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DETERMINANTS OF GOVERNMENT BOND SPREADS IN EUROPEAN TRANSITION ECONOMIES AND IMPLICATIONS FOR SMALL AND MEDIUM ENTERPRISES

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ABSTRACT

Given the need for transition economies to finance some of the investment required for development through borrowing, this paper empirically examines the determinants of government bond spreads, focusing on institutional quality as a contextual dimension. The literature generally assumes that market assessments of sovereign risk - i.e., the probability of default - and hence the cost of sovereign borrowing over the risk-free rate are based on the borrower's macroeconomic fundamentals, solvency, and liquidity indicators related to fiscal and financial variables, and indicators of external financial market volatility. Using fixed effect estimation, our findings suggest that government bond spreads in European transition economies are sensitive to domestic macroeconomic fundamentals and global financial market volatility. From macroeconomic fundamentals, fiscal deficit levels, inflation rates, and countries' effective exchange rates emerge as the leading indicators determining bond spreads over the observed period. Moreover, our results suggest that financial markets consider the quality of institutions when assessing default probabilities; hence, the potential risks arising from the quality of institutions are factored into the cost of sovereign borrowing. These results are robust to various extensions and robustness tests.

KEYWORDS: *government bonds, transition economies, Europe, SME implications*

1. INTRODUCTION

One of the most fundamental changes in public finances in transition economies after the collapse of the centrally planned economy was the switch from deficit financing strategies to a market-based system with the issuance of government securities subject to market yields (Barabas et al., 1999). In their efforts to raise living standards and economic growth, transition country governments have significantly increased their participation in domestic and international debt markets by issuing long-term government bonds. In the early stages of the transition, governments' ability to raise tax revenues was limited due to relatively low - in some countries, even negative - economic growth. Therefore, it was necessary to increase participation in debt markets to finance fiscal deficits in a market-oriented manner. In addition to their deficit financing needs, European transition economies with ambitions to integrate into the Eurozone had to establish a long-term yield curve to meet the convergence criteria derived from the Maastricht Treaty (Alexopoulou et al., 2009).

Although most European transition countries

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entered the transition period with relatively large macroeconomic imbalances and low institutional quality, they largely managed to correct these imbalances during the first decade of transition. The decline in output at the beginning of the transition was made up, while the large fiscal deficits experienced at the beginning were reduced in subsequent years. Despite social pressures and development needs to increase public spending beyond existing budgetary capacities, most transition countries kept their public debt low. In many cases, the debt remained well below the requirements of the Maastricht criteria. In some other countries, however, public debt increased substantially during the 2008 global financial crisis and the subsequent European sovereign debt crisis. Inflation rates, which were high and persistent at the beginning of the transition, were successfully reduced in most countries-an achievement later considered one of the greatest successes of the transition process (Fisher and Sahay, 2000; Fisher et al., 1996). Although these economies had relatively low scores on their index of institutional quality at the beginning of the transition, significant progress, albeit with backsliding in some areas, has been made since then.

Despite progress in macroeconomic stability and the successful implementation of structural reforms in line with market principles, the market perception remained that the sovereign credit risk of the European transition economies was still relatively high. Even though the significantly higher borrowing costs at the beginning of the transition gradually decreased in the following years, the differences between advanced European countries and other European transition countries remained.

Edwards (1984) was the first to relate sovereign debt default risk to sovereign borrowing costs and, in particular, to government bond spreads (i.e., the government bond yield differences between a given country and a comparable bond issued by an advanced economy, which is considered a "risk-free" bond) to explain market perceptions and, hence, sovereign risk valuations. In this constellation, countries that are perceived by markets to be riskier and, therefore, more likely to default are expected to have higher borrowing costs than countries that are perceived by markets to be less likely to default and whose securities are expected to have lower yields (Edwards, 1984, Ferruci, 2003; Nosbusch et al., 2008). The literature on bond pricing suggests that the market's assessment of a sovereign's probability of default, and hence the cost of sovereign borrowing, is influenced by some domestic macroeconomic indicators, fiscal and financial variables, and international indicators (Alexopoulou et al., 2009). Given the significant historical developments in European transition economies and the context of the proposed framework for sovereign risk default assessments, the question arises as to what determines the cost of sovereign borrowing in European transition economies. To answer this question, we examine the relative roles of macroeconomic fundamentals and external market conditions in explaining the borrowing costs of European transition economies. Taking into account the peculiarities of transition countries in terms of institution building, we also examine in this paper the role of a country's institutional quality in investors' assessment of creditworthiness. To this end, we develop an empirical model based on a fixed effect with Driscoll-Kraay standard errors to answer the questions above.

The remainder of the paper is organized as follows. Section 2 reviews the relevant empirical literature, and Section 3 describes the theoretical model and data description. The main empirical results are presented in Section 4, while in Section 5, we present our conclusions.

2. LITERATURE REVIEW

Extensive literature is devoted to empirically explaining the determinants and magnitude of factors affecting sovereign bond spreads[2]. However, no consensus exists on the best empirical model to explain sovereign bond spreads. However, it is generally accepted that both internal and external factors impact differences in sovereign borrowing costs. The pioneering work in this area is credited to Edwards (1984), who examined the determinants of sovereign bond spreads for 19 Less Developed Countries (LDCs) using a random effects model. Edwards argues that markets can make the distinction between "good" and "bad" borrowers based on the borrower's macroeconomic indicators as well as solvency and liquidity indicators related to fiscal and financial variables. Thus, his results suggest that the macroeconomic characteristics of the country provide information on the creditworthiness of the borrowing country. Among the macroeconomic indicators considered in this study, the debt-to-GDP ratio and international reserves held by the government are leading indica-

2 The sovereign bond spread refers to the difference in yield between a bond issued by a particular country and the yield of a bond with similar characteristics issued by an advanced economy with a triple A bond rating, which is considered as free of default risk.

tors when markets assess the credit risk of the borrowing country. In addition, liquidity indicators, measured by debt service to GDP, followed by the current account balance, are other essential factors in determining differences in the sovereign cost of borrowing among less developed borrowing countries.

The influential framework of Edwards (1984) was followed by subsequent studies in which domestic and external potential variables affecting sovereign bond spreads were generally included in the empirical specifications, similar to the Edwards (1984) study. Most empirical studies that followed in the late 1980s and the 1990s focused mainly on emerging markets. This was mainly motivated by the high levels of government debt and severe financial crises experienced by countries in Latin America and selected Asian countries during these periods.

In examining the determinants of government bond spreads in the 1990s in emerging economies, Min (1998) finds similar results to Edwards (1984), pointing out that international financial developments - measured by the three-month US Treasury bill rate - do not affect bond spreads in emerging economies. The oil price as an indicator of the external environment is also insignificant. While Ferruci's results suggest that a country's macroeconomic fundamentals play an essential role in determining sovereign bond spreads, external factors played a more prominent role in determining the cost of sovereign borrowing in emerging economies between 1992 and 2002. Of the external factors considered, his results suggest that a higher US short-term interest rate, as measured by the yield on a 30-day US T-bill, increases spreads in EMEs. In addition, volatility in international markets, as indicated by the S&P 500 equity index, is a crucial determinant of spreads in EMEs.

