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Can the Adoption of the Euro in Croatia Reduce the Cost of Borrowing?

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Abstract

The paper analyses the impact of euro adoption on the reduction of borrowing costs of EU member states. The results of the analysis point to the existence of a "euro premium" – after controlling for the dynamics in the macroeconomic fundamentals of particular countries and the market sentiment, member states of the monetary union have, on average, lower borrowing costs and higher credit ratings than other EU member states. In order to draw attention to the significance that the results could have for bank interest rates in Croatia in the event of euro adoption, a simple VAR model is used to demonstrate that there is a statistically significant transmission of the changes in government borrowing costs to interest rates on bank loans.

Keywords:
euro, borrowing costs, CDS premium, credit rating, Croatia

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Contents

1 Introduction

Government borrowing costs in financial markets primarily reflect the macroeconomic fundamentals of a country and market sentiment.[1] However, during the euro area sovereign debt crisis, it became evident that the variability of government borrowing costs can be greater than entailed by the macroeconomic fundamentals and market sentiment. During the crisis period, bond spreads[2] were strongly influenced by the spillover of financial shocks across countries.[3]

Besides the aforementioned main determinants of the borrowing cost, the literature suggests that there is another relevant factor for euro area member states – the so-called *euro premium*.[4] The term refers to a certain privilege of monetary union member states reflected in the reduced investor perception of their sovereign risk following euro adoption, which is not entailed by other macroeconomic fundamentals.

Related strands of literature suggest that the euro premium has changed over time (IMF, 2015, Wiegand, 2017). Before the crisis, it was positive, allowing the euro area member states to reap additional benefits from the investors' perception of a lower degree of risk associated with euro-denominated assets. However, after the global financial crisis and the European sovereign debt crisis broke out, the euro premium seemed to disappear. Still, there are signs that it has recovered and moved into positive territory in the recent period, which may serve as a stimulus for the EU member states not yet included in the monetary union to adopt the euro. The aforementioned literature calculates the euro premium from the perspective of investors and credit agency ratings. For that purpose, the authors apply the so-called IICCR index (International Investor Country Credit Rating Index) and the S&P credit rating. As far as the authors of this paper are aware, the empirical literature has not, until now, analysed the influence of the euro premium on CDS (credit default swap) or bond spread developments.

Building upon the existing literature, this paper examines the significance of the euro premium for the sovereign risk dynamics of European countries measured by the CDS premium and credit rating. The results based on panel regressions suggest that, after control for the dynamics of their macroeconomic and fiscal fundamentals, euro area member states have, on average, lower risk premiums and higher credit ratings than other EU member states. In other words, the existence of a positive euro premium is confirmed, in spite of its short-term disappearance during the European sovereign debt crisis, and signs of its recovery in the recent

1 The literature concerning the determinants of spreads is abundant and includes Eichengreen and Mody (200), Min (1998), Ferrucci (2003), Alexopolou, Bunda and Ferrando (2009), Petrova, Papaioannou and Bellas (2010) and Caceres, Segoviano and Guzzo (2010). In the case of Croatia, the determinants of spreads were analysed by e.g. Bobetko, Dumičić and Funda (2011), Žigman and Cota (2011) and Dumičić and Ridzak (2011).

2 Spread is a term used in the paper both for the difference between the yields on the bonds of a particular euro area member state and the yield on the German government bond and for the sovereign CDS premium for the debt of a member state.

3 Among others, Beirne and Fratzscher (2013) and Kunovac (2013).

4 See, for example, Swanson (2008), IMF (2015) and Wiegand (2017).

period are observed. In the entire observed period (2007-2016), euro area member states had, on average, 10% lower CDS premiums than other countries in the sample, and the effect is even stronger if the crisis period is excluded, in which case the CDS premiums were 35% lower.

Furthermore, another important result of the analysis is that the high level of financial euroisation is a relevant indicator when explaining the dynamics of a country's CDS premium and credit rating. When the high level of domestic financial euroisation is borne in mind, this finding can be particularly significant in the context of potential euro adoption in Croatia. Specifically, it suggests that euro adoption could have an *above-average positive effect* on government borrowing costs.

When interpreting the results it is necessary to exercise caution. The quantitative effects of euro adoption need not materialise in the short term – for instance, immediately upon joining the monetary union; rather, they represent average effects that materialise over a longer period, which includes the formal introduction of the euro. In addition, results are based on panel data analysis and, therefore, constitute merely the average impact of monetary union membership on the borrowing cost. Therefore, when interpreting the results at individual state level, it is necessary to be highly cautious and bear in mind the aforementioned limitations of the analysis.

