

UNIVERSITY OF WUPPERTAL  
BERGISCHE UNIVERSITÄT WUPPERTAL

EUROPÄISCHE WIRTSCHAFT UND  
INTERNATIONALE MAKROÖKONOMIK



Samir Kadiric/Arthur Korus

**The Effects of Brexit on Corporate Yield Spreads:  
Evidence from UK and Eurozone Corporate Bond Markets**

[Read our papers which stand for quality, independent economic analysis](#)

EIIW Diskussionsbeitrag 251  
EIIW Discussion Paper 251



*Europäische Wirtschaft und Internationale Wirtschaftsbeziehungen  
European Economy and International Economic Relations*

ISSN 1430-5445



Samir Kadiric / Arthur Korus

**The Effects of Brexit on Corporate Yield Spreads:  
Evidence from UK and Eurozone Corporate Bond Markets**

September 2018



*Herausgeber/Editor: Prof. Dr. Paul J.J. Welfens, Jean Monnet Chair in European Economic Integration*

EUROPÄISCHES INSTITUT FÜR INTERNATIONALE WIRTSCHAFTSBEZIEHUNGEN (EIIW)/  
EUROPEAN INSTITUTE FOR INTERNATIONAL ECONOMIC RELATIONS  
Bergische Universität Wuppertal, Campus Freudenberg, Rainer-Gruenter-Straße 21,  
D-42119 Wuppertal, Germany  
Tel.: (0)202 – 439 13 71  
Fax: (0)202 – 439 13 77  
E-mail: [welfens@eiiw.uni-wuppertal.de](mailto:welfens@eiiw.uni-wuppertal.de)  
[www.eiiw.eu](http://www.eiiw.eu)

JEL classification: C32, G12, G14, G32

Key words: corporate bond yield spreads, credit risk, Brexit, event-study



## **Summary**

Using event-study techniques we investigate the impact of Brexit-related events on the corporate bond yield spreads in the United Kingdom and euro area, respectively. We want to find out whether Brexit-related news, including the Brexit referendum itself, had an impact on the risk conditions in those two corporate bond markets. Our estimation results indicate that the announcement of the referendum result is associated with increasing credit spreads in the UK and EA. However, only the actual announcement of the UK referendum result itself had an influence on the credit spreads. Furthermore, we distinguish between the financial and the non-financial economic sectors in order to analyze more specific sector-related effects of the referendum event. Our estimation results suggest that UK credit spreads were more strongly influenced by the announcement of the results of the Brexit referendum than credit bond spreads in the euro area were. Finally, we split our sample into pre-referendum and post-referendum periods to consider the potential changing evaluation of the determinants of corporate bond spreads due to altering risk pricing triggered by the Brexit referendum result. We find that the effect of credit default risk is far stronger and plays a significant role in the post-referendum period in UK and EA, respectively.

**Acknowledgements:** This paper is part of EIIW research funded by the Deutsche Bundesbank; While the authors gratefully acknowledge funding from the Deutsche Bundesbank within the project “The Influence of Brexit on the EU28: Banking and Capital Market Adjustments as well as Direct Investment Dynamics in the Eurozone and other EU Countries”, opinions expressed within represent those of the authors and do not necessarily reflect the views of the Deutsche Bundesbank or its staff. We gratefully acknowledge editorial assistance by David Hanrahan (EIIW), data assistance by Behailu Shiferaw Benti and Valeryia Siarheyeva and comments by Prof. Dr. Paul J.J. Welfens. The usual disclaimer applies.



Samir Kadiric, M.B.A., Research Assistant at European Institute for International Economic Relations (EIIW) at the University of Wuppertal, Rainer-Gruenter-Str. 21, 42119 Wuppertal, Germany, [kadiric@eiiw.uni-wuppertal.de](mailto:kadiric@eiiw.uni-wuppertal.de)

Arthur Korus, Dipl.Ök., Research Assistant at European Institute for International Economic Relations (EIIW) at the University of Wuppertal, Rainer-Gruenter-Str. 21, 42119 Wuppertal, Germany, [Korus@eiiw.uni-wuppertal.de](mailto:Korus@eiiw.uni-wuppertal.de)

EIIW 2015 = 20 years of award-winning research

## **Effects of Brexit on Corporate Yield Spreads: Evidence from UK and Eurozone Corporate Bond Markets**

EIIW Diskussionsbeitrag 251  
EIIW Discussion Paper 251

### **Table of Contents**

<b>Table of Contents.....</b>	<b>I</b>
<b>List of Figures .....</b>	<b>II</b>
<b>List of Tables.....</b>	<b>II</b>
<b>1. Introduction .....</b>	<b>1</b>
<b>2. Theoretical Background and Related Literature .....</b>	<b>2</b>
<b>3. Data Description .....</b>	<b>5</b>
<b>4. Econometric Analysis .....</b>	<b>7</b>
4.1 Event Study Methodology .....	7
4.2 Estimation Results .....	9
4.3 Additional Brexit-related events.....	19
<b>5. Time-varying aspects.....</b>	<b>22</b>
<b>6. Conclusion .....</b>	<b>30</b>
<b>References.....</b>	<b>32</b>

# List of Figures

Figure 1: An overview of credit spreads..... 6

# List of Tables

Table 1: The impact of the Brexit referendum on UK credit spreads (overall economy).. 10

Table 2: The impact of the Brexit referendum on UK credit spreads (financial sector).... 12

Table 3: The impact of the Brexit referendum on UK credit spreads (non-financial sector)  
..... 13

Table 4: The impact of the Brexit referendum on EA credit spreads (overall economy) .. 15

Table 5: The impact of the Brexit referendum on EA credit spreads (financial sector) .... 17

Table 6: The impact of the Brexit referendum on EA credit spreads (non-financial sector)  
..... 18

Table 7: The impact of other Brexit-related events on UK credit spreads (overall  
economy)..... 20

Table 8: The impact of other Brexit-related events on EA credit spreads (overall economy)  
..... 21

Table 9: UK credit spreads overall economy ..... 24

Table 10: UK credit spreads financials ..... 25

Table 11: UK credit spreads non-financials ..... 26

Table 12: EA credit spreads overall economy..... 27

Table 13: EA credit spreads financials ..... 28

Table 14: EA credit spreads non-financials..... 29



# 1. Introduction

In our analysis we try to capture and measure the effect of the UK's decision to leave EU28 (Brexit) on the risk conditions in the United Kingdom (UK) and euro area (EA) corporate bond markets.

As yields are intensely disposed to variations in the overall bond market, they do not represent an appropriate way to capture and analyze risk conditions in the corporate bond market. On account of this, in our study we use the yield spread (sometimes just called the credit spread), i.e. that part of corporate bond yield that is above the yield of risk-free bonds - most prevalently government bonds with an equivalent maturity. The resulting corporate bond yield spreads as an indicator of a risk premium are expected to express the risk conditions exposure of firms in the UK and Eurozone. This issue is of key importance from a corporate finance but also from a policymaker's perspective because the UK's leaving of the EU (most probably on March 29th, 2019) will directly affect capital market structure as well as the timing of debt and fund-raising decisions.

Hence, our paper is related to the literature which focuses on the short-term effects of Brexit on financial markets. These studies elaborate on the impact of Brexit on stock markets, exchange rates, and interest rates. Davies and Studnicka (2017) analyze the effects of Brexit-related events on stock movements in the UK by using event study methods. They find that the announcement of the referendum's result led to a sharp decline of the FTSE 350. Also by conducting an event study, Ramiah, Pham and Moosa (2017) find that stock prices of financials were particularly affected by the Brexit referendum. Belke et al. (2016) study the impact of Brexit on policy uncertainty and international financial markets. They find that international stock markets were affected by an increase in the probability of Brexit. Moreover, Belke et al. (2016) find that European stock market indices were affected by an increase in the likelihood of Brexit and that the effects between European countries were similar.

By applying long-memory techniques, Caporale, Gil-Alana and Trani (2018) find that the Brexit referendum led to significant changes in the degree of persistence of the FTSE 100 Implied Volatility Index and on the British pound's implied volatility vis-à-vis the euro and the US dollar, respectively. Many studies also elaborate on the impact of Brexit on exchange rates. For instance, Korus and Celebi (2018) examine the impact of Brexit-related news on the spot exchange rate of the British pound against the euro. By splitting Brexit-related events into 'good' Brexit news and 'bad' Brexit news, they find that, bad Brexit news is associated with a depreciation of the British pound against the euro whereas good Brexit news appreciates the Pound sterling against the euro. The Bank of England (2016) examines the impact of the Brexit referendum on interest rates in the United Kingdom. It finds no clear impact of referendum-related news on short-term interest rates. Belke et al. (2016) also elaborate on the impact of Brexit on long-term interest rates. Their empirical results suggest that an increase in the Brexit probability decreased 10-year government bond yields in the UK and in risk-free countries, respectively. Though, they do find that sovereign CDS for 10-year government bonds increased in the UK due to Brexit.

A key aspect of our research in this paper is to determine and quantify the impact of Brexit-related events on risk conditions in the UK and EA corporate bond markets, respectively.

We focus on the yield spread of corporate bonds, defined as the yield differential of a corporate bond relative to that of a benchmark government bond yield with a similar maturity. We use daily data for the period from January 2013 to March 2018. We consider major determinants of corporate bond yield spreads, which are largely based and affirmed by previous studies in this field.

Several findings are of a particular interest. First, we investigate whether the announcement of the Brexit referendum result had an impact on UK and EA credit spreads for bonds with a remaining maturity of 1-3 years, 3-5 years, 5-7 years, 7-10 years and 10+ years, including all rating groups, respectively. We find that the effect of the referendum outcome on corporate bond markets is much stronger in the UK market than in the EA market. Second, differentiating between the financial and the non-financial economic sectors allows us to analyze more specific sector-related effects of the referendum result. Our results indicate that the impact of Brexit on credit spreads for a given maturity is higher for financials than for non-financials, especially in the EA where corporate bond spreads in the non-financial sector were hardly or not at all affected by the referendum result. Third, we split our sample into pre-referendum and post-referendum periods, to consider the potential changing evaluation of the determinants of corporate bond spreads due to altering risk pricing triggered by the Brexit referendum result. We find that the impact of determining variables on corporate bond yield spreads in the UK and EA is not constant over time and that particularly the effect of credit default risk is far stronger and plays a significant role in the post-referendum period in UK and EA, respectively.

This paper differs from others in that, to the best of our knowledge, we are the first to analyze the impact of Brexit on corporate bond yield spreads in the UK and EA. Further contributions of this study are as follows: (I) It extends the existing literature on corporate bond yield spreads in the UK and EA, which to date is rather scarce, while (II) analyzing the UK and EA corporate bond markets simultaneously allows for a direct comparison of the two markets and (III) it is the first to use of the forward swap market as an explanatory variable for credit spread.

The remainder of this paper is organized as follows. Section 2 presents the theoretical background and gives a review of related empirical literature. Section 3 presents the data used in this study. In section 4, we examine the theoretical determinants of credit spread and discuss our empirical results. Section 5 delivers time-varying estimation results before, section 6 finally concludes.

## **2. Theoretical Background and Related Literature**

The leading theoretical framework for studying the pricing of corporate debt was developed by Black/Scholes (1973) and Merton (1974). Black and Scholes (1973) presented a complete general equilibrium theory of the pricing of options and corporate liabilities, though the focus of their analysis lay on valuing options. Both Merton (1974) and Black/Scholes (1973) presciently recognized that a similar analysis could be applied to all corporate securities and became leading contributions in the development of pricing theory for corporate liabilities

in general. According to Merton (1974), the holder of risky corporate bonds can be treated as being an owner of risk-free bonds who has issued put options to the holder of the firm's equity. Based on this theory the so-called structural model of default was developed which is extensively used to analyze corporate bond spreads<sup>1</sup>. This model offers both a natural economic understanding and an endogenous clarification of credit default allowing applications of option pricing methods.

Another method for modeling credit risk is known as the reduced-form approach, essentially developed by Jarrow/Turnbull (1995), Duffie/Singleton (1999) and Duffee (1999). Compared to the structural models, reduced-form models are more flexible and therefore default risk can to some extent play a bigger role in the pricing of corporate bonds. While the earliest studies have only been able to explain less than half of the variation in credit spreads, leading to the emergence of the so-called "credit spread puzzle"<sup>2</sup>, more recent analyses in this field such as Chen/Collin-Dufresne/Goldstein (2009), Feldhütter/Schaefer (2018), Chen et al. (2018) are explaining variance in credit spreads very well and could lead to resolving the credit spread puzzle.

There is a vast body of empirical literature on corporate bond yield spreads, though most of these analyses focus on the US corporate bond market. Prior empirical work can be found in Longstaff/Schwartz (1995) and Duffee (1998). Longstaff/Schwartz (1995) use monthly data for industrial, utility and railroad corporate bond yields for the period from 1977 to 1992. They regress changes in credit spreads on proxies for two factors: Changes in the 30-year Treasury yield as a proxy for the changes in the interest rate and the returns on industrial, utility and railroad stock indices as a proxy for the return on the underlying assets. These two factors have good explanatory power and both are negatively related to credit spreads. Duffee (1998) focuses on the differences between callable and non-callable bonds and uses monthly data on investment grade corporate bonds from January 1985 through March 1995 to examine how yield spreads vary with changes in the level and slope of the Treasury term structure. He measures the slope with the spread between the 30-year constant-maturity Treasury yield and the 3-month Treasury bill yield and shows that the relation between yield spreads and the slope of the Treasury term structure is also generally negative. Furthermore, although considering various maturity and ratings combinations, only the inclusion of the level and slope of the Treasury term structure can explain (a little less than) 20% of the variation in the average credit spread.

Elton et al. (2001) are the first to analyze tax effects on changes in corporate bond credit spreads<sup>3</sup>. Compared to government bonds, corporate bonds have to offer a higher pre-tax return to yield the same after-tax return, since corporate bonds are subject to state and local taxes on interest payments while government bonds are not subject to these taxes. Indeed, they show that taxes account for a considerable portion of the differential between corporates and treasuries, but still a large part of the credit spread remains unexplained. However, using a model with the Fama-French factors (Fama/French (1993)), they find that as much as 85% of the unsolved spread can be interpreted as being a return for bearing systematic risk. To

---

<sup>1</sup> Structural models were further investigated and developed by, among others (see the literature overview in Huang, 2010), Black/Cox (1976), Longstaff/Schwartz (1995), Collin-Dufresne/Goldstein (2001) and more recently by Chen/Collin-Dufresne/Goldstein (2009), Huang/Huang (2012), Dötz (2014) and Feldhütter/Schaefer (2018).

<sup>2</sup> See, for example, Amato/Remolona (2003), Christensen (2008) and Goldstein (2010) for further discussion of the credit spread puzzle.

<sup>3</sup> We exclude tax effects in this study.

them, this is clear evidence that credit spreads contain a risk premium required for bearing systematic risk, which is above and beyond the expected loss from default. A subsequent study by Liu et al. (2009) underpin the findings of Elton et al. (2001) that taxes and systematic risk premiums are important factors determining credit spreads in US corporate bond market.

Collin-Dufresne/Goldstein/Martin (2001) likewise confirm the finding of Elton et al. (2001). They study the credit spread changes on a monthly basis for 688 bonds from 261 different issuers over the period between July 1988 and December 1997. They additionally control for various liquidity variables, asset volatility, nonlinear effects and the return on the S&P 500 amongst other essential financial and macroeconomic variables, and still they are able to explain only about 25% of the variation in the credit spread changes. Interestingly, the residuals from these regressions are highly cross-correlated, and a principal components analysis implies that they are mostly driven by a single common factor. This common systematic factor is likely not firm-specific but an aggregate factor common to all corporate bonds, liquidity premium may be one such factor. Following up on the work from Collin-Dufresne et al. (2001), Campbell/Taksler (2003) analyze the US corporate bond market from February 1995 to December 1999 focusing on the effects of equity volatility on corporate bond yields. Their results suggest that volatility can explain as much of the cross-sectional variation in yields as credit ratings can.

From a theoretical point of view it is anticipatory that for a less liquid asset, investors would demand higher expected returns as a compensation for the liquidity risk (Amihud/Mendelson, 1986). The most utilized measure for estimating liquidity is the bid-ask spread, however the spread is not always available for all bonds or for all time periods. Unlike other studies (e.g. Chakravarty/Sarkar (1999), Schultz (2001) and Hotchkiss/Ronen (2002)) which use the trading volume and bid-ask spread as measures of liquidity, Collin-Dufresne/Goldstein/Martin (2001) find only weak evidence for a liquidity premium in the corporate bond yield spread. This suggests that their measures of liquidity (the spread between on- and off-the-run Treasuries, swap spreads, and the frequency of quotes versus matrix prices in the Warga database) may simply be inadequate to capture this factor.