Thus, recognizing the importance of borrower credibility, a country's institutional quality, and political risk are essential issues that have received some attention in emerging market economies. In addition to country solvency, liquidity, and external factors, financial markets also consider the country's political and other institutional risks when evaluating sovereign bond spreads. Baldacci et al. (2008) examine the determinants of sovereign bond spreads with particular reference to political risk and the fiscal position of 30 emerging economies from 1997 to 2007. In constructing the variables that capture the impact of political risk, this paper uses information from the World Bank's Governance Index and the Heritage Foundation's Economic Freedom Index. Their results highlight the importance of political risk in determining the price of government borrowing by showing that the higher the political risk associated with a country, the higher the bond spread. As for the magnitude of this effect, the results suggest that a ten percent increase in the political risk index increases the bond spread by ten basis points.

Most studies focusing on the determinants of government bond spreads, emphasizing advanced economies, appeared mainly after or during the turmoil in global financial markets and the European sovereign debt crisis. The main focus of the studies that focused on advanced European economies, in addition to controlling for macroeconomic fundamentals and potential external factors of influence, was the impact of joining the EU and the European Monetary Union (EMU) on sovereign bond spreads. However, due to the recent financial crisis and the European sovereign debt crisis, macroeconomic fundamentals, particularly public finance indicators, regained importance in empirical models.

Afonso et al. (2015) examine, for a panel of 10 advanced EU economies, the extent to which the determinants of sovereign bond spreads changed before and during the global financial crisis and also during a period when the global financial crisis mutated into a sovereign debt crisis. Before the global financial crisis, domestic macroeconomic fundamentals were somewhat limited in explaining sovereign bond spreads across countries. In contrast, the international financial environment played a leading role in shaping sovereign bond yield movements during this period. However, as turmoil in global markets began to emerge, investors' approach to sovereign bond pricing changed significantly. During the global financial crisis, domestic macroeconomic indicators, particularly public finance indicators, emerged as the critical explanatory indicators in sovereign bond pricing.

Poghosyan (2012) examines the long-run determinants of bond spreads in 22 advanced economies over a twenty-year period, including the global financial crisis period, using the pooled mean group (PMG) estimation method. Overall, his results suggest that, in the long run, the debt-to-GDP ratio and potential GDP growth are the most critical determinants of yield spreads for the countries in the sample. In the short run, on the other hand, short-term interest rates, together with inflation, affect sovereign borrowing costs.

In addition to considering individual macroeconomic indicators in the empirical specification, some studies-although very few, include only credit ratings in place of individual domestic indicators. The role of sovereign credit ratings, as opposed to macroeconomic fundamentals, is significant for bond spreads but is limited compared to individual macro-fiscal indicators (e.g., Alfonso et al., 2012, 2015). Despite the limited role of credit ratings in yield movements, their role in triggering and escalating the crisis has been

primarily attributed to sovereign downgrades by credit rating agencies[3]. Specifically for the Greek debt crisis, Fatherstone (2011) attributes a significant role in the initial phase of the crisis to the sequence of sovereign downgrades by three major rating agencies (S&P, Moody's, and Fitch Group). Their increasingly influential role in the global economy and sovereign states has been heavily criticized, especially during the global financial and European debt crises. In an empirical study, Ozatay et al. (2007) examined sovereign credit ratings to compare their influence with the influence of macroeconomic fundamentals. They found that the role of credit ratings was somewhat limited.

In contrast to EME and studies of advanced countries, the determinants of government bond spreads in emerging markets have been relatively little studied. However, given the EU accession process, recent turbulent times in global financial markets, and the subsequent European sovereign debt crisis, some interest has also emerged in this region. Despite the recent increase in interest, however, there is still a significant gap in the systematic understanding of the determinants of government bond spreads in transition economies.

Nickel et al. (2009) examine the effects of fiscal and macroeconomic projections on sovereign bond yield spreads in the Czech Republic, Hungary, Poland, Russia, and Turkey. The results of their panel estimation suggest that projected fiscal deficits significantly impact sovereign bond yield spreads, while EU accession appears to lower sovereign borrowing costs. In addition, external financial developments are essential for sovereign bond yield movements in the countries considered. Based on the results, the authors conclude that sovereign risk cannot be captured only by the conventional variables in empirical regressions but that institutional considerations must also be considered to obtain a more comprehensive picture of sovereign creditworthiness.

The importance of government fiscal position on the cost of borrowing by CEE transition economy governments is also highlighted in the study by Perovic (2015). This study, which covers the period from 2000 to 2013, suggests that an increase in the deficit increases the government bond spreads. Similarly, it finds that the increase in public debt harms the cost of public borrowing.

Alexopoulou et al. (2009) use conventional indicators to explain government bond spreads over the 2001-2008 period in the context of transition countries.[4] Their results suggest that macroeconomic fundamentals are emphasized in both the long and short run. More specifically, the main determinants of sovereign bond spreads are the external debt-to-GDP ratio, inflation, the exchange rate, and trade openness. Moreover, in addition to macroeconomic fundamentals, external financial market volatility is also found to affect the sovereign cost of borrowing in CEE transition economies.

However, in Ebner's (2009) study, various factors are shown to affect government bond spreads in CEE transition economies.[5] Using regression analyses for individual countries, Ebner (2009) concludes that movements in sovereign bond spread in CEE countries are mainly due to external market developments, while macroeconomic fundamentals play almost no role. As far as external markets are concerned, the volatility of the stock market indicator (proxied by the ECB reference rate and the volatility index VDAX-NEW) turns out to be one of the most critical determinants of sovereign bond spreads. In contrast, the average EU inflation rate does not significantly affect sovereign bond spreads.

3. MODEL SPECIFICATION AND DATA DESCRIPTION

In modeling the determinants of government bond spreads, it is assumed that the spreads of a given country over a risk-free interest rate reflect the probability of default and of a loss given the default, where the probability of default is exogenously determined (Ferruci, 2003). Following the model developed by Edwards (1984) and the assumptions of perfect market competition and risk-neutral lenders, the equilibrium condition can be expressed as follows:

$$(1 + r_f) = pw + (1 - p)(1 + r^l) \quad (1),$$

where:

- r_f is the risk-free interest rate, which is, in our

3 The President of the European Commission called the credit rating downgrade of Portugal as adding speculation to the market (Reuters, 2011).

4 The countries under consideration are Bulgaria, Czech Republic, Latvia, Lithuania, Hungary, Poland, Romania and Slovakia. While the variables included in the regression are government debt to GDP, interest payments to GDP, fiscal balance to GDP, trade openness, current account balance to GDP, income per capita, inflation rate, exchange rate, short-term interest rate spreads and euro area equity market volatility.

5 The countries covered by this analysis are Poland, Hungary, Czech Republic, Slovenia, Lithuania, Romania, Bulgaria, Cyprus, Croatia and Turkey.

model, represented by the government bond yield of Germany,

- p represent the probability of default,
- w represent repayment in the case of default,
- r^l is the rate of return, which is, in our model, represented by the government bond yield of European transition economies.

Assuming from equation (1) that w is zero, then the spreads (s) between a risk-free bond and the rate on bond yield from a particular country can be expressed as follows:

$$s = r^l - r_f = \frac{p}{1-p}(1 + r_f) \qquad (2),$$

in which the country's risk premium is positively related to the probability of default and the risk-free interest rate. Following Edwards (1984) in assuming that the probability of default has a logistic form, the following specification is made:

$$p = \frac{\exp\left(\sum_{j=1}^{J} \beta_j x_j\right)}{1+\exp\left(\sum_{j=1}^{J} \beta_j x_j\right)} \qquad (3),$$

Where J represents the number of explanatory variables and x_j represents the corresponding coefficients.

