

Covi, Giovanni; Eydam, Ulrich

Working Paper

End of the sovereign-bank doom loop in the European Union? The bank recovery and resolution directive

Kiel Advanced Studies Working Papers, No. 468

Provided in Cooperation with:

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

Suggested Citation: Covi, Giovanni; Eydam, Ulrich (2016) : End of the sovereign-bank doom loop in the European Union? The bank recovery and resolution directive, Kiel Advanced Studies Working Papers, No. 468, Kiel Institute for the World Economy (IfW), Kiel

This Version is available at:

<https://hdl.handle.net/10419/142155>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Advanced Studies in International Economic Policy Research
Kiel Institute for the World Economy
Kiellinie 66
D-24105 Kiel/Germany

Working Paper No. 468

**End of the Sovereign-Bank Doom Loop in the European
Union? The Bank Recovery and Resolution Directive**

by

Giovanni Covi and Ulrich Eydam

May 2016

Kiel Advanced Studies Working Papers are preliminary papers, and responsibility for contents and distribution rests with the authors. Critical comments and suggestions for improvement are welcome.



End of the Sovereign-Bank Doom Loop in the European Union?

The Bank Recovery and Resolution Directive

G. Covi* and U. Eydam**

Kiel Institute for the World Economy
Advanced Study Program in International Economic Policy Research

Abstract

In this paper we examine the relationship between the default risk of banks and sovereigns, i.e. the ‘doom-loop’. Specifically we try to assess the effectiveness of the implementation of the new recovery and resolution framework. We use a panel with daily data on European banks and sovereigns ranging from 2008 to 2016. We find that there was a pronounced feedback loop between banks and sovereigns from 2008 to 2014. However, this feedback loop seems to have disappeared after the implementation of the new regulatory framework. This finding is robust across several specifications.

JEL Code: E58, G01, G18, L51.

Keywords: Financial Stability, Sovereign Bailout, Doom Loop, Bank Recovery and Resolution Directive, European Banking Union.

* University of Verona, Email: giovanni.covi@univr.it

** University of Potsdam, Email: ueydam@uni-potsdam.de

Over the course of the past 800 years, the terms of trade between the state and the banks have first swung decisively one way and then the other. For the majority of this period, the state was reliant on the deep pockets of the banks to finance periodic fiscal crises. But for at least the past century the pendulum has swung back, with the state often needing to dig deep to keep crisis-prone banks afloat. Events of the past two years have tested even the deep pockets of many states. In so doing, they have added momentum to the century-long pendulum swing. Reversing direction will not be easy. It is likely to require a financial sector reform effort every bit as radical as followed the Great Depression. It is an open question whether reform efforts to date, while slowing the swing, can bring about that change of direction. (A. Haldane, 2009: 11)

1. Introduction

Since the outbreak of the euro crisis the link between the default risk of governments and banks has become one of the major challenges in stabilizing the financial system. The connection between a fragile banking system and deteriorated government fiscal positions magnified the difficulties to reestablish a stable macroeconomic environment in the euro area. In order to achieve financial stability the link between government and bank default risk needs to be resolved.

On the one hand the European banks were one of the major creditors for European sovereigns. This implies that a decrease in the prices of government bonds can introduce a deterioration of the banks' balance sheet. On the other hand, with the emergence of the financial crisis in 2007/2008 it became evident that in times of financial turmoil governments ultimately have to bail-out national banks. However, such bail-outs go hand in hand with large increases in government debt that directly affect the solvency of national governments. Hence, if the bail-outs are large the value of government bonds can decrease which in turn affects the portfolio of the national banks and finally creates a feedback process between the default risk of banks and sovereigns. This risk connection, evolving from the aforementioned interdependence is often called the 'doom loop' or the 'vicious cycle'.

In order to stabilize the financial system three macro prudential measures have been undertaken since the financial crisis and the Euro crisis. The Basel III Accord was implemented in the European Union on 26th June 2013 through the Capital Requirements Regulation and Directive - CRD IV - which strengthen banks' balance sheet by enhancing minimum capital and liquidity standards as well as by imposing a leverage ratio. In addition the European Parliament initiated the European Banking Union by creating the Single Supervisory Mechanism (SSM), which on 4th November 2014 transferred the responsibility of financial supervision to the European Central Bank (ECB) and by implementing the Single Resolution Mechanism (SRM), which defines a common resolution framework for banks that entered fully into force on 1st January 2016. The banking union aims to ensure the safety and

soundness of the European banking system, to increase financial integration and stability and to create a consistent and homogenous supervisory and resolution framework across its member states. The SRM as well as the Basel III Accord affect the link between sovereigns and banks indirectly by lightening the idiosyncratic risk of both. Nevertheless a third measure was necessary to stop the existing spillovers between governments and banks. To this respect the Bank Recovery and Resolution Directive (BRRD) was agreed on 15th May 2014 and entered into force between January 2015 and January 2016 across the EU member states. The BRRD harmonizes the recovery and resolution of all credit institutions and investment firms by establishing a minimum requirement for own funds and eligible liabilities (MREL) and a bail-in clause. The BRRD sets clearly the following objective:

In the future, shareholders and creditors will have to bear the burden of bank failure, minimizing moral hazard and risks to taxpayers. Removing the implicit subsidy of large banks by governments will avoid the build-up of excessive risk and leverage within banks and the banking system as a whole... In this way MREL ensures sufficient loss absorbing capacity that should enable an orderly resolution, ensuring continuity of critical functions without recourse to public funds. (EBA, 2015, p. 5)

The goal of this paper is to assess whether these new regulatory standards are sufficient to break the link between sovereign risk and the default risk of the banking sector. Specifically we will evaluate empirically if the correlation of risks decreases through the implementation of the BRRD.

In order to identify the channel between bank and sovereign credit risk we need to overcome an omitted variables problem. Both bank and sovereign credit risk are affected by macroeconomic factors that could induce co-movements between them, even in absence of a direct link. This problem is addressed by implementing fixed effect estimation approach. First we control for bank specific effects and time fixed effects, additionally we include measures of volatility, foreign exposure of banks and a CDS market index. Furthermore, we include stock returns, the CISS and a stock market index to assess the robustness of the approach.

We find that the negative feedback process between bank and government CDS was quite pronounced in the Euro Area from 2012 to 2014. An increase in sovereign CDS of 10% translates into 0.3-0.4% increase in bank CDS. However, our results indicate that due to the implementation of the banking union, especially the implementation of the BRRD, this risk-link has been weakened. While the coefficient on government CDS was statistically significant before the implementation its significance decreased in 2015 and it finally became insignificant in 2016. This finding is robust across several different specifications.

The first part of the paper will recap the discussion on the link between sovereign and bank risk. Furthermore, it will provide a brief overview of the empirical literature. Finally, the

institutional features of the banking union will be presented. The second part of the paper will present the data, the estimation strategy and results. The last part of the paper will discuss the findings and building on this point out possible policy advices.

2. Bank Bailouts and Sovereign Credit Risk

2.1 The ‘Doom Loop’

The Euro crisis can be viewed as a phenomenon of multiple dimensions. The first dimension is a banking crisis in which undercapitalized banks face liquidity problems. The second dimension is a sovereign debt crisis in which sovereigns face increasing bond yields and might have challenges to fund the government activity. According to Shambough (2012) and Mody and Sandri (2012) those events are mutually reinforcing and are further exacerbated by the overall weak growth in the euro area.

Those dimensions taken together constitute the so called ‘vicious cycle’ or ‘doom loop’. This terminology clearly indicates that the problem is one of a negative feedback process. In the absence of a supranational resolution mechanism, sovereigns are solely in the responsibility to bail-out the national banks. Such a bank bail-out has a direct impact on the debt level of the sovereign and an indirect impact on the yields the sovereign has to pay when issuing debt¹. Domestic banks hold a large share of the debt issued by their corresponding sovereign on their balance sheets. The bail-out triggers a fall in the price of sovereign bonds which in turn leads to a deterioration of the bank’s balance sheet. Hence, a bank bail-out can start a downward spiral from government debt to bank balance sheets and vice versa². As argued by Merler and Pisani-Ferry (2012) and Breton et al. (2012) this negative feedback process is particularly pronounced in the euro area and adversely affects its financial stability.

Acharya et al. (2014) assess the feedback loop between banks and sovereign default risk empirically. They use panel data on European banks ranging from 2007 to 2011. In order to overcome endogeneity problems they employ a fixed effects estimation strategy. First, they document spillovers from bank to sovereign default risk due to the bail-outs. Furthermore, they show the existence of a two-way feedback process between the two. Ejsing and Lemke (2011) use weekly data ranging from 2008 to 2009 on bank and sovereign CDS. They find evidence in favor of a bank to sovereign risk transfer through the bail-outs. Stanga (2011)

¹ Merler and Pisani-Ferry (2012) argue that if market participants perceive that there is the risk of a bail-out yields of government bonds could already be affected. (p.204)

² Sgherri and Zoli (2009) verify that the deterioration in fiscal positions led to an increase in government bond risk premiums for most European countries. In particular they argue that increases in debt levels of sovereigns and concerns about the solvency of national banking systems have caused this increase (p.17).

uses weekly data on bank and government CDS ranging from 2007 to 2011. She uses a VAR with sign restrictions and finds evidence that points towards the existence of interlinkages between government and bank default risk. Especially she presents evidence that points towards a transfer of risk from banks to sovereigns due to the bail-outs.

More evidence regarding the two-way feedback process is presented by Alter and Beyer (2014). They use daily bank and sovereign CDS data ranging from 2009 to 2012 to construct spillover indices that capture the average interdependence between the sovereign and the corresponding banking sector. They report both, spillovers from banks to sovereigns and from sovereigns to banks (p.144). They find that both indices increase from 2010 to 2012 what indicates an intensification of the feedback process between banks and sovereigns in the euro area. Alter and Schueler (2012) investigate the interdependence of the default risk of euro area sovereigns and banks between 2007 and 2010. They use daily CDS data on seven European sovereigns and 14 banks. They apply a bivariate VEC and a VAR and compare a pre bail-out sample to a post bail-out sample. They find a pronounced effect of the risk transfer from banks to governments and evidence in favor of a two-way feedback loop (p. 3454). Furthermore, they find heterogeneous effects of the feedback process across countries but homogeneous effects within countries. Additional evidence for the two-way feedback process comes from Fratzscher and Rieth (2015). They conduct a SVAR analysis of bank and government CDS with daily data for the period from 2003 up to 2013. First they find that the risk connection between governments and banks is much stronger after the bail-out period compared to before. Furthermore, they find evidence that confirms the two-way feedback process between both. They also document that risk shocks that affect governments have a stronger effect on banks than vice versa.