Using a data set of 999 investment grade euro denominated corporate bonds, Houweling/Mentink/Vorst (2005) provide strong evidence of priced liquidity in the euro corporate bond market. Using a four-variable model to control for interest rate risk, credit risk, maturity and rating differences between bonds, they find that for eight out of nine liquidity proxies<sup>4</sup> the null hypothesis that liquidity risk is not priced is rejected. In their study, in contrast to Elton et al. (2001), tax effects are not included.

Longstaff/Mithal/Neis (2005) use weekly data on corporate bond prices for 68 US firms during the period from March 2001 to October 2002 to investigate the role of credit default swaps in explaining changes in credit spread. Using credit default swaps allows to directly measure the size of the default and non-default components in corporate yield spreads. They find that default component accounts for the majority of the credit spread across all ratings, which is in contrast to the results from previous studies. On the other hand, their results indicate that the default component does not explain the entire corporate credit spread. Using

---

<sup>4</sup> Liquidity proxies used are: issued amount, listed, euro, on-the-run, age, missing prices, yield volatility, number of contributors and yield dispersion

different interpretations of liquidity<sup>5</sup>, they find that bond-specific illiquidity measures are important in explaining cross-sectional differences, while market-wide measures of liquidity explain a sizeable portion of the common variation in all corporate yield spreads, which is clearly consistent with the evidence in Collin-Dufresne/Goldstein/Martin (2001). In contrast to Elton et al. (2001), they find only weak support for the hypothesis that the non-default component is due to tax effects.

Chen/Lesmond/Wei (2007) investigate bond-specific liquidity effects on the yield spreads using a battery of liquidity measures covering 4,000 US corporate bonds over a 9-year period from 1995 to 2003. Spanning both investment and speculative grade categories, they find the persistence of a strong explanatory power of liquidity for both categories, but it is more pronounced for speculative grade bonds. Moreover, consistent with Longstaff et al. (2005), they find inconsistent statistical evidence of a tax effect. However, in contrast to Longstaff et al. (2005) and Campbell/Taksler (2003), they find little evidence of the importance of either the outstanding principal amount in explaining bond liquidity nor of an equity volatility effect in explaining bond yield spreads. Bond-specific and macroeconomic liquidity effects are the subject of many subsequent studies, which confirm the result that the liquidity premium is an important determinant of expected bond returns; see e.g. Lin/Wang/Wu (2011). Analyzing recent financial crises, Dick-Nielsen/Feldhütter/Lando (2012) and Friewald/Jankowitsch/Subrahmanyam (2012) find that the effect of illiquidity increases dramatically with the onset of the subprime crisis particularly for non-investment grade bonds, confirming the hypothesis of “flight-to-quality” in periods of financial distress. Using a regime-switching model, Acharya/Amihud/Bharath (2013) confirm these results, suggesting the existence of time-varying liquidity risk of corporate bond returns conditional on episodes of flight to liquidity.

### 3. Data Description

In this section, we present the data used for estimating corporate bond yield spreads in the UK and the EA. We use daily data for the period from January 2013 to March 2018.

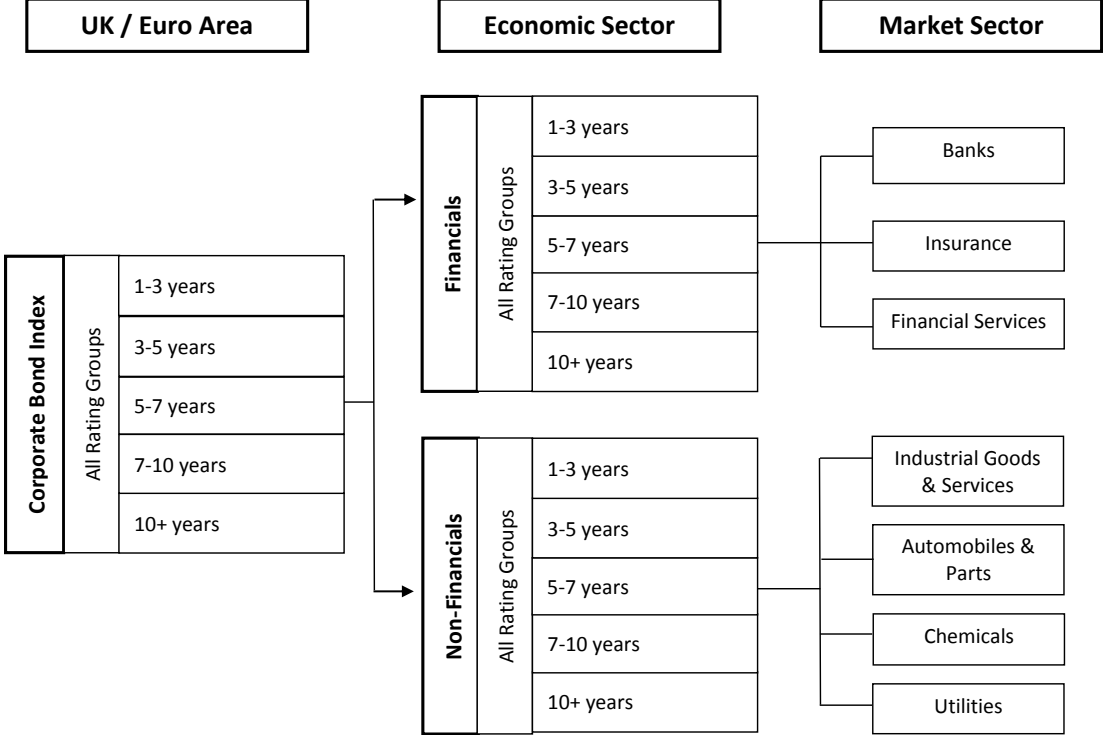
We use iBoxx indices on corporate and government bonds for the UK and EA, respectively, provided by IHS Markit. Sovereign bond indices contain data on yield, maturity and market value. In addition, corporate bond indices report data on the economy, economic sector, business sector and rating. In our analysis, we include indices on the economy as a whole, two diverse economic sectors (financial and non-financial) and seven business sectors (banks, insurance, financial services, chemicals, industrial goods and services, automobiles and parts and utilities). We explore a range of five different time-bands relating to the remaining maturity, namely 1-3 years, 3-5 years, 5-7 years, 7-10 years and 10+ years. We choose to take indices for all rating groups combined to capture the corporate bond market as a whole. The credit spread in the respective country  $j$  is defined as the difference between a corporate bond yield with a maturity of up to  $m$  and a benchmark government bond yield

---

<sup>5</sup> Longstaff/Mithal/Neis (2005) use the following liquidity proxies: bid-ask spread, notional amount outstanding, age of the bond, time to maturity and 2 dummy variables; one for bonds issued by financial firms and one for bonds issued by highly rated firms

with a maturity of up to m. Figure 1 presents an overview of the estimated credit spreads. All data relating to bonds have been obtained from Datastream.

**Figure 1: An overview of credit spreads**



Source: Own representation

Following the argumentation in ECB (2014), we decided to apply the OIS 3-month rate ( $ois_{j,t}$ ) as a proxy for a risk-free interest rate. In order to account for the slope of interest rate curve, we include term spread ( $trisk_{j,t}$ ) in our estimations, which is calculated as a difference between ten- and two-year benchmark government bond yields.  $lrisk_{j,s,t}$  represents the liquidity premium. In the absence of bid-ask data, we follow the approach of Schuknecht et al. (2010) and use the size of a debt issue discounted by yield of corresponding index.  $fwdswap_{j,t}$  is the 5-year forward on a 5-year swap rate in the UK and the EA, respectively. When estimating corporate bond yield spreads representing the economy as a whole, we use the return indices of the FTSE 100 and of the Euro Stoxx 50, as a proxy for return on equity. Return indices of FTSE financials and FTSE non-financials as well as Euro Stoxx financials and Euro Stoxx non-financials are used by estimation of particular economic and market sectors in the UK and EA, respectively. We include  $usvix_t$  in all regressions, which represents implied volatility of the S&P 500 index. All above data are obtained from Datastream.  $cds_{j,t}$  is credit default swap on the UK and EA. Credit default swap data on UK are obtained from Datastream. Credit default swap data for the EA is calculated as the sum of GDP-weighted credit default swaps for each member country, excluding Luxemburg and Greece. Luxemburg is excluded due to an absence of data whereas Greece is excluded to avoid the bias of an extremely high and volatile credit default swap. GDP data are extracted from Eurostat and credit default swap data on EA member countries are obtained from

Datastream.  $globav_t$  represents global investors' risk aversion and is calculated as the difference between the yield of US corporate BBB bonds and the 3-month Treasury rate. Corresponding data are extracted from the Federal Reserve Bank of St. Louis.

## 4. Econometric Analysis

### 4.1 Event Study Methodology

The choice of corporate bond yield spread determinants employed in our analysis is largely based on previous work in this field. We estimate the following regression model applying the ARMA Maximum Likelihood (ML) method, using a Gauss-Newton algorithm, over the period from 1 January, 2013, to 30 March, 2018:

$$\Delta CS_{j,s,m,t} = \alpha + \gamma brexit_t + \beta_1 \Delta ois_{j,t} + \beta_2 \Delta fwdswap_{j,t} + \beta_3 \Delta lrisk_{j,s,t} + \beta_4 \Delta trisk_{j,t} + \beta_5 \Delta cds_{j,t} + \beta_6 \Delta stockrtn_{j,s,t} + \beta_7 \Delta usvix_t + \beta_8 \Delta globav_t + \beta_9 ar(1) + \beta_{10} ma(1) + \varepsilon_t$$

where  $\Delta CS_{j,s,m,t}$  is our dependent variable of interest and represents the daily change of the credit spread in country  $j$ , for sector  $s$  and remaining maturity  $m$ . The credit spread in the respective country  $j$  is defined as the difference between a corporate bond yield with a maturity of up to  $m$  and a benchmark government bond yield with a maturity of up to  $m$ . The vector  $brexit_t$  is our independent variable of interest and is an event-dummy variable which is associated with the announcement of the referendum result. This dummy variable takes the value of one on 24 June, 2016 and zero elsewhere. In other specifications, an additional 16 Brexit-related events are included. In principle, Brexit is associated with lower expected future GDP growth rates due to lower aggregate productivity and hence lower expected firm profits. We suspect that aggregate productivity will decline due to increasing barriers to trade in goods and services, to labor and to capital mobility. Lower future firm earnings will lead to a weakening of firm values. A decreasing firm value is associated with an increase of a firm's default probability. Moreover, imported intermediate goods and services will get more expensive due to higher import tariffs. This will lead to higher production costs and hence lower expected profit prospects. Thus, a firm's default probability will rise. According to the dividend discount model of Gordon/Shapiro (1956), expectations about future effects induced by Brexit-related news will immediately affect financial assets and hence credit spreads. To sum up, we hypothesize that Brexit-related news is associated with increasing credit spreads.

Moreover, in other specifications we split our Brexit events into good Brexit news and bad Brexit news by reading to the Financial Times thoroughly as we suspect that not all Brexit-related news items in our event list are associated with rising credit spreads<sup>6</sup>. There may be some items of Brexit-related events news which lead to declining spreads because this news

---

<sup>6</sup> See Celebi/Korus (2018) for a detailed description of the classification of good and bad news.

might implicate that Brexit will not occur or that its impact on the respective economy might not be as severe as predicted. We have identified nine bad Brexit news events and eight good Brexit news events.

The variable  $ois_{j,t}$  reflects the three-month OIS rate in the UK and euro area, respectively. We add  $ois_{j,t}$  into our baseline specification in order to control for the impact of an increasing risk-free rate on credit spreads. An increase of the risk-free rate should affect credit spreads negatively because higher interest rates are associated with an increasing risk-neutral drift of the firm value process (Longstaff/Schwartz, 1995). Generally a higher drift leads to a lower risk-neutral probability of default and thus to declining credit spreads. Furthermore, by including  $ois_{j,t}$  into our regressions we also control for the impact of conventional monetary policies conducted by the Bank of England and the European Central Bank on the credit spreads, respectively.

$fwds_{j,t}$  is a 5-year forward on a 5-year swap rate in the UK and EA, respectively. A forward interest rate swap is a bilateral agreement in which two parties agree to swap the difference between a fixed interest rate and a flexible interest rate on a set date in the future with predefined terms. A forward swap can therefore be understood as an interest rate swap starting at a defined future date (for example, one may wish to enter into a 5-year swap 5 years from the present date). Investors use forward swaps to cover the future expected risk of changes in interest rates. An increase of the forward swap rate may imply investors' expectations about higher short rates in the future, which leads to a decrease in credit spreads. From a different point of view, higher expected future short rates could suggest a positive indication of future overall economic health, which again results in lower credit spreads. To sum up, we expect that the variable  $fwds_{j,t}$  has got a negative impact on our dependent variable of interest.

The variable  $lrisk_{j,t}$  captures the impact of liquidity risk on the credit spreads. In general, investors have to be compensated for holding less liquid assets. This implies lower prices for less liquid bonds which, in turn, leads to higher bond yields and therefore to higher yield spreads (Longstaff et al. (2005), Chen et al. (2007)). In this paper, we use the discounted size of a debt issue as a proxy for liquidity risk premium (Schuknecht et al., 2010). We suspect that the size of a debt issue has a negative impact on the credit spread.

The variable  $trisk_{j,t}$  represents term spread and controls for the impact of the slope of the interest rate term structure on credit spreads. The term spread is defined as the difference between the 10-year benchmark government bond yield and the 2-year benchmark government bond yield. The term spread could be used as an indicator for overall economic health (Duffee (1998), Collin-Dufresne et al. (2001)). An increase of the term spread reflects a stronger economy and hence an increasing term spread is associated with declining credit spreads. Moreover, an increase of the term spread may be associated with higher expected short-term rates and hence with decreasing credit spreads. To sum up, we expect that the variable  $trisk_{j,t}$  has a negative impact on our dependent variable of interest.

The corporate credit default swaps (CDS) provide an almost ideal way of directly measuring the size of the risk-neutral default component (credit risk premium plus expected default loss) in corporate yield spreads (Longstaff et al., 2005). In order to approximate the credit default risk we use the corresponding CDS premium on government bonds ( $cds_{j,t}$ ), due to



limited access to data corporate CDS. Nonetheless, recent research in this field has verified a strong theoretical and empirical evidence for risk transfer from sovereign to corporate (see, e.g., Augustin et al. (2016), Bedendo/Colla (2015), Acharya et al. (2014)). Thus, we believe that government CDS are still a good proxy for credit default risk in credit spreads. We expect that increasing CDS spreads are associated with rising credit spreads.

The variable  $stockrtn_{j,s,t}$  is the respective benchmark stock market index from the UK and the euro area, respectively. In this study, we use the return indices of the FTSE 100 and the Euro Stoxx 50. Equity markets reflect up-to-date information and are good indicators of the overall state of the economy (Longstaff/Schwartz (1995), Collin-Dufresne et al. (2001)). Thus by including benchmark stock market indices into our baseline specification, we try to capture the influence of changes in the business climate on credit spreads. An increase in the value of a firm's equity should decrease the probability of default and therefore we expect a negative impact on credit spreads.

Furthermore, we include the implied volatility of the S&P 500 index ( $usvix_t$ ). This variable captures the impact of global financial market uncertainty on our dependent variable of interest. Given expected profits, the volatility of firm value hurts bondholders, because it increases the probability of default (Campbell/Taksler, 2003). Thus, volatility should drive up the bond yields and increase credit spread ceteris paribus. Thus, we expect that an increase of the US VIX leads to rising credit spreads.

The variable  $globav_t$  represents global investors' risk aversion and is calculated as the difference between the yield of US BBB corporate bonds and 3-month US Treasury bond yields. Higher global risk aversion generally leads to a higher demand for safe assets due to a flight-to-quality response (Schuknecht et al. (2010), Klose/Weigert (2013)). Hence, in times of global financial turmoil or greater uncertainty, government bond yields decline and corporate bond yields rise. Thus, we expect a negative impact of  $globav_t$  on credit spreads in the UK and EA corporate bond markets.

In other specifications, we also control for the impact of macroeconomic news on credit spreads by including the United Kingdom series and the euro area series of the Citigroup economic surprise index (CESI). Furthermore, we check for the influence of the Bank of England's (NSMPBOE) European Central Bank's (NSMPECB) non-standard monetary policy announcements on our dependent variables of interest. Moreover, we include an AR(1) term ( $ar(1)$ ) and MA(1) term ( $ma(1)$ ) into our baseline specification. The term  $\varepsilon_t$  represents the error term.

The variables used in our regressions are defined as follows: Credit spreads, three-month OIS rates, the 5-year forward swap rates, the term spread, CDS spreads, our measure for general investor risk aversion, and the CESI index are expressed as percentage point changes. The size of a debt issue, benchmark stock market indices, and the US VIX are expressed in percentage rates of change.