The choice of explanatory variables included in the regression and represented by x_j, varies considerably between studies, conditional on their focus. Nevertheless, a set of indicators concerning domestic macroeconomic indicators related to the country's solvency and liquidity position are generally included. In addition to fundamental domestic indicators, external factors are considered.[6]

Combining equations (2) and (3), the log of spreads can be written as follows:

$$\log s = \log(1 + r_f) + \sum_{j=1}^{J} \beta_j x_j \qquad (4),$$

where x_j are the determinants of government bond spreads that capture the country-specific fundamentals and external global risk indicators, and β_j represents the corresponding coefficients.

The data utilized for empirical investigation of the determinants of government bond spreads in European transition economies are not balanced across countries due to data availability. Our sample starts in the first quarter of 2001 and ends in the third quarter of 2015. The data set includes eight European transition economies: Bulgaria, the Czech Republic, Croatia, Hungary, Poland, Romania, Slovakia, and Slovenia.

In choosing the dependent variable, we follow the established practice of using secondary market spreads. Our dependent variable, government bond spread, is computed from each country's yields on harmonized long-term government bonds, respectively, against a comparable bond yield for Germany, which is considered a risk-free investment.[7] In computing our dependent variable, we follow the example of Alexopoulo et al. (2009) by computing government bond spreads from yields on harmonized long-term government bonds relative to those of Germany for each country separately. However, Alexopoulo et al. (2009) use the long-term euro average yield for comparison, while we use Germany's long-term bonds. In Appendix 1, we have presented the dynamics of spreads on long-term government bonds for the EU transition economies compared with Germany. Eurostat provides the data monthly. Following the literature that uses quarterly data, we converted the monthly data into quarterly series by simple averaging (Ferruci, 2003; Alexopoulou et al., 2009). Despite the lost benefit of using high-frequency data (daily and monthly), a compromise was made for modeling purposes, namely the use of quarterly data, since the control variables consist of macroeconomic variables generally reported quarterly or annually.

Although economic theory does not provide a complete set of control variables that practitioners generally agree on, we draw on evidence from the existing empirical literature and our discussion of the context of transition to specify explanatory variables, which are listed below.

The country's fiscal position is one of the most widely observed indicators determining the cost of government borrowing. In addition to the practical intuition in favor of including the fiscal balance in the government bond spread equation, the correlation between the two is a well-established strand in economic theory.[8] The channels through which the fiscal deficit affects long-term interest rates are based on neoclassical theory and are manifested through national saving, whereby an increase in the budget deficit is followed by an absorption of national savings and an increase in aggregate demand. This pro-

6 More detailed discussion for the choice of variables follows in the section 3.5.

7 Triple A rating prevailed for Germany through our sample period.

8 According to Ebner (2009), investors tend to view and evaluate government creditworthiness based on the fiscal position of the country (this in addition to other indicators) in similar fashion as financial intermediates discriminate among borrowers based on their balance sheet information in addition to other information

cess would generate an excessive government debt supply and increase interest rates (Baldacci and Kumar, 2010; Elmendorf and Mankiw, 1998), in addition to upward pressure on interest rates. In addition to upward pressure on interest rates, large fiscal deficits indicate the presence of macroeconomic imbalances in a country, which would generate uncertainties in financial markets toward the macroeconomic stability of the country in question (Afonso et al., 2015).

Moreover, it has been shown that the country's fiscal position is the most essential indicator of government policy credibility when markets assess a country's creditworthiness. Implementing and maintaining sound fiscal policies or restoring a deteriorated fiscal position improves governments' credibility and, thus, perceived creditworthiness (Hauner et al., 2007). Based on economic theory and suggestions from the empirical literature, we specify our model using the fiscal balance as a ratio to GDP. Therefore, we assume that a higher fiscal deficit would increase government bond spreads; hence, we expect a negative correlation between government bond spreads and the country's fiscal balance.

It has been shown that in addition to the flow values of government debt obligations-represented by fiscal deficits-the accumulated stock of debt also plays a vital role in the perceived creditworthiness of the government. Therefore, the following empirical analyses use government debt as a percentage of GDP. The literature suggests that high levels of public debt increase the likelihood of a solvency crisis and, thus, the risk of default on sovereign obligations (Baldacci et al., 2010; Afonso et al., 2015; Giordano et al., 2012). Markets can be expected to respond to an increase in the debt-to-GDP ratio with an increase in the cost of borrowing in anticipation of this increased risk of default. Based on the suggestions in the literature, spreads are expected to be positively related to government debt-to-GDP ratios, implying that the higher a country's debt-to-GDP ratio, the higher its spreads. However, from a theoretical perspective, it is suggested that as long as the rate of economic growth is higher than the rate of debt growth, even a growing debt is considered sustainable and tolerable in risk assessment (Maltriz, 2011).

Since the government fiscal balance and the stock of debt are primarily dependent on the dynamics of economic activity, economic growth rates have been shown to significantly impact investors' expectations of the government's ability to repay. Sovereign bonds become riskier, widening spreads when economic activity slows (see also Afonso et al., 2012; Giordano et al., 2012). The increase in borrowing costs stems from the expectation that a growing economy- one that can generate more government tax revenues- will be more reliably able to meet its debt obligations, ceteris paribus, than a stagnant economy (Maltriz, 2011). Therefore, we use two indicators separately to account for the effect of economic growth rates on government bond spreads. Following the conventional approach, the quarterly real GDP growth rate is the first indicator. However, there are arguments that financial markets react more frequently than the published official annual or quarterly statistical data, and therefore one should consider an indicator with higher frequency (Giordano et al., 2012). Therefore, in addition to GDP growth rates, the second alternative indicator is the *industrial production index* provided by Eurostat quarterly, which is derived from monthly frequencies. As described in the literature, a negative sign is expected, suggesting that a higher growth rate of economic activity, measured either by the GDP growth rate or the industrial production index, would reduce sovereign bond spreads.

The *inflation rate* is considered by academics, policymakers, and markets alike as an essential indicator of the stability of a country's macroeconomic environment (Min, 2008; Guler and Talasli, 2012). Since the first introduction of bond spread equations in the seminal work of Edwards (1984), the inflation rate variable has become one of the most widely considered variables in bond spread models. According to Edwards (1984), a high inflation rate signals the possibility of tighter monetary policy and a balance of payments crisis, which increases the probability of default and puts upward pressure on government bond spreads. From the investor's perspective, higher inflation rates may also reduce the face value of the bond, meaning that a higher premium would be required in an inflationary environment. Therefore, an increase in the inflation rate is expected to push the bond spread; consequently, a positive sign is expected (Edward, 1984; Ebner, 2009; Baldacci et al., 2008; Min, 1998; Poghosyan, 2012; Arslanalp and Poghosyan, 2014).

Nevertheless, a negative sign is also plausible. It is also argued that a moderate inflation rate may positively impact sovereign spreads, as a moderate increase in prices increases the tax base, which would lead to higher tax revenues for the government and thus strengthens its ability to pay its outstanding debt. Moreover, a moderate inflation rate can gradually inflate the debt in real terms (Nickel et al., 2009). Alexopoulou et al. (2009) suggest that markets can tolerate higher inflation rates because structural factors mainly drive inflation in European transition economies. The presence of relatively higher inflation rates in European transition economies may be due to the rapid increase in industrial productivity growth, especially in the earlier stages of transition, which in turn may have led to upward pressure on the price

level in the non-tradable sector via wage pressures in a unified labor market and thus to higher domestic inflation rates. Such a mechanism in inflation developments in European transition economies suggests the existence of the Balassa-Samuelson effect, the importance of which for these economies has been confirmed by several studies (including Egert et al., 2002; Mihaljek and Klau, 2003). Based on the above, the actual domestic inflation rate is included in the empirical equations; however, the expected sign is ambiguous. Domestic inflation could be interpreted as a lack of monetary control or supply-side dynamics, depending on the context.