In order to break or at least weaken the link between government and bank risk Merler and Pisani-Ferry (2012) suggest different institutional reforms. One is the introduction of Eurobonds. This would introduce a new risk free asset for the European banks that is not linked to the solvency of a single sovereign but would be backed up by the whole EMU countries. The availability of such an asset could – at least in principle – weaken the risk exposure between sovereigns and banks. Another measure that has also been proposed by Breton et al. (2012) is to change the central banks collateral policy. Since all government bonds of EMU countries were identical in their ability to be pledgeable in the operations of the central bank, banks could widely ignore the idiosyncratic risk associated with different sovereign bonds. The introduction of a risk weighted system in the operations of the central

bank could therefore induce banks to recognize the risk of specific sovereigns and lead them to diversify their portfolios.

Many authors (e.g. Merler and Pisani-Ferry (2012) and Breton et al. (2012)) also suggest to move the supervision of large banks and the responsibility to rescue them to a supranational level. A supranational resolution mechanism could weaken the feedback process by reducing the potential cost of a bail-out for the national governments. As suggested by Breton et al. (2012) a bail-in mechanism, that is designed to clearly define the legal responsibility in the case of a default, could as well reduce the presence of the feedback process. As other measures mentioned above the aim of the bail-in mechanism is to induce investors and creditors of banks and sovereigns to price in the risk of a default correctly.

2.2 The European Banking Union

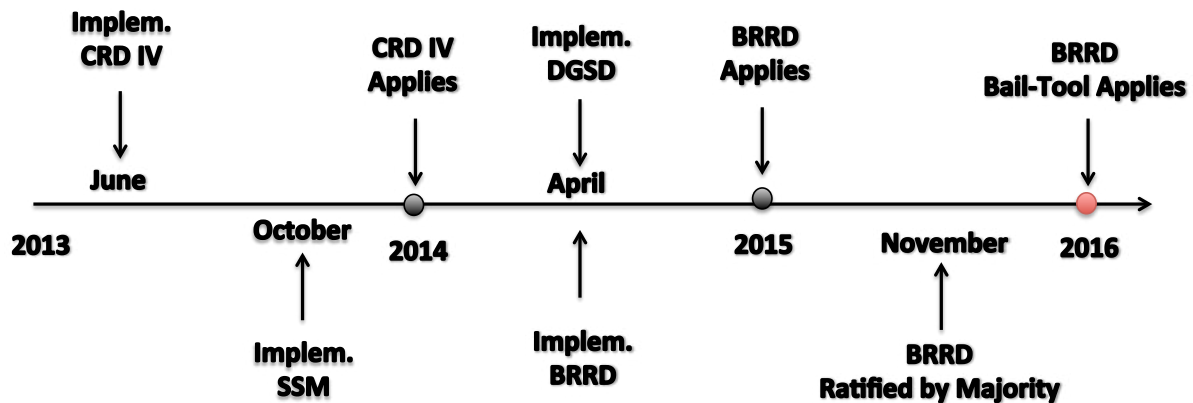
In order to address the issue of financial stability in the euro area, the European Parliament in accordance with the European Council decided to found the European Banking Union (EBU). As of 2016, the EBU consists of two pillars: the Single Resolution Mechanism (SRM) accompanied by the Single Supervisory Mechanism (SSM). The third pillar that should be implemented in the near future is the harmonization of deposit guarantee schemes across countries. Those pillars were legislated through the so-called Single Rulebook, which governs the legal framework of the EBU. The legislation took place through three directives. In June 2013 the Capital Requirements Regulation and Directive (CRD IV) was implemented, it legislates the conversion of the Basel III capital and liquidity requirements into EU law. In April 2014 the member states agreed upon the Deposit Guarantee Scheme Directive (DGSD) that harmonizes deposit insurance across member states. Afterwards, in May 2014 the Bank Recovery and Resolution Directive (BRRD) has been implemented. It provides a unified resolution framework for banks, defines the liabilities in case of a default and requires banks to build up a resolution fund. This new legal framework applies to all banks within the European Monetary Union (EMU) and other European banks that can choose to participate voluntarily³.

Figure I depicts the timeline of events. In June 2013 the European institutions agreed upon the implementation of CRD IV. Finally, from January 2014 onwards banks have to adjust gradually to the new capital requirements stated in Basel III. The main novelty here is the introduction of a minimum leverage ratio, new standards regarding capital requirements and the introduction of new liquidity requirements. Those measures should increase the loss

³ For instance Denmark, Switzerland and UK decided to opt-in and apply the reforms stated in the new legislations.

absorbing capacity of banks and enhance liquidity of the banking sector in times of turmoil (European Parliament, 2013).

Figure I
Timeline of EBU implementation



In October 2013 the implementation of the SSM has been announced. From November 2014 onwards the European Central Bank (ECB) has overtaken the task to supervise the European banking sector, according to the rules stated in the SSM. Therefore, the ECB is directly supervising the most ‘significant’ banks within Europe⁴. National supervisory boards are supporting the ECB by providing information on the significant banks and by supervising the remaining banks in their home countries. The SSM should ensure a common and coordinated supervision of banks, which in case of a failure could threaten the financial stability of the euro area (European Parliament, 2010).

In May 2014 the second pillar - the SRM - has been implemented through the BRRD, subsequently it entered into force in August 2014. Finally, the new directives have been ratified by the majority of participating states in November 2015. The new resolution framework established through the SRM then entered fully into force on 1 January 2016. From then on, all decisions regarding the resolution of banks, under the supervision of the ECB, are made by the Single Resolution Board (SRB). Under the new recovery and resolution framework banks are required to prepare recovery plans that are solely private law arrangements and do not involve institutional interventions. Furthermore, detailed resolution plans in accordance with the supervising authorities have to be prepared. Finally the new framework provides the SRB with a set of tools that can be applied in the case of a default.

⁴ The importance of the banks is assessed according to several criteria, important are size of the balance sheet, the ratio of the size of the balance sheet to the economic activity in the home country and whether the bank has applied for financial support from other European mechanisms.

Specifically those tools are: sales of business, bridge institutions, asset separation and a bail-in tool (European Parliament, 2014, Article 37).

The main novelty is the implementation of the bail-in tool (Deutsche Bundesbank, 2014, p.38). The bail-in tool works through a so-called liability cascade that defines a stepwise bail-in, in case of a bank resolution. This means that in case of default not only equity, but also debt instruments, issued by the defaulting institute, can be written-down or converted into equity. If these measures are still insufficient to recapitalize the bank, also subordinated liabilities and finally deposits that are not covered by the deposit guarantee schemes can be accessed. The bail-in therefore works like a firewall that should increase the loss absorbing capacity of banks before the governments have to recapitalize the banks.

In order for this new resolution mechanism to be effective, banks need to make sure that they have enough liabilities that could be bailed-in. Therefore, the BRRD defines a minimum requirement for eligible liabilities, the so-called ‘Minimum Required Eligible Liabilities’ (MREL). The MREL is set on a case-by-case basis by the resolution authority (European Parliament, 2014, Article 45). The new resolution framework is completed by the Single Resolution Fund (SRF) that is set up by the European banks, starting in 2015 and should be fully in operations in 2023 with a total amount of 55 billion euros. The SRF constitutes the last step in the resolution mechanism and clearly addresses the risk linkage between banks and sovereigns by imposing a firewall that should prevent spillovers from banks to sovereigns.

The main goals of the new reforms were to establish a harmonized legal framework across Europe, to reduce the degree of financial vulnerability and to alleviate the connection of banking and sovereign risk (European Parliament, 2014). Within this new framework the SSM addresses the problem of asymmetric information and regulatory arbitrage. By moving the supervision of banks to a supranational level coordination problems between national authorities should be reduced and hence a sound supervision should be possible. However, the SSM does not directly aim to weaken the link between government and bank default risk. In contrast the SRM aims directly at this link. By imposing a new resolution framework that consists of the bail-in cascade and the SRF the financial responsibility of governments in case of a bank default should be reduced. If market participants consider this new resolution mechanism to be effective, the risk link could be weakened.

However, two major issues cast doubt on the efficacy of the BRRD. A more general critique is that, as long as the Basel II regulations could not prevent the Great Financial Crisis of 2008/2009, then the additional requirements stated in Basel III might not be the right way to

stabilize the financial system. This perspective can be connected to the idea that the financial system is over-regulated, and too complex to be effectively supervised. As Haldane emphasizes:

Regulation of modern finance is complex, almost certainly too complex. That configuration spells trouble. As you do not fight fire with fire, you do not fight complexity with complexity. Because complexity generates uncertainty, not risk, it requires a regulatory response grounded in simplicity, not complexity. (Haldane, 2012: 19)

This statement rises a concern about the direction regulators have been pursuing since the aftermath of the Financial Crisis. Policy makers should rethink ‘how’ to regulate the banking system, instead of further tightening existing regulations. In the same line of reasoning Chen (2015) points out, that the weakness of the assessment procedure concerning recovery and resolution plans together with the complexity of the banks’ balance sheet and the lack of coordination between NCAs and SSM can undermine the credibility of the BRRD, and in turn its effectiveness.

The second issue is a more technical point. It concerns the capability for a resolution authority to bail-in bank assets located abroad or issued in a foreign country where the law of the home country does not apply. To this respect, cross-border claims, which enter the MREL calculation may not be legally sizeable in case of a bail-in, and therefore this may undermine the effectiveness of the resolution plan. Thus as clearly emphasized by Lehmann (2016) measures by the resolution state can have effects only to the extent permitted by the law of the target state, thereby making private international law collide with the banking resolution plan. Throughout this regulatory landscape the final judgment is left to the markets participants, who have to deal with these additional requirements and evaluate the likelihood of a bank default. Their judgement finally depends on the remaining likelihood of government interventions and ultimately determines the cost for a default protection, the credit default swap price. In the next section we evaluate how market participants respond to the BRRD implementation by conducting a panel data analysis.

3. The Empirical Analysis

In this section we test the outcome of the regulation, that is, has the BRRD’s implementation weakened the correlation between sovereign and bank default risk? According to the regulatory timetable, we should see a decrease in the explanatory power of the sovereigns’ CDS on banks’ CDS during the implementation period, that is, from January 2015. Furthermore we might expect a further decrease or even a breakdown of the sovereign bank

channel after the bail-in tool became fully effective across all the EU member states in January 2016.