## 4.2 Estimation Results

Firstly, we investigate whether the announcement of the Brexit referendum result had an impact on UK credit spreads for bonds with a remaining maturity of 1-3 years, 3-5 years, 5-

7 years, 7-10 years and 10+ years, including all rating groups, respectively. We expect that the release of the referendum result is associated with increasing credit spreads in the UK. Our benchmark specification also includes the UK three-month OIS rate, the UK five-year-five-year (5y/5y) forward swap rate, the liquidity premium, the change in 10-year minus 2-year UK government bond yields, the CDS premium on UK government bonds with a maturity of up to five years, the return index of the FTSE 100, the volatility index of the S&P 500 index, and the global risk aversion variable<sup>7</sup>. The estimation results are reported in Table 1.

**Table 1: The impact of the Brexit referendum on UK credit spreads (overall economy)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0007 (0.0005)	-0.0010 (0.0010)	-0.0011 (0.0009)	-0.0008 (0.0010)	0.0000 (0.0006)
Brexit	0.1881 (1.1164)	0.2293** (0.0894)	0.2093*** (0.0760)	0.1849*** (0.0496)	0.1623*** (0.0314)
UK OIS rate (3M)	-0.2312*** (0.0642)	-0.3769*** (0.0672)	-0.2529*** (0.0932)	-0.2256*** (0.0744)	-0.0052 (0.0424)
UK Forward Swap rate (5y/5y)	-0.2719*** (0.0098)	-0.1803*** (0.0106)	-0.1625*** (0.0096)	-0.1726*** (0.0104)	-0.1227*** (0.0085)
Liquidity premium	-0.8602*** (0.0244)	-0.4848*** (0.0291)	-0.4560*** (0.0183)	-0.5816*** (0.0251)	-0.5482*** (0.0277)
Term risk	0.2101*** (0.0112)	0.0101 (0.0125)	-0.0074 (0.0117)	-0.0402** (0.0168)	-0.0315** (0.0125)
Credit default risk	0.0005 (0.0004)	0.0004 (0.0003)	0.0002 (0.0003)	0.0005 (0.0003)	0.0003 (0.0002)
FTSE 100	-0.3787*** (0.0555)	-0.4100*** (0.0500)	-0.5003*** (0.0488)	-0.4596*** (0.0459)	-0.2813*** (0.0323)
US VIX	0.0319*** (0.0077)	0.0233*** (0.0065)	0.0242*** (0.0062)	0.0200*** (0.0052)	0.0199*** (0.0041)
Global risk aversion	0.0434*** (0.0137)	0.0082 (0.0130)	0.0160 (0.0132)	0.0022 (0.0119)	0.0245*** (0.0086)
AR(1)	-0.3113 (0.7573)	0.8747*** (0.0400)	0.8790*** (0.0385)	0.9013*** (0.0261)	0.8670*** (0.0329)
MA(1)	0.2773 (0.7656)	-0.7572*** (0.0545)	-0.7680*** (0.0526)	-0.7762*** (0.0382)	-0.7218*** (0.0450)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.39	0.41	0.41	0.42	0.40
Adjusted R-squared	0.38	0.41	0.40	0.42	0.40

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Our estimation results show that the three-month OIS rate, which could be considered as a risk-free rate, has a negative impact on the credit spreads for all bonds. In almost all cases the coefficient of the three-month OIS rate is highly statistically significant. However, the three-month OIS rate does not affect the credit spread for bonds with a maturity of up to 10

<sup>7</sup> We also controlled for the impact of macroeconomic news and unconventional monetary policies conducted by the BoE and the ECB, respectively. However, the results are in line with the benchmark results. These results are available on request.

year plus. Hence, our findings are consistent with the literature (Longstaff and Schwartz, 1995; Collin-Dufresne, 2001), which finds that an increase in drift is associated with a lower risk-neutral probability of default. Furthermore, our results indicate that the 5y/5y forward swap rate affects the credit spreads for all bonds negatively. Hence, the coefficient of the 5y/5y forward swap rate shows the expected sign. The coefficient is highly statistically significant in all cases. Concerning our proxy for market liquidity, the results show that this variable has a highly significantly negative impact on the corporate bond yield spreads. Hence, our results confirm the findings of Schuknecht et al. (2010).

The slope of the term structure has a statistically significant impact on the credit spread with a remaining maturity of 1-3 years, 7-10 years and 10+ years. We find that an increase of the slope of the term structure is associated with decreasing long-term corporate bond yield spreads, which is in line with theory. However, our results indicate that the slope of the term structure has a highly significantly positive impact on the corporate bond yield spread with a remaining maturity of 1-3 years, which is at odds with theory. Studies investigating the impact of the term structure on credit spreads in US are, however, inconclusive. On the one hand, Pavlova et al. (2015) find a negative relationship between the term structure and corporate bond spreads, while on the other hand, Chun et al. (2014) report a positive correlation. Moreover, our proxy variable for the corporate credit default risk has no statistically significant impact on our dependent variables of interest. Hence, our results indicate that either credit default risk does not play a role in explaining credit spreads in the UK or that our proxy does not really capture corporate credit default risk. If the latter explanation applies, the CDS premium of 5-year UK government bonds should not be correlated with corporate CDS spreads. The return index of the FTSE 100 is statistically significant with the predicted sign. Hence, an improvement of the business climate in the UK is associated with a declining credit spread for all bonds. Furthermore, our results show that higher global financial market uncertainty is associated with increasing credit spreads in the UK. The coefficient of the S&P 500 volatility index is statistically significant in all estimations. The global risk aversion variable shows a positive impact on our dependent variables of interest which is in line with our expectations. The coefficient of the global risk aversion variable has a statistically significant impact on the corporate bond yield spread with a remaining maturity of 1-3 years and 10+ years, respectively.

Our Brexit-event dummy has a statistically significant positive impact on almost all dependent variables of interest. We find no statistically significant impact of our Brexit-event dummy on the credit spread with a maturity of 1-3 years. Hence, our empirical results confirm our expectation that Brexit-related news items are associated with increasing corporate bond yield spreads in the UK because market participants expect lower future firm earnings due to Brexit. However, our empirical results indicate that only the announcement of the referendum result had an influence on the credit spreads in the UK. Our estimation results suggest that Brexit-related events, other than the announcement of the result of the Brexit referendum, have no statistically significant impact on corporate bond spreads in the UK.

Next, we differentiate between the financial and the non-financial economic sectors in order to analyze more specific sector-related effects of our Brexit-event dummy. In Tables 2 and 3 we report the impact of our Brexit dummy on the corporate bond yield spreads in the financial sector and the non-financial sector, respectively. Our results suggest that the announcement of the referendum result positively affected credit spreads in both the

financial and the non-financial sector. The impact only lacks significance in the case of financial bonds with a maturity of 3-5 years and non-financial bonds with a maturity of 1-3 years. Hence, the financial and the non-financial economic sectors were influenced by the Brexit referendum.

**Table 2: The impact of the Brexit referendum on UK credit spreads (financial sector)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0011 (0.0011)	-0.0013 (0.0010)	-0.0013 (0.0009)	-0.0012 (0.0010)	-0.0001 (0.0007)
Brexit	0.2453** (0.1037)	0.2411 (0.1841)	0.2114* (0.1229)	0.2220*** (0.0685)	0.1705*** (0.0266)
UK OIS rate (3M)	-0.2273** (0.1009)	-0.4845*** (0.0918)	-0.2500** (0.0991)	-0.2852*** (0.0775)	-0.0434 (0.0382)
UK Forward Swap rate (5y/5y)	-0.2853*** (0.0114)	-0.2346*** (0.0138)	-0.1692*** (0.0112)	-0.2057*** (0.0108)	-0.1368*** (0.0090)
Liquidity premium	-0.7668*** (0.0147)	-0.7704*** (0.0145)	-0.4249*** (0.0168)	-0.6425*** (0.0143)	-0.6666*** (0.0322)
Term risk	0.2415*** (0.0139)	0.0317*** (0.0113)	-0.0043 (0.0167)	-0.0155 (0.0166)	-0.0479*** (0.0128)
Credit default risk	0.0006 (0.0005)	0.0008 (0.0005)	0.0002 (0.0003)	0.0006* (0.0003)	0.0003 (0.0002)
FTSE Financials	-0.3899*** (0.0528)	-0.3593*** (0.0504)	-0.4426*** (0.0465)	-0.4059*** (0.0418)	-0.3101*** (0.0276)
US VIX	0.0406*** (0.0098)	0.02791*** (0.0103)	0.0299*** (0.0080)	0.0323*** (0.0067)	0.0249*** (0.0045)
Global risk aversion	0.0451*** (0.0165)	-0.0062 (0.0193)	0.0218 (0.0165)	-0.0064 (0.0136)	0.0244*** (0.0089)
AR(1)	0.9028*** (0.0418)	0.7884*** (0.0788)	0.7404*** (0.0587)	0.8391*** (0.0354)	0.8049*** (0.0325)
MA(1)	-0.8498*** (0.0538)	-0.6818*** (0.0937)	-0.5783*** (0.0720)	-0.6791*** (0.0486)	-0.5958*** (0.0452)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.43	0.42	0.39	0.48	0.50
Adjusted R-squared	0.42	0.42	0.39	0.48	0.49

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

**Table 3: The impact of the Brexit referendum on UK credit spreads (non-financial sector)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0004 (0.0005)	-0.0007 (0.0011)	-0.0009 (0.0009)	-0.0005 (0.0011)	0.0001 (0.0006)
Brexit	0.1819 (0.2840)	0.1871*** (0.0448)	0.1818*** (0.0270)	0.1734*** (0.0320)	0.1559*** (0.0293)
UK OIS rate (3M)	-0.0900 (0.0635)	-0.2018** (0.0820)	-0.2137*** (0.0663)	-0.2050*** (0.0763)	-0.0122 (0.0492)
UK Forward Swap rate (5y/5y)	-0.1858*** (0.0127)	-0.1655*** (0.0134)	-0.1795*** (0.0109)	-0.1454*** (0.0089)	-0.1365*** (0.0075)
Liquidity premium	-0.4014*** (0.0111)	-0.3235*** (0.0139)	-0.4834*** (0.0141)	-0.3774*** (0.0189)	-0.4198*** (0.0295)
Term risk	0.1048*** (0.0169)	0.0032 (0.0185)	0.0265*** (0.0102)	-0.0747*** (0.0126)	-0.0422*** (0.0133)
Credit default risk	0.0002 (0.0003)	-0.0001 (0.0003)	0.0001 (0.0003)	0.0001 (0.0003)	0.0002 (0.0002)
FTSE Non-Financials	-0.3782* (0.2142)	-0.2238 (0.2052)	0.2514 (0.1886)	-0.5911*** (0.1880)	-0.8275*** (0.1661)
US VIX	0.0332*** (0.0062)	0.0254*** (0.0061)	0.0314*** (0.0057)	0.0230*** (0.0050)	0.0228*** (0.0036)
Global risk aversion	0.0347** (0.0140)	0.0252* (0.0135)	0.0171 (0.0133)	0.0060 (0.0122)	0.0148* (0.0081)
AR(1)	-0.3195 (0.2771)	0.8857*** (0.0254)	0.9022*** (0.0375)	0.9201*** (0.0231)	0.8532*** (0.0291)
MA(1)	0.2223 (0.2787)	-0.7645*** (0.0338)	-0.8039*** (0.0515)	-0.8017*** (0.0349)	-0.6824*** (0.0382)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.24	0.29	0.36	0.32	0.39
Adjusted R-squared	0.24	0.28	0.35	0.31	0.38

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Moreover, we find that the three-month OIS rate negatively affected both the financial corporate bond yield spreads and the non-financial corporate bond spreads. We also find that the 5y/5y forward swap rate negatively influenced corporate bond yield spreads in the financial and the non-financial sectors, respectively. Hence, the 5y/5y forward swap rate affects credit spreads in the financial and the non-financial sectors in the same way. Our proxy for the liquidity premium has a highly statistically negative impact on all dependent variables of interest. Furthermore, the absolute size of the coefficients and the statistical significance of our measure of liquidity risk suggest that this variable is the most relevant systematic factor. The slope of the term structure affects credit spreads in the financial and the non-financial sectors, respectively. However, in a few cases, the coefficient of our term structure variable shows no statistical significance in both Table 2 and Table 3.

Furthermore, our estimation results reported in Table 2 and Table 3 suggest that the 5-year UK sovereign CDS spread plays only a minor role in explaining corporate bond yield spreads in both the financial sector and the non-financial sector. The coefficient of the return index of the FTSE Financials index in Table 3 displays a highly statistically significant impact on

credit spreads in the financial sector. As predicted by theory, the estimated signs are always negative. The return index of the FTSE Non-Financials index has a significant impact for parts of the analyzed corporate bond yield spreads in the non-financial sector (see Table 3). Moreover, the volatility index of the S&P 500 index has a positive significant impact on the analyzed portfolios. The global risk aversion variable shows a positive impact on our dependent variables of interest which is in line with theory. Sometimes the coefficient shows a negative sign but in these cases the global risk aversion variable has no significant impact.

Next, we examine whether the announcement of the Brexit referendum result had an effect on euro area (EA) credit spreads for bonds with remaining maturities of 1-3 years, 3-5 years, 5-7 years, 7-10 years and 10+ years, including all rating groups, respectively. On the one hand, we want to find out whether corporate bond yield spreads in the euro area were affected by Brexit-related events, and on the other hand we want to see whether EA credit spreads or UK corporate bond yield spreads were most effected by Brexit-related news. We expect that UK credit spreads were more strongly affected by Brexit events than EA corporate bond spreads. The estimation results for the impact of the announcement of the Brexit referendum results on EA corporate bond yield spreads are reported in Table 4.

**Table 4: The impact of the Brexit referendum on EA credit spreads (overall economy)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0002 (0.0004)	-0.0002 (0.0005)	0.0001 (0.0005)	0.0002 (0.0005)	-0.0000 (0.0005)
Brexit	0.0870* (0.0523)	0.0883* (0.0504)	0.0837 (0.0844)	0.0718 (0.2112)	0.0904*** (0.0331)
EA OIS rate (3M)	-0.1189** (0.0521)	-0.1411** (0.0551)	-0.1819*** (0.0599)	-0.1562*** (0.0570)	0.0633 (0.0696)
EA Forward Swap rate (5y/5y)	-0.0382** (0.0154)	-0.0634*** (0.0179)	-0.0535*** (0.0187)	-0.0808*** (0.0177)	-0.0472*** (0.0161)
Liquidity premium	-0.4906*** (0.0233)	-0.5268*** (0.0261)	-0.6530*** (0.0270)	-0.7690*** (0.0369)	-0.3755*** (0.0250)
Term risk	-0.0514** (0.0227)	-0.0844*** (0.0251)	-0.1933*** (0.0260)	-0.2465*** (0.0244)	-0.1813*** (0.0243)
Credit default risk	-0.0051*** (0.0002)	-0.0054*** (0.0003)	-0.0071*** (0.0003)	-0.0060*** (0.0003)	-0.0044*** (0.0003)
Eurostoxx 50	0.0612* (0.0342)	0.1743*** (0.0410)	0.2249*** (0.0406)	0.2972*** (0.0399)	0.1883*** (0.0407)
US VIX	0.0224*** (0.0054)	0.0360*** (0.0057)	0.0340*** (0.0060)	0.0424*** (0.0060)	0.0388*** (0.0057)
Global risk aversion	0.0031 (0.0118)	-0.0045 (0.0120)	-0.0002 (0.0122)	-0.0003 (0.0123)	0.0082 (0.0117)
AR(1)	-0.4388* (0.2255)	-0.1610 (0.3361)	-0.5041 (0.3424)	-0.5072 (0.8671)	-0.3363* (0.1723)
MA(1)	0.5009** (0.2196)	0.2267 (0.3320)	0.5497* (0.3286)	0.5258 (0.8565)	0.4402*** (0.1646)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.25	0.23	0.27	0.26	0.18
Adjusted R-squared	0.24	0.23	0.27	0.26	0.17

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Our estimation results suggest that the announcement of the referendum result is associated with increasing credit spreads in the EA. The coefficient of our Brexit-event dummy shows a positive sign and is partly statistically significant. Our Brexit-event dummy has a statistically significant impact on 1-3 years, 3-5 years, and 10+ years credit spreads in the euro area, respectively.

Concerning the impact of short-term interest rates on EA credit spreads, we find a negative impact, as predicted by theory, of the three-month OIS rate on credit bond yield spreads in the EA. However, we find that the three-month OIS rate positively affects 10+ years EA credit spreads but the coefficient is not statistically significant. Furthermore, the 5y/5y forward swap rate has a statistically significant impact on credit spreads in the euro area. In almost all regressions, the coefficient of the 5y/5y forward swap rate is highly statistically significant. As expected, the 5y/5y forward swap rate negatively influences our dependent variables of interest. Our proxy for market liquidity is found to have a statistically negative impact on EA credit spreads. The slope of the term structure shows a statistically negative

impact on credit bond yield spreads in the euro area. Hence, higher expected future short rates or rather an improvement of economic health increased credit spreads in the euro area.