Although the focus of this paper is on the impact of euro area membership on government borrowing costs in financial markets, the results may be relevant for the borrowing costs of all domestic sectors. In other words, lower government borrowing costs following the adoption of the euro could put downward pressure on interest rates on loans in the banking sector and thus have a positive effect on other economic entities as well (Albertazzi et al., 2012, Zoli, 2013). The paper addresses this issue using a simple VAR model to analyse the extent to which the oscillations of the CDS spread for Croatia were relevant to the interest rate dynamics of domestic banks. Results suggest that the aforementioned transmission is *statistically and economically significant*; however, the overall significance of CDS developments is *not* dominant in determining domestic interest rates.

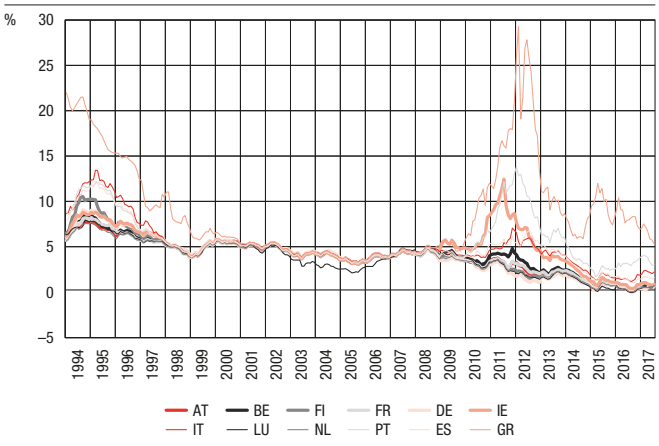
As with the assessment of the euro premium, the interpretation of these results requires caution. Firstly, the analysis was conducted based on Cholesky identification, which is why the CDS shocks identified, although statistically orthogonal relative to other shocks, do not allow meaningful structural interpretation. For example, assuming that Croatia joins the monetary union and the risk premium drops, it is not entirely clear whether CDS developments would, in this case, be the same as those identified in this analysis, and, consequently, it is not entirely clear whether a similar response is to be expected from domestic banks' interest rates. In order to reach such a conclusion, a much more complex model is needed. In spite of the aforementioned disadvantage, and although our results represent the average effect on interest rates, we consider them a good starting point for a more detailed analysis of the transmission mechanism mentioned above.

The paper is divided into several chapters. The second chapter provides an overview of borrowing cost changes in euro area member states from 1990, when the EMU was established, to this day. The third chapter quantifies the effect that joining the euro area would have on government borrowing costs and the country's credit rating, based on which the euro premium is calculated. The fourth chapter examines the transmission of CDS dynamics for Croatia to interest rates of domestic banks. Finally, the paper discusses benefits that may arise from reduced government borrowing costs for Croatia.

2 Developments in the borrowing costs of euro area member states

The favourable effect that joining the monetary union could have on the borrowing cost can be observed in the context of the decrease in the yield on long-term government bonds. The convergence of long-term yields on the government bonds of member states had been achieved years before the introduction of the common currency. Initially, the establishment of the EMU was accompanied by great uncertainty, as it was not clear whether a sufficient number of member states would be capable of meeting the convergence criteria or

Figure 1 Ten-year government bond yields of EU core member states



Source: ECB.

whether they would simply withdraw from the treaty. The uncertainties waned gradually as countries made progress in reducing inflation rates and fiscal imbalances. As market participants believed that the bonds of these countries would be converted into euro simultaneously, they were treated as substitutes and their yields began to converge. Upon the introduction of the common currency (stage three of the EMU), bond yields of euro area member states were very low and relatively stable over a longer period (Figure 1). In the literature, this benefit of lower yields of euro area member states arising from their membership in the monetary union, beyond their macroeconomic fundamentals, is referred to as the *euro premium*.

Empirical research confirms that long-term interest rates in euro area member states decreased considerably and converged immediately upon the introduction of the euro. For instance, Ehrmann et al. (2007) examine the integration of the bond markets in France, Germany, Italy and Spain after euro adoption and conclude that the countries witnessed strong convergence of government bond yields of varying maturities. This cannot be attributed exclusively to the decrease in the significance of idiosyncratic shocks specific for particular member states, but is rather partially a result of the creation of the monetary union.[5] Côté and Graham (2004) also confirm the strong convergence of long-term government bond yields of euro area member states, but emphasize that the process of their synchronisation across member states began prior to the adoption of the euro owing to the harmonisation of monetary and fiscal policies with the aim of meeting the Maastricht criteria.

At the beginning of the global crisis, in 2008 and 2009, long-term interest rates grew noticeably in certain euro area member states (particularly in the peripheral ones), and government bond yields of euro area member states began to diverge, particularly after the onset of the European sovereign debt crisis in 2010 and 2011. It seems that bond spreads of countries most heavily affected by the crisis were narrower before the crisis than their macroeconomic fundamentals would imply, while after the crisis, the opposite applied. In other words, the positive euro premium that had existed before the crisis disappeared during the crisis and perhaps even moved into negative territory.