3.1 Data and Summary Statistics

As a proxy for credit risk we use the CDS prices of banks and sovereigns, where each bank is matched with the corresponding sovereign. Then, we control for the foreign exposure of each country's financial sector since changes in banks' credit risk may be driven by changes in the sovereign credit risk of other countries. To this respect the Bank for International Settlement provides quarterly data on total claims that the domestic banking system owns versus private and public entities of foreign countries. Using this database and following the procedure described in Archarya et al. (2014) and Kallestrup et al. (2016) we construct a foreign exposure index as the weighted average of the other countries' sovereign CDS rates, where the weights are determined according to country-specific exposures up to 85% of the total banking system's foreign claims⁵. As there exist additional global factors that are likely to drive both time-series we control for changes in aggregate volatility by using the VDAX, and for common movements in the CDS market by adding the iTraxx Europe. Both variables are important factors in the pricing of credit risk. In addition we want to take into account market-wide changes in the financial sector fundamentals by considering the Eurostoxx600banks. All those series are measured on a daily basis, which provides us with a large data set. The downside of using daily data is that the data may be noisy. This could be due to a lack of liquidity, which could lead to classical measurement error. In this case, we would expect our estimates to be biased downwards. We examine this issue in the robustness section. Additional control variables are used for robustness checks and can be found in the appendix. In order to assess the impact of the BRRD, we have to precisely identify the countries that have complied with the regulatory requirements. According to the third ISDA monitor following the implementation of the BRRD in national law, as of 7th January 2016 all the members of the European Union with the exception of Poland have implemented it (ISDA, 2016)⁶. Moreover, the United Kingdom although it has implemented the bail-in tool in January 2015, it lacks the complementary measure - MREL - that ensures the effectiveness of

⁵ We include foreign exposures of a country's banks until we have reached 85% of the total foreign exposure, as this eliminates the need to deal with countries for which a time series of CDS premiums is not available for the sovereign or the largest banks. Then the index is normalized to 100%.

⁶ Although Switzerland is not a member of the European Union, it has implemented a regime with similar characteristics to the BRRD. Nevertheless this regime was implemented in different steps between 2012 and 2016, and its bail-in tool entered into force in January 2012. For this reason UBS and Credit Suisse will not be considered for the analysis.

the bail-in tool. For this reason banks headquartered in the UK will be omitted from the sample⁷.

We use Datastream to determine whether a bank has publicly traded 5 year senior CDS. We identify 47 banks with publicly traded CDS. Next, we search in Datastream whether the bank has publicly traded equity, and whether its sovereign has publicly traded CDS over the entire period. According to these criteria we identify 30 banks, which are reported in table I.

Table I
List of Banks

Banks	Country	Bank Number		Country	Bank Number
Erste Group	AT	1	Intesa Sanpaolo	IT	16
KBC Bank	BE	2	Unicredit Bank	IT	17
Dexia Credit Local	BE	3	Mediobanca	IT	18
BNP Paribas	FR	4	Unione di Banche	IT	19
Credit Agricole	FR	5	ING Bank	ND	20
Societe Generale	FR	6	Banco Comercial Portugues	PT	21
Commerzbank	DE	7	BBVA	ES	22
Deutschebank	DE	8	Banco de Sabadel	ES	23
IKB Indstrbk	DE	9	Banco Popular Espanol	ES	24
Bayerische Landesbk	DE	10	Banco Santander	ES	25
Allied Irish bank	IE	11	Bankiter	ES	26
Bank of Ireland	IE	12	Nordea Bank	SWE	27
Permanent Ltd	IE	13	Svenska Bank	SWE	28
Monte dei Paschi	IT	14	Swedbank	SWE	29
Popolare di Milano	IT	15	Danskbank	DK	30

Our analysis focuses on the period ranging from January 2012 to April 2016⁸. Furthermore we drop observations with two consecutive zero changes in bank CDS or sovereign CDS in order to avoid stale data⁹. Therefore the N by T dimension of the dataset equals to 30 banks and 955 trading days, respectively. This yields a total of 28.640 observations. Moreover to clearly identify the evolution of the “doom-loop” from the aftermath of the Euro crisis to the BRRD implementation, we divide the time span in four sub-periods of equal length, and a fifth period with one third of data. Table A.1 in the appendix reports the summary statistics for bank CDS and sovereign CDS in levels as well as log changes of CDS, foreign exposure, and stock prices for the full sample, and the subsamples.

We define period 1 as starting in January 1st, 2012, and ending December 31st, 2012. This period captures the peak of the Euro crisis as well as the “whatever it takes” Draghi’s speech on 26th July 2012, which defined the beginning of the decrease in sovereign and bank default risk. To this respect it is important to emphasize that an increase/decrease of the comovement

⁷ The MREL is only in the phase-in process, and it will be fully operational in January 2020 (ISDA, 2016, p. 37).

⁸ Our available data already starts in 2008. Some of the robustness checks in the Appendix use the extended time period.

⁹ The data selection and cleaning procedure is implemented following Acharya et al. (2016, p. 2712).

between the two time series may be triggered by a common (hidden) factor, and not by a strengthening or weakening of the sovereign-bank channel. This point will be fully investigated in section 3.2. Throughout this period the average bank CDS and sovereign CDS is at its highest, respectively 411 bps and 213 bps. Moreover the CDS volatility is extremely high respectively 257 bps for bank CDS, while 201 bps for sovereign CDS. From period 2, which starts in January 2013 and ends December 31st, 2013 the average bank and sovereign CDS and its volatility almost halved every consequent year. The lowest level is reached in period 4 - 2015 - which is characterized by BRRD implementation. During this subsample we see a further decrease in bank and sovereign risk, with average bank and sovereign CDS of 128 bps and 54 bps respectively. Ultimately in period 5 that starts in January 2016, although the bail-in clause becomes enforceable, the average bank and sovereign CDS increases compared to period 4. This countertrend might be due to the January 2016 stock market turmoil, during which Eurostoxx600 and the Eurostoxx600banks lost respectively 30% and 40% of its market value compared to its December 2015 peak. Figure I illustrates the evolution of both indexes since January 2012. For our analysis this distressed condition experienced by the financial markets during the beginning of 2016 represents an ideal robustness check. The increase in the comovement, when it is not followed by a strengthening of the feedback-loop between sovereign and bank CDS, may give first evidence that the link between the two has been weakened.

Figure II
Stock Market Performance January 2012 – April 2016

This figure shows the evolution of two broad market indexes respectively STOXX Europe 600 Banks (LHS) and Stoxx Europe 600 (RHS) from January 2012 to April 2016. The left figure shows a 40% collapse of bank-wide sector index starting from December 2015 and ending in April 2016. The right figure shows an equivalent decrease in STOXX Europe 600 Index, which represents large, mid and small capitalization companies across 18 countries of the European region. The data are from Datastream.

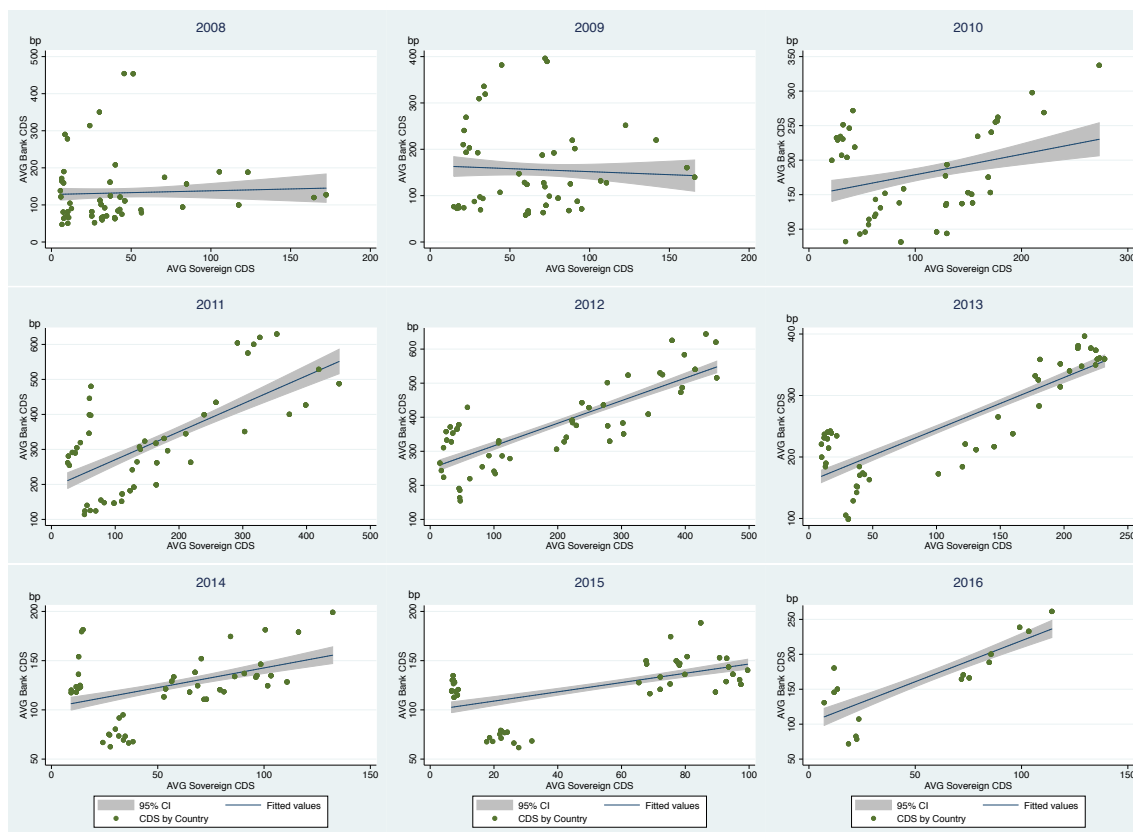


3.2 Stylized Facts

In order to frame the comovement of bank and sovereign CDS from its inception - the Financial Crisis of 2008 - figure II shows the scatterplot of bank and sovereign CDS by country and month from January 2008 to April 2016. The sample comprehends banks belonging to the largest countries - France, Germany, Italy, and Spain - for a total amount of 18 banks.

Figure III
Comovement of Sovereign CDS and Bank CDS (2009-2016)

This figure shows a scatterplot of average bank CDS and sovereign CDS by month and country. The sample comprehends the four largest European countries (France, Germany, Italy and Spain) covering the period from January 2009 to April 2016. Sovereign CDS is the average CDS by month and country. Bank CDS is the equal-weighted average bank CDS by country and month. The data are from Datastream.



We clearly see that only after the beginning of the European sovereign debt crisis – in the end of 2009 - bank and sovereign CDS started to strongly commove. Concerns regarding the solvability of the banking system, which owned a significant part of the sovereign debt created the feedback loop. The comovement kept on intensifying during 2011 and 2012, the peak of the crisis. In 2013 bank and sovereign CDS faced an evident decrease in absolute terms, but markets were still pricing the negative reinforcing mechanism. Only from 2014 the slope flattened remarkably, and almost became horizontal during 2015. Contrary in the beginning of 2016 the trend reversed, and the line steepened again likely due to the January

stock market crash, which drives both time series.

Just for this reason as clearly pointed out by Acharya et al. (2014, p. 2721) “the main challenge in establishing a direct feedback loop between sovereign and financial sector credit risk is that there may be another (unobserved) factor that affects both bank and sovereign credit risk”. To this respect shocks to macroeconomic fundamentals may trigger an increase in sovereign CDS, and at the same time through a different channel, affect the profitability of a bank. Such a factor contributes to increase or decrease the comovement between both time series even if the doom-loop channel is inactive. Therefore changes in macroeconomic and financial conditions may generate a correlation between sovereign and bank credit risk even in the absence of a direct feedback mechanism.

