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Reforming the Regulatory Treatment of Sovereign Exposures in Banking Regulation

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Abstract

The European sovereign debt crisis has shown the tight linkage between sovereign and bank balance sheets. In the aftermath of the crisis, several reforms have been discussed in order to mitigate the sovereign-bank nexus. These reforms include the abolishment of preferential government bond treatment in banking regulation. This paper gives a detailed overview of literature and data which are closely related to the existing preferential sovereign bond treatment in bank regulation and highlights the need for reforms especially in the euro area. Against this background, the following three regulatory reforms are described and discussed: (i) positive risk weights for government bonds in bank capital regulation, (ii) sovereign exposure limits, and (iii) haircuts for government bonds in bank liquidity regulation. The discussion focusses on the effects of these reforms for bank behaviour and financial stability.

Keywords: sovereign bonds, preferential treatment, bank regulation, sovereign risk, financial contagion, regulatory reforms

JEL classification: H63, H12, G11, G18

I. Introduction

The European sovereign debt crisis has demonstrated the tight linkage between sovereign and bank balance sheets. In response to the crisis, several reforms have been discussed in order to break the sovereign-bank nexus. One of the most well-known recent reforms is the European Banking Union which is based on three pillars: the Single Supervisory Mechanism (SSM), the Single Resolution Mechanism (SRM) and the European Deposit Insurance Scheme (EDIS). Two of the three pillars, namely the SSM and the SRM, have already been implemented in the European Union (EU). However, the Banking Union only covers

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one side of the sovereign-bank loop, preventing the transfer of risks from the banking sector to the sovereign. Owing to a mitigation of contagion effects also from sovereigns to banks, some economists advocate in favour of repealing the preferential treatment of government bonds in banking regulation, see for example *Weidmann* (2016), *ESRB* (2015, p. 111). This paper adds to this policy discussion in two ways. First, it gives a broad overview of facts which underline the potential systemic risk related to the current preferential treatment of government bonds in bank regulation. Second, it describes and discusses three regulatory reforms dealing with the abolishment of the preferential government bond treatment in banking regulation.

As a starting point, the paper presents the regulatory treatment of sovereign exposure under the Basel Accords and EU legislation. Most notably, sovereign bonds receive a zero risk weight in capital regulation, they are exempted from the large exposure requirements, and they are classified as highly liquid in the liquidity regulation framework. Furthermore, the term "sovereign risk" is defined and an overview of potential forms of sovereign defaults is given. Against this background, the paper discusses whether the treatment of sovereign bonds in banking regulation as risk-free and highly liquid is justified. Based on (i) a depiction of yields from sovereign bonds in the European Monetary Union (EMU), (ii) a short description of the sovereign default in Greece, and (iii) an assessment of the possibilities for an overindebted EMU country to reduce its debt, it is concluded that sovereign debt from EMU countries is not per se default risk-free. Consequently, neglecting sovereign risk in banking regulation could be an issue for the stability of the banking sector. In order to assess the extent of this issue, stylised facts regarding the sovereign bond portfolios held by banks in the euro area are presented. It is shown that banks in stressed countries (Greece, Ireland, Italy, Portugal and Spain) have more than doubled their sovereign exposures from the year 2008 until the beginning of 2019. Furthermore, the banks' home bias in sovereign bond holdings in stressed countries (except Ireland) is significantly higher in 2019 than that of banks in non-stressed countries. In order to emphasise the crucial role sovereign bonds play for banks, the paper outlines reasons for banks holding sovereign debt in normal times, and incentives banks may have to increase their (domestic) government holdings in times of sovereign distress. Furthermore, the paper briefly describes the main channels through which sovereign risk can affect the banking sector. Finally, three regulatory reforms addressing a potential regulatory gap are discussed: applying positive risk weights for sovereign bonds in bank capital regulation, considering sovereign exposures under the large exposure requirement, and applying haircuts for sovereign bonds in bank liquidity regulation. The discussion focusses on the potential implications of the regulatory reforms for bank behaviour and financial stability. Concerning the banks' reaction in response to the reforms, the discussion concludes that all reforms would affect

banks in the euro area quite differently. Positive risk weights for sovereign bonds would mainly affect banks with high sovereign bond holdings for which high risk weights would apply, i. e. Italian and Spanish banks. Large exposure limits for sovereign bonds would strongly encourage especially Italian and German banks to restructure their sovereign portfolios. The reason is that these banks hold the highest amount of domestic sovereign bonds in relation to their amount of equity. As most of the banks currently over-fulfil the Liquidity Coverage Ratio (LCR), it is expected that low haircuts for "less-liquid" sovereign bonds would imply that the LCR would not become binding for the majority of banks. In this case, the consequences for banks in the euro area would be quite small. With respect to financial stability, the discussion shows that two of the three reforms, positive risk weights for government bonds and sovereign exposure limits, would make banks more resilient to sovereign risk as they would reduce credit and concentration risk in banks' balance sheets. However, haircuts for sovereign bonds in the liquidity regulation could make banks more vulnerable to sovereign risk. This is the case as banks were incentivised from this regulation to hold more sovereign bonds. Hence, the contagion channel between sovereigns and banks would be tighter and the banks' leverage ratio would increase.

The rest of the paper is structured as follows. Section II. presents the regulatory treatment of sovereign exposure under the Basel Accords and EU law. Section III. defines the term "sovereign risk" and explains forms of sovereign defaults. In this context it is investigated whether sovereign debt from EMU countries is risk-free. Moreover, the section presents stylised facts regarding the sovereign bond holdings of banks in the EMU and explains motives for banks holding sovereign bonds. Section IV. describes the main contagion channels between sovereigns and banks. Section V. discusses reforms dealing with the abolishment of the preferential sovereign bond treatment. The final section concludes the paper.

II. Regulatory Treatment of Sovereign Exposures

This section captures the existing regulatory treatment of sovereign exposures under the existing Basel framework and EU legislation. The focus lies on risk weights for sovereign exposures, the treatment of sovereign exposures under the leverage ratio, the large exposure framework and the liquidity requirements.