Following the outbreak of the crisis, the empirical literature focused on discovering the reasons behind the divergence in the assessment of default risk of euro area member states. One of the reasons for the divergence cited in the literature is the fact that financial markets began attributing greater importance to the macroeconomic fundamentals of countries significantly affected by the crisis (e.g. Greece) and penalised any deterioration in the fiscal indicators in all euro area member states more severely due to suspicions regarding the determination of the European Central Bank to provide necessary liquidity should the crisis escalate. The question arose as to how much the rise in the government bond yields and their spreads was a result of

5 The authors confirm their conclusions based on the daily data from the bond markets. The application of such data has the advantage of setting a higher standard for assessing bond market convergence as it is more probable that a certain degree of government arbitrage will reduce differences in interest rates at lower frequencies.

deterioration in macroeconomic fundamentals and to what extent it was influenced by other factors. For instance, Beirne and Fratzscher (2013) assess the extent to which deterioration in macroeconomic fundamentals, changes in the response of financial markets to an increase in sovereign risk in neighbouring countries and other unobserved changes in the behaviour of market participants contribute to a rise in sovereign risk after the outbreak of the crisis. Their results show that macroeconomic fundamentals of euro area member states, particularly those on the periphery, became relatively more significant in assessing sovereign risk after than before the crisis and that the transmission of sovereign risk from one euro area market to the other declined. Moreover, a strong increase in sovereign risk was recorded in a large number of states that cannot be explained by deterioration in fundamentals, pointing to financial contagion. The authors conclude that financial markets underestimated the sovereign risk of peripheral euro area member states in the pre-crisis period and that they may have overrated its relevance after the onset of the crisis. Aizenmann et al. (2013) also discovered that the risk in southern peripheral euro area member states (Portugal, Italy, Ireland, Greece and Spain) was overrated after the outbreak of the crisis as a result of the market's expectation of future deterioration in the fundamentals of these countries (instead of reliance on current fundamentals) and excessive market pessimism associated with the deterioration in the fiscal indicators of these countries. De Grauwe and Ji (2013) confirm that a sudden increase in the spreads of peripheral euro area member states in the period after 2010 was the result of, among other things, a change in the economic sentiment of investors and their significantly greater caution regarding the deterioration in the fiscal indicators of these countries. The authors conclude that, in the context of deterioration in fiscal indicators, markets are significantly less tolerant to euro area member states than to countries where the central bank can still serve as the lender of last resort. Another explanation for the stronger increase in the CDS spreads of euro area peripheral member states than would be implied by their fundamentals is found by De Santis (2015) in the so-called redenomination risk. The term indicates the risk that, in the event that a country exits the euro area, its assets will be redenominated in a new currency which could be devalued vis-a-vis the euro.

A study very closely linked to our analysis, Wiegand (2017), shows that the euro premium existed before the crisis, from investor point of view, but that it disappeared in 2010, after which it began to recover, and, ultimately, return into positive territory in 2015 and 2016. However, its level over the past two years has been half of what it was in the pre-crisis period. Consequently, a positive euro premium, although lower than in the pre-crisis period, could be a significant motive for countries to introduce the euro. In addition, the author stresses that the adoption of the euro is particularly important for countries that are heavily euroised, because it reduces currency risk, which is, in turn, reflected in the risk perception of these countries.

3 Measuring the effect of reduced borrowing costs following euro adoption

The effect of euro adoption on the borrowing costs of EU member states was estimated using a regression model which describes the developments in the risk premiums and credit ratings of EU countries based on the dynamics of macroeconomic fundamentals and other factors, which include a dummy variable for euro area membership (euro premium) as the key factor used in the analysis and a dummy variable for the level of financial euroisation. We also observe the euro premium over time in order to establish whether it is possible, in the current conditions, for a country joining the monetary union to expect improvement in investor perception of its sovereign risk.

3.1 CDS, credit rating and their determinants

The risk premium of a particular country is usually measured by the difference (spread) between the yield on its bond and the yield on a risk-free or low-risk instrument. In practice, German government bonds are most frequently taken as risk-free.

Investors investing in government bonds can hedge against credit risk by purchasing a CDS, a financial instrument allowing them to transfer the credit risk associated with the bond to the seller of the instrument. By purchasing a CDS, the investor buys insurance in case the government is not capable of meeting its obligations, e.g. paying out a coupon and/or the nominal value of the bond. In theory, CDS and bond spreads should have similar dynamics[6]; however, in practice, there are several reasons why CDS and bond spreads sometimes diverge (De Wit, 2006), although, as a rule, there is a high correlation between the two.