3.3 Estimation strategy

In order to address the problem of the comovement between the CDS of banks and sovereigns we employ a fixed effects estimation strategy. Bank fixed effects should control for all bank specific characteristics, while time fixed effects should take into account market wide common effects. Furthermore a large set of control variables is included that should capture additional confounding factors. This approach closely resembles the one implemented by Acharya et al. (2014).

The results of the common residual and time series diagnostics justify our exact estimation specification. According to a Dickey-Fuller test all series used in the following estimations are stationary (for banks as well as countries). In order to assess whether there is a problem with serial correlation we run a Durbin-Watson test. However, with a test statistic of 2.0139 we conclude that there is no serial correlation. Another issue might be the presence of heteroscedasticity. A residual plot indicates that there is some degree of heteroscedasticity in the residuals. This is further confirmed by a test of cross sectional independence as suggested in Pesaran (2004). Finally, we check whether the residuals are normally distributed. A standardized probability plot and a plot of the quantiles of the residuals against the quantiles of a normal distribution reveals that the residuals follow a non-normal distribution. As it is often the case with financial time series we find fat-tails. The finding of non-normality of the error is also confirmed by the Doornik-Hansen test for multivariate normality¹⁰. In the following estimations we use clustered standard errors within banks to overcome potential problems caused by remaining serial correlation and heteroscedasticity.

3.4 Model Specification

¹⁰ In order to ensure that the non-normality does not affect the inference the following two specifications are also estimated with bootstrapped standard errors and the corresponding outputs are provided in the appendix. Furthermore the appendix contains the residual diagnostics.

First of all we want to estimate the following OLS benchmark regression:

$$\Delta \log(\text{Bank CDS}_{ijt}) = \alpha_i + \beta \Delta \log(\text{SovCDS}_{jt}) + \gamma \Delta \log(\text{FXCDS}_{jt}) + \Delta(X_t) + \varepsilon_{ijt}$$

where i is the subscript identifying the bank, j indicates the residence country of the bank, and t indicates the time period. Moreover $\Delta \log(\text{Bank CDS}_{ijt})$ is the change in the natural logarithm of the bank CDS from day t to $t+1$, $\Delta \log(\text{SovCDS}_{jt})$ is the daily change in the natural logarithm of the sovereign CDS, $\Delta \log(\text{FXCDS}_{jt})$ is the daily change in the natural logarithm of the CDS foreign exposure index, $\Delta(X_t)$ is the change in the global factors - VDAX, iTraxx Europe and Eurostoxx600banks - which capture any effects across time, and α_i are bank fixed effects capturing idiosyncratic fluctuations at bank level. Ultimately we cluster the standard errors at the bank level to allow for correlation of errors terms within banks.

Table II presents the results of the benchmark model. We include results for the period before, during, and after the BRRD implementation. The focus of our analysis is β , the coefficient of interest capturing the relationship between changes in bank and sovereign CDS rates, that is, the feedback process. For each specification there are six columns of results. From column 1 to column 6 results for the benchmark specification are presented, while from column 7 to column 12 results after having controlled for daily changes in the natural logarithm of banks' stock price - $\Delta \log(SP_{it})$ - are reported.

Columns (2) to (4) find that the coefficients on sovereign CDS are positive and statistically significant before BRRD implementation period. A 10% increase in sovereign CDS raises bank CDS by 0.5%, 0.4% and 0.6% respectively. This brings additional evidence in support of the direct sovereign-to-bank channel investigated by Acharya et al. (2014). Column (5) reports the coefficient on sovereign CDS during the implementation period. It decreases in magnitude and loses most of its statistical significance, passing from 1% to 10% of confidence level. Ultimately column (6) shows the result after the implementation period. The coefficient is economically small and becomes statistically insignificant, bringing evidence in support of the effective implementation of the regulation. Furthermore also the coefficients of the control variables are statistically significant and with the expected sign. The adjusted R-squared of the specification varies between 0.2 and 0.37. Columns (7) to (12) present the results for the benchmark specification after having controlled for banks' equity returns and the Eurostoxx600banks. Although the bank stock return coefficient and the Eurostoxx600banks index return are highly statistically significant and possess the expected negative sign, their inclusion has little impact on the magnitude of the sovereign CDS

coefficient. The adjusted R-squared improves slightly. Overall, our results are robust across years and clearly point out the breakdown of direct sovereign-bank feedback-loop after the introduction of the bank recovery and resolution directive. Moreover, the decrease in the explanatory power and significance of sovereign CDS in 2015 shows that markets were adjusting to the transition from a bail-out to a bail-in system.

TABLE II
Bank CDS and Changes in Sovereign CDS Explanatory Power
(Controlling for Global and Bank-Specific Factors)

This table shows the effect of sovereign credit risk on bank credit risk before, during and after the implementation of the BRRD. The sample covers all banks with publicly traded credit default swaps (CDS) headquartered in Eurozone countries plus Denmark and Sweden. Columns (1) to (6) cover the specification without controlling for stock returns and the Eurostoxx600banks, while from columns (7) to (12) they are included. $\Delta \text{Log}(\text{Bank CDS})$ is the daily log change in bank CDS – the dependent variable, $\Delta \text{Log}(\text{Sovereign CDS})$ is the daily log change in sovereign CDS, $\Delta \text{Log}(\text{VDAX})$ is the daily change in the volatility index, $\Delta \text{Log}(\text{Itraxeu})$ is the daily change in the iTraxx Europe Index, $\Delta \text{Log}(\text{FX CDS})$ is the daily change in the foreign exposure CDS index, $\Delta \text{Log}(\text{SP})$ is the daily log change in bank stock price, and $\Delta \text{Log}(\text{EUSX600banks})$ is the daily log change in Eurostoxx600banks. All columns include bank fixed effects. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Fixed Effects 2012-2016	Fixed Effects 2012	Fixed Effects 2013	Fixed Effects 2014	Fixed Effects 2015	Fixed Effects 2016	Fixed Effects 2012-2016	Fixed Effects 2012	Fixed Effects 2013	Fixed Effects 2014	Fixed Effects 2015	Fixed Effects 2016
$\Delta \text{Log}(\text{SovCDS})$	0.0488*** (0.0139)	0.0483*** (0.0160)	0.0404*** (0.0131)	0.0650*** (0.0216)	0.0357* (0.0197)	0.0233 (0.0216)	0.0462*** (0.0135)	0.0465*** (0.0154)	0.0378*** (0.0126)	0.0625*** (0.0211)	0.0353* (0.0197)	0.0196 (0.0208)
$\Delta \text{Log}(\text{VDAX})$	0.00774** (0.00371)	0.00178 (0.00561)	0.00327 (0.00595)	0.0385*** (0.00776)	-0.0194*** (0.00684)	0.0467** (0.0197)	-0.00962** (0.00365)	-0.00693 (0.00644)	-0.0172** (0.00636)	0.0248*** (0.00829)	-0.0389*** (0.00853)	0.0189 (0.0208)
$\Delta \text{Log}(\text{Itraxeu})$	0.357*** (0.0430)	0.322*** (0.0482)	0.323*** (0.0397)	0.278*** (0.0414)	0.401*** (0.0449)	0.424*** (0.0651)	0.317*** (0.0397)	0.278*** (0.0457)	0.277*** (0.0371)	0.256*** (0.0419)	0.363*** (0.0413)	0.399*** (0.0591)
$\Delta \text{Log}(\text{FX CDS})$	0.165*** (0.0430)	0.237*** (0.0473)	0.251*** (0.0477)	0.156*** (0.0362)	0.0933** (0.0433)	0.179** (0.0659)	0.155*** (0.0408)	0.227*** (0.0450)	0.245*** (0.0466)	0.152*** (0.0354)	0.0864** (0.0419)	0.174*** (0.0623)
$\Delta \text{Log}(\text{SP})$							-0.0441*** (0.0134)	-0.0523*** (0.0165)	-0.0536*** (0.0174)	-0.0383*** (0.0165)	-0.0180 (0.0142)	-0.0922*** (0.0281)
$\Delta \text{Log}(\text{EUSX600banks})$							-0.136*** (0.0203)	-0.0701** (0.0305)	-0.178*** (0.0281)	-0.109*** (0.0343)	-0.167*** (0.0379)	-0.0499 (0.0399)
Constant	-0.000487*** (8.37e-05)	-0.000922*** (0.000183)	-0.000705*** (0.000121)	-0.00131*** (6.03e-05)	-2.32e-05 (3.38e-05)	0.00426*** (0.000202)	-0.000523*** (7.95e-05)	-0.000977*** (0.000171)	0.000669*** (0.000123)	-0.00131*** (6.07e-05)	-2.11e-05 (3.35e-05)	0.00374*** (0.000305)
Observations	28,610	7,298	7,138	6,241	6,445	1,488	28,610	7,298	7,138	6,241	6,445	1,488
R-squared	0.247	0.243	0.304	0.201	0.221	0.363	0.252	0.248	0.312	0.203	0.224	0.371
N. Banks	30	30	29	30	30	30	30	30	29	30	30	30
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
$\Delta \text{Log}(\text{SP})$							YES	YES	YES	YES	YES	YES
$\Delta \text{Log}(\text{EUSX600banks})$							YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Ultimately to avoid that additional sources of variability may be the reason for the comovement between sovereign and bank CDS, we include day fixed effects. This last specification should capture all the remaining market-wide changes in macroeconomic fundamentals that directly affect both bank and sovereign credit risk¹¹. Specifically, we estimate the following OLS regression:

$$\Delta \log(\text{Bank CDS}_{ijt}) = \alpha_i + \zeta_t + \beta \Delta \log(\text{SovCDS}_{jt}) + \gamma \Delta \log(\text{FXCDS}_{jt}) + \delta \Delta(X_t) + \varepsilon_{ijt}$$

The specification remains equal to the benchmark model with the exception of the day fixed

¹¹ These fixed effects capture all macro fundamentals that have a common effect on the financial sector.

effects that are captured by ζ_t . To establish whether the results remain unchanged, we test whether changes in sovereign CDS continue to influence changes in bank CDS after including the time dummies.