1. Risk Weights for Sovereign Bonds

To quantify (sovereign) credit risk in the banking book, banks can choose between two approaches: (i) the standardised approach and (ii) the internal ratings-based (IRB) approach (*BCBS*, 2006).

a) Standardised Approach

The standardised approach allows banks to determine risk weights for (sovereign) exposure in a standardised manner based on external ratings from credit rating agencies (CRAs).[1] If sovereign credit ratings are available, a weighting range from 0 % to 150 % exists, which is illustrated in Table 1. If sovereign ratings are not available, a risk weight of 100 % is applied to sovereign exposures. However, the *BCBS* (2006, paragraph 54) stipulates that at national discretion a lower risk weight can be applied to banks' sovereign exposures, or exposures to their central bank, if they are denominated and funded in domestic currency.

Note that the Basel Accords are not legally binding per se. However, the Basel recommendations formed the starting point for the Capital Requirement Directive (CRD IV)[2] and the Capital Requirement Regulation (CRR)[3], which apply to all banks in the EU. According to the CRR there are three ways for sovereign bonds of obtaining a zero risk weight under the standardised approach: (i) if the central government has the highest credit assessment of "1" (Article 114(2)), if the exposure is denominated and funded in domestic currency of the Member State (Article 114(4)), and (iii) if the sovereign exposure is denominated and funded in the domestic currency of any Member State (Article 114(5)). However, the last article only applied for a transitional period which ended on 31. December 2017, with a phasing-out period until 2020.

Table 1

Sovereign Risk Weights Under the Basel II Standardised Approach

Credit Assessment	AAA to AA–	A+ to A–	BBB+ to BB–	BB+ to B–	Below B–	Unrated
Risk Weight	0 %	20 %	50 %	100 %	150 %	100 %

Source: BCBS (2006, paragraph 53)

[1] The methodology used in the Basel document is based on ratings from Standard & Poor's (BCBS, 2006, p. 19).

[2] Directive 2013/36/EU of the European Parliament and of the Council on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, OJ L 176, 27.6.2013, p. 338.

[3] Regulation (EU) No 575/2013 of the European Parliament and of the Council on prudential requirements for credit institutions and investment firms, OJ L 176, 27.6.2013, p. 1.

b) Internal Ratings-Based Approach

The IRB approach allows banks to calculate risk weights for given (sovereign) exposures on their own internal rating systems. This approach should be used by large and sophisticated banks and allows for a more nuanced differentiation of credit risk. For calculating credit risk, the following risk parameters are necessary: the probability of default (PD), the loss given default (LGD), the exposure at default (EAD), and the effective maturity (M). Two broad approaches exist to determine these risk parameters: a foundation and an advanced approach (*BCBS*, 2006, paragraph 245).[4]

Regarding the treatment of sovereign exposures, the two approaches do not differ. Table 2 shows risk weights and capital charges under the IRB approach for sovereign exposures with an LGD of 45 % and an M of 2.5 years, for several

Table 2

Illustrative Sovereign Risk Weights and Capital Charges Under the Basel II IRB Approach

Asset class: LGD: 45 % M: 2.5 years	*Sovereign exposure*	
PD (in %)	*Risk weight (in %)*	*Capital charge (in %)*
0.00	0.00	0.00
0.01	7.53	0.06
0.02	11.32	0.91
0.03	14.44	1.16
0.05	19.65	1.57
0.10	29.65	2.37
0.05	69.61	5.57
1.00	92.32	7.39
5.00	149.86	11.99
10.00	193.09	15.45
20.00	238.23	19.06

Source: ESRB (2015, p. 16)

[4] In the following, the paper does not distinguish between the foundation and the advanced approach. The acronym IRB refers to both approaches.

default probabilities. Once a bank decides to use the IRB approach for certain asset classes, it is expected that the bank will extend this approach across all material asset classes (*BCBS*, 2006, paragraph 256). However, there is an exception for asset classes if they fulfil the following two conditions (*BCBS*, 2006, paragraph 259): First, they are immaterial in nature, and second, for assets that are classified as non-significant business units. For these assets it is permitted to compute credit risk with the standardised approach.

However, the "permanent partial use" in the CRR (Article 150) permits IRB-banks applying the standardised approach for sovereign exposures. In contrast to the Basel Accords, there are no conditions for IRB-banks to use the standardised approach for sovereign exposures. Hence, the assessment of sovereign bonds under the IRB approach is much broader under EU law than required in the Basel Accords.

2. Leverage Ratio

Within the Basel III framework, a non-risk-based leverage ratio was introduced. The aim of this instrument is to restrict the build-up of excessive leverage in the banking sector, and to minimise the costs of any model-risk in the system of risk-weighted assets (ESRB, 2015, p. 21). The leverage ratio is defined as (*BCBS*, 2014a):

$$\frac{\text{Tier 1 capital}}{\text{Total exposures}} \geq 3\%$$

It consists of two components: The Tier 1 capital (numerator), and the total exposures (denominator). Tier 1 capital – also referred to as the core capital – consists primarily of equity capital and disclosed reserves. The total exposures are the sum of: on-balance sheet exposures, derivative exposures, securities financing transactions exposures and off-balance sheet (OBS) items (*BCBS*, 2014a, paragraph 14).

With respect to EU law, the CRR was supplemented by a Delegated Regulation (Delegated Regulation (EU) 2015/62) which forms the legal basis for the leverage ratio. Since 2015, banks publicly have to disclosure their leverage ratio and its components. The CRD II (that will apply from June 2021) will transform the leverage ratio into a binding requirement. In the Basel Accords as well as in the CRR, sovereign exposures are fully included in the leverage ratio, meaning that they do not receive preferential treatment compared to other asset classes.