The price of the CDS depends on a country's macroeconomic fundamentals, which reflect the bond issuer's probability of default. Fundamentals are most frequently described by total public debt and budget balance, real growth and GDP per capita. High public debt and budget deficit can be linked to difficulties in debt servicing, which is why a positive connection between public debt and borrowing cost and a negative connection between budget balance and the CDS spread is expected. The real GDP growth rate and the level of GDP per capita should positively affect the ability to service debt, which is why they are expected to be linked to lower spreads. In addition to macroeconomic fundamentals, the borrowing cost is also affected by global risk appetite (or aversion), as is the case with the prices of other financial assets freely traded on the market.

The determinants of spreads for Croatian government bonds have been analysed in several research papers, notably in Bobetko, Dumičić and Funda (2011), Žigman and Cota (2011) and Dumičić and Ridzak (2011). In the aforementioned analyses, the authors stress the significance of macroeconomic fundamentals for the developments in the financial markets. However, during the euro area sovereign debt crisis, it became evident that there are other factors affecting the dynamics of spreads. Kunovac (2013) uses a sample of selected EU member states (Croatia included) to find that a significant portion of spread variability is linked to the spillover of financial shocks across countries. The fact that the intensity of such spillovers is often significantly greater than implied by the link between macroeconomic fundamentals points to the presence of financial contagion. Furthermore, due to frequent deterioration in the countries' credit ratings, the question of the extent to which they affect the increase in government borrowing costs also arose.

Credit ratings, like bond and CDS spreads, also rate sovereign risk and therefore depend on similar macroeconomic and fiscal indicators. An increase in public debt and a widened budget deficit are thus expected to contribute to a deterioration of a country's rating, while accelerated real GDP growth and higher GDP per capita are expected to provide a positive contribution. It is important to note that credit rating agencies base their assessment of sovereign risk on other qualitative assessments as well, using a wide range of economic, fiscal and political factors.

3.2 Data

The analysis has been conducted on quarterly panel data available from the first quarter of 2007 to the last quarter of 2016 for 23 European Union member states (due to the lack of data, the analysis begins from 2007 and Greece, Cyprus, Malta, Luxembourg and the United Kingdom have been excluded). In the first step of the analysis, we estimated the connection between the CDS spread (or a country's credit rating) and the selected fundamentals – public debt, budget balance, real growth, global risk aversion index (VIX), GDP per capita, the common CDS spread component,[7] dummy variable for euro area membership and dummy variable

6 Assuming that i is the yield on a one-year bond, r is the yield on an equivalent risk-free instrument and cds is the corresponding premium of insurance against the credit risk associated with the bond, the purchase of the insured portfolio consisting of the aforementioned bond and insurance in the form of CDS is approximately equal to the purchase of a risk-free security because $i - cds = r$ applies. Consequently, $cds = i - r$, meaning that the CDS and the bond spread are, in theory, equivalent.

7 Based on Kunovac (2013), we estimate the common European CDS premium component using principal component analysis in order to take into

for euroisation. We used five-year CDS premiums taken from S&P Capital IQ. Credit rating is calculated as the average of the country's ratings according to the three most relevant credit rating agencies (Moody's, S&P, Fitch).[8] Credit rating data were drawn from the Bloomberg database. The source of data on macroeconomic fundamentals is Eurostat. The data on the VIX index, the risk appetite indicator, were taken from the Chicago Board Options Exchange (CBOE). Finally, the dummy variable for euroisation takes the value one if the share of foreign currency deposits in total savings and time deposits[9] is higher than 50% or if the share of loans made in a foreign currency or with a currency clause exceeds 50% of total loans. The sources of data for this variable are the ECB and national central banks.

3.3 Euro premium calculation

CDS spreads are entered into the model as logarithms[10], while credit ratings are represented as levels. A one-year moving average was calculated for public debt, budget balance and GDP per capita in order to exclude short-term cyclical fluctuations, while real GDP was defined in terms of annual growth rates. Unobserved heterogeneity among countries included in the sample is taken into account by adding fixed effects. Accordingly, the basic specification of the model is:

$$\begin{aligned} Y_{i,t} &= c + \eta_i + \beta_1 Debt_{i,t} + \beta_2 Balance_{i,t} + \beta_3 GDP_{i,t} + \beta_4 VIX_t + \\ &+ \beta_5 PC_t + \beta_6 GDPpc_{i,t} + \sum_{t=1}^{T} \beta_{7,t} D_t EA_{i,t} + \beta_8 Euroisation_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where $Y_{i,t}$ is the CDS premium/credit rating for a country i in time t, c is a constant, η_i are fixed effects for each country i, and $\varepsilon_{i,t}$ is the model random error.

The changes in the risk premium are explained by a series of indicators: $Debt_{i,t}$ denotes the government public debt of a country i in time t as a percentage of GDP, $Balance_{i,t}$ is the government budget balance of a country i in time t as a percentage of GDP, $GDP_{i,t}$ is the country's i annual real GDP growth rate in time t, VIX_t is the market volatility index in time t, PC_t is the common spread component in time t, $GDPpc_{i,t}$ is the country's i GDP per capita in time t.