TABLE III
Bank CDS and Changes in Sovereign CDS Explanatory Power
(Controlling for Time FE and Bank-Specific Factor)

This table shows the effect of sovereign credit risk on bank credit risk before, during and after the implementation of the BRRD. The sample covers all banks with publicly traded credit default swaps (CDS) headquartered in Eurozone countries plus Denmark and Sweden. Columns (1) to (6) cover the specification without controlling for stock returns, while from columns (7) to (12) they are included. $\Delta\text{Log}(\text{Bank CDS})$ is the daily log change in bank CDS – the dependent variable, $\Delta\text{Log}(\text{Sovereign CDS})$ is the daily log change in sovereign CDS, $\Delta\text{Log}(\text{VDAX})$ is the daily change in the volatility index, $\Delta\text{Log}(\text{Itraxeu})$ is the daily change in the iTraxx Europe Index, $\Delta\text{Log}(\text{FX CDS})$ is the daily change in the foreign exposure CDS index, and $\Delta\text{Log}(\text{SP})$ is the daily log change in bank stock price. All columns include bank fixed and time effects. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

VARIABLES	(1) Fixed Effects 2012-2016	(2) Fixed Effects 2012	(3) Fixed Effects 2013	(4) Fixed Effects 2014	(5) Fixed Effects 2015	(6) Fixed Effects 2016	(7) Fixed Effects 2012-2016	(8) Fixed Effects 2012	(9) Fixed Effects 2013	(10) Fixed Effects 2014	(11) Fixed Effects 2015	(12) Fixed Effects 2016
$\Delta \text{Log}(\text{SovCDS})$	0.0209** (0.00978)	0.0377*** (0.0119)	0.0261*** (0.00702)	0.0322** (0.0142)	-0.00373 (0.0205)	0.00230 (0.0177)	0.0202** (0.00975)	0.0368*** (0.0116)	0.0253*** (0.00690)	0.0317** (0.0142)	-0.00405 (0.0205)	0.00195 (0.0176)
$\Delta \text{Log}(\text{VDAX})$	0.0247 (0.463)	-0.0355 (0.0620)	0.297 (0.198)	-1.756 (1.167)	0.891 (0.604)	-0.0859 (0.766)	0.0309 (0.459)	-0.0430 (0.0626)	0.291 (0.198)	-1.757 (1.167)	0.894 (0.604)	-0.0459 (0.759)
$\Delta \text{Log}(\text{Itraxeu})$	0.840* (0.456)	0.848*** (0.192)	-1.742* (0.899)	1.774 (1.076)	7.655* (3.882)	0.763*** (0.272)	0.829* (0.454)	0.846*** (0.195)	-1.739* (0.898)	1.772 (1.077)	7.676* (3.881)	0.771*** (0.271)
$\Delta \text{Log}(\text{FX CDS})$	0.0580* (0.0286)	0.102 (0.0722)	0.134*** (0.0413)	0.0872** (0.0320)	0.00638 (0.0254)	0.0454 (0.0486)	0.0569* (0.0285)	0.0994 (0.0707)	0.134*** (0.0410)	0.0864** (0.0320)	0.00605 (0.0254)	0.0410 (0.0470)
$\Delta \text{Log}(\text{SP})$							-0.0360*** (0.0120)	-0.0444*** (0.0147)	-0.0458*** (0.0144)	-0.0322** (0.0132)	-0.0117 (0.0143)	-0.0726** (0.0320)
Constant	-0.00292 (0.0117)	-0.00746*** (0.00156)	-0.00682* (0.00386)	-0.00295 (0.00369)	0.0198*** (0.00586)	-0.00138 (0.00192)	-0.00267 (0.0116)	-0.00739*** (0.00158)	-0.00682* (0.00387)	-0.00295 (0.00369)	0.0198*** (0.00586)	-0.00141 (0.00189)
Observations	28,610	7,298	7,138	6,241	6,445	1,488	28,610	7,298	7,138	6,241	6,445	1,488
R-squared	0.380	0.358	0.424	0.342	0.373	0.459	0.381	0.360	0.427	0.343	0.373	0.462
N. Banks	30	30	29	30	30	30	30	30	29	30	30	30
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
$\Delta \text{Log}(\text{SP})$							YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table III, which retains the same structure of table III, reports the results of the regressions. As we see, Columns (2) to (4) find that the coefficients on sovereign CDS are positive and statistically significant before BRRD implementation period, although economically smaller than the benchmark specification. A 10% increase in sovereign CDS raises bank CDS by almost 0.3-0.4%. Furthermore columns (5) and (6), which shows respectively the results during and after the implementation period, confirm that sovereign CDS are statistically insignificant and in magnitude close to 0. These results are robust to controlling for changes in banks' equity prices - columns (7) to (12) - which are statistically significant and possess the expected negative sign. Moreover the explanatory power of the model improves, explaining almost 38% of the variation in daily changes in bank CDS across the entire sample.

This specification strengthens the results of the benchmark specification. Since the

implementation of the BRRD in January 2015, the sovereign CDS have lost, on average, their explanatory power on bank CDS. The doom-loop and its direct costs for the banking system seem to have returned to its pre-bailout period level. Increases in sovereign CDS seem to have no direct effects on bank CDS.

3.5 Robustness Checks

The results of the benchmark model and the time fixed effects specification have established that the introduction of the BRRD was effective in its main objective: breaking the doom-loop between sovereigns and the banking system. To this respect we want to conduct various robustness checks to verify the consistency of our results by changing the model specifications. First, following the specification in Acharya et al. (2014) we create two interactions terms between bank fixed effects and the CDS market index as well as between bank fixed effects and the volatility index. This technique should be able to take into account the heterogeneity in bank characteristics. Table IV reports the coefficients of the regressions. Our results are quantitatively similar to table III. Remarkably, altogether, the variables explain 48% of the variation in daily changes in bank CDS across the entire period.

**TABLE IV - Robustness
(Controlling for Interaction Terms)**

This table examines the robustness of our main results by reporting the coefficients after having controlled for interaction terms, respectively between bank fixed effects and the iTraxx Europe CDS index as well as bank fixed effects and the volatility index. Columns (1) to (6) cover the specification without controlling for stock returns, while from columns (7) to (12) they are included

VARIABLES	(1) Fixed Effects 2012-2016	(2) Fixed Effects 2012	(3) Fixed Effects 2013	(4) Fixed Effects 2014	(5) Fixed Effects 2015	(6) Fixed Effects 2016	(7) Fixed Effects 2012-2016	(8) Fixed Effects 2012	(9) Fixed Effects 2013	(10) Fixed Effects 2014	(11) Fixed Effects 2015	(12) Fixed Effects 2016
$\Delta \text{Log (SovCDS)}$	0.0130 (0.00794)	0.0244*** (0.00825)	0.0201*** (0.00588)	0.0279*** (0.00959)	-0.0142 (0.0198)	-0.0129 (0.0160)	0.0129 (0.00794)	0.0244*** (0.00818)	0.0199*** (0.00583)	0.0279*** (0.00959)	-0.0142 (0.0199)	-0.0126 (0.0160)
$\Delta \text{Log (FX CDS)}$	-0.00313 (0.0184)	0.00538 (0.0248)	0.0494 (0.0305)	0.0293 (0.0265)	-0.0435* (0.0239)	-0.00800 (0.0415)	-0.00322 (0.0185)	0.00520 (0.0246)	0.0507 (0.0306)	0.0292 (0.0266)	-0.0435* (0.0239)	-0.00948 (0.0408)
$\Delta \text{Log (SP)}$							-0.0159* (0.00854)	-0.0109* (0.00586)	-0.0212** (0.00985)	-0.0181 (0.0149)	-0.00102 (0.00970)	-0.0346 (0.0265)
Constant	-0.0242*** (0.00333)	-0.0209*** (0.00330)	-0.00638 (0.00388)	-0.00384 (0.00371)	0.0183*** (0.00594)	-0.000891 (0.00192)	-0.0242*** (0.00334)	-0.0209*** (0.00333)	-0.00638 (0.00388)	-0.00383 (0.00371)	0.0183*** (0.00594)	-0.000892 (0.00191)
Observations	28,610	7,298	7,138	6,241	6,445	1,488	28,610	7,298	7,138	6,241	6,445	1,488
R-squared	0.478	0.463	0.554	0.431	0.465	0.664	0.478	0.463	0.555	0.432	0.465	0.664
N. Banks	30	30	29	30	30	30	30	30	29	30	30	30
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
$\Delta \text{Log (SP)}$							YES	YES	YES	YES	YES	YES
Interaction term	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Second, we run a dynamic panel model to control for endogeneity arising from the relation between bank and sovereign CDS and its dynamic nature. We do so by adding the lagged value of the dependent variable: *Lagged $\Delta \log(\text{Bank CDS})$* . In this way we control for the possibility that current changes in the independent variable may depend on past changes in the dependent variable. Since we have a large t dimension and a small n the criticism of Nickell

(1981), who points out possible biases, should not be a problem in our case. Table V reports the coefficients of the regressions for the benchmark model and the time fixed effect specification. All the coefficients are qualitatively and quantitatively similar to Table II and Table III respectively.

**TABLE V - Robustness
(Controlling for Dynamic Panel)**

This table examines the robustness of our main results by reporting the coefficients after having controlled for *Lagged* $\Delta \log(\text{Bank CDS})$. Columns (1) to (6) report the coefficients of the regression for the full sample with the benchmark model specification. Columns (7) to (12) report the coefficients of the regressions for the full sample with time fixed effects model specification.

VARIABLES	(1) Fixed Effects 2012-2016	(2) Fixed Effects 2012	(3) Fixed Effects 2013	(4) Fixed Effects 2014	(5) Fixed Effects 2015	(6) Fixed Effects 2016	(7) Fixed Effects 2012-2016	(8) Fixed Effects 2012	(9) Fixed Effects 2013	(10) Fixed Effects 2014	(11) Fixed Effects 2015	(12) Fixed Effects 2016
$\Delta \text{Log}(\text{SovCDS})$	0.0449*** (0.0132)	0.0458*** (0.0159)	0.0362*** (0.0121)	0.0627*** (0.0210)	0.0354* (0.0191)	0.00561 (0.0198)	0.0204** (0.00965)	0.0371*** (0.0119)	0.0255*** (0.00693)	0.0320** (0.0141)	-0.00325 (0.0196)	0.000156 (0.0174)
Lagged $\Delta \text{Log}(\text{Bank CDS})$	0.0433** (0.0166)	0.0521 (0.0322)	0.0776*** (0.0176)	-0.00562 (0.0179)	-0.00300 (0.0368)	0.121*** (0.0205)	-0.0257 (0.0225)	-0.0153 (0.0392)	0.0245 (0.0355)	-0.0717*** (0.0208)	-0.0715* (0.0417)	0.0519 (0.0337)
Constant	-0.000463*** (8.73e-05)	-0.000794*** (0.000187)	-0.000547*** (0.000126)	-0.00132*** (7.73e-05)	-2.07e-05 (3.13e-05)	0.00336*** (0.000295)	0.00726 (0.0232)	-0.00207 (0.00326)	-0.00681* (0.00387)	-0.00272 (0.00338)	0.0202*** (0.00583)	-0.00164 (0.00192)
Observations	28,580	7,268	7,138	6,241	6,445	1,488	28,580	7,268	7,138	6,241	6,445	1,488
R-squared	0.254	0.251	0.318	0.204	0.224	0.385	0.381	0.359	0.427	0.346	0.376	0.464
N. Banks	30	29	29	30	30	30	30	29	29	30	30	30
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lagged-Banks CDS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Eustxxx600banks	YES	YES	YES	YES	YES	YES						
Time FE							YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Furthermore, the results are also robust to changes in the length of the sample window, to variations in the sample composition. The additional robustness checks can be found in the appendix.