3. *Large Exposure Framework*

The large exposure framework supplements the risk-based capital standards in the Basel II and III Accord (*BCBS*, 2014c). The framework was introduced by the BCBS in April 2014 and should protect internationally active banks from large losses, resulting from the sudden default of a single counterparty. A large exposure is defined as the sum of all exposure values of a bank to a counterparty if it is equal to or above 10 % of the bank's eligible capital base (*BCBS*, 2014c, paragraph 14). The minimum large exposure requirement stipulates that a bank's large exposure is not allowed to be higher than 25 % of the bank's Tier 1 capital.[5] A more stringent limit of 15 % applies for exposures of global systemically important banks (G-SIB) to other G-SIB. According to the Basel Accords (BCBS, 2014c, paragraph 61) and the CRR (Article 400), banks' exposures to sovereigns and their central banks are exempted from the large exposure framework.

4. *Liquidity Requirements*

The BCBS introduced two minimum standards for funding liquidity within the Basel III Accord: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).

a) Liquidity Coverage Ratio

The aim of the LCR is to promote the short-term resilience of banks' liquidity profiles by ensuring that banks have sufficient unencumbered high-quality liquid assets (HQLA) to withstand a significant stress scenario of a duration of at least one month. The LCR is defined as (*BCBS*, 2013):

$$LCR = \frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 calender days}} \geq 100\%$$

It consists of two components: the stock of HQLA (numerator) and the total expected net cash outflows over the next 30 calendar days (denominator). HQLA are assets with a high potential to be quickly and easily liquidated at little or no loss of value even in times of stress. There are two categories of HQLA: level 1 assets and level 2 (A and B) assets. No quantitative limits and haircuts apply to level 1 assets, whereas level 2 assets can only comprise up to 40 % of the stock of HQLA and they are subject to haircuts of at least 15 %.

[5] A detailed Tier 1 capital definition is given in paragraphs 49 to 96 in BCBS (2010).

Sovereign bonds are eligible to be classified as level 1 assets when they satisfy at least one of the following three conditions (*BCBS*, 2013, paragraph 50): (i) they are assigned a 0 % risk weight under the Basel II standardised approach, (ii) they are issued in domestic currencies by the sovereigns in the countries in which the liquidity risk is being taken or the bank's home country, (iii) sovereign bond holdings which are denominated in foreign currencies are eligible up to the amount of the bank's net cash outflows in that foreign currencies in times of distress. Moreover, the LCR framework requires that the HQLA should be well diversified within each asset class. However, there is an exception for sovereign bonds of the bank's jurisdiction in which the bank operates, or of its home jurisdiction (*BCBS*, 2013, paragraph 44). In line with Basel III, the CRR (Article 412) allows banks to assess sovereign bonds as HQLA in the liquidity coverage requirement, so that also in EU legislation sovereign bonds receive a preferential treatment.

b) Net Stable Funding Ratio

The NSFR is designed to supplement the LCR. It requires banks to have a sustainable maturity structure of their assets and liabilities over a one-year time horizon. Formally, the liquidity ratio is defined as (*BCBS*, 2014b):

$$NSFR = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\%$$

It consists of two components: the available amount of stable funding (numerator) and the required amount of stable funding (denominator). The available amount of stable funding is calculated by the total value of a bank's capital and liabilities expected to be reliable over the time horizon of one year. Note that funding instruments which are regarded as stable funding sources receive a high available stable funding (ASF) factor and vice versa. The required amount of stable funding is based on the liquidity characteristics of banks' assets and OBS exposures. Note that the higher the liquidity value of an asset or an OBS exposure, the lower the required stable funding (RSF) factor and vice versa.

Sovereign securities are assigned an RSF factor of 5 % within the NSFR if they are classified as level 1 assets in the LCR. Only coins, banknotes and central bank reserves are assigned a lower RSF factor of 0 %, whereas level 2 assets are assigned RSF factors of between 15 % and 50 %. With respect to the CRR, the NSFR contains only a reporting obligation, however, the CRR II will incorporate a binding requirement. Regarding the sovereign bond treatment, there are no significant differences in Basel III and the CRR so that the preferential treatment exists also under EU law.

III. Sovereign Risk

For decades sovereign risk was mainly an issue for emerging markets and no OECD country defaulted on its domestic debt between 1950 and 2010 (*Reinhart/Rogoff*, 2010). However, the European sovereign debt crisis and especially the Greek sovereign debt crisis, with its peak in 2010–2012, highlighted that sovereign risk is not only an issue for emerging economies.

1. Sovereign Risk and Sovereign Defaults

There is no single definition of the term "sovereign risk" in the existing literature and it contains various risk factors, depending on the context and the user (*Pepino*, 2015, p. 9). The *ESRB* (2015, p. 44) defines sovereign risk as:

> "Sovereign risk arises from the fact that a sovereign may, for a significant time, have higher expenditures than tax revenues and go so much into debt that, eventually, it finds it impossible or undesirable to pay its debts as they fall due or, more generally, may not comply with its contractual debt obligations."

This definition assigns "sovereign risk" to the category of "sovereign credit/default risk" which also incorporates risks like migration or spread risk (*ESRB*, 2015, p. 45).[6]

The definition from the ESRB refers to an outright sovereign default, i. e. the failure of a sovereign to meet the principal or interest payment on the due date. In the case of an outright default, the sovereign rarely defaults on its entire amount of outstanding debt. Commonly, the sovereign negotiates a debt restructuring or exchange programme with its creditors. Such programmes are mostly accompanied by losses for creditors as the maturity dates on the newly exchanged sovereign bonds will be extended and/or the bonds' face value and the coupon rates will be reduced. Due to the "reduced" debt obligations, the sovereign will be able continuing its debt payments – at least for a given period.