Our results, displayed in Table 4, also suggest that rising sovereign CDS premia lead to lower corporate bond yield spreads in the euro area. Hence, our empirical findings concerning the impact of the 5-year sovereign CDS spread on EA credit spreads stand in contradiction to theory. We suspect that heterogeneity within the euro area plays an important role, due to different countries' creditworthiness. On the one hand, increasing sovereign CDS premia may be associated with decreasing credit bond spreads in safe haven countries like Germany and the Netherlands, on the other hand rising sovereign CDS premia could be associated with rising credit spreads in countries like Spain and Portugal (Klose/Weigert, 2013). Furthermore, we find that the return index of the Eurostoxx 50 has a significantly positive impact on EA credit spreads. This puzzling result might be explained by the role of the Eurostoxx 50 as a measure for financial market uncertainty (Deutsche Bundesbank, 2017). The coefficient of the volatility index of the S&P 500 displays a significantly positive influence on corporate bond yield spreads in the euro area. Moreover, our empirical results show that our proxy for global risk aversion is not statistically significant.

Next, we examine the impact of our Brexit-event dummy on corporate bond yield spreads in the financial sector and the non-financial sector in the euro area, respectively. Estimation results are reported in Table 5 and Table 6. Our results indicate that the financial sector was more strongly affected by the announcement of the Brexit referendum result than the non-financial sector. Our Brexit-event dummy variable has a statistically significant impact on all credit spreads in the financial sector. The announcement of the referendum result is associated with increasing corporate bond yield spreads in the financial sector. Moreover, estimated coefficients display the same magnitude for all maturities. In contrast to that, our Brexit-event dummy has a limited impact on credit spreads in the non-financial sector. The statistical significance of the dummy variable is rather weak. Our Brexit-event dummy has a statistically significant impact only on 10+ years credit spreads in the non-financial sector. The coefficient shows a positive sign and hence the announcement of the referendum result has led to rising 10+ year's credit spreads in the non-financial sector. Furthermore, our results reported in Table 5 and Table 6 indicate that the financial sector in both the United Kingdom and the euro area was affected by the announcement of the Brexit referendum result. However, our empirical results suggest that credit spreads in the UK non-financial sector were influenced by our Brexit-event dummy whereas corporate bond spreads in the EA non-financial sector were hardly effected by the referendum result.



**Table 5: The impact of the Brexit referendum on EA credit spreads (financial sector)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.000497 (0.0004)	-0.0004 (0.0005)	-0.0001 (0.0006)	-0.0002 (0.0007)	-0.0001 (0.0007)
Brexit	0.1279*** (0.0281)	0.1379*** (0.0283)	0.1400*** (0.0329)	0.1489*** (0.0332)	0.1311** (0.0620)
EA OIS rate (3M)	-0.1011* (0.0580)	-0.0952* (0.0573)	-0.0922 (0.0623)	-0.1755** (0.0699)	0.0520 (0.0996)
EA Forward Swap rate (5y/5y)	0.0121 (0.0162)	-0.0377** (0.0188)	-0.0371* (0.02026)	-0.0216 (0.0218)	-0.1273*** (0.0214)
Liquidity premium	-0.2473*** (0.0234)	-0.4626*** (0.0280)	-0.5664*** (0.0315)	-0.4106*** (0.0410)	-0.3458*** (0.0248)
Term risk	-0.0914*** (0.0231)	-0.1035*** (0.0256)	-0.1603*** (0.0268)	-0.2011*** (0.0308)	-0.1490*** (0.0317)
Credit default risk	-0.0037*** (0.0003)	-0.0043*** (0.0003)	-0.0056*** (0.0004)	-0.0035*** (0.0005)	-0.0030*** (0.0005)
Eurostoxx Financials	0.0690** (0.0289)	0.1029*** (0.0352)	0.1172*** (0.0380)	0.0479 (0.0437)	0.0099 (0.0475)
US VIX	0.0222*** (0.0057)	0.0379*** (0.0056)	0.0386*** (0.0061)	0.0523*** (0.0070)	0.0611*** (0.0074)
Global risk aversion	-0.0046 (0.0130)	-0.0038 (0.0119)	-0.0204 (0.01317)	-0.0023 (0.0163)	0.0152 (0.0174)
AR(1)	-0.0435 (0.2119)	0.1817 (0.2435)	-0.2047 (0.2056)	0.0687 (0.1823)	-0.3141 (0.2260)
MA(1)	0.1397 (0.2108)	-0.0862 (0.2485)	0.3119 (0.2001)	0.0691 (0.1834)	0.4076* (0.2163)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.16	0.21	0.22	0.14	0.14
Adjusted R-squared	0.16	0.20	0.22	0.14	0.13

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

**Table 6: The impact of the Brexit referendum on EA credit spreads (non-financial sector)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	0.0001 (0.0004)	-0.0001 (0.0005)	0.0001 (0.0005)	0.0001 (0.0004)	0.0000 (0.0005)
Brexit	0.0626 (0.0795)	0.0606 (0.0584)	0.0626 (0.1108)	0.0468 (0.1422)	0.0790** (0.0309)
EA OIS rate (3M)	-0.1688*** (0.0513)	-0.1873*** (0.0565)	-0.2109*** (0.0595)	-0.1278** (0.0578)	0.0586 (0.0698)
EA Forward Swap rate (5y/5y)	-0.0761*** (0.0152)	-0.0887*** (0.0190)	-0.0922*** (0.0190)	-0.0845*** (0.0170)	-0.0409*** (0.0166)
Liquidity premium	-0.66120*** (0.0138)	-0.6211*** (0.0292)	-0.7546*** (0.0259)	-0.7191*** (0.0280)	-0.4288*** (0.0241)
Term risk	-0.013 (0.0217)	-0.0786*** (0.0273)	-0.1796*** (0.0260)	-0.2361*** (0.0247)	-0.1937*** (0.0245)
Credit default risk	-0.0061*** (0.0003)	-0.0064*** (0.0003)	-0.0081*** (0.0003)	-0.0073*** (0.0003)	-0.0050*** (0.0003)
Eurostoxx Non-Financials	-0.0007 (0.0402)	0.2008*** (0.0457)	0.2808*** (0.0456)	0.3622*** (0.0428)	0.2269*** (0.0444)
US VIX	0.0187*** (0.0058)	0.0336*** (0.0058)	0.0300*** (0.0062)	0.0385*** (0.0059)	0.0345*** (0.0057)
Global risk aversion	0.0034 (0.0128)	-0.0018 (0.0124)	0.0076 (0.0125)	0.0023 (0.0123)	0.0065 (0.0115)
AR(1)	-0.4974* (0.2745)	-0.2612 (0.3276)	-0.5493 (0.4080)	0.4109 (0.8878)	-0.2447 (0.1849)
MA(1)	0.5500** (0.2695)	0.3278 (0.3209)	0.5846 (0.3950)	-0.4305 (0.8817)	0.3498* (0.1796)
No. Obs.	1365	1367	1367	1367	1367
R-squared	0.34	0.28	0.33	0.32	0.20
Adjusted R-squared	0.33	0.27	0.32	0.31	0.19

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Furthermore, we find that the three-month OIS rate has a statistically significant impact on three of five credit spreads in the financial sector and on four of five spreads in the non-financial sector. Whenever the impact of the risk-free rate on credit spreads turns out to be statistically significant, the coefficient shows a negative sign. The 5y/5y forward swap rate has a significant negative impact on corporate bond yield spreads in the EA non-financial sector and is less significant in the EA financial sector. Our proxy for liquidity risk has a highly statistically significant impact on credit spreads in both the financial sector and the non-financial sector, respectively. Moreover, we find that the slope of the term structure plays an important role in explaining the change of the credit spreads in the financial and non-financial sectors. Our default risk variable displays a significantly negative impact on credit spreads in the financial and non-financial sector. The return index of the Eurostoxx Financials has a statistically significant impact only on short- and medium-term spreads in the financial sector. The coefficient of the return index of the Eurostoxx Financials shows a positive sign, which is at odds with theory. Almost all credit spreads in the non-financial sector were statistically significantly affected by the return index of the Eurostoxx Non-

Financials. The coefficient also shows a positive sign. Furthermore, credit spreads in the financial and non-financial sectors were positively influenced by the volatility index of the S&P 500. We also find that the coefficient of the global risk aversion variable turns out to be statistically insignificant.

Additionally, we estimate the impact of the Brexit referendum result on seven different business sectors to test whether credit spreads from the three financial business sectors (banks, financial services and insurance) and 4 non-financial business sectors (industrial goods and services, chemicals, automobiles and parts and services) react differently. In fact, due to diverse risk conditions in each business sector and given that different business sectors are influenced by macroeconomic instabilities in different ways, we expect to find that credit spread response differ across sectors. Unfortunately, our model provides unstable results. Thus, from the perspective of statistical significance we are not able to deliver final and conclusive compelling evidence on the impact of the Brexit referendum result on specific business sectors. However, this lack of robust results may simply reflect the fact that for analyzing business sectors more specific data on a microeconomic level are required. This holds especially for the EA corporate bond market due to a higher heterogeneity in that market. For the sake of brevity, we present no results here but these are available on request.

### **4.3 Additional Brexit-related events**

In this section we study the impact of 16 Brexit-related events, excluding the referendum, on corporate bond yield spreads in the UK and the euro area, respectively. These 16 Brexit-related pieces of news are divided into bad Brexit events and good Brexit events by reading the Financial Times thoroughly. Hence, we create an event dummy which consists of bad Brexit events and a dummy variable which captures good Brexit events. With our event identification strategy we find a total of eight bad Brexit event days and eight good Brexit event days<sup>8</sup>. We suspect that bad Brexit news are associated with increasing credit spreads in the UK and the euro area, respectively. Concerning the influence of good Brexit news on corporate bond yields in both the UK and euro area we expect that the coefficient sign of the Brexit good news dummy variable is continuously negative. Estimation results are reported in Table 7 and Table 8.

---

<sup>8</sup> The announcement of the referendum result is classified as bad Brexit news.

**Table 7: The impact of other Brexit-related events on UK credit spreads (overall economy)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0006 (0.0005)	-0.0007 (0.0009)	-0.0009 (0.0008)	-0.0006 (0.0009)	0.0002 (0.0006)
Brexit bad news	0.0120 (0.0104)	-0.0000 (0.0035)	0.0061 (0.0052)	0.0074 (0.0066)	0.0003 (0.0067)
Brexit good news	0.0003 (0.0140)	-0.0024 (0.0111)	-0.0003 (0.0076)	0.0002 (0.0076)	0.0038 (0.0048)
UK OIS rate (3M)	-0.5982*** (0.0432)	-0.7814*** (0.0353)	-0.6322*** (0.0383)	-0.5730*** (0.0352)	-0.2868*** (0.0271)
UK Forward Swap rate (5y/5y)	-0.2905*** (0.0103)	-0.2098*** (0.0111)	-0.1805** (0.0101)	-0.2037*** (0.0103)	-0.11526*** (0.0091)
Liquidity premium	-0.9480*** (0.0258)	-0.5977*** (0.0280)	-0.5223*** (0.0196)	-0.7191*** (0.0246)	-0.6759*** (0.0300)
Term risk	0.2249*** (0.0118)	0.0281** (0.0137)	0.0002 (0.0125)	-0.0406** (0.0180)	-0.0338** (0.0134)
Credit default risk	0.0009*** (0.0003)	0.0010*** (0.0003)	0.0007** (0.0003)	0.0009*** (0.0029)	0.0007*** (0.0002)
FTSE 100	-0.4292*** (0.0584)	-0.4623*** (0.0542)	-0.5667*** (0.0533)	-0.5100*** (0.0503)	-0.3249*** (0.0367)
US VIX	0.0245*** (0.0079)	0.0138** (0.0063)	0.0160** (0.0063)	0.0122** (0.0053)	0.0134*** (0.0041)
Global risk aversion	0.0383*** (0.0143)	0.0029 (0.0141)	0.0108 (0.0141)	-0.0025 (0.0130)	0.0215** (0.0094)
AR(1)	-0.2858 (0.8217)	0.8692*** (0.0470)	0.8725*** (0.0446)	0.8980*** (0.0308)	0.8652*** (0.0383)
MA(1)	0.2531 (0.8295)	-0.7722*** (0.0605)	-0.7770*** (0.0578)	-0.7937*** (0.0429)	-0.7532*** (0.0498)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.35	0.35	0.34	0.37	0.33
Adjusted R-squared	0.35	0.34	0.34	0.36	0.32

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Firstly, we investigate whether bad and good Brexit news has an impact on credit spreads in the UK economy as a whole (see Table 7). Our empirical results suggest that bad Brexit events, excluding the announcement of the referendum result, has no statistically significant impact on corporate bond yield spreads in the UK. Concerning the impact of good Brexit news on UK credit spreads, we find no statistical significance. Thus, our empirical results suggest that good Brexit news has no impact on corporate bond spreads in the UK. Hence, we conclude that only the announcement of the referendum result, and no other Brexit news, has an impact on UK corporate bond yield spreads<sup>9</sup>.

<sup>9</sup> We also find that bad Brexit news, excluding the referendum, and good Brexit news have no statistically significant impact on corporate bond yield spreads in the financial sector and the non-financial sector in the UK, respectively.

**Table 8: The impact of other Brexit-related events on EA credit spreads (overall economy)**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0001 (0.0004)	-0.0002 (0.0005)	0.0002 (0.0005)	0.0002 (0.0005)	0.0001 (0.0005)
Brexit bad news	-0.0027 (0.0054)	0.0026 (0.0061)	0.0015 (0.0076)	0.0016 (0.0063)	-0.0013 (0.0069)
Brexit good news	0.0037 (0.0086)	0.0036 (0.0106)	0.0035 (0.0154)	0.0044 (0.0139)	0.0058 (0.0137)
EA OIS rate (3M)	-0.1630*** (0.0505)	-0.1883*** (0.0541)	-0.2217*** (0.0591)	-0.1920*** (0.0559)	0.0217 (0.0687)
EA Forward Swap rate (5y/5y)	-0.0421*** (0.0158)	-0.0676*** (0.0180)	-0.0552*** (0.0190)	-0.0842*** (0.0179)	-0.0471*** (0.0165)
Liquidity premium	-0.5172*** (0.0228)	-0.5525*** (0.0260)	-0.6667*** (0.0271)	-0.7914*** (0.0366)	-0.3804*** (0.0253)
Term risk	-0.0489** (0.0233)	-0.0839*** (0.0255)	-0.1952*** (0.0265)	-0.2497*** (0.0247)	-0.1830*** (0.0247)
Credit default risk	-0.0048*** (0.0002)	-0.0052*** (0.0003)	-0.0069*** (0.0003)	-0.0058*** (0.0003)	-0.0042*** (0.0003)
Eurostoxx 50	0.0324 (0.0329)	0.1456*** (0.0399)	0.1946*** (0.0390)	0.2726*** (0.0380)	0.1546*** (0.0384)
US VIX	0.0181*** (0.0047)	0.0316*** (0.0051)	0.0301*** (0.0055)	0.0391*** (0.0054)	0.0350*** (0.0053)
Global risk aversion	0.0019 (0.0118)	-0.0067 (0.0120)	-0.0017 (0.0123)	-0.0017 (0.0123)	0.0063 (0.0117)
AR(1)	-0.4054* (0.2255)	-0.0837 (0.33289)	-0.4669 (0.3209)	-0.3759 (0.9423)	-0.2197 (0.1794)
MA(1)	0.4710** (0.2198)	0.1550 (0.3265)	0.5178* (0.3093)	0.3961 (0.9351)	0.3315* (0.1742)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.23	0.22	0.26	0.25	0.16
Adjusted R-squared	0.22	0.21	0.25	0.25	0.15

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Secondly, we elaborate on the impact of bad news, excluding the announcement of the referendum result, and good news on EA credit spreads, respectively (see Table 8). Our empirical results indicate that bad Brexit news, excluding the referendum, has no statistically significant influence on EA credit spreads. Thus, when removing the main Brexit event from other bad Brexit event days, we find no significant impact on UK and EA credit spreads, respectively. Concerning the influence of good Brexit news, we also find no statistical significance<sup>10</sup>. Thus, only the announcement of the referendum result itself has an impact on our dependent variable of interest. Hence, it seems that good Brexit news has an impact on neither UK credit spreads nor on EA corporate bond spreads.

<sup>10</sup> We also find no statistically significant impact of Brexit-related events, excluding the referendum, on credit spreads in the financial sector and the non-financial sector in the euro area, respectively.

## 5. Time-varying aspects

One concern about the estimates in section 4.2 is that they do not take into account the possible time-variation in investors' risk sensitivity and the pricing of risk. It is plausible to assume that the influence of credit spread determining variables changes over time. Prior work on corporate yield spreads has already indicated the possibility of a time varying influence of the determining variables; see, for example, Longstaff/Mithal/Neis (2005). This problem was the subject of ongoing work. Using a Markov regime-switching model, Acharya/Amihud/Bharath (2013) and Klein/Pliszka (2018) confirm these findings and moreover are able to show that particularly in periods of stressed market conditions systematic risk factors play a much more important role by determining changes in credit spreads, in the US as well as in EA corporate bond markets. Furthermore, analyzing recent financial crises, Dick-Nielsen/Feldhütter/Lando (2012) and Friewald/Jankowitsch/Subrahmanyam (2012) find that in times of financial turmoil the effect of illiquidity increases dramatically.