4. Conclusion

Our investigations of the bank sovereign feedback loop have shown that after the financial crisis and throughout the Euro crisis a pronounced feedback process between banks and sovereigns was at work. However, our results indicate that with the introduction of the European banking union this relationship has weakened or even disappeared. An important factor in the effectiveness of the EBU seems to be the recent implementation of the Bank Recovery and Resolution Regime. Countries that have implemented the new resolution and recovery framework saw a strong decrease in the risk link between banks and governments. This may indicate that market participants have assessed the banking system's loss absorbing capacity and the shift in responsibility to be sufficient to avoid state intervention in case of banks' default, thereby making the bail-in mechanism credible and effective. This outcome, in turn should have an economically positive impact on the cost of debt refinancing by banks and states. Nevertheless this current change of direction - to use Haldane's words - may be just temporary, as it was before the Great Financial Crisis, and only an extreme event may

definitely test its effectiveness. To date, regulators' objective seems to have been achieved; anyway the Basel II's failure and the subsequent financial meltdown have to remind us that in a capitalist system the 'crock of gold under the rainbow' does not - for its own nature - exist.

5. References

- Acharya V., Drechsler I., Schnabl P. (2014), "A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk", *The Journal of Finance*, LXIX(6):2689-2739
- Alter, A. and Beyer, A. (2014), "The dynamics of spillover effects during the European sovereign debt turmoil", *Journal of Banking & Finance*, 42, pp. 134 – 153
- Alter, A. and Schüler, Y. (2012), "Credit spread interdependencies of European states and banks during the financial crisis", *Journal of Banking & Finance*, 36, pp. 3444-3468
- Breton, R. and Pinto, C. and Weber, P. (2012), "Banks, moral hazard, and public debts, Banque de France Financial Stability Review", No. 16, p.57 – 70
- Chen, C. H. (2015) , "The Recovery Framework in the BRRD and its Effectiveness", SSRN No. 2610594, Accessed at ssrn.com/abstract=2610594
- Deutsche Bundesbank (2014), "Europe's new recovery and resolution regime for credit institutions", Deutsche Bundesbank Monthly Report, p. 31 - 55
- Ejsing, J. and Lemke, W. (2011), "The Janus-headed salvation: Sovereign and bank credit risk premia during 2008-2009", *Economic Letters* 110, p.28 - 31
- European Banking Association (2015), EBA Final Draft Regulatory Technical Standards. On Criteria for Determining the Minimum Requirement for Own Funds and Eligible Liabilities Under Directive 2014/59/EU. Regulatory technical standards, 3rd July 2015. Accessed on 01/04/2016 at www.eba.europa.eu/documents/10180/1132900/EBA-RTS-2015-05+RTS+on+MREL+Criteria.pdf
- European Parliament (2010), Regulation No 1093/2010 of The European Parliament and of The Council of 24 November 2010 establishing a European Supervisory Authority (European Banking Authority). Official Journal of the European Union, 15th December 2010. Accessed on 10/04/2016 at eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R1093&from=EN
- European Parliament (2013), Directive 2013/36/EU of The European Parliament and of The Council of 26 June 2013 on access to activity of credit institutions and the prudential supervision of credit institutions and investment firms. Official Journal of the European Union, 27th May 2013. Accessed on 10/04/2016 at eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013L0036&from=EN
- European Parliament (2014), Directive 2014/59/EU of The European Parliament and of The Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms. Official Journal of the European Union, 15th May 2014. Accessed on 01/04/2016 at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0059&from=IT>
- Fratzscher, M. and Rieth, M. (2015), "Monetary Policy, Bank Bailouts and the Sovereign-Bank Risk Nexus in the Euro Area", DIW Discussion Papers No. 1448
- Guan, W. (2003), "From the Help Desk: Bootstrapped Standard Errors", *Stata Journal*, Vol. 3(1): 71-80
- Haldane, A. (2009), "Banking on the State", BIS Review No. 139/2009
- Haldane, A. (2012), "The Dog and the Frisbee", BIS Central Bankers' Speeches

- International Swap and Derivative Association (2016), BRRD Implementation Monitor, 13th January 2016. Accessed on 01/04/2016 at www2.isda.org/isda-brrd-implementation-monitor/
- Lehmann, M. (2016), “Bail-in and Private International Law: How to make Bank Resolution Measures Effective Across Borders”, SSRN No. 2759763, Accessed at ssrn.com/abstract=2759763
- Kallestrup R., Lando D., and Murgoci A. (2016), “Financial Sector Linkages and the Dynamics of Bank and Sovereign Credit spreads”, *Journal of Empirical Finance*, Vol. 37: 30-88
- Merler, S. and Pisani-Ferry, J. (2012), “Hazardous tango: sovereign-bank interdependence and financial stability in the euro area”, *Banque de France Financial Stability Review*, No. 16, p.201 – 210
- Mody, A. and Sandri, D. (2012), “The Eurozone crisis: how banks and sovereigns came to be joined at the hip, *Economic Policy*”, CEPR, vol. 27(70), p 199-230, 04.
- Nickell, S. (1981), “Biases in dynamic models with fixed effects”, *Econometrica* 49(6): 1417/1426.
- Pesaran, M. H. (2004), “General diagnostic tests for cross section dependence in panels”, University of Cambridge, Faculty of Economics, Cambridge Working Papers in Economics No. 0435
- Sgherri, S. and Zoli, E. (2009), “Euro Area Sovereign Risk During the Crisis”, IMF Working Paper, 09/222, p.1- 23
- Shambaugh, J. C. (2012), “The Euro’s Three Crises”, *Brookings Papers on Economic Activity*
- Stanga, I. (2011), “Sovereign and Bank Credit Risk during the Global Financial Crisis”, DNB Working Paper, No. 314

Appendix

A.1 Statistical Properties

This appendix presents summary statistics and residual diagnostics of the main specification estimated in the paper.

Table A.1
Summary Statistics

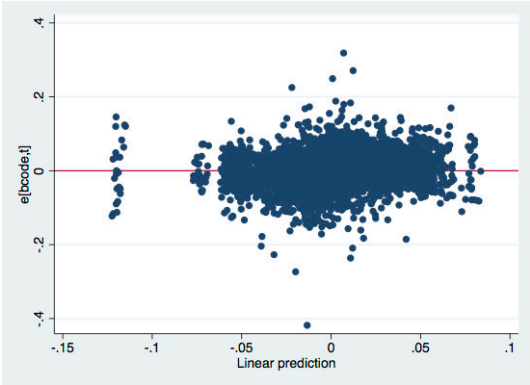
This table provides summary statistics on bank characteristics and bank credit risk. The sample covers all banks with publicly traded credit default swaps (CDS) in Eurozone countries plus Denmark and Sweden. It summarizes statistics for the periods after Euro Crisis at the daily level. Bank CDS is the average bank CDS in basis points (bp), Sovereign CDS is the average sovereign CDS, $\Delta \text{Log}(\text{Bank CDS})$ is the daily log change in bank CDS, $\Delta \text{Log}(\text{Sovereign CDS})$ is the daily log change in sovereign CDS, $\Delta \text{Log}(\text{Bank Stock Price})$ is the average equity return, and $\Delta \text{Log}(\text{Foreign Exposure CDS})$ is the daily change in foreign exposure CDS.

Full Sample (01/01/2012 to 23/03/2016)	n	Mean	S.D.	Quantiles				
				Min	.25	Mdn	.75	Max
Bank CDS (bp)	28640	239,1	194,0	37,8	107,9	171,7	306,0	1819,4
Sovereign CDS (bp)	28640	111,2	132,2	6,6	29,2	69,7	139,8	1521,5
$\Delta \text{Log}(\text{Bank CDS})$	28610	0%	3%	-43%	-1%	0%	0%	33%
$\Delta \text{Log}(\text{Sovereign CDS})$	28610	0%	5%	-56%	-1%	0%	1%	53%
$\Delta \text{Log}(\text{Bank Stock Price})$	28610	0%	3%	-108%	-1%	0%	1%	109%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	28610	0%	2%	-34%	-1%	0%	1%	20%
Period 1 (01/01/2012 to 01/01/2013)								
Bank CDS (bp)	7328	411,0	257,1	71,4	210,2	344,0	533,3	1.819,4
Sovereign CDS (bp)	7328	213,4	201,3	10,1	47,4	151,1	339,6	1.521,5
$\Delta \text{Log}(\text{Bank CDS})$	7298	0%	3%	-43%	-1%	0%	0%	17%
$\Delta \text{Log}(\text{Sovereign CDS})$	7298	0%	6%	-56%	-2%	0%	2%	50%
$\Delta \text{Log}(\text{Bank Stock Price})$	7298	0%	4%	-34%	-2%	0%	2%	43%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	7298	0%	2%	-13%	-2%	0%	1%	11%
Period 2 (01/01/2013 to 01/01/2014)								
Bank CDS (bp)	7138	259,9	143,4	52,8	143,9	239,9	363,6	742,1
Sovereign CDS (bp)	7138	112,1	94,7	8,2	22,1	95,1	197,4	502,0
$\Delta \text{Log}(\text{Bank CDS})$	7138	0%	2%	-16%	-1%	0%	0%	18%
$\Delta \text{Log}(\text{Sovereign CDS})$	7138	0%	5%	-51%	-1%	0%	1%	53%
$\Delta \text{Log}(\text{Bank Stock Price})$	7138	0%	3%	-20%	-1%	0%	1%	23%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	7138	0%	2%	-12%	-1%	0%	1%	12%
Period 3 (01/01/2014 to 01/01/2015)								
Bank CDS (bp)	6241	143,5	71,7	37,8	83,4	126,8	187,4	399,5
Sovereign CDS (bp)	6241	61,9	42,0	7,7	27,7	57,7	88,2	315,8
$\Delta \text{Log}(\text{Bank CDS})$	6241	0%	3%	-29%	-1%	0%	0%	25%
$\Delta \text{Log}(\text{Sovereign CDS})$	6241	0%	5%	-39%	-1%	0%	1%	41%
$\Delta \text{Log}(\text{Bank Stock Price})$	6241	0%	3%	-35%	-1%	0%	1%	34%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	6241	0%	2%	-16%	-1%	0%	1%	14%
Period 4 (01/01/2015 to 01/01/2016)								
Bank CDS (bp)	6445	127,7	65,3	38,8	75,1	119,3	160,0	452,4
Sovereign CDS (bp)	6445	53,9	37,0	6,6	13,7	62,4	81,3	197,3
$\Delta \text{Log}(\text{Bank CDS})$	6445	0%	3%	-24%	-1%	0%	1%	28%
$\Delta \text{Log}(\text{Sovereign CDS})$	6445	0%	6%	-39%	-1%	0%	0%	39%
$\Delta \text{Log}(\text{Bank Stock Price})$	6445	0%	3%	-108%	-1%	0%	1%	109%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	6445	0%	3%	-34%	-1%	0%	1%	20%
Period 5 (01/01/2016 to 01/04/2016)								
Bank CDS (bp)	1488	175,4	127,4	45,0	91,2	152,3	201,3	737,8
Sovereign CDS (bp)	1488	59,5	46,2	6,7	14,3	64,6	85,8	286,4
$\Delta \text{Log}(\text{Bank CDS})$	1488	1%	4%	-24%	0%	0%	2%	33%
$\Delta \text{Log}(\text{Sovereign CDS})$	1488	1%	6%	-34%	-1%	0%	1%	35%
$\Delta \text{Log}(\text{Bank Stock Price})$	1488	0%	4%	-36%	-3%	0%	2%	36%
$\Delta \text{Log}(\text{Foreign Exposure CDS})$	1488	0%	3%	-13%	-1%	0%	1%	17%

The following figure A.I shows the residuals plotted against the fitted values. It shows some outliers as well as some systematic patterns. However both seem to be not too severe given the amount of observations. The presence of heteroscedasticity is also confirmed by Pesara’s test of cross sectional independence with a test statistic of -22.292 and a p-value of 0.0000 we reject the null of homoscedasticity.