Following the evaluation methodology of Fitch (a credit rating agency) in assessing the creditworthiness of governments, we consider the *unemployment rate* as an indicator of long-term economic sustainability (Bouchet et al. 2003). Along with the flow and stock of public debt, and the level of economic growth, the unemployment rate is considered by rating agencies to be a leading indicator for assessing the overall health of an economy. We, therefore, assume that an increase in the unemployment rate would lead to a widening of government bond spreads; hence, a positive relationship is expected.

The country's external position and competitiveness concerning external markets matter for bond yield spreads. In this context, we use the *current account balance* as a share of GDP. It is suggested in the literature that since the current account balance provides information on the external debt of the economy (public and private sector indebtedness), deterioration of this indicator indicates an unsustainable external position (external insolvency) (Strahilov, 2006). Therefore, a higher current account deficit is expected to lead to an increased perception of the probability of default and, consequently, to an increase in sovereign bond yield.

Following De Grauwe and Ji (2014), we include the *real effective exchange rate* to measure the economy's trade competitiveness. When the real exchange rate appreciates, the country is expected to lose price competitiveness as residents pay relatively less for imports and exports become more expensive. Therefore, a future current account deficit is expected, increasing sovereign risk and spreads (Min, 1998; Giordano et al., 2012). Based on the above, a positive sign is expected.

The literature points out that external factors play an important role in addition to country-specific indicators. In many countries, they are even the sole determinant of the cost of government borrowing. In this respect, we follow the example of Ferruci (2003) and Ebner (2009), among others. We include the Chicago Board Options Exchange Volatility Index (VIX), which measures the implied volatility of the *S&P 500 index* and serves as a proxy for international financial risk; in other words, an indicator of volatility in international financial markets (Mody, 2009). A higher value of the international risk factor is expected to put upward pressure on government bond spreads. Therefore, a positive sign is expected. In addition to the financial market volatility index, following Ferrucci (2003), Kamin and Kleis (1999), and Baldacci et al. (2008), among others, we also include the *US Fed fund 30 days* future rate as an indicator of global liquidity conditions and the availability of credit in the global financial system. This indicator is considered a proxy for market expectations of the US FED (Federal Reserve) policy rate in the literature. It is expected to impact the global financial market and asset allocation significantly. Based on the evidence, we expect a higher US policy rate to increase market perceptions of sovereign default and thus drive up government bond spreads (Maltritz, 2012).

The role of *institutional quality* on the government cost of borrowing, one of the foci of this paper, has been considered in previous literature. However, little research has been devoted to this essential determinant of bond spreads across countries. Because there are many functions of institutions and no single, universally accepted indicator to measure the quality of institutions, we follow the literature by using the Worldwide Governance Indicators (WGI), which quantify developments in six different segments of public institutions. The WGI indicators contain information aggregated from several underlying variables provided by different sources, with scores ranging from -2.5 for worst performance to 2.5 for best performance. Indicators are provided annually, and we linearly interpolate the data quarterly.[9] In cases where interpolation is used, the cost of linear imposition is highlighted in the data. However, it can be argued that the cost of interpolating institutional quality data may be small because the dynamics of institutional quality are not likely to fluctuate with daily or monthly frequency. Even in observed annual data, indicators move slowly between years. If interpolation had not been used for the institutional quality data, the cost of using only annual data would have been even higher. In this case, we would lose valuable information from our quarterly macroeconomic and international indicators strongly influencing the estimation technique. Because of the loss of information,

9 We follow Ebner (2009) in using EViews to interpolate the data and using the function "linear match last".

the overall conclusions could also be affected (Ferruci, 2003). The WGI provides information on the six different but interrelated governance dimensions, which are discussed in more detail in the Appendix.

For our estimation - since there is no single preferred indicator that serves as a proxy for institutional quality - we are faced with the question of whether to consider the above indicators separately or together in regressions. Although there are merits to examining the role of separate dimensions of the quality of governance in government creditworthiness, we follow Langbein and Knack's (2008) study by conducting a Factor Analysis (FA) on the six individual indicators to extract one indicator.

The FA technique is a variable reduction procedure for cases where a correlation is observed between many variables that may provide the same information. Accordingly, using the FA technique, we could retain one (preferably) or a few essential common factors to capture the variation in the risk premium attributable to variation in institutional quality.

Based on the results of the factor analyses in Appendix 2, we consider the retained factor from the FA analysis as an indicator representing the overall trend in institutional quality for the needs of our subsequent regression estimates. To check for robustness, we also run regressions in which we include the six individual indicators in the estimated models. However, these results are not presented but are available upon request.

In addition to the country-specific variables, the external indicators, and the institutional quality indicator, we also introduce dummy variables in our regressions. Since important events have taken place in global financial markets during the period under study that may significantly impact the government's cost of borrowing, we account for possible structural breaks during our analyses by introducing *dummy variables*. By introducing dummy variables, we aim to capture the impact of the global financial crisis. Following Afonso et al. (2015), we date these developments from the third quarter of 2007 and up to the first quarter of 2009.

4. ESTIMATION RESULTS

In estimating empirically the determinants of government bond spreads, therefore, government creditworthiness, the following basic regression is utilized:

The subscript *i* refers to countries (1...8), and *t* refers to the period starting with the first quarter of 2001 for the Czech Republic, Hungary, Poland, and Slovakia. Bulgaria's first year of data availability is the first quarter of 2003, Romania - the second quarter of 2005, and Slovenia the first quarter. And the sample ends in the third quarter of 2015 for all countries in the sample, resulting in an unbalanced panel (see Table 1). The β - (1...10) represents the estimated coefficients. $Spreads_{i,t}$ is the difference between the bond yield of a European transition economy as compared to the yield on bonds issued by Germany, which are considered a risk-free asset:

Spreads = i - *i**, where i represents the yield of government bonds of European transition economies and *i** represents the government bond yields of Germany.

The estimated results in Table 1 below are presented in four columns. The first column contains the estimated results from the basic regression specification. In contrast, the second column contains the estimated results with a dummy variable included to account for the period of the global financial crisis. In the third column, we present the estimated results of the second model specification, which considers the differences between the macroeconomic indicators of a given transition country and the corresponding indicators for Germany. The fourth column contains the second empirical model specification, including the dummy variable for the global financial crisis. The interpretation of the results is based on the first and second columns, although comparisons are also made with the second model specification (Columns 3 and 4).

Overall, the estimated relationships between the independent and dependent variables are consistent with our general expectations and previous empirical findings. The results are satisfactory regarding the explanatory power of the regression and the sign and significance level of the individual estimates, albeit with one exception. Contrary to our expectations, the relationship between public debt as a proportion of GDP and sovereign bond spreads is negative but insignificant in all specifications. Although a positive relationship is expected based on previous results and economic theory, suggesting that growing government debt increases the cost of sovereign borrowing-there are also cases that show a negative sign.

$$Spreads_{i,t} = \alpha + \beta_1 Deficit_{i,t} + \beta_2 Inflation_{i,t} + \beta_3 CAGDP_{i,t} + \beta_4 Unemployment_{i,t} + \beta_5 GDPgrowth_{i,t} + \beta_6 DebtGDP_{i,t} + \beta_7 REER_{i,t} + \beta_8 FEDFUNDS_{i,t} + \beta_9 SP500_{i,t} + \beta_{10} InstitutionQ_{i,t} + \varepsilon_{i,t} \quad (6).$$

A negative relationship between gross government debt and sovereign spreads is also reported in Ebner's (2009) study, where the negative relationship prevailed for some CEE countries in the sample, which are also part of our group of countries.[10] Although Ebner (2009) does not comment on this negative relationship, we suspect that given that the majority of countries in our sample had relatively low levels of public debt during the study period, investors in government bonds of these countries may have been more tolerant of growing public debt levels as compared to the more indebted countries.[11] Given the low level of public debt, increasing government borrowing for public capital investment can also be favorable for economic growth. From an economic growth perspective, such an increase in public borrowing, which can contribute to the country's expected economic growth prospects, is therefore viewed more positively than an increase in public borrowing to finance current expenditures.