The following dummy variables were used as key variables in our analysis: $EA_{i,t}$ is the dummy variable which takes the value one if the country i is a member of the EMU in time t (and zero otherwise), D_t is the time dummy variable taking the value one at the moment t (and zero otherwise), $Euroisation_{i,t}$ is the dummy variable taking the value one if the country is highly euroised at the moment t (and zero otherwise). It is important to stress that the parameter $\beta_{7,t}$ with the variable indicating membership in the monetary union ($D_tEA_{i,t}$) changes over time, enabling us to calculate the time-varying euro premium (see Wiegand, 2017).

Note that, in the model where the dependant variable is represented as a logarithm (CDS spread), the interpretation of dummy variable effects (the time-varying euro premium and the level of euroisation) is not trivial. In order to allow the interpretation of parameters with dummy variables in terms of percentage change, it is necessary to calculate exponentials $exp(\beta_{7,t})$ and $exp(\beta_8)$ instead of actual values $\beta_{7,t}$ and β_8. However, even such a transformation can be biased, unless the error is log normal – technically, we may say that the expectation operator and the logarithm function "do not commute". The aforementioned bias is usually small and, in

account possible spillover and financial contagion effects across EU countries, as well as other common dynamics. This variable includes, to a large extent, a surge in the observed premiums which occurred during the European sovereign debt crisis. Omitting this variable from our specification could lead to inconsistently estimated model parameters.

8 A comparable discrete linear scale was constructed for all three agencies where each rating level was assigned a score from 1 to 17, the highest possible rating (AAA for S&P and Fitch and Aaa for Moody's) being 17. Each of the remaining rating levels was assigned an appropriate score, and the last level of the so-called investment status (BBB for S&P and Fitch and Ba3 for Moody's) was assigned the score '8'. The group comprising the lowest rating levels (below CCC+ for S&P and Fitch and Caa1 for Moody's) was assigned the score '1'.

9 Demand deposits were included in the euroisation calculation for Sweden and Latvia.

10 By using logarithms, series variance is compressed and stabilized, reducing the problem of unequal variance in residuals, or the so-called error heteroscedasticity. Furthermore, this type of compression can be helpful in the interpretation of obtained elasticities – having in mind the relatively wide dispersion of CDS premiums (over time and across countries), the reaction of spreads may be more informative when it is represented in terms of percentage change rather than levels (percentage points).

practice, often disregarded,[11] but it is necessary to bear in mind that the analysis is based on biased results (for more details, see Giles, 2011, and Kunovac et al., 2008).

3.4 Results

The results of the parameter estimate are available in Table 1 and show that macroeconomic fundamentals have a statistically significant effect on the CDS premium and credit rating. An increase in public debt and global risk aversion drives the CDS premium up and credit rating down, while an increase in budget balance and real GDP drives the CDS premium down and credit rating up.[12]

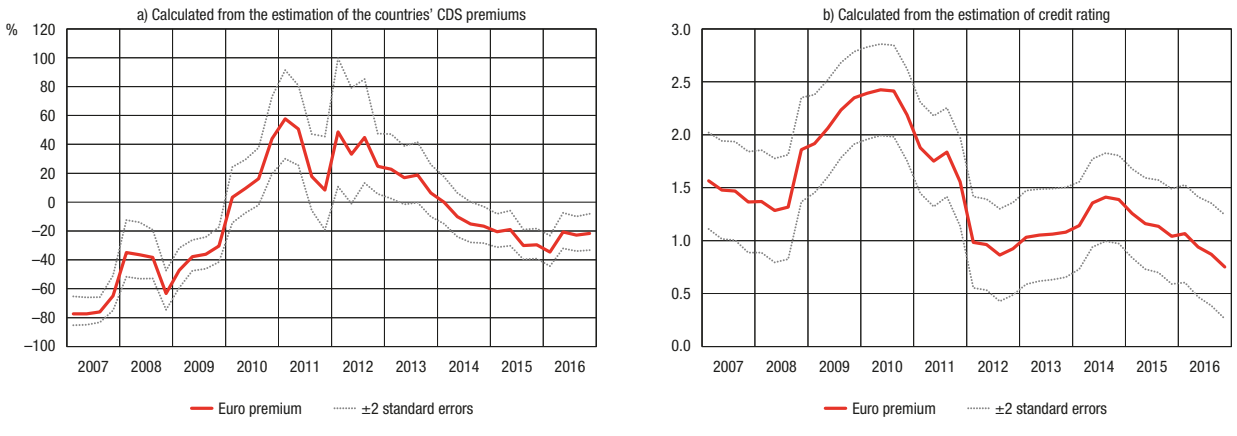
Based on models with fixed effects, we calculated the time-varying euro premium incorporated in the movement of CDS spreads and credit ratings. The movement of the euro premium in CDS spreads (Figure 2a) shows that the premium existed until 2010, i.e. in the period preceding the public debt crisis in euro area member states. After controlling for relevant macroeconomic and fiscal indicators and the economic sentiment in the markets, euro area member states had lower average CDS spreads than other countries included in the sample. Our results confirm the findings about investor perception obtained by Wiegand (2017) and suggest that the euro premium, which had been incorporated in the borrowing cost before the crisis, temporarily disappeared during the crisis. What is more, it seems that, during that period, membership in the monetary union increased the perception of risk of member states, as their CDS spreads grew more than would have been