Figure A.I
Residuals vs. fitted values

This figure shows the residuals of the estimated main specification plotted against the fitted values. The underlying model is the main specification including time-fixed effects.



From visual inspection of a standardized probability plot and a plot of the quantiles of the residuals against the quantiles of a normal distribution, in figure A.II, one can see that the residuals seem to follow a non-normal distribution.

Figure A.II
Residual diagnostics

This figure shows a standardized probability plot (left) and a plot of the quantiles of the residuals against the quantiles of a normal distribution (right). The residuals stem from a regression of the main specification including time-fixed effects.

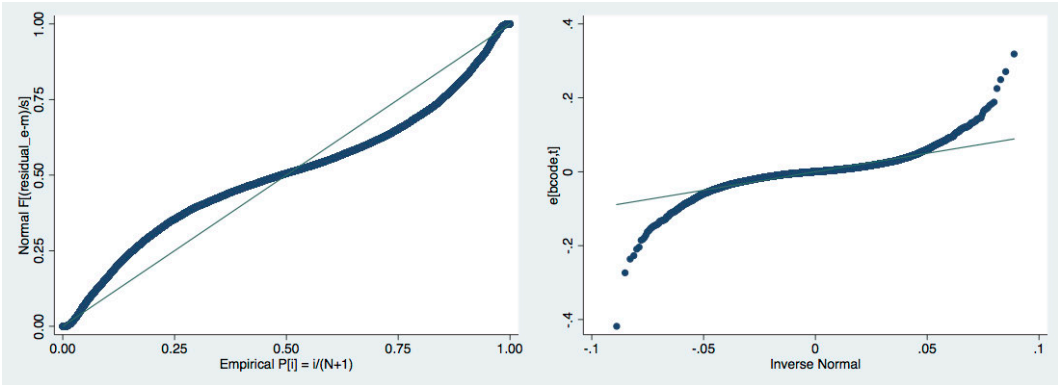
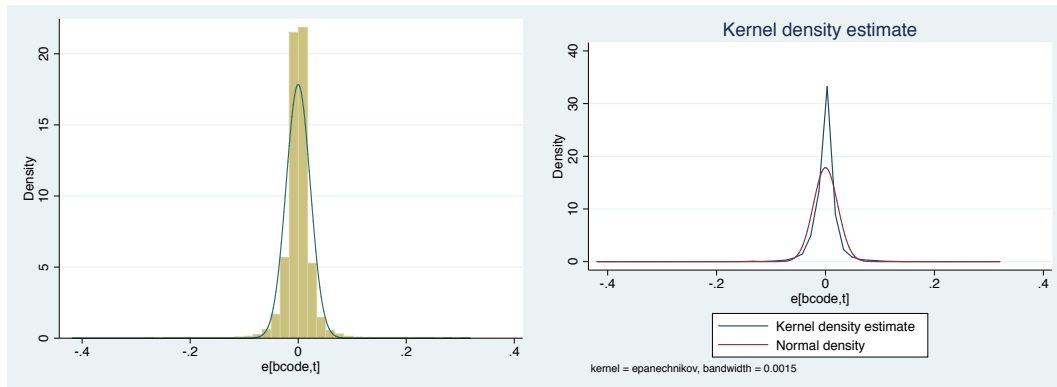


Figure A.III shows a histogram of the residuals. It is apparent that the distribution matches somewhat a normal distribution, however especially the tails and the center do not fit a normal distribution quite well.

Figure A.III

Histogram and density plot of the residuals

This figure shows a histogram of the residuals (left) and a kernel density plot of the residuals (right). The residuals stem from a regression of the main specification including time-fixed effects.



This is also confirmed by a Doornik-Hansen test for multivariate normality with a $\chi^2(2)$ of 52608 and a p-value of 0.

A.2 Robustness Checks

This appendix provides additional robustness checks. At first we address the presence of non-normality in the errors by estimating the main specification with bootstrapped standard errors. Table A.2 provides a comparison of the main-specification estimated with clustered standard errors (even columns) and bootstrapped standard errors (odd columns).

TABLE A.2 - Robustness

(Time Fixed Effect Specification: Bootstrap S.E. 200 Iterations)

This table examines the robustness of our time fixed effects specification by reporting the coefficients with bootstrapped standard errors. Odd and even columns report the coefficients with and without bootstrapped standard errors, respectively.

VARIABLES	(1) Fixed Effects 2012	(2) Fixed Effects BS 2012	(3) Fixed Effects 2013	(4) Fixed Effects BS 2013	(5) Fixed Effects 2014	(6) Fixed Effects BS 2014	(7) Fixed Effects 2015	(8) Fixed Effects BS 2015	(9) Fixed Effects 2016	(10) Fixed Effects BS 2016
Δ Log (SovCDS)	0.0368*** (0.0116)	0.0368*** (0.0126)	0.0253*** (0.00690)	0.0253** (0.0117)	0.0317** (0.0142)	0.0317** (0.0148)	-0.00405 (0.0205)	-0.00405 (0.0199)	0.00195 (0.0176)	0.00195 (0.0164)
Δ Log (VDAX)	-0.0430 (0.0626)	-0.0430 (0.0585)	0.291 (0.198)	0.291 (0.191)	-1.757 (1.167)	-1.757* (1.018)	0.894 (0.604)	0.894 (0.568)	-0.0459 (0.759)	-0.0459 (0.748)
Δ Log (Itraxeu)	0.846*** (0.195)	0.846*** (0.196)	-1.739* (0.898)	-1.739** (0.854)	1.772 (1.077)	1.772* (0.948)	7.676* (3.881)	7.676** (3.743)	0.771*** (0.271)	0.771*** (0.282)
Δ Log (FX CDS)	0.0994 (0.0707)	0.0994 (0.0709)	0.134*** (0.0410)	0.134*** (0.0395)	0.0864** (0.0320)	0.0864*** (0.0297)	0.00605 (0.0254)	0.00605 (0.0238)	0.0410 (0.0470)	0.0410 (0.0493)
Δ Log (SP)	-0.0444*** (0.0147)	-0.0444*** (0.0155)	-0.0458*** (0.0144)	-0.0458*** (0.0156)	-0.0322** (0.0132)	-0.0322** (0.0146)	-0.0117 (0.0143)	-0.0117 (0.0214)	-0.0726** (0.0320)	-0.0726* (0.0382)
Constant	-0.00739*** (0.00158)	-0.00739*** (0.00148)	-0.00682* (0.00387)	-0.00682* (0.00405)	-0.00295 (0.00369)	-0.00295 (0.00346)	0.0198*** (0.00586)	0.0198*** (0.00588)	-0.00141 (0.00189)	-0.00141 (0.00202)
Observations	7,298	7,298	7,138	7,138	6,241	6,241	6,445	6,445	1,488	1,488
R-squared	0.360	0.360	0.427	0.427	0.343	0.343	0.373	0.373	0.462	0.462
N. Banks	30	30	29	29	30	30	30	30	30	30
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Stock Prices	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

It is apparent that bootstrapping the standard errors does not affect the conclusion regarding the presence of the doom-loop before 2015. Moreover after 2015 the significance level of the

coefficient on sovereign CDS decreases even further. Overall using bootstrapped standard errors does not affect our findings.

Furthermore, in order to verify that our findings are not driven by a general economic recovery, we estimate the main-specification including only countries that exhibit positive GDP growth according to Eurostat. Table A.3 provides the results for this regression.

TABLE A.3 - Robustness
(Time Fixed Effect Specification: Economic Recovery)

This table examines the robustness of our time fixed effects specification by reporting the coefficients after having controlled for those countries that were experiencing an economic recovery during 2012, 2013, 2014. Respectively the countries excluded in the estimation are: Italy, Portugal and Spain; Italy and Spain; Italy and Sweden.

VARIABLES	(1)	(2)	(3)
	Fixed Effects 2012	Fixed Effects 2013	Fixed Effects 2014
Δ Log (SovCDS)	0.0291** (0.0104)	0.0193*** (0.00664)	0.0401* (0.0201)
Δ Log (VDAX)	-0.214** (0.0812)	-0.0559 (0.131)	0.108 (0.184)
Δ Log (Itraxeu)	1.218*** (0.313)	-0.429 (0.452)	0.0724 (0.182)
Δ Log (FX CDS)	0.271*** (0.0742)	0.199*** (0.0600)	0.130*** (0.0390)
Δ Log (SP)	-0.0465** (0.0177)	-0.0480** (0.0179)	-0.0328** (0.0149)
Constant	-0.0103*** (0.00248)	-0.00256 (0.00151)	0.000985 (0.000834)
Observations	4,257	4,307	4,445
R-squared	0.341	0.394	0.373
N. Banks	18	18	21
Bank FE	YES	YES	YES
Time FE	YES	YES	YES
Stock Prices	YES	YES	YES
Stance	Recovery	Recovery	Recovery

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

It is clear that the economic recovery didn't really affect the comovement between Bank CDS and Sovereign CDS. During the three years preceding the implementation of BRRD, the coefficient of sovereign CDS remains statistically significant and economically relevant. Moreover, the magnitude of the coefficient even increases in 2014 - column (3) - compare to 2013.

Furthermore, we examine the robustness of our results to controlling for changes in the time window and country-specific characteristics. To this respect we divide the dataset into two sub-samples, ranging from January 2012 to end 2014 and from January 2015 to April 2016, respectively. Table A.4 presents the results with the full sample from columns (1) to (6). We find that all our results are unchanged. Moreover, we modify the sample by omitting countries outside the Eurozone (Denmark and Sweden) columns from (7) to (12). We find that all our results are qualitatively unchanged.