Moreover, these economies have experienced relatively low public debt and relatively robust economic growth over the years. According to Matrizi (2012), increasing public debt in the face of robust economic growth can be considered sustainable from the perspective of sovereign risk assessment. Therefore investors are more risk tolerant in such an environment. Given the above considerations, a negative sign is perhaps not surprising.

Comparing two model specifications based on their explanatory power, we can find that the variance of government bond spreads in both model specifications is well explained by the included variables (R-squared = 0.87 in both model specifications). Our results in Table 1 show that government bond spreads in European transition economies over the period are both responsive to domestic economic and institutional developments and influenced by tensions and uncertainties in global financial markets.

Our results support the initial conjecture and previous empirical findings on the persistence of sovereign bond spreads (Hallerberg and Wolf, 2006; Ferruci, 2003; Alexopoulou et al., 2009). The first lagged value of the dependent variable enters highly significantly in all model specifications, suggesting that earlier values of government borrowing significantly affect the current cost of borrowing. Moreover, the value of the first lagged dependent variable coefficient is well below one, indicating a stable dynamic process (Roodman, 2009). The significant but negative coefficient on the third lag indicates the alternating sign pattern typical of dynamic models specified with multiple lags. Together with the significant coefficient for the fourth lag in Columns 3 and 4, this supports our specification with four lags of the dependent variable (although this is an obvious choice for quarterly data). Since the dependent variable is transformed into natural logs, the estimated coefficients for the lagged values are interpreted as constant elasticities. These estimates suggest that about seventy percent of the changes in bond spreads in the previous quarter are carried forward to the current quarter.

The statistical significance level of the coefficients on the first and further lags of the dependent variable confirms the need for a dynamic model specification when investigating sovereign bond spreads. Thus, models that fail to consider these dynamics may suffer from dynamic misspecification and lead to misleading results. Before discussing the other variables in our model, it is essential to note that the coefficients reported in Table 1 are short-run effects, as the lagged dependent variable is included as a regressor.

Looking at the impact of macroeconomic fundamentals, our results suggest that the country's fiscal position matters for sovereign bond pricing. In addition to the importance of the size of the fiscal deficit for the sovereign cost of borrowing (at the five percent significance level in Columns 1 and 2), the different fiscal position of a transitional European economy relative to Germany also plays an important role (at the 5 percent significance level in Columns 3 and 4). According to our estimated coefficient in Column 1 (-0.0158), a one-unit deterioration in the fiscal position (e.g., a one-percentage-point deterioration from -1 percent to -2 percent) would lead to a percentage increase in bond spreads of about 1.6 percent (e.g., from 1 percent to 1.16 percent- i.e., an increase of 16 basis points). This semi-elasticity means that the absolute change in the dependent variable is not linear but depends on the level of the dependent variable. Significant positive results of the country's fiscal position in the government bond spread in the context of European transition economies are also found in the study by Perovic (2015) and Alexopoulou et al. (2009). However, the study by Ebner (2009) found that the fiscal position of CEE transition economies does not play a role in determining sovereign borrowing costs.

10 A negative sign is reported for Poland, the Czech Republic, Slovenia and Romania.

11 On average, for all countries in the sample throughout the period of our study, debt to GDP levels are just above the 40% level. Nevertheless, the debt to GDP ratio increased considerably during the European sovereign debt crisis in some countries and noticeably in Hungary, Croatia and Slovenia, although the public debt levels gradually declined after the European sovereign debt crisis period.

TABLE 1. Regression results

VARIABLES	(1) ln_Spreads	(2) ln_Spreads	(3) ln_Spreads	(4) ln_Spreads
L1_ln_Spreads	0.723***	0.719***	0.775***	0.766***
	(0.125)	(0.126)	(0.124)	(0.126)
L2_ln_Spreads	-0.00355	-0.00604	0.00686	0.00357
	(0.0938)	(0.0935)	(0.0992)	(0.0987)
L3_ln_Spreads	-0.190*	-0.191*	-0.199*	-0.199*
	(0.0999)	(0.100)	(0.103)	(0.103)
L4_ln_Spreads	0.136	0.136	0.145*	0.141*
	(0.0826)	(0.0821)	(0.0792)	(0.0783)
Deficit	-0.0158**	-0.0154**	-0.0142**	-0.0139**
	(0.00625)	(0.00611)	(0.00576)	(0.00559)
Inflation	0.0242*	0.0255*	0.0262**	0.0284**
	(0.0132)	(0.0133)	(0.0121)	(0.0122)
Unemployment	0.0105	0.0132	0.00732	0.0105
	(0.0100)	(0.0111)	(0.00845)	(0.00932)
GDPgrowth	-0.00826	-0.00706	-0.00261	-0.000394
	(0.00634)	(0.00585)	(0.00638)	(0.00616)
DebtGDP	-0.00417	-0.00397	-0.00256	-0.00207
	(0.00271)	(0.00276)	(0.00245)	(0.00258)
CAGDP	6.55e-05	0.000156	0.000906	0.00116
	(0.00124)	(0.00122)	(0.00222)	(0.00217)
REER	0.00890*	0.00872*	-0.00551	-0.00619
	(0.00518)	(0.00506)	(0.00600)	(0.00614)
SP500	0.0454***	0.0451***	0.0382	0.0221
	(0.00794)	(0.00795)	(0.0523)	(0.0592)
FEDFUNDSfutur30D	0.641***	0.641***	0.381	0.313
	(0.0667)	(0.0662)	(0.258)	(0.284)
InstitutionQ	-0.108	-0.123*	-0.0994	-0.125*
	(0.0649)	(0.0711)	(0.0645)	(0.0786)
Crisis		-0.156*		-0.208**
		(0.0815)		(0.0983)
Constant	-65.36	-65.36	-38.56	-31.55
	(6.332)	(6.277)	(26.57)	(29.29)
R-squared	0.8729	0.8737	0.8682	0.869
Observations	313	313	317	317
Number of groups	8	8	8	8

Note: The standard errors reported in parentheses are those of Driscoll-Kraay. All estimates include quarterly dummy variables, which are not reported in the table.
*** p<0.01, ** p<0.05, * p<0.1.

In addition to the country's fiscal position, our results suggest that the inflation rate impacts the government's creditworthiness (Columns 1 and 2). Based on the results, a one percentage point increase in the inflation rate in a European transition economy would lead to a 0.24 percent increase in bond spreads. In addition to the importance of changes in the price level in European transition economies, our results suggest that financial markets also look closely at price developments in comparison (differentiated) with inflation developments in Germany (Columns 3 and 4). These results underscore the importance of inflation stability as a general indicator of the quality of macroeconomic management, and the results from Columns 3 and 4 suggest that any deviation from price developments in Germany can be viewed as a deviation from sound macroeconomic conditions.