Note, that a sovereign default decision, in general, does not necessarily depend on the sovereign's ability to pay its debt. It is also possible that a sovereign is not willing to serve its debt although it has the ability. In this case a sovereign default is driven by strategic reasons ("strategic default"). A strategic default may be beneficial for a sovereign as it can increase the total financial resources in the domestic economy. This can be realised through a selective sovereign default, meaning that a sovereign only defaults on debt which is held by foreign

[6] Migration risk arises due to rating downgrades. Spread risk arises when the spread between bond-yields listed on the secondary market and corresponding risk-free rates starts to increase (ESRB, 2015, p. 45).

investors (*Gennaioli* et al., 2014, p. 820). Losses then mostly emerge abroad, whereas the domestic costs of the default are low.[7]

Whether a sovereign defaults on its debt obligation also depends on the currency in which the debt is denominated (domestic currency or foreign currency). If the sovereign debt is denominated in the domestic currency, an over-indebted country has the possibility to serve its debt by printing money. This is not possible if the debt is denominated in foreign currency. Furthermore, printing money to pay the debt is only feasible if the country has monetary sovereignty, meaning that the sovereign has legal control over its currency. From this perspective, government debt denominated in the domestic currency can be seen as "default-risk free" as "[governments], when issuing debt in local currency, have the unique power, to print money to pay their obligations and thus can avoid default" (*Damodaran*, 2010, p. 14).

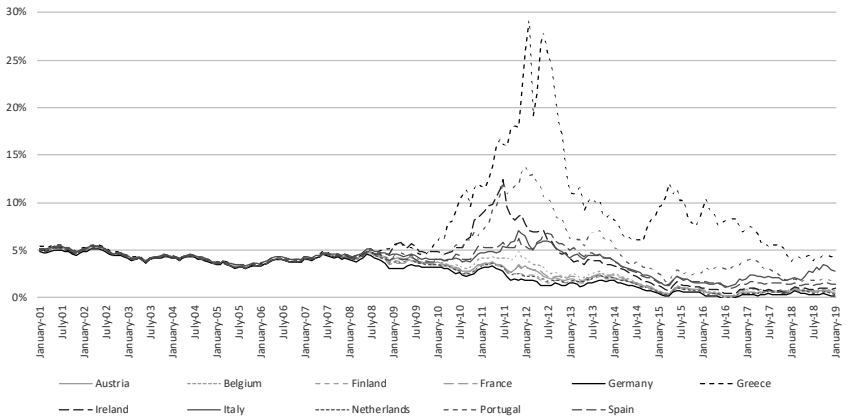
A side effect of printing money to finance domestic debt obligations is inflation, which reduces the real value of outstanding sovereign debt. Inflating sovereign debt away can be seen as a sovereign "real default", as creditors' claims lose value driven by internal currency devaluation. Another form of a sovereign "real default" exists when there is a change in the currency in which the sovereign debt is denominated, i. e. in the case of a currency redenomination (*ESRB*, 2015, p. 85).[8] If, for example, a country in a monetary union leaves the union, it is likely that it will reintroduce the old national currency. This will be followed by a redenomination of debt contracts that fall under the country's own law. The value of existing sovereign bonds which will be redenominated is thus dependent on the valuation of the reintroduced national currency. In the case of an external currency devaluation (relative to the currency in the monetary union) creditors will face losses as the real value of their sovereign bonds decreases.

2. Sovereign Risk and Sovereign Defaults in the Euro Area

The European sovereign debt crisis underlined that the risk of a sovereign outright default, and also of a real default de facto exists in the EMU. Figure 1 shows the yields of 10-year euro area sovereign debt from January 2001 to January 2019. Before 2008 the yields were about the same. However, after the Lehman collapse in autumn 2008 the yields started to diverge. The sovereign yields mainly in the GIIPS countries (Greece, Ireland, Italy, Portugal and Spain; later in

[7] Note that such a perfect discrimination is hard to exercise for the sovereign as sovereign bonds are traded in secondary markets. Hence, the sovereign does not exactly now where the bonds are being held.

[8] Reasons for a currency redenomination can be: (i) high inflation and currency devaluation, (ii) when a currency union is formed, (iii) when one country, or more countries in a currency union leave the union, (iv) when the total currency union breaks up.



Data Source: European Central Bank (ECB)

Figure 1: Yields of 10-Year Euro Area Sovereign Debt

the paper also referred to as "stressed countries") increased significantly from around 2008 until 2014, whereas the sovereign yields from bonds in Austria, Belgium, Germany, Finland, France and the Netherlands (later in the paper also referred to as "non-stressed countries") decreased. These yield spreads resulted from several reasons. *Barrios* et al. (2009) show that at the beginning of the crisis, the government bond yield spreads within the euro area were mainly driven by three factors: (i) the different sovereign default risks, (ii) the different market liquidity of sovereign bonds, and (iii) changes in investors' preferences. What is crucial is that since the outbreak of the crisis, the expected default risks of sovereigns in the EMU have been differing significantly from each other. As higher sovereign bond risk premiums directly impact the sovereign refinancing conditions, CRAs have responded to these developments. Standard and Poor's, for example, announced credit rating downgrades for nine EU member states in the years 2010–2012 (*Baum* et al., 2016, p. 117).

The Greek sovereign debt crisis showed that it is possible that for an EMU Member State to default on its debt. The Greek sovereign default was one of the largest in history, besides the default in Argentina in 2005 (*Das* et al., 2012). After several reforms to rescue Greece, debt restructuring programmes were proposed in 2012 which related to all privately held sovereign bonds which had been issued prior to 2012. The programmes required bond holders to turn their Greek government bonds into new securities with lower face values, lower interest rates and longer maturities. As a result, the face value of Greece's debt decreased by € 108 billion (or 52.5 % of the eligible debt) (*Zettelmeyer* et al., 2013,

p. 527).[9] The total "haircuts" suffered by the creditors from the debt restructuring programmes were estimated to be, on average, between 59 % and 65 %, depending on the methodology which was used (*Zettelmeyer* et al., 2013).

An outright sovereign default can be avoided when a sovereign has monetary sovereignty. Then a sovereign has the possibility to serve its debt by printing money. This is not the case in the EMU, where the Member States transferred the monetary policy to the Eurosystem[10]. Article 130 of the Treaty on the Functioning of the European Union (TFEU) declares that the Eurosystem is formally independent from political influence. The decision-making bodies of the Eurosystem are prohibited from taking instructions from any EU institution. The independence of the ECB helps to maintain price stability, the primary objective of the European System of Central Banks (ESCB[11]).