Table 1 The effect of fundamentals, risk aversion, EMU membership and euroisation level in the country on the CDS premium and credit rating

	Debt	*Balance*	GDP	VIX	PC	GDP p. c.	EA	Euroisation	C	R^2
CDS premium	1.72***	–4.53***	–4.02***	2.98***	8.02***	0.01***	Figure 2a	37.33***	25.58	0.93
Credit rating	–0.096***	0.054***	0.039***	–0.009***		0.000***	Figure 2b	0.142	12.763***	0.95

Notes: Symbols ***, ** and * indicate significance levels of 1%, 5% and 10% respectively. Significance levels are based on White robust standard errors.
Source: Authors' calculations.

Figure 2 Euro premium



Source: Authors' calculations.

11 When calculating the model parameters, the adjustment for the aforementioned bias was taken into account as in Giles (2011). Parameters are available upon request. The euro premium and all other parameters based on this alternative method of assessment deviate only slightly from the results given in Table 1.

12 The robustness of the results was verified by estimating a model without fixed effects, which, in addition to the independent variables from the original model, also includes the square of GDP per capita in order to control for the unobserved heterogeneity among countries, as well as to analyse the potential non-linear correlation between GDP per capita and CDS premium/credit rating (see Kunovac and Ravnik, 2017). Obtained results do not deviate significantly from those given above and are available upon request.

expected based on the dynamics of their fundamentals and the market sentiment. Over the past three years, the euro premium has recovered slightly, *but it is still lower than before the public debt crisis in the euro area*. If the entire period is observed, euro area member states had, on average, around 10% lower CDS premiums than other states included in the sample, and the effect is even stronger if the crisis period is excluded, in which case the CDS premiums would have been almost 35% lower.

The euro premium calculated on the basis of credit rating estimation (Figure 2b) was positive throughout the entire period, even though it dropped considerably during the crisis, after which it stabilised at a level almost a half lower than that before the crisis, although still in positive territory. Over the entire period, euro area member states had, on average, a credit rating approximately one and a half times higher than other countries included in the sample.

An important finding of the analysis is that highly euroised countries, such as Croatia, have a higher average CDS premium and lower average credit rating[13] than other countries included in the sample. This suggests that these countries could gain additional benefit from euro adoption, in addition to that implied by the positive euro premium.

4 Transmission of changes in the country's risk premium to bank interest rates in Croatia

In this chapter, we use a simple (Bayesian) VAR model in differences to quantify the extent to which the changes in the perception of risk of Croatia's sovereign debt measured by the CDS spread is transmitted to banks' interest rates on household and corporate loans. In order to control for external factors, we included the first component of CDS spreads of European countries[14] in the model using block-exogeneity restrictions (see Krznar and Kunovac, 2010). We used monthly data for the period from the beginning of January 2007 to the end of February 2017. The source of data for interest rates of banks and corporations is the CNB.