Moreover, our results suggest that the growth of economic activity does not affect the sovereign cost of borrowing in European transition economies. While not significant, the sign is negative and consistent with previous results and our expectations. Giordano et al. (2012) point out that financial markets may be more responsive to indicators with higher frequency than to GDP growth rates published quarterly or annually. Therefore, in addition to real GDP growth rates, we use the industrial production index as an alternative indicator to account for domestic economic activity, which is also not statistically significant. In addition to GDP growth rates and the industrial production index, our results also suggest that the current account balance as a proportion to GDP and the unemployment rate do not play a role in determining the cost of sovereign borrowing, as the results of both variables are not significant in all model specifications.

Consistent with previous findings, our results suggest that the appreciation of the real effective exchange rate (REER)-an indicator that accounts for countries' competitive position in international markets-has a significant effect on sovereign bond spreads in the first model specification but is not significant in the second model specification. According to our results, a one-unit appreciation of the REER index (base=100) relative to its principal competitors in international markets (implying a loss of price competitiveness) increases sovereign bond spreads by 0.90 percent (Columns 1 and 2). With such outcomes, De Grauwe and Ji (2014) suggest that financial markets anticipate future current account deficits and debt problems; hence, a higher risk premium is demanded in such an environment[12].

In addition to the influence of macroeconomic fundamentals, our two included indicators, accounting for financial risks in global markets and liquidity conditions, are highly significant in our first model specification (Columns 1 and 2), suggesting that developments in the external environment play a significant role in the sovereign borrowing costs of transition economies. According to our results, a one-unit increase in our volatility index (S&P 500; mean across the sample = 20.8) should lead to a 4.50 percent increase in sovereign bond spreads. Moreover, our second indicator, which accounts for potential liquidity shortages in financial markets (FEDFUNDSfutur30, an index with base = 100), is also highly significant in the first model specification but not in the second model specification (3 and 4). The coefficient of 0.641 in Column 1 suggests that an average quarterly change in the US Federal Fund rate during the sample period (0.0108) increases bond spreads by slightly less than 0.70 percent in the countries in our sample. These results are consistent with findings reported in the literature focusing on transition economies, as well as in studies focusing on emerging market economies, which emphasize the importance of common external factors affecting the cost of borrowing in less advanced economies (Ferrucci, 2003; Baldacci et al., 2008; Arora and Cerisola, 2001; Eichengreen and Mody, 2000; Kamin and Kleist, 1999).

Finally, and central to our research, institutional quality plays a role in a sovereign's creditworthiness, as indicated by the significant results in both model specifications (Columns 2 and 4). Our results suggest that financial markets consider the quality of institutions for a given country when estimating default probabilities and that potential risks arising from institutional instability are therefore incorporated into the sovereign borrowing costs. Our institutional quality indicator is significant at the 10 percent level in both model specifications, suggesting that a one-point increase in institutional quality (on a 5-point scale) would lead to a 12.3 percent decrease in gov-

12 However, it can be also argued that REER appreciation that arises from an increase in the relative quality of goods and services produced within the domestic economy, which will result in increasing demand for exports and reducing demand for imports, would have the opposite effect on the current account balance. In this case, the outcome of successful supply-side reforms could lead to CA improvement and a negative sign on bond spreads would be expected in the long run. We test the alternative hypotheses by introducing a dummy variable to account for appreciation/depreciation of the REER and the results confirm our expectation in terms of sign, although not with respect to statistical significance.

ernment bond spreads in the first model specification (Column 2) and a 12.5 percent decrease in the second model specification (Column 4). In the case of the institutional quality variable, it is difficult to obtain an accurate estimate in a fixed effects regression because most of the variance in our sample is between countries (SD =1.04) rather than within countries (SD =0.29).[13] This exceeds the standard "within-between" threshold, where variables are typically considered "slowly moving" and thus resemble time-invariant variables where most of their effects are absorbed by fixed effects. Accordingly, in the case of our institutional variable, a significance level of ten percent is particularly noteworthy.

The impact of institutional quality on government bond spreads in European transition economies may be attributed to several factors. First of all, and not only European transition specific, since sovereign debt repayment is difficult to enforce, institutional credibility is also expected to play an important role in reassuring markets about debt repayment capabilities (Eaton and Gersovitz, 1981). Since sovereign borrowing does not depend on the provision of collateral, institutional credibility is expected to contribute and play a role similar to collateral in enhancing financial market confidence in sovereign debt compliance. Second, given the extensive institutional developments that characterize these countries, financial markets may be more responsive to institutional developments in transition economies. Institutional change from centrally planned to democratic and liberalized markets has occurred differently over the years of the study. In this context, financial market confidence in a country's achievements toward optimal institutional transformation may also have varied.

Moreover, the difficulties in quantifying actual institutional developments and the low frequency of data available to support financial decisions may have contributed significantly to this prevailing uncertainty. The latter is critical, given the rapidity of financial market dynamics and daily financial decisions compared to the annual availability of information on institutional quality. Finally, institutional quality provides information on the country's stability (Moser, 2007). In this regard, countries associated with institutional fragility, i.e., unstable government, are associated with higher risk. Consequently, higher spreads are attributed to them to compensate for the higher risk investors take. To our knowledge, these results are the first for European transition economies to incorporate institutional quality in a sovereign bond equation, supporting Hallerberg and Wolf's (2006) suggestion that studies that neglect institutional quality in their empirical specifications may lead to omitted variable bias.

The dummy variable representing the period of the global financial crisis (specified from Q3 2007 to Q1 2009) has a significant and negative in both model specifications (at the 10 percent and 5 percent significance levels, respectively). This suggests that government bond spreads in European transition economies declined during the global financial crisis. Since the reported results are somewhat unexpected, we investigate these results further. Since it could be argued that the onset of the global financial crisis may have occurred at a different time in transition economies than in advanced economies, we have tried alternative specifications for the global financial crisis period based on various suggestions from the literature. However, in all alternative specifications, the negative and significant results predominate.

This negative and consistent result in both model specifications, which contrasts with other empirical findings, may provide important information about investor behavior during global financial stress.[14] From this perspective, government securities in European transition economies may have been viewed as relatively safe during great financial stress, thus yielding higher returns on investment placement. According to Sgehrri and Zoli (2009), during periods of high financial stress, there is a tendency to flee to safety, particularly to relatively liquid markets. Therefore, European transition sovereign security markets may have been attractive during the international financial crisis. Moreover, the relatively low sovereign bond yields in Germany during the financial turmoil may have led investors to seek higher yields, similar to what happened during the dot com bubble burst in the US in the early 2000s- i.e., at times when there was a significant surge in the capital flow towards Emerging Market Economies, in search of higher yields (Mohan, 2009). In this regard, during the global financial crisis, European transition economies had relatively sound macroeconomic indicators and a particularly low

13 Using Stata's xtsum command.

14 The study of Ebner (2009) include a dummy variable controlling for the Argentinian crisis and negative and significant results are reported for Slovakia, Romania, , and Croatia. For EU advanced economies, Arslanalp and Poghosyan (2014) report negative and significant result for their crisis dummy variable and suggest that bond spreads in advanced economies may have declined during global financial crisis as a result of shift of investor's capital from riskier assets to safer advanced economies sovereign bonds.

debt burden, suggesting a relatively low probability of default. Moreover, some studies have found that domestic banks tend to increase their exposure to their home sovereign in times of crisis, which can lead to a decline in sovereign spreads (Acharya and Steffen, 2013). Under these circumstances, there has been a relative decline in the spread of European transition economies.