Nevertheless, transferring monetary policy to an independent central bank does not automatically prevent the monetisation of sovereign debt (*ESRB*, 2015, p. 46). To ensure this, Article 123 of the TFEU prohibits any form of the monetary financing of public debt or deficits, for all EU central banks. After the global financial crisis of 2007/2008 and in response to, from the ECB's perspective too low inflation rates in 2014/2015, the ECB launched purchase programmes for government bonds. It has been questioned whether these programmes violate the prohibition of monetary financing and exceed the monetary policy mandate of the ECB. Against this background, there have been initiated constitutional complaints against the Outright Monetary Transactions programme (OMT) and the Public Sector Purchase Programme (PSPP) with the German Federal Constitutional Court. However, both constitutional complaints were unsuccessful (*Bundesverfassungsgericht*, 2016; *Court of Justice of the European Union*, 2018). Hence, from a legal perspective, the risk of monetising sovereign debt in the euro area does not exist.

The previous analyses show that sovereign debt from EMU Member States are not per se default risk-free, implying that the current situation in the EMU represents a new reality (*ESRB*, 2015, p. 50). On the one hand, the euro is the domestic currency in the EMU. On the other hand, EMU Member States have transferred their monetary policy to the ECB, and the TFEU provides central bank independence and prohibits monetary financing. From this perspective, the situation in the EMU is similar to that of a government issuing debt in a foreign currency. From a theoretical point of view an outright sovereign de-

[9] For a detailed description of the Greek debt restructuring of 2012 see Zettelmeyer et al. (2013).

[10] The Eurosystem is composed of the ECB and the national central banks of the euro area Member States.

[11] The ESCB comprises the ECB and all national central banks of all EU Member States.

fault is the only possible form of debt reduction in the EMU (*Alesina* et al., 1992).

One could think that an over-indebted EMU country could leave the Monetary Union so that it would regain access to monetary policy tools. However, for Member States there does exist an exit option in the treaties. Although there is no legal right for a Member State to leave the EMU, the future of the euro was questionable during the sovereign debt crisis and there were fundamental doubts over the integrity of the EMU. As long as the euro remains the national currency in all EMU Member States, the exchange rate risk within the Union can be neglected. However, *Klose/Weigert* (2014) show that redenomination risk played a crucial role during the European sovereign debt crisis.[12] They find that euro area sovereign bond yields incorporated redenomination risk premiums/discounts in the crisis. In particular, *Klose/Weigert* (2014) show that there were redenomination risk premiums for sovereign bonds from the countries: Portugal, Ireland, Spain and Italy, as their currencies were expected to depreciate (vis-à-vis the euro) after exiting the EMU. In contrast, there were redenomination risk discounts for sovereign bonds from France, the Netherlands, Germany, Austria and Belgium, as their currencies were expected to appreciate.

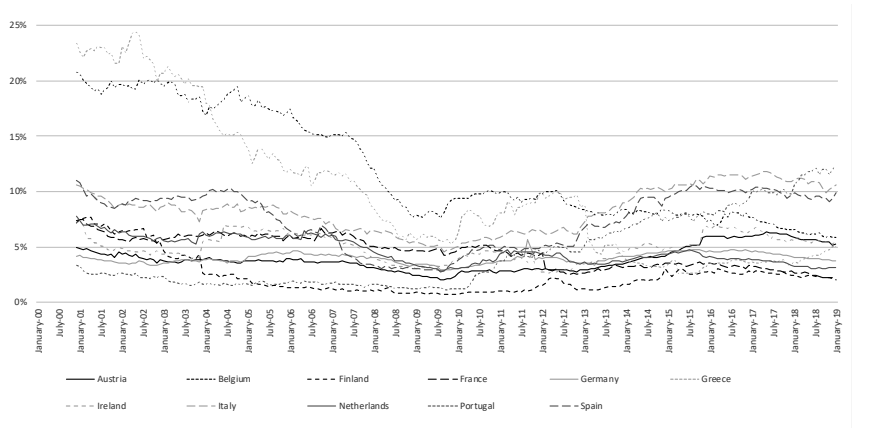
3. Banks' Sovereign Bond Holdings in the Euro Area

Whether an increase of sovereign risk has systemic implications also depends on the level and the composition of banks' sovereign bond portfolios.

a) Banks' Total Sovereign Bond Holdings

Figure 2 shows the banks' total euro area sovereign debt holdings of selected EMU countries from January 2000 to January 2019. Comparing the banks' sovereign exposures at the beginning of 2000 with the exposures in January 2019, shows that most of them were significantly larger in 2000. Especially banks in Greece and Belgium reduced their sovereign holdings. However, Greek banks did not continuously reduce their sovereign exposures. Since the global financial crisis of 2007/2008, they sharply increased their euro area sovereign holdings. This trend stopped in 2012, as a result of the debt restructuring programmes (*ESRB*, 2015, p. 77). The decreasing trend over the whole period can also be observed for French and Dutch banks, but less strongly. Another trend could be observed for banks in Spain, Italy, Portugal and Ireland. They decreased their sovereign debt holdings from 2000 until 2008 and since then they (gradually) increased their government bond exposures. In contrast to these de-

[12] See also *Di Cesare* et al. (2012) and *Bayer* et al. (2018).