TABLE A.4 - Robustness
(Controlling for Time Window & Eurozone)

This table examines the robustness of our main results by reporting the coefficients after having controlled for time window and country-specific characteristics. Columns (1) to (6) report the coefficients of the regression for the full sample. Columns (7) to (12) report the coefficients of the regressions when omitting banks with headquarter outside the Eurozone (Denmark and Sweden).

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Fixed Effects 2012-2014	Fixed Effects 2015-2016	Fixed Effects 2012-2014	Fixed Effects 2015-2016	Fixed Effects 2012-2014	Fixed Effects 2015-2016	Fixed Effects 2012-2014	Fixed Effects 2015-2016	Fixed Effects 2012-2014	Fixed Effects 2015-2016	Fixed Effects 2012-2014	Fixed Effects 2015-2016
Δ Log (SovCDS)	0.0324*** (0.00863)	-0.00203 (0.0171)	0.0317*** (0.00852)	-0.00262 (0.0172)	0.0251*** (0.00577)	-0.0116 (0.0166)	0.0353** (0.0153)	-0.000727 (0.0291)	0.0346** (0.0152)	-0.00139 (0.0293)	0.0247** (0.00979)	-0.0163 (0.0273)
Δ Log (VDAX)	1.488*** (0.290)	-0.749 (0.792)	1.480*** (0.293)	-0.739 (0.788)			1.726*** (0.306)	-0.614 (0.856)	1.723*** (0.308)	-0.597 (0.848)		
Δ Log (Itraxeu)	-1.409*** (0.348)	-0.334 (0.402)	-1.405*** (0.350)	-0.332 (0.402)			-1.666*** (0.377)	-0.232 (0.448)	-1.668*** (0.378)	-0.228 (0.448)		
Δ Log (FX CDS)	0.102** (0.0382)	0.0134 (0.0258)	0.101** (0.0378)	0.0126 (0.0257)	0.0304 (0.0207)	-0.0379 (0.0229)	0.0992** (0.0414)	0.0150 (0.0264)	0.0987** (0.0412)	0.0135 (0.0263)	0.0274 (0.0243)	-0.0408* (0.0234)
Δ Log (SP)			-0.0419*** (0.0105)	-0.0250 (0.0187)	-0.0192** (0.00729)	-0.01000 (0.0122)			-0.0395*** (0.00905)	-0.0420 (0.0315)	-0.0208*** (0.00735)	-0.0188 (0.0219)
Constant	0.0115*** (0.00358)	0.0199*** (0.00593)	0.0114*** (0.00359)	0.0198*** (0.00593)	-0.0223*** (0.00342)	0.0183*** (0.00599)	0.0135*** (0.00417)	0.0178** (0.00682)	0.0135*** (0.00418)	0.0178** (0.00683)	-0.0295*** (0.00357)	0.0161** (0.00689)
Observations	20,677	7,933	20,677	7,933	20,677	7,933	18,313	7,038	18,313	7,038	18,313	7,038
R-squared	0.369	0.403	0.371	0.403	0.467	0.514	0.379	0.397	0.381	0.399	0.480	0.517
N. Banks	30	30	30	30	30	30	26	26	26	26	26	26
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Stock Prices			YES	YES	YES	YES			YES	YES	YES	YES
Interaction					YES	YES					YES	YES
Eurozone							YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Additionally, we examine the robustness of our results by controlling for sample exclusion restrictions. This test is important to check whether country-specific bank characteristics drive the results of the regressions. We implement the specification used in Table V with time fixed effects and the interaction terms. Columns (1) to (3) report the coefficients after having excluded Austria, Germany and Denmark, early adopters of the BRRD¹². Columns (4) to (6) report the coefficients after having omitted banks belonging to Italy. Columns (7) to (9) report the coefficients after having omitted banks belonging to Spain. Columns (10) to (12) report the coefficients after having omitted banks belonging to France.

Table A.5 summarizes the results of the regressions. All the results are qualitatively and quantitatively unchanged, confirming once more that the introduction of the BRRD has effectively signalled the markets that banks will not be rescued by their national governments anymore.

¹² These three countries have adopted the BRRD with its bail-in tool in January 2015.

TABLE A.5 - Robustness
(Controlling for Sample Exclusion Restrictions)

This table examines the robustness of our main results by reporting the coefficients with sample exclusion restriction. Columns (1) to (3) reports the coefficients of the regressions when omitting banks with headquarter in Austria, Germany and Denmark. Columns (4) to (6) report the coefficients of the regressions when omitting banks with headquarter in Italy. Columns (7) to (9) report the coefficients of the regressions when omitting banks with headquarter in Spain. Columns (10) to (12) report the coefficients of the regression when omitting banks with headquarter in France.

VARIABLES	(1) Fixed Effects 2012-2014	(2) Fixed Effects 2015	(3) Fixed Effects 2016	(4) Fixed Effects 2012-2014	(5) Fixed Effects 2015	(6) Fixed Effects 2016	(7) Fixed Effects 2012-2014	(8) Fixed Effects 2015	(9) Fixed Effects 2016	(10) Fixed Effects 2012-2014	(11) Fixed Effects 2015	(12) Fixed Effects 2016
Δ Log (SovCDS)	0.0283*** (0.00655)	-0.0191 (0.0261)	0.0442 (0.0346)	0.0230*** (0.00562)	-0.0150 (0.0215)	-0.0112 (0.0156)	0.0225*** (0.00592)	-0.0221 (0.0213)	-0.0104 (0.0165)	0.0258*** (0.00643)	-0.0148 (0.0210)	-0.0194 (0.0163)
Δ Log (FX CDS)	0.0358 (0.0211)	-0.0484* (0.0249)	-0.0386 (0.0308)	0.0468* (0.0241)	-0.0468* (0.0241)	-0.0383 (0.0367)	0.0477* (0.0245)	-0.0479* (0.0256)	-0.0109 (0.0454)	0.0161 (0.0201)	-0.0463* (0.0253)	-0.0130 (0.0414)
Δ Log (SP)	-0.0206** (0.00874)	-0.00141 (0.0105)	-0.0405 (0.0346)	-0.0187** (0.00730)	0.00309 (0.00851)	-0.0254 (0.0231)	-0.0171** (0.00734)	0.00268 (0.00962)	-0.0326 (0.0272)	-0.0176** (0.00724)	0.000974 (0.00946)	-0.0307 (0.0261)
Constant	-0.0214*** (0.00371)	0.0125* (0.00709)	-0.000512 (0.00235)	-0.0224*** (0.00404)	0.0175*** (0.00559)	-0.00114 (0.00187)	-0.0233*** (0.00409)	0.0222*** (0.00685)	-0.000948 (0.00231)	-0.0198*** (0.00342)	0.0183*** (0.00597)	-0.00100 (0.00216)
Observations	16,576	5,256	1,198	16,156	5,082	1,178	16,859	5,189	1,194	18,590	5,836	1,353
R-squared	0.487	0.469	0.650	0.476	0.467	0.717	0.451	0.437	0.649	0.418	0.420	0.613
N. Banks	24	24	24	24	24	24	25	25	25	27	27	27
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Stock Prices	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Interaction Term	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Without: AT, DE, and DK	YES	YES	YES									
Without: IT				YES	YES	YES						
Without: ES							YES	YES	YES			
Without: FR										YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Furthermore, we estimate our results by omitting banks with government participation: the three Irish banks, and Dexia bank¹³. Here we expect a further decrease in the magnitude of the sovereign CDS coefficient, since a bank loss directly affects the government balance sheet. Table A.6 presents the results of this specification, which is estimated both at daily (columns 1 to 4) and weekly (columns 5 to 8) frequency.

At daily frequency the sovereign CDS coefficient pre-BRRD introduction decreases compared to the main specification as one would expect (columns 1 and 3). While post-introduction - columns (2) and (4) - it remains statistically insignificant. This remarks how direct government participation in the banking system works as an amplifier of the feedback-loop.

Finally, we run the same specification on weekly data, columns (5) to (8), we find that the effect is even stronger, the sovereign CDS coefficient strongly decreases and becomes insignificant.

¹³ The Irish government has rescued during the 2010 Irish economic downturn its 3 major banks - Allied Irish Bank, Permanent tsb, and Bank of Ireland - entering with a government participation of 99.8%, 75% and 15%, respectively. Moreover since December 2012, Dexia Bank (BE) is almost totally owned by the Belgian and French governments, which hold 50% and 44% of the shares, respectively (Source: Banks' Own Website).

**TABLE A.6 - Robustness
(Controlling for Government Participation)**

This table examines the robustness of our main results by reporting the coefficients with sample exclusion restriction. Columns (1) to (4) report the coefficients for daily data, while columns (5) to (8) report regressions on weekly data. Columns (3) to (4) and from (7) to (8) report the coefficients of the regressions when omitting banks with government participation.

VARIABLES	(1) Fixed Effects 2012-2014	(2) Fixed Effects 2015-2016	(3) Fixed Effects 2012-2014	(4) Fixed Effects 2015-2016	(5) Fixed Effects 2012-2014	(6) Fixed Effects 2015-2016	(7) Fixed Effects 2012-2014	(8) Fixed Effects 2015-2016
Δ Log (SovCDS)	0.0317*** (0.00852)	-0.00262 (0.0172)	0.0252*** (0.00685)	-0.00857 (0.0190)	0.0464** (0.0183)	0.100** (0.0472)	0.0469** (0.0175)	0.0642 (0.0448)
Δ Log (VDAX)	1.480*** (0.293)	-0.739 (0.788)	1.631*** (0.315)	-0.384 (0.808)	0.262** (0.102)	0.0754 (0.0696)	0.308** (0.111)	0.0518 (0.0791)
Δ Log (Itraxeu)	-1.405*** (0.350)	-0.332 (0.402)	-1.534*** (0.381)	-0.415 (0.461)	-0.0304 (0.161)	0.303*** (0.0953)	-0.0534 (0.175)	0.357*** (0.101)
Δ Log (FX CDS)	0.101** (0.0378)	0.0126 (0.0257)	0.110** (0.0521)	0.0814* (0.0447)	0.130* (0.0647)	0.0846 (0.0600)	0.124* (0.0697)	0.199* (0.105)
Δ Log (SP)	-0.0419*** (0.0105)	-0.0250 (0.0187)	-0.0611*** (0.0148)	-0.0455* (0.0247)	-0.0547* (0.0286)	-0.0991** (0.0398)	-0.0916*** (0.0321)	-0.138** (0.0552)
Constant	0.0114*** (0.00359)	0.0198*** (0.00593)	0.0124*** (0.00382)	0.0230*** (0.00653)	0.0173*** (0.00609)	-0.0204*** (0.00602)	0.0153** (0.00631)	-0.0175** (0.00755)
Observations	20,677	7,933	18,383	6,923	4,489	1,907	3,998	1,657
R-squared	0.371	0.403	0.434	0.478	0.416	0.549	0.551	0.628
N. Banks	30	30	26	26	30	30	26	26
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Stock Prices	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
State Owned	YES	YES						
Weekly Data					YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1