5. IMPLICATIONS OF GOVERNMENT CREDITWORTHINESS FOR BANKS AND LOANS TO SMALL AND MEDIUM ENTERPRISES

Given the increase in government debt and the existing differences in sovereign borrowing costs in the European transition economies, the question arises to what extent the government's creditworthiness affects the private sector's borrowing costs. In other words, does increasing government bond yields increase borrowing costs for non-financial corporations and households? And how does this affect overall economic growth?

The Bank for International Settlements report (CGFS, 2011) provides an overview of the potential transmission channels of government stress to private borrowing conditions, albeit relatively brief. According to this report, there are at least four possible specific channels for transmitting stress from the sovereign to the financial sector, which can lead to higher interest rates or lower quantitates of loans supplied to the private sector. The first potential channel is through the asset side of banks. Since banks hold government debt on the asset side, a deterioration in the sovereign creditworthiness devalues sovereign assets, weakens banks' balance sheets, and, therefore, negatively affects funding costs and banks' ability to secure liquidity.

Several motives drive the financial sector, particularly the banking sector, to get involved in government debt securities. The first is the interbank lending motive. Since government bonds are considered safe investments, these securities and other triple-A-rated securities are often used as collateral in interbank lending. Moreover, given the high rating of government securities, holding these securities as collateral allows banks to access liquidity provided by Central Banks (Bolton and Jeanne, 2011). Moreover, D'Erasmo et al. (2019) and Frey and Weth (2019) argue that the favorable regulatory treatment of banks' investments in government debt has served as an additional incentive to invest in government bonds. Because holdings of government bonds are considered safe assets, they do not fall under the restrictions imposed by public prudency regulations (which require sufficient capital holdings) that limit banks' risk levels, the authors note. However, D'Erasmo et al. (2019) emphasize that government securities are not always safe (as demonstrated in particular during the recent sovereign debt crisis). The favorable treatment of investments in government debt by regulators, which incentivizes government debt holdings, poses significant spillover risk to the financial sector and the broader economy in times of increasing sovereign stresses.

The second channel of action is that of collateral. Since banks use government debt as collateral for their interbank lending, a reduction in the value of government securities due to an increase in sovereign risk reduces banks' funding capacity. In this view, an increase in sovereign risk would cause the value of government securities held by the bank and used as collateral to decline. Consequently, the ability of banks to obtain liquidity in interbank markets would be reduced (Altavilla et al., 2016; CGFS, 2011). With the reduction in banks' borrowing capacity that results from the increase in sovereign risk, banks' lending conditions to the private sector are also likely to deteriorate. This deterioration in private sector credit conditions manifests itself in banks either through increased interest rates for loans or reduced lending volume.

The third channel is through the credit ratings of the credit rating agencies (e.g., S&P, Moody's, and Fitch). In the event of a sovereign rating downgrade due to an increase in credit risk, the rating of banks in the downgraded country can be expected to undergo a similar downgrade. Finally, the increase in sovereign risk reduces the possibility of providing an implicit and explicit guarantee by the government for banks, which in turn increases banks' funding costs.

In addition to the above four specific channels through which government risk can affect the banking sector and thus the cost and volume of private borrowing, there is also the possibility of an influence through the channel of general economic activity. An increase in sovereign risk could also lead to a general economic recession, increasing private sector borrowers' riskiness. Also, it may lead to a deterioration in bank funding costs. Regardless of banks' exposure to the government debt, this could lead to a tightening of credit to the private sector, either through an increase in interest rates or a reduction in the volume of credit due to increased risks to the banking business environment and increased risks to businesses operating in the downgraded economy.

Given the channels of stress transmission from government creditworthiness to the banking sector and through loans to the private sector described

above, the impact of a deterioration in government creditworthiness in the private sector could be significant and should be studied empirically. However, further investigation in this direction is reserved for future research.

6. CONCLUSIONS

This study empirically examined the determinants of government bond spreads for eight European transition economies from 2001 to the second quarter of 2015. The results suggest that government bond spreads in European transition economies are both sensitive to domestic economic and institutional developments and influenced by tensions and uncertainties in global financial markets. From a macroeconomic fundamentals perspective, the results suggest that budget deficit levels, inflation rates, and REER play an essential role in markets' assessment of sovereign creditworthiness. However, we do not find evidence that debt levels or economic growth rates determine sovereign borrowing costs.

In addition to the influence of macroeconomic fundamentals, developments in the external environment also play an essential role in sovereign borrowing costs. Among the controlled variables in our model, our first indicator of global financial market tensions (S&P 500) and the second external indicator, the US Fed fund 30 days future rate, are highly significant indicators of global liquidity conditions and credit availability in the first model specification.

Our results suggest that institutional quality matters for sovereign borrowing costs. Given the significant institutional changes that have characterized the countries studied, our results suggest that financial markets consider the quality of a given country's institutions when assessing the default probabilities. Potential risks arising from institutional instability are thus incorporated into the cost of sovereign borrowing.

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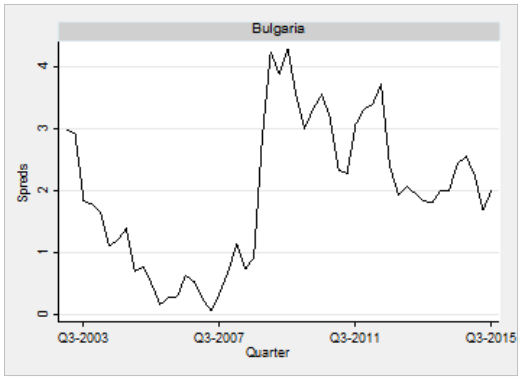
ČIMBENICI U ODREĐIVANJU RAZLIKE KAMATNIH STOPA DRŽAVNIH OBVEZNICA U TRANZICIJSKIM EUROPSKIM EKONOMIJAMA I IMPLIKACIJE ZA MALA I SREDNJA PODUZEĆA