Data Source: ECB

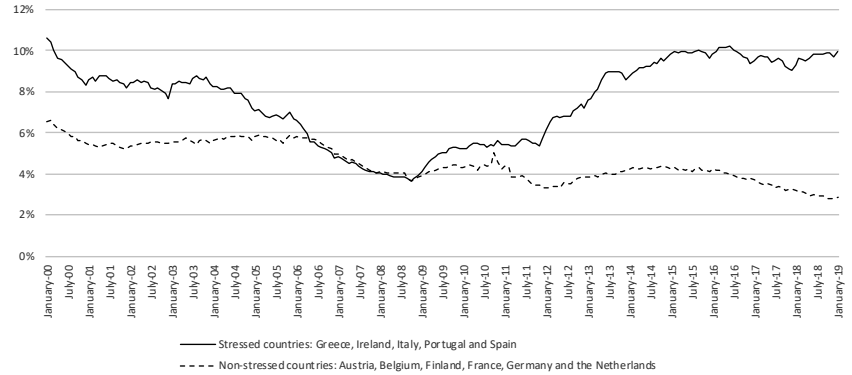
Figure 2: Banks' Total Euro Area Sovereign Debt Holdings as a Percentage of Their Total Assets in Selected Euro Area Countries

velopments, the sovereign debt exposures from banks in Austria, Germany and Finland remained quite stable over the period from 2000 until 2019.

b) Banks' Sovereign Exposures in Stressed and Non-Stressed EMU Countries

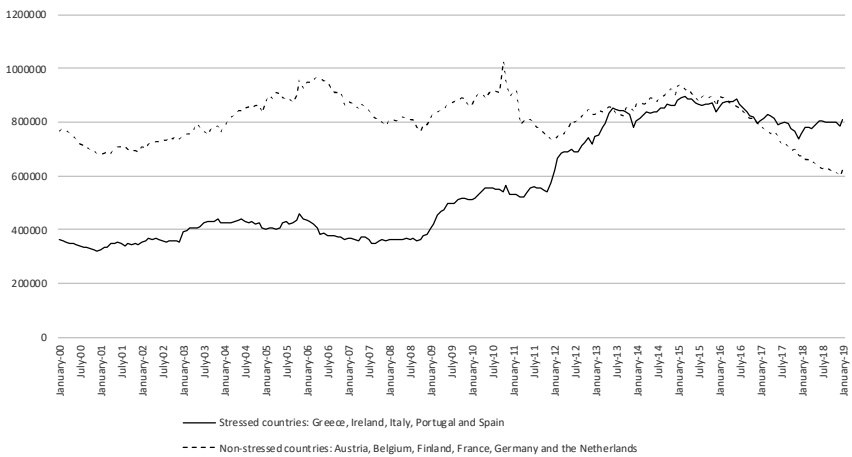
It is noticeable that the development of banks' sovereign holdings in most stressed euro area countries and those in non-stressed euro area countries has diverged since the global financial crisis of 2008 until today (2019). The different evolution of sovereign bond exposures from banks in stressed and non-stressed euro area countries are displayed in Figure 3. The figure shows the averaged total euro area sovereign debt holdings across the two country groups from January 2000 to January 2019. Banks in both groups decreased the average euro area sovereign debt holdings from 2000 until 2008, but the reduction of banks in stressed countries was stronger. This development started to diverge in 2008. The average sovereign debt from banks in non-stressed countries remained quite stable, whereas banks in stressed euro area countries have more than doubled their average euro area sovereign debt holdings in recent years.

One may expect that the increased share of sovereign bonds from banks in stressed countries is because banks' balance sheets shrunk during and after the global financial crisis, rather than that of the banks' increase in sovereign holdings (ESRB, 2015, p. 79). To address this issue, Figure 4 shows the banks' average total euro area government bond portfolios in *millions of euro* in stressed and



Data Source: ECB

Figure 3: Banks' Total Euro Area Sovereign Debt Holdings as a Percentage of Their Total Assets in Certain Stressed and Non-Stressed Euro Area Countries



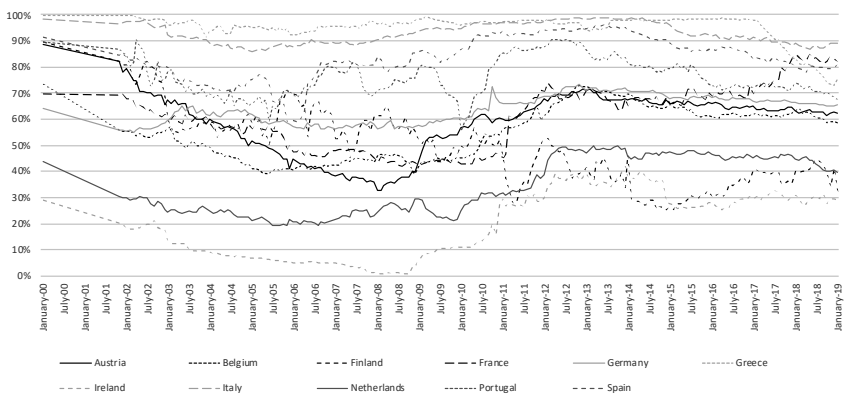
Data Source: ECB

Figure 4: Banks' Total Euro Area Sovereign Debt Holdings in Certain Stressed and Non-Stressed Euro Area Countries (in € million)

non-stressed euro area countries from January 2000 to January 2019. The figure highlights that the level of banks' sovereign debt holdings in stressed countries – and not just their ratio to total assets – increased significantly post-2008. Accordingly, the increased share of sovereign bond exposures in the banks' balance sheets from banks in stressed countries is not driven by a reduction in total assets.

c) The Banks' Home-Bias in Sovereign Bond Holdings

With respect to the composition of the banks' sovereign exposures, Figure 5 displays the development of the share of banks' *domestic* sovereign bonds to total euro area sovereign bonds ("home bias") from January 2000 to January 2019. It is shown that the banks' home bias in sovereign bond holdings exceeds 50 % for most of the countries in the considered period. Only the banks in Ireland and the Netherlands hold less than 50 % domestic sovereign bonds of their total euro area sovereign exposures over the whole period from 2000 to January 2019. The sovereign debt home bias of banks in Finland significantly decreased from 2000 until January 2019. Banks in Austria, Belgium, France and Germany reduced their home bias in sovereign bonds in the first decade, but they increased their share of domestic sovereign holdings over the time period from 2008 until 2012. Banks in France significantly increased their home bias in sovereign bond holdings from 2016 until 2019. Most notably, the share of domestic bonds is the highest for banks in Greece, Italy, Spain and Portugal, the home bias of banks in these countries is at most times over 70 %.