If the real underlying coefficients are time varying, as several previous studies have shown, then the estimated coefficients in Tables 1-6 are potentially inaccurate and may also be misleading in interpreting investor's risk sensitivity and the pricing of risk. Additionally, as shown in section 4.3, only the result of the Brexit referendum has a strong significant impact on corporate yield spreads. All other Brexit-related events were statistically insignificant. Thus we decided to split our sample in two sub-samples, namely a pre-referendum (January 1<sup>st</sup>, 2013, to June 23<sup>rd</sup>, 2016) and post-referendum period (June 24<sup>th</sup>, 2016, to March 30<sup>th</sup>, 2018), to allow to consider the potential changing evaluation of the determinants of corporate bond spreads. We follow Friewald/Jankowitsch/Subrahmanyam (2012) and incorporate a dummy variable for the post-referendum period. We similarly include interaction terms between the dummy variable and our credit spread determinants for the post-referendum period, with the aim of analyzing whether the changes in credit spreads are more sensitive to our determining variables in times of market turmoil due to altering risk pricing triggered by the Brexit referendum result. The results for the UK credit spreads (overall economy) are reported in Table 9.

We do not observe a statistically significant increase in all of the proxies but there are some noteworthy findings which we would like to highlight. Interestingly, we cannot confirm a "flight-to-liquidity", which was observed by previous studies. Our proxy variable for liquidity has a statistically significant additional impact on the credit spreads in three out of five maturities, however with different sign. The liquidity variable has a negative sign with a maturity of 7-10 years but a positive sign with a maturity of 3-5 years and 5-7 years. This finding restricts our ability to make precise conclusions about the additional impact of liquidity on credit spreads. Although, Acharya/Amihud/Bharath (2013) find that in a stress regime the sign of liquidity betas is quite the opposite for investment grade and speculative bonds. In episodes of stressed macroeconomic and financial conditions, investors are more averse to illiquidity shocks and they respond by switching from illiquid assets, such as speculative bonds, to investment grade bonds which are known to be more liquid. This finding may provide a plausible explanation for our results, since we do not distinguish between different rating categories. This question is beyond the scope of this paper and represents an interesting avenue for further research.

The most pronounced change can be observed for credit default risk. Surprisingly, our proxy variable turned significant and has a highly statistically significant impact on yield spreads in three out of five maturities, namely with a maturity of 1-3 years, 5-7 years and 10+ years. Unfortunately, due to limited access to corporate CDS data, we use the corresponding CDS premium on government bonds, which means we are unable to measure the direct impact of corporate default risk. We can measure only the indirect impact of default risk as a consequence of the risk transfer channel from sovereign to corporate. Nevertheless, this is an important result suggesting that default risk plays a more important role in periods of market turmoil. Also our two global variables, global volatility and global risk aversion, point to some interesting developments after the Brexit referendum. First, we record statistical significance only with a maturity of 10+ years and second, for all five different maturities, except for global risk aversion with a maturity 7-10 years, the sign has turned and changed into negative. These results indicate that the United Kingdom's safe haven status was weakening in this period (see, Bernoth/Erdogan, 2012)<sup>11</sup>. This has serious consequences for policymakers when it comes to taking the necessary actions in order to moderate the effects of Brexit in its aftermath.

---

<sup>11</sup> As a result of the Brexit vote, S&P and Fitch downgraded the sovereign credit rating of the UK to 'AA' with a negative outlook on June 27<sup>th</sup>/28<sup>th</sup>, 2016

**Table 9: UK credit spreads overall economy**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0005 (0.0005)	-0.0008 (0.0009)	-0.0008 (0.0008)	-0.0006 (0.0009)	0.0002 (0.0006)
UK OIS rate (3M)	-0.5384 *** (0.1050)	-1.2267 *** (0.1279)	-0.6511 *** (0.1411)	-0.4817 *** (0.1403)	-0.1440 (0.1381)
UK Forward Swap rate (5y/5y)	-0.2788 *** (0.0118)	-0.2113 *** (0.0129)	-0.1920 *** (0.0128)	-0.1736 *** (0.0133)	-0.1395 *** (0.0133)
Liquidity premium	-0.988 *** (0.0291)	-0.6973 *** (0.0377)	-0.5607 *** (0.0244)	-0.6366 *** (0.0309)	-0.7241 *** (0.0524)
Term risk	0.2044 *** (0.0130)	-0.0200 (0.0152)	-0.0175 (0.0131)	-0.0384 (0.0201)	-0.0483 *** (0.0162)
Credit default risk	0.0002 (0.0004)	0.0005 (0.0004)	0.0001 (0.0004)	0.0005 (0.0004)	0.0003 (0.0003)
FTSE 100	-0.4515 *** (0.0643)	-0.4411 *** (0.0640)	-0.5187 *** (0.0601)	-0.5394 *** (0.0562)	-0.3385 *** (0.0410)
US VIX	0.0278 *** (0.0097)	0.0180 ** (0.0080)	0.0239 *** (0.0077)	0.0144 ** (0.0067)	0.0202 *** (0.0053)
Global risk aversion	0.0593 *** (0.0166)	0.0268 (0.0153)	0.0255 (0.0161)	-0.0066 (0.0151)	0.0357 *** (0.0117)
(BREXIT/Ref. Dummy) x (UK OIS rate (3M))	0.0068 (0.1250)	0.5197 *** (0.1360)	0.0410 (0.1484)	-0.0364 (0.1466)	-0.1327 (0.1433)
(BREXIT/Ref. Dummy) x (UK Forward Swap rate (5y/5y))	-0.0331 (0.0273)	-0.0042 (0.0300)	0.0418 (0.0239)	-0.0834 *** (0.0247)	-0.0613 *** (0.019)
(BREXIT/Ref. Dummy) x (Liquidity premium)	0.1209 (0.071)	0.1803 *** (0.0602)	0.1328 *** (0.0405)	-0.2030 *** (0.0703)	0.0617 (0.0613)
(BREXIT/Ref. Dummy) x (Term risk)	0.0564 (0.0361)	0.1534 *** (0.0503)	0.0566 (0.0407)	-0.0124 (0.0483)	0.0351 (0.0299)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0023 *** (0.0008)	0.0013 (0.0007)	0.0017 *** (0.0006)	0.0012 (0.0006)	0.0008 ** (0.0004)
(BREXIT/Ref. Dummy) x (FTSE 100)	0.0560 (0.1534)	-0.0022 (0.1240)	-0.1824 (0.1168)	0.0913 (0.1326)	-0.0317 (0.0936)
(BREXIT/Ref. Dummy) x (US VIX)	-0.0090 (0.0164)	-0.0090 (0.0125)	-0.0210 (0.0122)	-0.0056 (0.0101)	-0.0204 *** (0.0076)
(BREXIT/Ref. Dummy) x (Global risk aversion)	-0.0663 (0.0375)	-0.0600 (0.0392)	-0.0403 (0.0341)	0.0101 (0.0298)	-0.0478 ** (0.0196)
AR(1)	-0.2546 (0.7112)	0.8734 *** (0.0512)	0.8770 *** (0.0442)	0.9012 *** (0.0302)	0.8784 *** (0.0387)
MA(1)	0.2156 (0.7174)	-0.7851 *** (0.0645)	-0.7848 *** (0.0570)	-0.7947 *** (0.0416)	-0.7732 *** (0.0505)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.3594	0.3616	0.3519	0.3753	0.3457
Adjusted R-squared	0.3504	0.3526	0.3427	0.3665	0.3365

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

We now move on to separately examining the financial and non-financial economic sectors in order to analyze more specific sector-related changes in the impact of determining variables on credit spreads in the pre- and post-referendum periods. Not surprisingly, a very similar picture also emerges for the financial and non-financial sectors. Tables 10 and 11 report the results. The findings reveal strong commonalities except for our credit default risk variable. While for the non-financial sector the variable still stays statistically significant for 3 out of 5 maturities, namely with a maturity of 1-3 years, 5-7 years and 10+ years, for the financial sector we observe significance only with a maturity of 1-3 years. This finding suggest that Brexit and rising trade barriers with a potential to limit trade with EU – and other non-EU countries - would have a strong negative impact on the productivity and



profitability of affected firms in the non-financial sector, an effect that would degrade the credit worthiness of UK firms in this sector and lead to a higher refinancing costs.

**Table 10: UK credit spreads financials**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0009 (0.0010)	-0.0010 (0.0011)	-0.0011 (0.0009)	-0.0009 (0.0010)	0.0001 (0.0007)
UK OIS rate (3M)	-0.5127 *** (0.1580)	-1.263 *** (0.1601)	-0.4622 *** (0.1238)	-0.5963 *** (0.1291)	-0.2637 (0.1501)
UK Forward Swap rate (5y/5y)	-0.3155 *** (0.0134)	-0.2264 *** (0.0167)	-0.2019 *** (0.0142)	-0.2113 *** (0.0134)	-0.1613 *** (0.0112)
Liquidity premium	-0.8841 *** (0.0160)	-0.6945 *** (0.0256)	-0.4367 *** (0.0212)	-0.6747 *** (0.018)	-0.9252 *** (0.0434)
Term risk	0.2608 *** (0.0160)	-0.0016 (0.0132)	-0.0014 (0.0196)	0.0012 (0.0192)	-0.0722 *** (0.0155)
Credit default risk	0.0003 (0.0006)	0.0010 (0.0006)	0.0006 (0.0005)	0.0007 (0.0004)	0.0003 (0.0003)
FTSE Financials	-0.4594 *** (0.0611)	-0.4501 *** (0.0593)	-0.5008 *** (0.0548)	-0.4953 *** (0.0494)	-0.3647 *** (0.0343)
US VIX	0.0382 *** (0.0123)	0.0265 ** (0.0119)	0.0282 *** (0.0099)	0.0276 *** (0.0085)	0.0221 *** (0.0061)
Global risk aversion	0.0676 *** (0.0189)	0.0130 (0.0220)	0.0413 ** (0.0196)	-0.0204 (0.0170)	0.0376 *** (0.0119)
(BREXIT/Ref. Dummy) x (UK OIS rate (3M))	-0.0868 (0.1818)	0.4880 *** (0.1803)	-0.1736 (0.1458)	0.0148 (0.1458)	-0.0240 (0.1587)
(BREXIT/Ref. Dummy) x (UK Forward Swap rate (5y/5y))	0.0860 ** (0.0375)	-0.0454 (0.0455)	0.0899 *** (0.0303)	-0.0315 (0.0326)	-0.0254 (0.0217)
(BREXIT/Ref. Dummy) x (Liquidity premium)	0.2155 *** (0.0503)	-0.3294 *** (0.0338)	-0.0207 (0.0349)	-0.1262 *** (0.0477)	0.2231 *** (0.0678)
(BREXIT/Ref. Dummy) x (Term risk)	-0.0454 (0.0478)	0.1298 (0.0730)	0.0154 (0.0479)	-0.0375 (0.0577)	0.0368 (0.0323)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0023 ** (0.0010)	0.0009 (0.0011)	0.0002 (0.0007)	0.0011 (0.0008)	0.0008 (0.0004)
(BREXIT/Ref. Dummy) x (FTSE Financials)	-0.2428 (0.1267)	-0.0794 (0.1272)	-0.1901 ** (0.0965)	-0.0687 (0.1018)	-0.0894 (0.0646)
(BREXIT/Ref. Dummy) x (US VIX)	-0.0241 (0.0206)	-0.0227 (0.0181)	-0.0177 (0.0150)	-0.0140 (0.0123)	-0.0171 ** (0.0084)
(BREXIT/Ref. Dummy) x (Global risk aversion)	-0.0785 (0.0484)	-0.0420 (0.0589)	-0.0601 (0.0414)	0.0260 (0.0357)	-0.0519 ** (0.0214)
AR(1)	0.9011 *** (0.0587)	0.7938 *** (0.0876)	0.7577 *** (0.0651)	0.8447 *** (0.0400)	0.8189 *** (0.0387)
MA(1)	-0.8611 *** (0.0712)	-0.7006 *** (0.1021)	-0.6185 *** (0.0785)	-0.7096 *** (0.0526)	-0.664 *** (0.0507)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.4009	0.3977	0.3597	0.4419	0.4544
Adjusted R-squared	0.3925	0.3892	0.3507	0.434	0.4467

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

**Table 11: UK credit spreads non-financials**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0004 (0.0005)	-0.0007 (0.001)	-0.0007 (0.0009)	-0.0003 (0.0011)	0.0002 (0.0006)
UK OIS rate (3M)	-0.1920 (0.1356)	-0.8625 *** (0.1586)	-0.5747 *** (0.1353)	-0.4181 ** (0.1718)	-0.1635 (0.1343)
UK Forward Swap rate (5y/5y)	-0.1448 *** (0.0180)	-0.1910 *** (0.0175)	-0.1916 *** (0.0163)	-0.1190 *** (0.0134)	-0.1330 *** (0.012)
Liquidity premium	-0.2763 (0.0166)	-0.6159 *** (0.0224)	-0.5391 *** (0.0170)	-0.2984 *** (0.0225)	-0.5770 *** (0.0539)
Term risk	0.0757 *** (0.0210)	-0.0225 (0.0200)	0.0364 *** (0.0117)	-0.0842 *** (0.0152)	-0.0406 ** (0.0170)
Credit default risk	0.0002 (0.0004)	0.0000 (0.0004)	0.0002 (0.0004)	0.0004 (0.0003)	0.0004 (0.0002)
FTSE Non-Financials	0.0500 (0.3132)	0.3708 (0.3210)	0.5481 (0.3003)	-0.5424 (0.2846)	-0.1707 (0.2273)
US VIX	0.0343 *** (0.0076)	0.0214 *** (0.0073)	0.0350 *** (0.0070)	0.0209 *** (0.0060)	0.0264 *** (0.0045)
Global risk aversion	0.0592 *** (0.0163)	0.0468 *** (0.0145)	0.0201 (0.016)	0.0077 (0.0141)	0.0253 ** (0.0108)
(BREXIT/Ref. Dummy) x (UK OIS rate (3M))	-0.2635 (0.1466)	0.3265 ** (0.1654)	0.0253 (0.1408)	-0.0908 (0.1761)	-0.1297 (0.1380)
(BREXIT/Ref. Dummy) x (UK Forward Swap rate (5y/5y))	-0.1723 *** (0.0273)	0.0281 (0.0300)	-0.0178 (0.0247)	-0.1363 *** (0.0232)	-0.0967 *** (0.0157)
(BREXIT/Ref. Dummy) x (Liquidity premium)	-0.4600 *** (0.0328)	0.5696 *** (0.0342)	0.1233 *** (0.0396)	-0.4114 *** (0.0563)	0.0882 (0.0686)
(BREXIT/Ref. Dummy) x (Term risk)	0.1187 *** (0.0411)	0.0449 (0.0634)	-0.0428 (0.0498)	0.0437 (0.0516)	-0.0223 (0.0306)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0017 *** (0.0006)	0.0012 (0.0007)	0.0013 ** (0.0006)	0.0005 (0.0006)	0.0008 ** (0.0003)
(BREXIT/Ref. Dummy) x (FTSE Non-Financials)	-1.1184 ** (0.4549)	-2.2743 *** (0.4819)	-1.965 *** (0.4427)	-0.0004 (0.4773)	-1.8184 *** (0.3656)
(BREXIT/Ref. Dummy) x (US VIX)	-0.0142 (0.0132)	-0.0097 (0.0133)	-0.0235 ** (0.0114)	-0.0085 (0.0091)	-0.0231 *** (0.0068)
(BREXIT/Ref. Dummy) x (Global risk aversion)	-0.0608 (0.0348)	-0.0686 (0.0399)	-0.0205 (0.0349)	-0.0118 (0.032)	-0.0382 ** (0.0187)
AR(1)	-0.3147 (0.2968)	0.8757 *** (0.0349)	0.8981 *** (0.0453)	0.9221 *** (0.0252)	0.8701 *** (0.0356)
MA(1)	0.2255 (0.3003)	-0.7731 *** (0.0446)	-0.8179 *** (0.0579)	-0.8188 *** (0.0367)	-0.7422 *** (0.0462)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.2289	0.2754	0.3108	0.2727	0.3248
Adjusted R-squared	0.2181	0.2652	0.3011	0.2624	0.3153

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Next, we examine whether there were some changes in risk pricing in the EA corporate bond market as a consequence of the Brexit referendum outcome. The results are reported in Table 12. Our proxy for liquidity risk gets a positive sign with a maturity of 1-3 years and 5-7 years which is a somewhat similar development to the UK corporate bond market. We notice a statistically significant increase of our newly introduced variable, the 5y/5y forward swap rate, which indicates investors' stronger sensitivity to future expected interest rates development and overall economic health. Interestingly, we observe the most evident change once again of the credit default risk variable. In the post-referendum period, our proxy for default risk has a positive sign and is highly statistically significant for all five different maturities. This is strong evidence for the risk transfer channel from sovereign to corporate

in the euro area countries, especially in times of market turmoil, which was already affirmed by previous studies (see, e.g., Augustin et al. (2016), Bedendo/Colla (2015)). The problem of risk transfer from sovereign to corporate should be of particular importance for the euro area governments, since EA is a heterogeneous union with country ratings ranging from B+ for Greece and BBB for Italy to AA for France and AAA for Germany, so that country risk problems could easily be overlooked and disregarded.