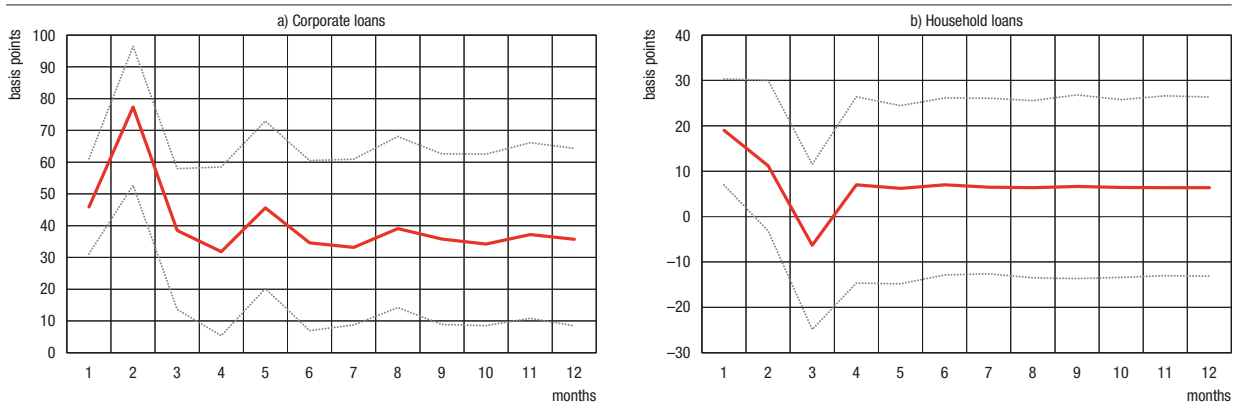
In the applied VAR model, we identified three mutually orthogonal shocks: the shock in the common component of CDS spreads of EU member states, the shock of the domestic CDS spread and the shock to bank interest rates. The transmission of CDS developments onto bank interest rates depends on the shocks that generate CDS dynamics at a given moment. For instance, the CDS spread for Croatia can be under the dominant influence of external factors, i.e. shocks to the common CDS spread component, or under the influence of domestic factors (see Kunovac, 2013). Although the aforementioned external factors are generally relevant for developments in interest rates, they are not primarily significant for this analysis. There is no basis for expectation that, in the event of euro adoption and the consequential possible CDS decline, the transmission will occur through its external component. If, in the context of euro adoption, the transmission of *total* CDS variation to interest rates (including the domestic and the external component) were observed, the effect would certainly be significantly overestimated. For the purposes of this analysis it is necessary to identify the isolated shock of the domestic CDS spread component and quantify its effect on the interest rates of banks. Due to the orthogonality of shocks in the model, the shock to the domestic CDS variable is, by definition, *cleared* from the influence of external shocks, and, as such, it provides the required interpretation.

Using Choleksy identification, we identified the shocks of the model with the following sequence of endogenous variables: the common CDS spread component, the CDS spread of the Republic of Croatia and the interest rates of banks, after which we used the standard tools of VAR analysis, impulse response function and variance decomposition to discover the extent to which the changes in the CDS spread for Croatia are relevant for bank interest rates.

13 Statistically significant in the assessment of credit rating only in the model without fixed effects.

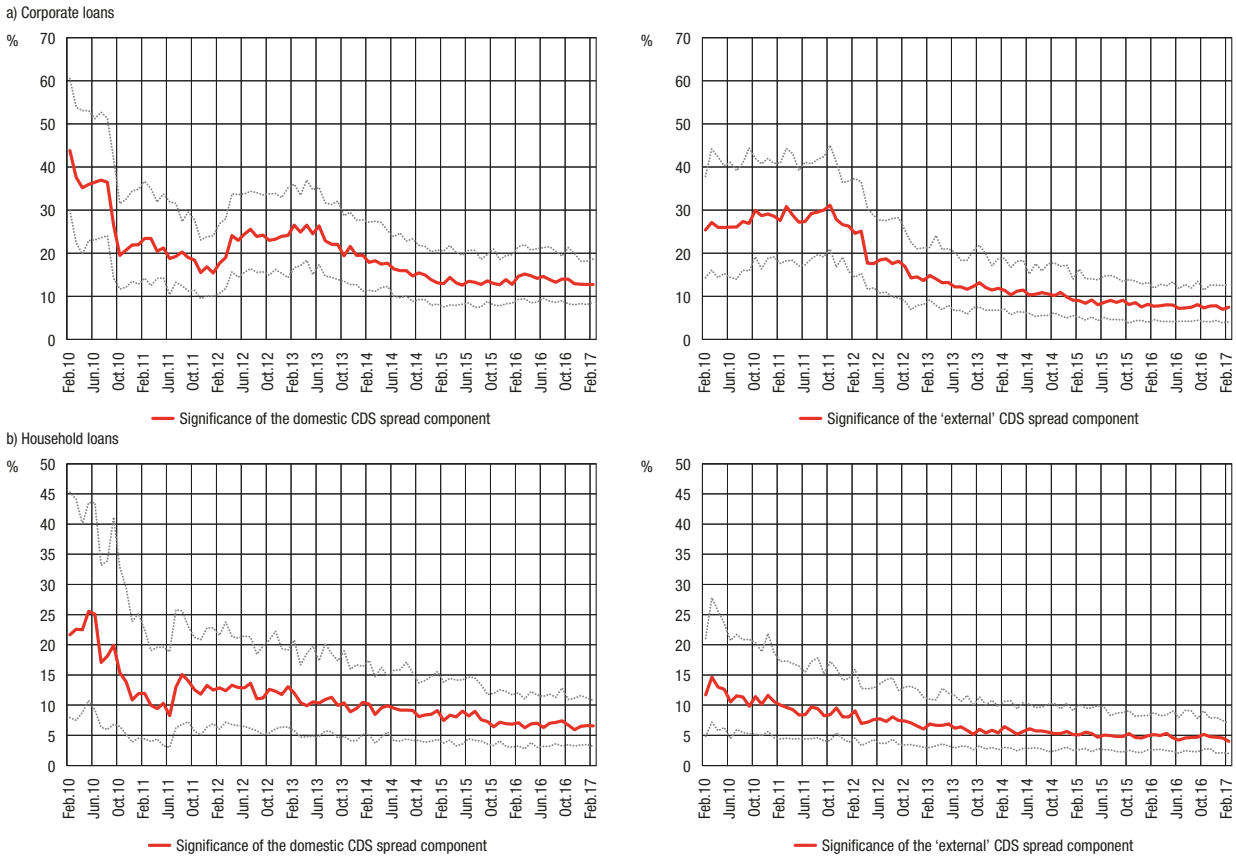
14 Besides the variables specified above, we added the EURIBOR and the indicator of regulatory costs for banks to the model in order to verify the robustness of the results. The results thus obtained did not deviate significantly from those shown here.