Data Source: ECB

Figure 5: Banks' Domestic Sovereign Debt Holdings as a Percentage of Their Total Euro Area Sovereign Debt Holdings

4. Why Banks Hold Sovereign Bonds

There are a host of reasons for why banks hold sovereign bonds. Some of these reasons are structural and permanent in nature, while others are temporary, meaning that they arise, for example, in times of sovereign distress (*Lenarčič* et al., 2016, p. 10).

a) Motives for Banks Holding Sovereign Bonds in Normal Times

Usually, government bonds carry high credit ratings and are considered to be low-risk (in particular from developed economies). These characteristics of sovereign bonds make them attractive for banks to hold. One reason for banks to invest in sovereign bonds is to diversify and reduce their overall balance sheet risk, that in turn reduces their funding costs (*Lenarčič* et al., 2016, p. 11). Assets that are less risky tend to have higher market liquidity, so that some banks hold sovereign bonds as a way of storing liquidity (*Gennaioli* et al., 2014). Note that banks can also store liquidity by holding cash or close substitutes to public debt, however, holding sovereign exposure is generally less costly (*Lenarčič* et al., 2016, p. 10). Due to the low credit risk and the high market liquidity, sovereign debt is an eligible asset class which is used as collateral. Banks use government bonds, inter alia, for interbank refinancing operations, for refinancing operations with the central bank and/or for repurchase agreements (*Bolton*/*Jeanne*, 2011, p. 162). Some banks hold large amounts of sovereign bonds as they operate as the primary dealer or marketmakers for government bonds (*BCBS*, 2017, p. 12). In the former case, banks act as an underwriter and buy sovereign debt securities from the government in order to sell them for a profit. Another argument for holding sovereign bonds are regulatory reasons. The liquidity requirements (LCR and NSFR) stipulate that banks should hold sufficient HQLA – sovereign securities are classified as level 1 HQLA. It is beneficial for banks to fulfil the liquidity requirements with sovereign securities as holding sovereign debt is generally less costly than holding other liquid assets. Within the capital regulation framework, government exposures receive a zero risk weight, implying that banks do not have to set aside equity capital to protect potential losses (*Bonner*, 2016; *Acharya*/*Steffen*, 2015). This makes investing in sovereign bonds more attractive compared to other asset classes.

b) Motives for Banks Holding (Domestic) Sovereign Bonds in Times of Sovereign Distress

The motives for holding government debt can change when sovereign risk increases. In the previous Section 3 it was shown that especially banks in stressed

euro area countries have increased their (domestic) sovereign bond holdings since 2008. There has been a growing literature in recent years investigating motives for this relationship.

The "carry trade" hypothesis states that banks borrow at relatively low interest rates in non-stressed countries and invest in high-yielding sovereign bonds in stressed countries (*Acharya*/*Steffen*, 2015). This can be rational for banks as they will benefit from the spreads as long as there is no materialisation of default risk. The carry-trade behaviour can be driven by risk-shifting (moral hazard) motives and regulatory reasons. The risk-shifting (moral hazard) motive reveals how especially troubled banks place a bet on their own survival, in the sense that they shift their investments into risky government bonds (*Acharya*/*Steffen*, 2015; *Ari*, 2016). In the event of a sovereign default, domestic banks' balance sheets will deteriorate and it is expected that troubled banks will go bankrupt anyway (independently of their level of sovereign bond holdings). However, they will benefit from sovereign holdings when the sovereign's situation improves, as then there will be an increase in sovereign bond prices. Regulatory reasons can also force troubled (undercapitalised) banks to engage in carry trades (*Acharya*/*Steffen*, 2015). They have an incentive to substitute high risk-weighted assets with zero-risk-weighted high-yielding sovereign bonds. Through this adjustment strategy undercapitalised banks are able to fulfil the risk-weighted capital ratio and it increases the short-term return on equity. However, this bank behaviour leads to a crowding-out effect as credit is reallocated from the private to the public sector (*ESRB*, 2015).

The deficit-absorption hypothesis argues that domestic banks act as residual buyers when sovereign risk increases and macroeconomic factors deteriorate (*Lenarčič* et al., 2016, p. 13). A deterioration in macroeconomic fundamentals is typically associated with larger fiscal deficits. To finance the deficits, sovereigns can issue public bonds. The resulting higher sovereign bond supply on the government bond market will lead to an increase in sovereign bond yields, which makes financing for sovereigns more expensive. This effect can be reinforced due to the retrenchment of foreign sovereign bond investors in times of sovereign distress. The national banking sector can prevent sovereign financing issues by absorbing the excess supply of government bonds. This behaviour can reduce the sovereign default probability and can be self-preserving for banks, as it might reduce negative spill-overs from sovereign risk to their own performance (*ESRB*, 2015, p. 99).

The increasing banks' domestic sovereign bond holdings during times of sovereign distress can also be a result of moral suasion by national sovereigns (*Acharya*/*Rajan*, 2013; *Becker*/*Ivashina*, 2017; *Chari* et al., 2014). In this case, sovereigns prompt domestic banks to purchase domestic sovereign bonds with the aim to stabilise sovereign bond yields and hence avoid sovereign financing

issues. There is empirical evidence that, in particular, government-owned banks and banks with politicians on the board of directors increased their home bias in sovereign holdings during times of sovereign distress (*De Marco*/*Macchiavelli*, 2016).

Discriminatory reasons can also be responsible for the increased banks' domestic sovereign bond investments in a sovereign debt crisis. The investment in risky domestic sovereign bonds can be more attractive for banks in comparison to the investment in foreign sovereign debt. The advantage exists due to the assumption that sovereigns may discriminate between domestic and foreign creditors in the case of a default (*Broner* et al., 2014). Such a selective default induces that domestic investors will benefit from the high bond yields, whereas they are less likely to be defaulted. Against this background, domestic sovereign debt becomes more attractive for domestic investors, leading to a re-nationalisation of sovereign bond markets.