**Table 12: EA credit spreads overall economy**

Variables	1-3	3-5	5-7	7-10	10+
Constant	0.0000 (0.0004)	0.0000 (0.0005)	0.0003 (0.0005)	0.0003 (0.0005)	0.0002 (0.0005)
EA OIS rate (3M)	-0.2584 *** (0.0520)	-0.2268 *** (0.0572)	-0.2885 *** (0.0614)	-0.2487 *** (0.0597)	0.0136 (0.0742)
EA Forward Swap rate (5y/5y)	-0.0341 (0.0178)	-0.0600 *** (0.0206)	-0.0343 (0.0223)	-0.0713 *** (0.0207)	-0.0242 (0.0204)
Liquidity premium	-0.7329 *** (0.0300)	-0.6206 *** (0.0304)	-0.7626 *** (0.0296)	-0.8892 *** (0.0426)	-0.3781 *** (0.0272)
Term risk	-0.0585 ** (0.0281)	-0.0739 ** (0.0301)	-0.2066 *** (0.0322)	-0.2534 *** (0.0304)	-0.1729 *** (0.0320)
Credit default risk	-0.0058 *** (0.0003)	-0.0059 *** (0.0003)	-0.0078 *** (0.0004)	-0.0064 *** (0.0004)	-0.0047 *** (0.0004)
Eurostoxx 50	0.0651 (0.0378)	0.1538 *** (0.0444)	0.1902 *** (0.0429)	0.2695 *** (0.0426)	0.1438 *** (0.0438)
US VIX	0.0142 ** (0.0063)	0.0306 *** (0.0069)	0.0242 *** (0.0072)	0.0330 *** (0.0075)	0.0348 *** (0.0076)
Global risk aversion	-0.0058 (0.0126)	-0.0130 (0.0143)	-0.0054 (0.0141)	-0.0105 (0.0158)	0.0047 (0.0146)
(BREXIT/Ref. Dummy) x (EA OIS rate (3M))	0.2973 (0.2193)	0.2155 (0.2172)	0.3927 (0.2497)	0.3309 (0.2120)	0.0551 (0.2147)
(BREXIT/Ref. Dummy) x (EA Forward Swap rate (5y/5y))	-0.0465 (0.0427)	-0.0633 (0.0438)	-0.1220 *** (0.0450)	-0.0927 ** (0.0437)	-0.1345 *** (0.0400)
(BREXIT/Ref. Dummy) x (Liquidity premium)	0.3442 *** (0.0468)	0.1083 (0.0574)	0.1228 (0.0725)	0.1774 ** (0.0789)	-0.1100 (0.0670)
(BREXIT/Ref. Dummy) x (Term risk)	0.0145 (0.0478)	-0.0167 (0.0534)	0.0338 (0.0564)	0.0170 (0.0525)	-0.0229 (0.0535)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0050 *** (0.0010)	0.0041 *** (0.0010)	0.0049 *** (0.0010)	0.0034 *** (0.0009)	0.0025 *** (0.0009)
(BREXIT/Ref. Dummy) x (Eurostoxx 50)	-0.0588 (0.1123)	-0.0367 (0.1161)	0.0333 (0.1203)	-0.0189 (0.1111)	0.0148 (0.1133)
(BREXIT/Ref. Dummy) x (US VIX)	-0.0003 (0.0126)	-0.0041 (0.0122)	0.0057 (0.0132)	0.0066 (0.0116)	-0.0076 (0.0113)
(BREXIT/Ref. Dummy) x (Global risk aversion)	-0.0060 (0.0299)	-0.0011 (0.0274)	-0.0110 (0.0271)	0.0052 (0.0257)	-0.0129 (0.0246)
AR(1)	-0.3872 (0.3381)	-0.0162 (0.3683)	-0.3189 (0.3823)	-0.3915 (1.1787)	-0.1734 (0.1763)
MA(1)	0.4330 (0.3322)	0.0828 (0.3666)	0.3712 (0.3729)	0.4076 (1.1697)	0.2896 (0.1729)
No. Obs.	1367	1368	1369	1370	1371
R-squared	0.2701	0.2424	0.2905	0.2805	0.1825
Adjusted R-squared	0.2598	0.2317	0.2805	0.2703	0.1709

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

In the same way as before, in the next step we analyze the changes in impact of our determining variables on credit spreads in the pre-referendum and post-referendum periods differentiating between the financial and non-financial sectors. The results are summarized

in Tables 13 and 14. The outcomes confirm the previously observed risk transfer channel which plays an important role by determining credit spreads for the financial as well as for the non-financial sector. Additionally, in reference to the financial sector, the respective benchmark stock market index (Eurostoxx Financials) gets a negative sign, which is consistent with theory, and is highly statistically significant with a remaining maturity of 1-3 years, 3-5 years, 5-7 years and 7-10 years. This finding indicates that investors pay more attention to the business climate and to the future expected overall state of economy in the post-referendum period. Concerning the non-financial sector in EA, the corporate bond market liquidity variable has a strong statistically highly significant additional impact on credit spreads, although for all maturities the sign is positive.

**Table 13: EA credit spreads financials**

Variables	1-3	3-5	5-7	7-10	10+
Constant	-0.0003 (0.0005)	-0.0002 (0.0005)	0.0002 (0.0006)	0.0000 (0.0007)	0.0000 (0.0007)
EA OIS rate (3M)	-0.1898 *** (0.0632)	-0.1781 *** (0.0612)	-0.2142 *** (0.0650)	-0.2707 *** (0.0751)	0.0292 (0.1066)
EA Forward Swap rate (5y/5y)	0.0173 (0.0186)	-0.0288 (0.0220)	-0.0243 (0.0249)	-0.0164 (0.0254)	-0.0483 (0.0284)
Liquidity premium	-0.3364 *** (0.0346)	-0.5396 *** (0.0338)	-0.7226 *** (0.0375)	-0.5422 *** (0.0457)	-0.1279 *** (0.0272)
Term risk	-0.0838 *** (0.0277)	-0.1049 *** (0.0308)	-0.1749 *** (0.0357)	-0.2132 *** (0.0380)	-0.1573 *** (0.0429)
Credit default risk	-0.0039 *** (0.0003)	-0.0046 *** (0.0004)	-0.0060 *** (0.0004)	-0.0036 *** (0.0005)	-0.0034 *** (0.0006)
Eurostoxx Financials	0.0962 *** (0.0338)	0.1243 *** (0.0405)	0.1621 *** (0.0421)	0.0753 (0.0488)	0.0092 (0.0525)
US VIX	0.0151 ** (0.0071)	0.0356 *** (0.0071)	0.0306 *** (0.0078)	0.0489 *** (0.0096)	0.0681 *** (0.0103)
Global risk aversion	-0.0094 (0.0157)	-0.0065 (0.0142)	-0.0350 ** (0.0164)	-0.0147 (0.0211)	0.0177 (0.0204)
(BREXIT/Ref. Dummy) x (EA OIS rate (3M))	0.1740 (0.2148)	0.1247 (0.2207)	0.3156 (0.2504)	0.0780 (0.2817)	-0.0066 (0.3649)
(BREXIT/Ref. Dummy) x (EA Forward Swap rate (5y/5y))	-0.0341 (0.0464)	-0.0706 (0.0481)	-0.1127 ** (0.0481)	-0.0807 (0.0528)	-0.3046 *** (0.0525)
(BREXIT/Ref. Dummy) x (Liquidity premium)	0.0876 (0.0478)	0.0576 (0.0605)	0.1864 ** (0.0766)	0.1742 (0.0963)	-0.7779 *** (0.0822)
(BREXIT/Ref. Dummy) x (Term risk)	-0.0177 (0.0517)	0.0042 (0.0579)	0.0336 (0.0534)	0.0211 (0.0656)	-0.0423 (0.0736)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0034 *** (0.0011)	0.0038 *** (0.0011)	0.0042 *** (0.0011)	0.0026 ** (0.0013)	0.0042 *** (0.0015)
(BREXIT/Ref. Dummy) x (Eurostoxx Financials)	-0.2535 *** (0.0891)	-0.2166 ** (0.0904)	-0.2704 *** (0.0955)	-0.2743 *** (0.1041)	-0.1602 (0.1217)
(BREXIT/Ref. Dummy) x (US VIX)	-0.0050 (0.0128)	-0.0166 (0.0122)	-0.0071 (0.0124)	-0.0170 (0.0140)	-0.0401 *** (0.0153)
(BREXIT/Ref. Dummy) x (Global risk aversion)	-0.0109 (0.0319)	-0.0147 (0.0277)	0.0100 (0.0286)	0.0093 (0.034)	-0.0224 (0.0365)
AR(1)	0.4799 *** (0.1785)	0.2542 (0.2424)	-0.0405 (0.2468)	0.1391 (0.2056)	-0.0955 (0.2635)
MA(1)	-0.3966 ** (0.1856)	-0.1574 (0.2483)	0.1433 (0.2461)	-0.0141 (0.2089)	0.1905 (0.2602)
No. Obs.	1367	1367	1367	1367	1367
R-squared	0.1579	0.2009	0.2393	0.1427	0.1624
Adjusted R-squared	0.146	0.1896	0.2286	0.1306	0.1506

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

**Table 14: EA credit spreads non-financials**

Variables	1-3	3-5	5-7	7-10	10+
Constant	0.0001 (0.0004)	0.0000 (0.0005)	0.0003 (0.0005)	0.0003 (0.0004)	0.0002 (0.0005)
EA OIS rate (3M)	-0.3854 *** (0.0490)	-0.2949 *** (0.0570)	-0.3352 *** (0.0605)	-0.2226 *** (0.0603)	0.0053 (0.0736)
EA Forward Swap rate (5y/5y)	-0.0714 *** (0.0169)	-0.0865 *** (0.0216)	-0.0747 *** (0.0225)	-0.0776 *** (0.0197)	-0.0340 (0.0206)
Liquidity premium	-1.0745 *** (0.0220)	-0.7721 *** (0.0348)	-0.8850 *** (0.0294)	-0.8375 *** (0.0331)	-0.4734 *** (0.0254)
Term risk	-0.0363 (0.0267)	-0.0766 ** (0.0324)	-0.1916 *** (0.0319)	-0.2414 *** (0.0313)	-0.1710 *** (0.0325)
Credit default risk	-0.0070 *** (0.0003)	-0.0072 *** (0.0003)	-0.0089 *** (0.0003)	-0.0078 *** (0.0003)	-0.0053 *** (0.0004)
Eurostoxx Non-Financials	0.0294 (0.0421)	0.1609 *** (0.0487)	0.2144 *** (0.0485)	0.2976 *** (0.0465)	0.1644 *** (0.0482)
US VIX	0.0052 (0.0063)	0.0272 *** (0.0068)	0.0201 *** (0.0072)	0.0302 *** (0.0073)	0.0283 *** (0.0075)
Global risk aversion	-0.0163 (0.0129)	-0.0151 (0.0143)	-0.0021 (0.0145)	-0.0092 (0.0155)	-0.0002 (0.0143)
(BREXIT/Ref. Dummy) x (EA OIS rate (3M))	0.4898 ** (0.2393)	0.3461 (0.2285)	0.5538 ** (0.2468)	0.4135 (0.2173)	0.0833 (0.1971)
(BREXIT/Ref. Dummy) x (EA Forward Swap rate (5y/5y))	-0.0189 (0.0425)	-0.0531 (0.0484)	-0.1109 ** (0.0462)	-0.0766 (0.0441)	-0.0895 ** (0.0420)
(BREXIT/Ref. Dummy) x (Liquidity premium)	0.7143 *** (0.0432)	0.2529 *** (0.0666)	0.2014 *** (0.0683)	0.2011 *** (0.0625)	0.0127 (0.0686)
(BREXIT/Ref. Dummy) x (Term risk)	0.0243 (0.0439)	0.0014 (0.0608)	0.0434 (0.0572)	0.0199 (0.0537)	-0.0463 (0.0536)
(BREXIT/Ref. Dummy) x (Credit default risk)	0.0056 *** (0.0010)	0.0046 *** (0.0010)	0.0052 *** (0.0010)	0.0035 *** (0.0009)	0.0024 *** (0.0009)
(BREXIT/Ref. Dummy) x (Eurostoxx Non-Financials)	0.0279 (0.1341)	0.0866 (0.1358)	0.1878 (0.1321)	0.1413 (0.1229)	0.0772 (0.1231)
(BREXIT/Ref. Dummy) x (US VIX)	0.0094 (0.014)	0.0016 (0.0131)	0.0089 (0.014)	0.0085 (0.0121)	-0.0009 (0.0114)
(BREXIT/Ref. Dummy) x (Global risk aversion)	0.0057 (0.0323)	0.0104 (0.0285)	-0.0014 (0.0279)	0.0101 (0.026)	-0.0055 (0.0246)
AR(1)	-0.4880 (0.5390)	-0.1019 (0.3797)	0.1474 (0.5243)	0.4577 (0.9356)	-0.1164 (0.1785)
MA(1)	0.5167 (0.5315)	0.1676 (0.3751)	-0.1005 (0.5264)	-0.4754 (0.9288)	0.2366 (0.1764)
No. Obs.	1365	1367	1367	1367	1367
R-squared	0.4095	0.2983	0.3511	0.3367	0.2014
Adjusted R-squared	0.4012	0.2884	0.342	0.3273	0.1902

Note: standard errors in parentheses, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively.

Estimating determinants of corporate bond yield spreads in times of market turmoil is of particular interest for governments, companies and investors to illuminate the conditions under which the refinancing of debt is particularly costly and to generate information, if possible, about which variables should be monitored with the intention of possibly reducing refinancing costs. The inconstancy of statistical significance – sometimes even involving changes in sign – makes it difficult to recommend which determinant policymakers and companies should monitor to prevent increasing refinancing costs.

## 6. Conclusion

Policymakers and financial economists alike are concerned about the impact of Brexit on future economic developments in the UK and EU27 member countries, respectively. Over the last three years, several issues relating to Brexit and its effects have been analyzed at a theoretical and empirical level. Corporate bond markets are still less liquid than equity or foreign exchange markets, nonetheless they play a very important role for fund-raising from the perspective of companies and are a reliable indicator for risk conditions in the market.

In this paper we examined the impact of Brexit-related events on the risk conditions in the United Kingdom and euro area corporate bond markets, respectively. The model includes daily spreads data covering the period from January 2013 to March 2018. We consider the major determinants of corporate bond yield spreads, which are largely based on and affirmed by previous studies in this field. An appreciable feature of our analysis is the lead use of forward swap rate data, which has shown a significant importance in almost all our empirical findings indicating that future expected interest rate developments play an important role in determining credit spreads.

A number of important insights about the estimation of credit spreads in the UK and EA corporate bond markets emerges from this study. We show that Brexit-related events had an impact on risk conditions in those two corporate bond markets. However, our estimation results suggest that only the referendum result is associated with increasing corporate bond yield spreads. Additionally, our findings indicate that UK credit spreads were more strongly influenced by the announcement of the result of the Brexit referendum than were credit bond spreads in the euro area. Distinguishing between the financial and the non-financial economic sectors allowed us to analyze more specific sector-related effects of the referendum result. We find that the financial sectors in both the UK and EA were affected by the announcement of the Brexit referendum result. However, the results suggest that credit spreads in the UK non-financial sector were significantly influenced by the Brexit vote whereas corporate bond spreads in the EA non-financial sector were hardly affected by the referendum result.

Furthermore, we split our sample into two sub-samples, namely pre-referendum and post-referendum periods, to allow to consider the potential changing evaluation of the determinants of corporate bond spreads due to altering risk pricing triggered by the Brexit referendum result. The results demonstrate that risk perception is rather volatile and can change intensely over time especially in periods of market turmoil. Our findings indicate that the United Kingdom's safe haven status was weakening in the post-referendum period. That brings serious consequences for policymakers when it comes to taking actions necessary to moderate the effects in the aftermath of Brexit. Additionally, we find that the effect of the credit default risk measure is far stronger and plays a significant role in the post-referendum period in both the UK and EA. This finding is of particular importance not only to corporates but also to governments, since we measure the indirect impact due to the risk transfer channel from sovereign to corporates.