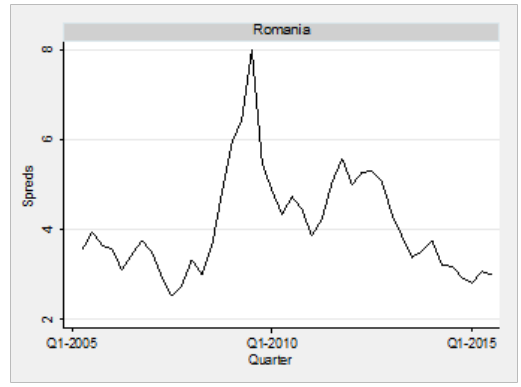
SAŽETAK

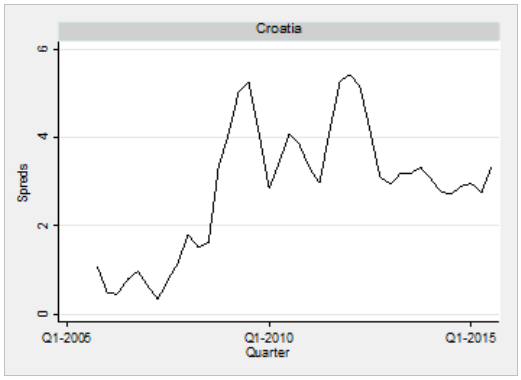
S obzirom na potrebu tranzicijskih ekonomija za financiranjem nekih od ulaganja potrebnih za razvoj putem zaduživanja, ovaj rad empirijski ispituje čimbenike, koji djeluju na određivanje razlike kamatnih stopa državnih obveznica, s posebnim naglaskom na kvalitetu institucija kao kontekstualnu dimenziju. U literaturi se općenito pretpostavlja da se ocjene tržišta rizika suverenog duga (odnosno vjerojatnosti neizvršenja kreditnih obveza), a samim tim, i troškovi zaduživanja države iznad nulte razine rizika, temelje na temeljnim makroekonomskim pokazateljima zemlje-dužnika, pokazatelja solventnosti i likvidnosti, koji se odnose na fiskalne i financijske varijable te pokazatelja vanjske financijske tržišne volatilnosti. Pomoću procjene fiksnih efekata, rezultati istraživanja ukazuju da su razlike kamatnih stopa državnih obveznica u tranzicijskim europskim ekonomijama osjetljive na temeljne domaće makroekonomske pokazatelje i globalnu financijsku tržišnu volatilnost. Od temeljnih makroekonomskih pokazatelja, kao vodeći se izdvajaju razine fiskalnog deficita, inflacijske stope i učinkoviti tečajevi zemalja te određuju razlike kamatnih stopa obveznica tijekom promatranog razdoblja. Osim toga, rezultati istraživanja ukazuju da financijska tržišta uzimaju u obzir kvalitetu institucija pri procjeni vjerojatnosti neizvršenja financijskih obveza. Stoga se potencijalni rizici, koji proizlaze iz kvalitete institucija, uzimaju u obzir pri određivanju troškova zaduživanja države. Dobiveni su rezultati robusni za različite dodatne pretpostavke, uz korištenje različitih testova robusnosti.

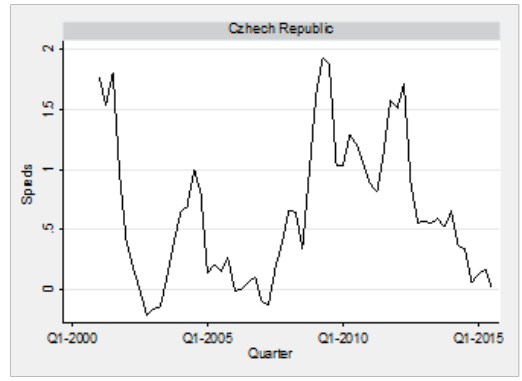
KLJUČNE RIJEČI: *državne obveznice, tranzicijske ekonomije, Europa, implikacije za mala i srednja poduzeća.*

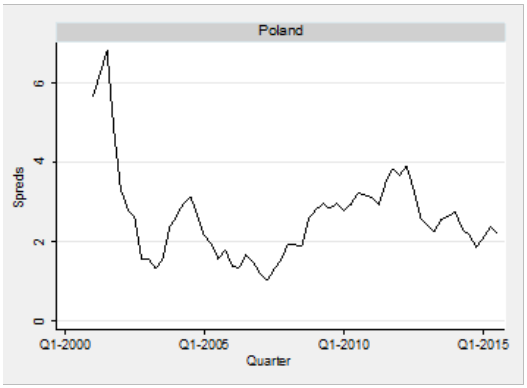
APPENDIX I. Government bond yield spreads dynamics

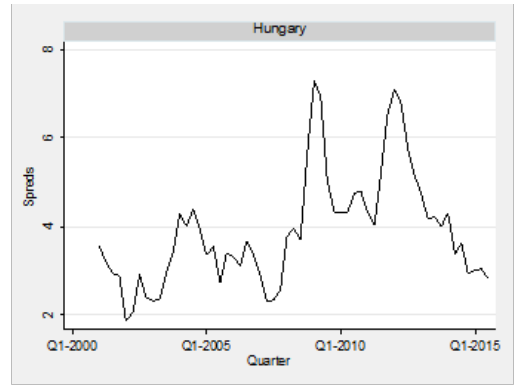


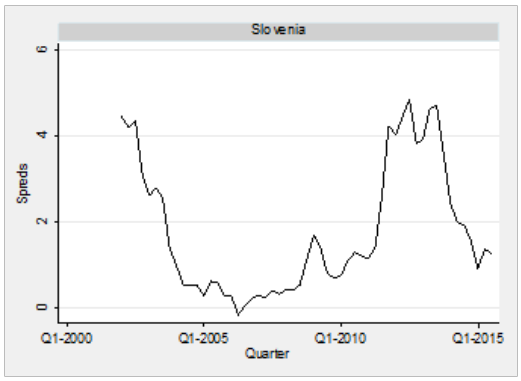


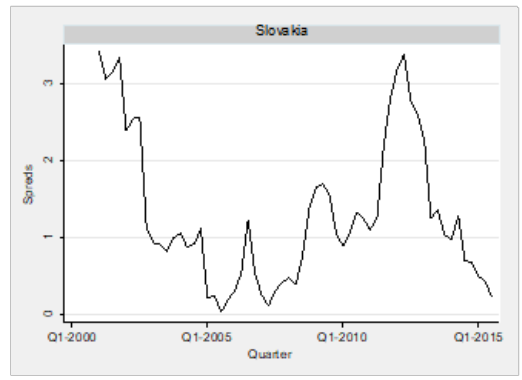












APPENDIX II. Institutional quality indicators

- *Voice and accountability*: This indicator captures citizens' perceptions of their ability to choose their own government, their perceptions of freedom of association, freedom of expression, and free media. It covers issues such as the presence of the military in politics and democratic accountability.
- *Political stability and absence of violence*: Measures perceptions of the likelihood of politically motivated violence, including terrorist threats. This indicator includes information on government stability, internal conflicts, external conflicts, and ethnic tensions.
- *Government effectiveness*: Measures the perception of the quality of public services and their independence from political pressure. In other words, it measures the perception of bureaucratic quality. In addition, it provides information on perceptions of the quality of policy formulation and implementation, as well as the credibility of the government's commitment to those policies.
- *Regulatory quality*: Provides information on perceptions of the government's ability to formulate and implement sound policies and regulations that enable and encourage private sector development.
- *Rule of law*: Contains information about agents' perceptions of law and order. More specifically, it measures the extent to which agents have confidence in the rule of law and in the quality of contract enforcement, property rights, the police, and the courts, as well as in the likelihood of crime and violence.
- *Control of corruption*: this indicator provides information about the perception of the extent to which public power is exercised for private benefit.

APPENDIX III. Factor Analyses

The identification and selection of a common factor in FA analyses is based on the values of the eigenvalues of the factorized variables that are greater than one, based on the Kaiser-Guttman criterion. According to this criterion, the variables with eigenvalues of one or greater than one contribute by one or more to the variance in the factorized variables. And as a rule of thumb, factor variables with a value greater than one have a significant impact on the variance of the factorized variables, while factor variables with a value less than one are considered an insignificant part of the variance of the underlying variables. The results of the factor analyses, presented in Table 2 below, indicate a single dominant factor explaining the variance in the factorized variables. The eigenvalue of the first factor is 4.82, while it is only 0.56 for the second factor. Moreover, as can be seen from the table below, the first factor explains about 80% of the total variance in the factorized variables.

TABLE 2. Factor analysis for the six Worldwide Governance Indicators

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	4.82628	4.26314	0.8044	0.8044
Factor2	0.56314	0.29851	0.0939	0.8982
Factor3	0.26464	0.10092	0.0441	0.9423
Factor4	0.16372	0.04643	0.0273	0.9696
Factor5	0.11729	0.05236	0.0195	0.9892
Factor6	0.06493		0.0108	1.0000
LR test: independent vs. saturated: chi2(15) = 2842.92 Prob>chi2 = 0.0000				