** (0.006)		0.009 (0.006)	0.013* (0.007)	0.036*** (0.009)
Projected debt, +10Y (EC)		0.002 (0.002)		0.002 (0.002)			
Δ Projected debt, +10Y (EC)					0.000 (0.002)	−0.004 (0.003)	
VIX			0.022*** (0.008)	0.019*** (0.007)	0.022*** (0.007)	0.023*** (0.007)	0.065*** (0.014)
Liquidity			−0.185*** (0.052)	−0.111* (0.064)	−0.140** (0.068)	−0.144** (0.066)	−0.225 (0.094)
EPUI			0.002 (0.002)	0.004*** (0.002)	0.004** (0.002)	0.004** (0.002)	0.006 (0.006)
Public debt * NMS						−0.011 (0.012)	

Δ Projected debt, +10Y (EC) * NMS						0.015** (0.006)	
Δ Projected debt, +1Y (REH) * NMS							0.072 (0.097)
Observations	342	233	338	233	233	233	286
Adj. R²	0.62	0.74	0.64	0.75	0.75	0.76	0.57

Notes: EPUI stands for Economic Policy Uncertainty index (source: http://www.policyuncertainty.com/index.html). Expected debt levels are proxied either with European Commission long-term forecasts (EC) or with rational short-term expectations (REH). NMS denotes dummy that equals 1 for EU new member states (countries joining EU since 2004). Numbers in parentheses below estimated coefficients are standard errors. *** denotes significance level at 99 percent; ** denotes significance level at 95 percent; * denotes significance level at 90 percent. The specification [7] includes rational expectations among explanatory variables, therefore 2SLS method was used. Instruments include lags of GDP per capita, public debt, primary balance, liquidity of the sovereign bonds market, VIX and EPUI.

Source: own calculations.

in NMS to long-term debt projections makes financial markets more powerful in motivating fiscal authorities to discipline fiscal policy than in other EU economies.

The overall weak response of the markets to long-term debt projections may be associated with high uncertainty related to the projections as well as with the fact that the projections published before the global financial crisis proved to be overly optimistic for several old EU member states. The markets may also understand the conditional character of debt projections. However, if a similar equation is estimated assuming rational short-term expectations, the expected increase in debt is statistically insignificant even for the NMS.[8]

Additional risk factors, i.e. liquidity and global risk aversion, have expected signs and are significant in the estimated models. Economic policy uncertainty also seems to increase the spreads.

Summing up, our results suggests that while pricing sovereign debt in the European economies financial markets consider default, liquidity and international risk factors. However, assessing the default risk they pay attention mostly to the current fiscal situation, treating the long-term debt projections as an additional factor only in the new EU member states.

4. CONCLUSIONS

Since the debt crisis in Europe, the issue of fiscal sustainability has gained on importance in economic debate. It should also be significant for financial markets, in particular for government bond markets, because fiscal sustainability is directly related to government solvency. Therefore, financial market participants should take into account expected rather than current values of public debt while pricing long-term government securities. However, forming long-term expectations of fiscal variables may be difficult, because fiscal situation depends on many different factors. For European countries, the European Commission issues every three years Fiscal Sustainability Reports, containing long-term public debt projections that take into account implicit future government liabilities. As such, these projections potentially contain useful information for financial markets and therefore can influence long-term sovereign bond yields.

Empirical results presented in this study show that current levels of public debt and primary balance exert influence on sovereign bond yields spreads. At the same time, long-term debt projections, capturing fiscal costs of population ageing, have only marginal impact on the long-term government bond yields spreads. This impact is stronger for the EU new member states, which can be perceived as the factor motivating fiscal authorities to run more responsible policy. The weak response of financial markets to long-term debt projections may be due to high uncertainty related to the projections and their conditionality. In

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[8] In the specification [7] the expected increase in public debt based on unbiased expectations is used only for NMS. However, we estimated the specification analogous to model [7], in which we replaced long-term EC debt projections with 1-year-ahead REH forecasts. The latter variable was statistically insignificant for the whole group of economies.

our view, however, long-term debt projections will gain on importance as the costs related to population ageing will start to materialize and there will be more post-crisis observations available.

We see two important starting points for future research. First, the issue of non-linearities in the spread equation. In line with our findings, the impact of fiscal variables on spreads may be different for old and new EU member states. This issue should be investigated further because it may concern also other variables. Second, the question how the financial markets form their fiscal expectations seems important. If the fiscal authorities could credibly commit to reach certain level of debt in the future this could impact the cost of debt servicing immediately, similarly to the commitment of monetary authorities to reach certain inflation target that should lead to decrease in inflation.

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DŁUGOTERMINOWE PROJEKCJE DŁUGU PUBLICZNEGO A RENTOWNOŚCI OBLIGACJI RZĄDOWYCH – ANALIZA PANELOWA DLA KRAJÓW UE

STRESZCZENIE

Rentowności długoterminowych obligacji rządowych powinny odzwierciedlać oczekiwania makroekonomiczne odnośnie do różnych zmiennych, w tym przyszłej polityki fiskalnej. W niniejszym artykule wykorzystujemy unikalny zestaw danych zawierający długoterminowe prognozy długu publicznego, przygotowywane przez Komisję Europejską, w celu zbadania, czy wielkości te wpływają na rynkową wycenę długu rządowego w gospodarkach Unii Europejskiej. Wyniki badania pokazują, że bieżący dług publiczny i, w szczególności, saldo pierwotne budżetu wpływają na rentowność obligacji rządowych, podczas gdy długoterminowe prognozy długu w znacznie mniejszym stopniu oddziałują na te rentowności. Oznacza to, że albo prognozy Komisji Europejskiej odnośnie do przyszłej sytuacji fiskalnej nie pokrywają się z prognozami rynków finansowych, albo że rynki finansowe – uwzględniając niepewność prognoz formułowanych na długi czas – są krótkowzroczne i koncentrują się na zjawiskach obserwowanych na bieżąco. Wykazujemy również, iż wpływ długoterminowych projekcji fiskalnych na spready obligacji rządowych jest silniejszy w nowych krajach członkowskich UE, które dołączyły do niej w 2004 r. lub później, niż w pozostałych gospodarkach UE.

Słowa kluczowe: rentowność obligacji rządowych, prognozy fiskalne, Unia Europejska, dane panelowe.

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