Our findings are useful for analyzing further aspects of Brexit and its impact on future economic development. Future research should focus on testing whether the consideration of a different measure of credit worthiness is able to highlight additional aspects of risk

conditions in the UK and EA corporate bond markets and changes in them due to the Brexit aftermath, respectively. In addition, an advanced detailed analysis of specific business sectors, for example banks, financial services, automobile etc., would generate even further information of particular interest for corresponding companies in the relevant sectors.

## References

- Acharya, V.V.; Amihud, Y.; Bharath, S.T. (2013), Liquidity risk of corporate bond returns: conditional approach, *Journal of Financial Economics*, Vol. 110(2), 358-386.
- Acharya, V.V.; Drechsler, I.; Schnabl, P. (2014), A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk, *Journal of Finance*, Vol. 69(6), 2689-2739.
- Amato, J.D.; Remolona, E.M. (2003), The Credit Spread Puzzle, BIS Quarterly Review, December 2003, 51-64.
- Amihud, Y; Mendelson, H. (1986), Asset pricing and the bid-ask spread, *Journal of Financial Economics*, Vol. 17(2), 223-249.
- Amorsson, A; Zoega G. (2016), On the causes of Brexit, CESifo Working Paper 6056.
- Augustin, P.; Boustanifar, H.; Breckenfelder, J.; Schnitzler, J. (2016), Sovereign to Corporate Risk Spillovers, ECB Working Papers Series, No. 1878, January 2016, revisited June 2018, forthcoming in *Journal of Money, Credit and Banking*.
- Bank of England (2016), Inflation Report May 2016, London.
- Bedendo, M.; Colla, P. (2015), Sovereign and corporate credit risk: Evidence from the Eurozone, *Journal of Corporate Finance*, Vol 55(c), 34-52.
- Belke, A; Dubova I.; Osowski T. (2016), Policy Uncertainty and International Financial Markets: The Case of Brexit, *Ruhr Economic Papers* 657.
- Bernoth, K.; Erdogan, B. (2012), Sovereign bond yield spreads: A time-varying coefficient approach, *Journal of international Money and Finance*, Vol. 31(3), 639-656.
- Black, F.; Cox, J. (1976), Valuing Corporate Securities: Some Effects of Bond Indenture Provisions, *Journal of Finance*, Vol. 31(2), 351-367.
- Black, F.; Scholes, M. (1973), The Pricing of Options and Corporate Liabilities, *Journal of Political Economy*, Vol. 81(3), 637-654.
- Campbell, J.Y.; Taksler, G.B. (2003), Equity Volatility and Corporate Bond Yields, *Journal of Finance*, Vol. 58(6), 2321-2350.
- Celebi, K.; Korus, A. (2018), The impact of Brexit on the the British Pound/Euro Exchange rate, EIIW Discussion Paper No. 243.
- Chakravarty, S.; Sarkar, A. (1999), Liquidity in U.S. Fixed Income Markets: A Comparison of the Bid-Ask Spread in Corporate, Government and Municipal Bond Markets, FRB of New York Staff Report No. 73, March 1999. Available at SSRN: <https://ssrn.com/abstract=163139> or <http://dx.doi.org/10.2139/ssrn.163139>
- Caporale, G.M.; Gil-Alana L.; Trani T. (2018), Brexit and Uncertainty in Financial Markets, *International Journal of Financial Studies*, Vol. 6(1), 21.
- Chen, L.; Collin-Dufresne, P.; Goldstein, R.S. (2009), On the Relation Between the Credit Spread Puzzle and the Equity Premium Puzzle, *Review of Financial Studies*, Vol. 22(9), 3367-3409.
- Chen, L.; Lesmond, D.A.; Wei, J. (2007), Corporate Yield Spreads and Bond Liquidity, *Journal of Finance*, Vol. 62(1), 119-149.



- Chen, H.; Cui, R.; He, Z.; Milbradt K. (2018), Quantifying Liquidity and Default Risks of Corporate Bonds over the Business Cycle, *Review of Financial Studies*, Vol. 31(3), 852-897.
- Christensen, J. (2008), The Corporate Bond Credit Spread Puzzle, FRBSF Economic Letter, 2008-10.
- Chun, O. M.; G. Dionne, G.; François, P. (2014), Credit spread changes within switching regimes, *Journal of Banking & Finance*, Vol. (49), 41–55.
- Collin-Dufresne, P.; Goldstein, R.S. (2001), Do Credit Spreads Reflect Stationary Leverage Ratios?, *Journal of Finance*, Vol. 56(5), 1929–1957.
- Collin-Dufresne, P.; Goldstein, R.S.; Martin; J.S. (2001), The Determinants of Credit Spread Changes, *Journal of Finance*, Vol. 56(6), 2177-2207.
- Davies, R.B.; Studnicka Z. (2017), The Heterogeneous Impact of Brexit: Early Indications from the FTSE, CESifo Working Papers 6478.
- Dick-Nielsen, J.; Feldhütter, P.; Lando, D. (2012), Corporate bond liquidity before and after the onset of the subprime crisis, *Journal of Financial Economics*, Vol. 103(3), 471-492.
- Dötz, N. (2014), Decomposition of country-specific corporate bond spread, Deutsche Bundesbank, Discussion Paper, No. 37/2014.
- Duffee, G.R. (1998), The Relation Between Treasury Yields and Corporate Bond Yields, *Journal of Finance*, Vol. 53(6), 2225-2241.
- Duffee, G.R. (1999), Estimating the Price of Default Risk, *Review of Financial Studies*, Vol. 12(1), 197-226.
- Duffie, D.; Singleton, K. (1999), Modeling Term Structure of Defaultable Bonds, *Review of Financial Studies*, Vol. 12(4), 687–720.
- Deutsche Bundesbank (2017), Monthly report, January 2017, Deutsche Bundesbank, Frankfurt am Main.
- ECB (2014), Euro area risk-free interest rates: measurement issues, recent developments and relevance to monetary policy, ECB monthly bulletin July 2014, 63-78.
- Elton, E.J.; Gruber, M.J.; Agrawal, D.; Mann, C. (2001), Explaining the Rate Spread on Corporate Bonds, *Journal of Finance*, Vol. 56(1), 247-277.
- Fama, E.F.; French, K.R. (1993), Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, Vol. 33(1), 3-56.
- Feldhütter, P.; Schaefer, S.M. (2018), The Myth of the Credit Spread Puzzle, *Review of Financial Studies*, Vol. 31(8), 2897–2942.
- Friewald, N.; Jankowitsch, R.; Subrahmanyam, M.G. (2012), Illiquidity or credit deterioration: A study of liquidity in the US corporate bond market during financial crises, *Journal of Financial Economics*, Vol. 105(1), 18-36.
- Goldstein, R. (2010), Can Structural Models of Default Explain the Credit Spread Puzzle?, FRBSF Economic Letter, 2010-06.
- Gordon, M.J.; Shapiro, E. (1956), Capital equipment analysis: the required rate of profit, *Management Science*, Vol 3(1), 102-110.
- Hotchkiss, E.S.; Ronen, T. (2002), The Informational Efficiency of the Corporate Bond Market: An Intraday Analysis, *Review of Financial Studies*, Vol. 15(5), 1325-1354.

- Houweling, P.; Mentink, A.; Vorst, T. (2005), Comparing possible proxies of corporate bond liquidity, *Journal of Banking & Finance*, Vol. 29(6), 1331-1358.
- Huang, J-Z (2010), The Structural Approach to Modeling Credit Risk, in: Lee, C-F; Lee, A.C.; Lee, J. (ed.) (2010), *Handbook of Quantitative Finance and Risk Management*, Springer, Boston, MA.
- Huang, J-Z; Huang, M. (2012), How Much of the Corporate-Treasury Yield Spread is Due to Credit Risk?, *Review of Asset Pricing Studies*, Vol. 2(2), 153-202.
- Jarrow, R.; Turnbull, S. (1995), Pricing Derivatives on Financial Securities Subject to Default Risk, *Journal of Finance*, Vol. 50(1), 53–86.
- Lin, H.; Wang, J.; Wu, C. (2011), Liquidity risk and expected corporate bond returns, *Journal of Financial Economics*, Vol. 99(3), 628-650.
- Liu, S.; Shi, J.; Wang, J.; Wu, C. (2009), The determinants of corporate bond yields, *Quarterly Review of Economics and Finance*, Vol. 49(1), 85-109.
- Klein, A.C.; Pliszka, K. (2018), The time-varying impact of systematic risk factors on corporate bond spreads, Discussion Papers No. 14/2018, Deutsche Bundesbank, Frankfurt am Main, June 2018.
- Klose, J.; Weigert, B. (2013), Sovereign yield spreads during the Euro-crisis – Fundamental factors versus redenomination risk, German Council of Economic Experts, Working Paper 07/2012, revisited September 2013.
- Krause, T.; Noth F.; Tonzer L. (2016), Brexit (probability) and effects on financial market stability, IWH Online, 5/2016, Halle Institute for Economic Research.
- Longstaff, F.A.; Schwartz, E. (1995), A Simple Approach to Valuing Risky Fixed and Floating Rate Debt, *Journal of Finance*, Vol. 50(3), 789–820.
- Longstaff, F.A.; Mithal, S.; Neis, E. (2005), Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit Default Spread Market, *Journal of Finance*, Vol. 60(5), 2213-2253.
- Merton R. (1974), On the Pricing of Corporate Debt: The Risk Structure of Interest Rates, *Journal of Finance*, Vol. 29(2), 449-470.
- Pavlova, I.; A. M. Hibbert, A.M.; Barber, J.R.; Dandapani, K. (2015), Credit Spreads and Regime Shifts, *Journal of Fixed Income*, Vol. 25(1), 58–74.
- Ramiah, V.; Phama H.N.A.; Moosab I. (2017), The sectoral effects of Brexit on the British economy: early evidence from the reaction of the stock market, *Applied Economics*, Vol. 49(26), 2508-2514.
- Schuknecht, L.; von Hagen, J.; Wolswijk, G. (2010), Government bond risk premiums in the EU revisited: the impact of the financial crisis, ECB Working Paper No. 1152, Frankfurt am Main, February 2010.
- Schultz, P. (2001), Corporate Bond Trading Costs: A Peek Behind the Curtain, *Journal of Finance*, Vol. 56(2), 677-698.

## EIIW Discussion Papers

### ISSN 1430-5445:

Standing orders (usually about 10 issues): academic rate 90 Euro p.a.; normal rate 250 Euro p.a.  
Single orders: academic rate 10 Euro per copy; normal rate 30 Euro per copy.

Die Zusammenfassungen der Beiträge finden Sie im Internet unter:  
The abstracts of the publications can be found in the internet under:

<http://www.eiiw.eu>

- No. 150 **CASSEL, D., WELFENS, P.J.J.:** REGIONAL INTEGRATION, INSTITUTIONAL DYNAMICS AND INTERNATIONAL COMPETITIVENESS, DECEMBER 2006
- No. 151 **Welfens, P.J.J., Keim, M.:** Finanzmarktintegration und Wirtschaftsentwicklung im Kontext der EU-Osterweiterung, März 2007
- No. 152 **Kutlina, Z.:** Realwirtschaftliche und monetäre Entwicklungen im Transformationsprozess ausgewählter mittel- und osteuropäischer Länder, April 2007
- No. 153 **Welfens, P.J.J.; Borbély, D.:** Structural Change, Growth and Bazaar Effects in the Single EU Market, September 2008
- No. 154 **Feiguine, G.:** Die Beziehungen zwischen Russland und der EU nach der EU-Osterweiterung: Stand und Entwicklungsperspektiven, Oktober 2008
- No. 155 **Welfens, P.J.J.:** Ungelöste Probleme der Bankenaufsicht, Oktober 2008
- No. 156 **Addison J.T.:** The Performance Effects of Unions. Codetermination, and Employee Involvement: Comparing the United States and Germany (With an Addendum on the United Kingdom), November 2008
- No. 157 **Welfens, P.J.J.:** Portfoliomodell und langfristiges Wachstum: Neue Makroperspektiven, November 2008
- No. 158 **Welfens, P.J.J.:** Growth, Structural Dynamics and EU Integration in the Context of the Lisbon Agenda, November 2008
- No. 159 **Welfens, P.J.J.:** Growth, Innovation and Natural Resources, December 2008
- No. 160 **Islami, M.:** Interdependence Between Foreign Exchange Markets and Stock Markets in Selected European Countries, December 2008
- No. 161 **Welfens, P.J.J.:** Portfolio Modelling and Growth, January 2009
- No. 162 **Bartelmus, P.:** Sustainable Development – Has It Run Its Course?, January 2009
- No. 163 **Welfens, P.J.J.:** Intégration Européenne et Mondialisation: Défis, Débats, Options, February 2009
- No. 164 **Welfens, P.J.J.:** ЭКОНОМИЧЕСКИЙ РОСТ, ИННОВАЦИИ И ПРИРОДНЫЕ РЕСУРСЫ, February 2009
- No. 165 **Welfens, P.J.J.; Vogelsang, M.:** Regulierung und Innovationsdynamik in der EU-Telekommunikationswirtschaft, February 2009
- No. 166 **Welfens, P.J.J.:** The International Banking Crisis: Lessons and EU Reforms, February 2009
- No. 167 **Schröder, C.:** Financial System and Innovations: Determinants of Early Stage Venture Capital in Europe, March 2009

- No. 168 **Welfens, P.J.J.:** Marshall-Lerner Condition and Economic Globalization, April 2009
- No. 169 **Welfens, P.J.J.:** Explaining Oil Price Dynamics, May 2009
- No. 170 **Welfens, P.J.J.; Borbély, D.:** Structural Change, Innovation and Growth in the Single EU Market, August 2009
- No. 171 **Welfens, P.J.J.:** Innovationen und Transatlantische Bankenkrise: Eine ordnungspolitische Analyse, August 2009
- No. 172 **Erdem, D.; Meyer, K.:** Natural Gas Import Dynamics and Russia's Role in the Security of Germany's Supply Strategy, December 2009
- No. 173 **Welfens P.J.J.; Perret K.J.:** Structural Change, Specialization and Growth in EU 25, January 2010
- No. 174 **Welfens P.J.J.; Perret K.J.; Erdem D.:** Global Economic Sustainability Indicator: Analysis and Policy Options for the Copenhagen Process, February 2010
- No. 175 **Welfens, P.J.J.:** Rating, Kapitalmarktsignale und Risikomanagement: Reformansätze nach der Transatlantischen Bankenkrise, Februar 2010
- No. 176 **Mahmutovic, Z.:** Patendatenbank: Implementierung und Nutzung, Juli 2010
- No. 177 **Welfens, P.J.J.:** Toward a New Concept of Universal Services: The Role of Digital Mobile Services and Network Neutrality, November 2010
- No. 178 **Perret J.K.:** A Core-Periphery Pattern in Russia – Twin Peaks or a Rat's Tail, December 2010
- No. 179 **Welfens P.J.J.:** New Open Economy Policy Perspectives: Modified Golden Rule and Hybrid Welfare, December 2010
- No. 180 **Welfens P.J.J.:** European and Global Reform Requirements for Overcoming the Banking Crisis, December 2010
- No. 181 **Szanyi, M.:** Industrial Clusters: Concepts and Empirical Evidence from East-Central Europe, December 2010
- No. 182 **Szalavetz, A.:** The Hungarian automotive sector – a comparative CEE perspective with special emphasis on structural change, December 2010
- No. 183 **Welfens, P.J.J.; Perret, K.J.; Erdem, D.:** The Hungarian ICT sector – a comparative CEE perspective with special emphasis on structural change, December 2010
- No. 184 **Lengyel, B.:** Regional clustering tendencies of the Hungarian automotive and ICT industries in the first half of the 2000's, December 2010
- No. 185 **Schröder, C.:** Regionale und unternehmensspezifische Faktoren einer hohen Wachstumsdynamik von IKT Unternehmen in Deutschland; Dezember 2010
- No. 186 **Emons, O.:** Innovation and Specialization Dynamics in the European Automotive Sector: Comparative Analysis of Cooperation & Application Network, October 2010
- No. 187 **Welfens, P.J.J.:** The Twin Crisis: From the Transatlantic Banking Crisis to the Euro Crisis? January 2011
- No. 188 **Welfens, P.J.J.:** Green ICT Dynamics: Key Issues and Findings for Germany, March 2012
- No. 189 **Erdem, D.:** Foreign Direct Investments, Energy Efficiency and Innovation Dynamics, July 2011
- No. 190 **Welfens, P.J.J.:** Atomstromkosten und -risiken: Haftpflichtfragen und Optionen rationaler Wirtschaftspolitik, Mai 2011
- No. 191 **Welfens, P.J.J.:** Towards a Euro Fiscal Union: Reinforced Fiscal and Macroeconomic Coordination and Surveillance is Not Enough, January 2012