Figure 3 Impulse response functions



Note: The number of lags is set at three using the Akaike information criterion.
Source: Authors' calculations.

Figure 4 CDS spread significance for the variance of banks' interest rates



Note: The Diebold-Yilmaz index was calculated by extending the observed sample on a monthly level starting from February 2010.
Source: Authors' calculations.

The impulse response function of the estimated model shows that, during the observed period, the interest rates of domestic banks were under the influence of the change in the risk premium measured by the CDS spread. Figure 3 shows that the transmission was fast and fully materialised within several months. The reaction of bank interest rates on corporate loans to the exogenous increase in CDS of 100 basis points was statistically significant, on average, amounting to 50–70 basis points within the first three months, while in the nine

months that followed, the interest rates responded by approximately 40 basis points. The reaction of banks' interest rates on household loans was significantly weaker. At the beginning of the observed period, the effect on the interest rates hovered around 20 basis points, but in the long term it was very small.

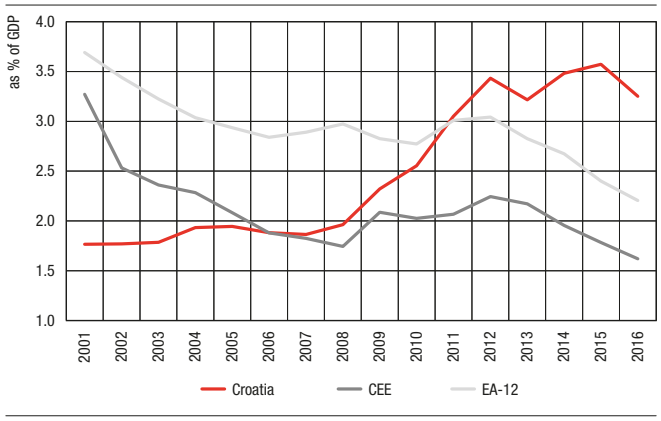
Once the statistical connection between CDS changes and the banks' interest rates has been established, the question arises of the relative significance of CDS for the variation of interest rates relative to other variables affecting their movement, which may be determined on the basis of variance decomposition.

Figure 4 shows the so-called Diebold-Yilmaz index illustrating the percentage of the variance of banks' interest rates in the period from February 2010 to February 2017 which can be explained by the identified shocks of the domestic and the *external* CDS spread component. The results show that the significance of the domestic CDS spread component for the oscillations in banks' interest rates changed over time. During the European public debt crisis (until the end of 2012) it stood at somewhat higher levels, around 25% for corporations and around 14% for households, on average. After that, the significance of the domestic CDS spread component for both loan groups started to decline. As explained earlier, the CDS spread affects banks' interest rates through its *external* ("imported") component as well. The effect of that component, although less significant for this analysis, has a noticeable effect on the variance of bank interest rates, but it also dropped gradually towards the end of the observed period. The result is in line with the findings in Kunovac (2013), showing that a large portion of CDS and bond spread variance is under the influence of external developments.

5 Conclusion

The results of this analysis can be highly significant for Croatia. Firstly, a decline in the risk premium, which may occur if Croatia joins the monetary union, would contribute to a decrease in the interest rate on new government borrowing. Reducing the price of borrowing is important because Croatia is a heavily indebted country. Although recently the cost of servicing the public debt in the market was reduced, it is still relatively high in Croatia compared with old euro area member states and peer countries (Figure 5).

Figure 5 Expenditures for interest on public debt



Notes: CEE countries include Bulgaria, the Czech Republic, Hungary, Poland and Romania. EA-12 refers to Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.
Source: AMECO database.

The paper describes two simple analyses which have shown that, first, highly euroised countries, such as Croatia, have, on average, higher CDS premiums and lower credit ratings than other countries included in the sample. For this reason, such countries could gain additional benefit from euro adoption, in addition to that derived from the positive euro premium. Second, we have demonstrated that the drop in the risk premium of

the Republic of Croatia is transmitted to interest rates on loans of domestic banks. This may, ultimately, have consequences noticeable in overall real activity.

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