- No. 192 **Irawan, Tony:** ICT and economic development: Conclusion from IO Analysis for Selected ASEAN Member States, November 2013
- No. 193 **Welfens, P.J.J.; Perret, J.:** Information & Communication Technology and True Real GDP: Economic Analysis and Findings for Selected Countries, February 2014
- No. 194 **Schröder, C.:** Dynamics of ICT Cooperation Networks in Selected German ICT Clusters, August 2013
- No. 195 **Welfens, P.J.J.; Jungmittag, A.:** Telecommunications Dynamics, Output and Employment, September 2013
- No. 196 **Feiguine, G.; Solojova, J.:** ICT Investment and Internationalization of the Russian Economy, September 2013
- No. 197 **Kubielas, S.; Olender-Skorek, M.:** ICT Modernization in Central and Eastern Europe, May 2014 Trade and Foreign Direct Investment New Theoretical Approach and Empirical Findings for US Exports & European Exports
- No. 198 **Feiguine, G.; Solovjova, J.:** Significance of Foreign Direct Investment for the Development of Russian ICT sector, May 2014
- No. 199 **Feiguine, G.; Solovjova, J.:** ICT Modernization and Globalization: Russian Perspectives, May 2014
- No. 200 **Syraya, O.:** Mobile Telecommunications and Digital Innovations, May 2014
- No. 201 **Tan, A.:** Harnessing the Power of ICT and Innovation Case Study Singapore, June 2014
- No. 202 **Udalov, V.:** Political-Economic Aspects of Renewable Energy: Voting on the Level of Renewable Energy Support, November 2014
- No. 203 **Welfens, P.J.J.:** Overcoming the EU Crisis and Prospects for a Political Union, November 2014
- No. 204 **Welfens, P.J.J.; Irawan, T.:** Trade and Foreign Direct Investment: New Theoretical Approach and Empirical Findings for US Exports and European Exports, November 2014
- No. 205 **Welfens, P.J.J.:** Competition in Telecommunications and Internet Services: Problems with Asymmetric Regulations, Dezember 2014
- No. 206 **Welfens, P.J.J.:** Innovation, Inequality and a Golden Rule for Growth in an Economy with Cobb-Douglas Function and an R&D Sector, März 2015
- No. 207 **Perret, J.K.:** Comments on the Impact of Knowledge on Economic Growth across the Regions of the Russian Federation
- No. 208 **Welfens, P.J.J.; Irawan T.:** European Innovations Dynamics and US Economic Impact: Theory and Empirical Analysis, June 2015
- No. 209 **Welfens, P.J.J.:** Transatlantisches Freihandelsabkommen EU-USA: Befunde zu den TTIP-Vorteilen und Anmerkungen zur TTIP-Debatte, Juni 2015
- No. 210 **Welfens, P.J.J.:** Overcoming the Euro Crisis and Prospects for a Political Union, July 2015
- No. 211 **Welfens, P.J.J.:** Schumpeterian Macroeconomic Production Function for Open Economies: A New Endogenous Knowledge and Output Analysis, January 2016
- No. 212 **Jungmittag, A.; Welfens, P.J.J.:** Beyond EU-US Trade Dynamics: TTIP Effects Related to Foreign Direct Investment and Innovation, February 2016
- No. 213 **Welfens, P.J.J.:** Misleading TTIP analysis in the 6<sup>th</sup>/7<sup>th</sup> May 2016 issue of DER SPIEGEL, May 2016
- No. 214 **Welfens, P.J.J.:** TTIP-Fehlanalyse im SPIEGEL Heft 6. Mai 2016, Mai 2016
- No. 215 **Welfens, P.J.J.; Irawan, T.; Perret, J.K.:** True Investment-GDP Ratio in a World

Economy with Investment in Information & Communication Technology, June 2016

- No. 216 **Welfens, P.J.J.:** EU-Osterweiterung: Anpassungsprozesse, Binnenmarktdynamik und Euro-Perspektiven, August 2016
- No. 217 **Perret, J.K.:** A Spatial Knowledge Production Function Approach for the Regions of the Russian Federation, June 2016
- No. 218 **Korus, A.:** Currency Overvaluation and R&D Spending, September 2016
- No. 219 **Welfens, P.J.J.:** Cameron's Information Disaster in the Referendum of 2016: An Exit from Brexit? September 2016
- No. 220 **Welfens, P.J.J.:** Qualitätswettbewerb, Produktinnovationen und Schumpetersche Prozesse in internationalen Märkten, October 2016
- No. 221 **Jungmittag, A.:** Techno-Globalisierung, October 2016
- No. 222 **Dachs, B.:** Techno-Globalisierung als Motor des Aufholprozesses im österreichischen Innovationssystem, October 2016
- No. 223 **Perret, Jens K.:** Strukturwandel in der Europäischen Union am Beispiel ausgewählter Leitmärkte mit besonderem Bezug auf die Innovationstätigkeit der Mitgliedsländer, October 2016
- No. 224 **Irawan, T.; Welfens, P.J.J.:** ICT Dynamics and Regional Trade Bias in Asia: Theory and Empirical Aspects, October 2016
- No. 225 **Korus, A.:** Erneuerbare Energien und Leitmärkte in der EU und Deutschland, October 2016
- No. 226 **Dachs, B.; Budde, B.:** Fallstudie Nachhaltiges Bauen und Lead Markets in Österreich, October 2016
- No. 227 **Welfens, P.J.J.:** eHealth: Grundlagen der Digitalen Gesundheitswirtschaft und Leitmarktperspektiven, October 2016
- No. 228 **Korus, A.:** Innovationsorientierte öffentliche Beschaffung und Leitmärkte: Politische Initiativen in der EU, October 2016
- No. 229 **Irawan, T.; Welfens, P.J.J.:** IKT Dynamik und regionale Handelsverzerrungen in Asien: Theorie und empirische Aspekte, Oktober 2016
- No. 230 **Nan, Yu:** Innovation of renewable energy generation technologies at a regional level in China: A study based on patent data analysis, December 2016
- No. 231 **Welfens, P.J.J.; Debes, C.:** Globale Nachhaltigkeit 2017: Ergebnisse zum EIIW-vita Nachhaltigkeitsindikator, April 2017
- No. 232 **Welfens, P.J.J.:** Negative Welfare Effects from Enhanced International M&As in the Post-BREXIT-Referendum UK, April 2017
- No. 233 **Udalov, V.; Welfens, P.J.J.:** Digital and Competing Information Sources: Impact on Environmental Concern und Prospects for Cooperation, April 2017
- No. 234 **Welfens, Paul J.J.:** The True Cost of BREXIT for the UK: A Research Note, October 2017
- No. 235 **Welfens, P.J.J.; Hanrahan, D.:** BREXIT: Key Analytical Issues and Insights from Revised Economic Forecasts, January 2018
- No. 236 **Welfens, Paul J.J.:** Techno-Globalisierung, Leitmärkte und Strukturwandel in wirtschaftspolitischer Sicht, August 2017
- No. 238 **Welfens, P.J.J.:** Foreign Financial Deregulation under Flexible and Fixed Exchange Rates, June 2017

- No. 239 **Welfens, P.J.J.; Kadiric, S.:** Neuere Finanzmarktaspekte von Bankenkrise, QE-Politik und EU-Bankenaufsicht, July 2017
- No. 240 **Welfens, P.J.J.; Hanrahan, D.:** The BREXIT Dynamics: British and EU27 Challenges after the EU Referendum, May 2017
- No. 241 **Welfens, P.J.J.; Baier, F.:** BREXIT and FDI: Key Issues and New Empirical Findings, January 2018
- No. 242 **Welfens, P.J.J.:** International Risk Management in BREXIT and Policy Options, March 2018
- No. 243 **Korus, A.; Celebi, K.:** The Impact of Brexit on the British Pound/Euro Exchange rate The Impact of Brexit on the British Pound/Euro Exchange rate, April 2018
- No. 244 **Welfens, P.J.J.; Yushkova, E.:** IKT-Sektor in China und Wirtschaftsbeziehungen zu Deutschland, April 2018
- No. 245 **Udalov, V.:** Analysis of Individual Renewable Energy Support: An Enhanced Model, June 2018
- No. 246 **Welfens, P.J.J.:** Lack of International Risk Management in BREXIT?, July 18 2018

## **Weitere Beiträge von Interesse:**

### **Titels of related interest:**

**Paul J.J. Welfens** (2017), Macro Innovation Dynamics and the Golden Age  
New Insights into Schumpeterian Dynamics, Inequality and Economic Growth, Springer  
Heidelberg

**Paul J.J. Welfens** (Nov. 2016), Brexit aus Versehen: Europäische Union zwischen  
Desintegration und neuer EU, Springer Heidelberg

**Paul J.J. Welfens; Jens K. Perret; Tony Irawan; Evgeniya Yushkova** (2015), Towards  
Global Sustainability, Springer Berlin Heidelberg

**Paul J.J. Welfens; A. Korus; T. Irawan** (2014), Transatlantisches Handels- und  
Investitionsabkommen: Handels-, Wachstums- und industrielle Beschäftigungsdynamik in  
Deutschland, den USA und Europa, Lucius & Lucius Stuttgart

**Paul J.J. Welfens** (2013), Grundlagen der Wirtschaftspolitik, 5. Auflage, Springer Berlin  
Heidelberg

**Paul J.J. Welfens** (2013), Social Security and Economic Globalization, Springer Berlin  
Heidelberg

**Paul J.J. Welfens** (2012), Clusters in Automotive and Information & Communication  
Technology, Springer Berlin Heidelberg

**Paul J.J. Welfens** (2011), Innovations in Macroeconomics, 3rd revised and enlarged  
edition, Springer Berlin Heidelberg

**Paul J.J. Welfens** (2011), Zukunftsfähige Wirtschaftspolitik für Deutschland und Europa,  
Springer Berlin Heidelberg

**Paul J.J. Welfens; Cillian Ryan, eds.** (2011), Financial Market Integration and Growth,  
Springer Berlin Heidelberg

**Raimund Bleischwitz; Paul J.J. Welfens; Zhong Xiang Zhang** (2011), International  
Economics of Resource Efficiency, Physica-Verlag Heidelberg

**Paul J.J. Welfens; John T. Addison** (2009), Innovation, Employment and Growth Policy  
Issues in the EU and the US, Springer Berlin Heidelberg

**Paul J.J. Welfens; Suthiphand Chirathivat; Franz Knipping** (2009), EU – ASEAN,  
Springer Berlin Heidelberg

**Paul J.J. Welfens; Ellen Walther-Klaus** (2008), Digital Excellence, Springer Berlin  
Heidelberg

**Huib Meijers; Bernhard Dachs; Paul J.J. Welfens** (2008), Internationalisation of  
European ICT Activities, Springer Berlin Heidelberg



- Richard Tilly; Paul J.J. Welfens; Michael Heise** (2007), 50 Years of EU Economic Dynamics, Springer Berlin Heidelberg
- Paul J.J. Welfens; Mathias Weske** (2007), Digital Economic Dynamics, Springer Berlin Heidelberg
- Paul J.J. Welfens; Franz Knipping; Suthiphand Chirathivat** (2006), Integration in Asia and Europe, Springer Berlin Heidelberg
- Edward M. Graham; Nina Oding; Paul J.J. Welfens** (2005), Internationalization and Economic Policy Reforms in Transition Countries, Springer Berlin Heidelberg
- Paul J.J. Welfens; Anna Wziatek-Kubiak** (2005), Structural Change and Exchange Rate Dynamics, Springer Berlin Heidelberg
- Paul J.J. Welfens; Peter Zoche; Andre Jungmittag; Bernd Beckert; Martina Joisten** (2005), Internetwirtschaft 2010, Physica-Verlag Heidelberg
- Evgeny Gavrilenkov; Paul J.J. Welfens; Ralf Wiegert** (2004), Economic Opening Up and Growth in Russia, Springer Berlin Heidelberg
- John T. Addison; Paul J.J. Welfens** (2003), Labor Markets and Social Security, Springer Berlin Heidelberg
- Timothy Lane; Nina Oding; Paul J.J. Welfens** (2003), Real and Financial Economic Dynamics in Russia and Eastern Europe, Springer Berlin Heidelberg
- Claude E. Barfield; Günter S. Heiduk; Paul J.J. Welfens** (2003), Internet, Economic Growth and Globalization, Springer Berlin Heidelberg
- Thomas Gries; Andre Jungmittag; Paul J.J. Welfens** (2003), Neue Wachstums- und Innovationspolitik in Deutschland und Europa, Physica-Verlag Heidelberg
- Hermann-Josef Bunte; Paul J.J. Welfens** (2002), Wettbewerbsdynamik und Marktabgrenzung auf Telekommunikationsmärkten, Springer Berlin Heidelberg
- Paul J.J. Welfens; Ralf Wiegert** (2002), Transformationskrise und neue Wirtschaftsreformen in Russland, Physica-Verlag Heidelberg
- Paul J.J. Welfens; Andre Jungmittag** (2002), Internet, Telekomliberalisierung und Wirtschaftswachstum, Springer Berlin Heidelberg
- Paul J.J. Welfens** (2002), Interneteconomics.net, Springer Berlin Heidelberg
- David B. Audretsch; Paul J.J. Welfens** (2002), The New Economy and Economic Growth in Europe and the US, Springer Berlin Heidelberg
- Paul J.J. Welfens** (2001), European Monetary Union and Exchange Rate Dynamics, Springer Berlin Heidelberg

**Paul J.J. Welfens** (2001), Internationalization of the Economy and Environmental Policy Options, Springer Berlin Heidelberg

**Paul J.J. Welfens** (2001), Stabilizing and Integrating the Balkans , Springer Berlin Heidelberg

**Richard Tilly; Paul J.J. Welfens** (2000), Economic Globalization, International Organizations and Crisis Management, Springer Berlin Heidelberg

**Paul J.J. Welfens; Evgeny Gavrilencov** (2000), Restructuring, Stabilizing and Modernizing the New Russia, Springer Berlin Heidelberg

**Paul J.J. Welfens; Klaus Gloede; Hans Gerhard Strohe; Dieter Wagner** (1999), Systemtransformation in Deutschland und Rußland, Physica-Verlag Heidelberg

**Paul J.J. Welfens; Cornelius Graack** (1999), Technologieorientierte Unternehmensgründungen und Mittelstandspolitik in Europa, Physica-Verlag Heidelberg

**Paul J.J. Welfens; George Yarrow; Ruslan Grinberg; Cornelius Graack** (1999), Towards Competition in Network Industries, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1999), Globalization of the Economy, Unemployment and Innovation, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1999), EU Eastern Enlargement and the Russian Transformation Crisis, Springer Berlin Heidelberg

**Paul J.J. Welfens; S. Jungbluth; H. Meyer; John T. Addison; David B. Audretsch; Thomas Gries; Hariolf Grupp** (1999), Globalization, Economic Growth and Innovation Dynamics, Springer Berlin Heidelberg

**Paul J.J. Welfens; David B. Audretsch; John T. Addison; Hariolf Grupp** (1998), Technological Competition, Employment and Innovation Policies in OECD Countries, Springer Berlin Heidelberg

**John T. Addison; Paul J.J. Welfens** (1998), Labor Markets and Social Security, Springer Berlin Heidelberg

**Axel Börsch-Supan; Jürgen von Hagen; Paul J.J. Welfens** (1997), Wirtschaftspolitik und Weltwirtschaft, Springer Berlin Heidelberg

**Paul J.J. Welfens; George Yarrow** (1997), Telecommunications and Energy in Systemic Transformation, Springer Berlin Heidelberg

**Jürgen v. Hagen; Paul J.J. Welfens; Axel Börsch-Supan** (1997), Springers Handbuch der Volkswirtschaftslehre 2, Springer Berlin Heidelberg

**Paul J.J. Welfens; Holger C. Wolf** (1997), Banking, International Capital Flows and Growth in Europe, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1997), European Monetary Union, Springer Berlin Heidelberg

**Richard Tilly; Paul J.J. Welfens** (1996), European Economic Integration as a Challenge to Industry and Government, Springer Berlin Heidelberg

**Jürgen v. Hagen; Axel Börsch-Supan; Paul J.J. Welfens** (1996), Springers Handbuch der Volkswirtschaftslehre 1, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1996), Economic Aspects of German Unification, Springer Berlin Heidelberg

**Paul J.J. Welfens; Cornelius Graack** (1996), Telekommunikationswirtschaft, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1996), European Monetary Integration , Springer Berlin Heidelberg

**Michael W. Klein; Paul J.J. Welfens** (1992), Multinationals in the New Europe and Global Trade, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1992), Economic Aspects of German Unification, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1992), Market-oriented Systemic Transformations in Eastern Europe, Springer Berlin Heidelberg

**Paul J.J. Welfens** (1990), Internationalisierung von Wirtschaft und Wirtschaftspolitik, Springer Berlin Heidelberg

**Paul J.J. Welfens; Leszek Balcerowicz** (1988), Innovationsdynamik im Systemvergleich, Physica-Verlag Heidelberg