IV. Contagion Channels Between Sovereigns and Banks

Sovereign exposures can generate several risks for banks as credit, refinancing, interest rate or market risk (*BCBS*, 2017, p. 4). This paper focusses on risks for banks induced by sovereign credit/default risk. Sovereign credit risk adversely affects the banking sector through various channels. Four main channels have been identified in the literature: (i) the direct exposure channel, (ii) the collateral channel, (iii) the sovereign credit ratings channel, and (iv) the government support channel (*BCBS*, 2017; CGFS, 2011; *ESRB*, 2015).[13]

1. Direct Exposure Channel (or Asset Holding Channel)

Sovereign risk affects banks through their direct holdings of sovereign bonds or their derivative positions with sovereigns. Increases in sovereign risk thus weaken banks' balance sheets and increase their riskiness. The extent of this effect depends on the purpose for which banks hold their sovereign securities. If these assets are held in the trading or available-for-sale book, they are carried at market value on the banks' balance sheets (*CGFS*, 2011, p. 13). In this case, falling government bond prices will lead to direct losses for banks and to an erosion of their capital base. If sovereign bonds are expected to be held to maturity,

[13] In addition to these channels, the CGFS (2011) and the ESRB (2015) examine further channels: the international spillover channel, the risk-aversion channel, the non-interest income channel, the crowding-out channel, and the hedging strategy channel. However, the BCBS finds that these channels are less evident. In addition to the channels mentioned above, the BCBS (2017) identifies a further channel: the macroeconomic channel.

these bonds are put in the banking book and are carried at amortised cost (*CGFS*, 2011, p. 13). A drop in government bond prices will then not have direct effects for banks' balance sheets. Losses are only recorded when the bonds are impaired, i. e. when a sovereign default or restructuring becomes very likely or is realised. Nonetheless, banks are affected indirectly as their cost of funding increases. This is because banks' balance sheets become more risky and investors want to be compensated for this higher risk.

Due to the market-making role of banks, some banks are exposed to sovereigns through over-the-counter (OTC) derivatives (*CGFS*, 2011, p. 16).[14] Increasing sovereign risk affects banks in the same way as sovereign exposures in the trading or available-for-sale book as OTC derivatives are carried at market value. Hence, increasing sovereign risk will reduce the market value of banks' derivative positions, which leads to market-to-market losses on banks' income statement and thus to a reduction in the amount of equity capital.

2. Collateral Channel (or Liquidity Channel)

Sovereign risk affects banks as it reduces the collateral value of sovereign bonds and of other asset classes (*ESRB*, 2015; *CGFS*, 2011). Banks use sovereign bonds for a range of transactions, inter alia, to secure their wholesale funding with central banks, for private repo markets and covered bond issuance, and to back OTC derivative transactions. Increasing sovereign risk restricts the eligibility and the availability of collateral and deteriorates banks' funding conditions through the following mechanisms (*CGFS*, 2011, p. 17 f.): First, when sovereign debt is pledged as collateral, increasing sovereign risk could trigger a margin call, meaning banks will have to post more securities or they will have to sell some of their assets to fulfil the maintenance margin. Second, sovereign distress leads to higher haircuts for sovereign bonds and other asset classes that are used as collateral. The level of haircuts is determined by collateral valuation uncertainty, credit risk and market liquidity (*CGFS*, 2011, p. 18). As domestic sovereign haircuts often serve as a "floor" for haircuts to many asset classes in the economy, higher sovereign risk not only affects haircuts which apply to sovereign securities, it rather affects haircuts of a broad range of assets which are used as collateral. Third, increasing sovereign risk – and especially sovereign downgrades – can lead to an exclusion of sovereign bonds accepted as collateral by investors in private markets, as well as from the pool of collateral eligible for specific transactions with the central bank. The latter was the case during the Greek sovereign debt crisis. The ECB "has decided to suspend the application of

[14] Sovereigns are incentivised to use financial derivatives as they allow them to adjust their currency composition or the interest rate of their outstanding debt positions. Banks are key counterparties in these transactions.

the minimum credit rating threshold in the collateral eligibility requirements for the purposes of the Eurosystem's credit operations in the case of marketable debt instruments issued or guaranteed by the Greek government", (*ECB*, 2010).

3. Government Support Channel

Increasing sovereign risk adversely affects the banking sector when banks benefit from explicit or implicit government guarantees (*ESRB*, 2015; *CGFS*, 2011). Explicit guarantees exist in the form of governments providing guarantees against the default on bank bonds, meaning that if a bank defaults, the interest and principal payments from the guaranteed bonds will be made by the government. Implicit guarantees stem from the expectations of the market participants that government authorities will provide financial support to a systemically important bank (SIB) when it gets into trouble. Such a bailout can be economically justified as the bankruptcy of an SIB can cause large shocks to the whole financial system and the real economy (systemic risk). These forms of public support (explicit and implicit guarantees) generally reduce the credit risks and the funding costs for those banks benefitting from the guarantees. However, if the public finances deteriorate in one country, the value of these guarantees will decrease and the funding costs of banks which rely on such guarantees will increase. The reason is that due to the deterioration of public finances, the banks' investors expect that the sovereign may no longer be able to bail out domestic banks.[15]

4. Sovereign Credit Rating Channel

Sovereign credit ratings are important for banks in many aspects. Increasing sovereign risk can lead to sovereign downgrades which have negative implications for banks in two respects (*CGFS*, 2011, p. 20). First, sovereign downgrades increase banks' equity and debt funding costs. Note that a sovereign downgrade reveals as a clear signal to investors that banks, which are affected by the higher sovereign risk have become riskier. To compensate the investors for this higher risk banks have to pay higher interest rates, and their funding costs increase (*CGFS*, 2011, p. 20). Second, sovereign downgrades often lead to a deterioration of domestic banks' credit ratings as sovereign ratings represent a ceiling for firms' (financial and non-financial) ratings in the economy. The *CGFS* (2011, p. 20) shows that the share of banks that were downgraded (between 2007 and

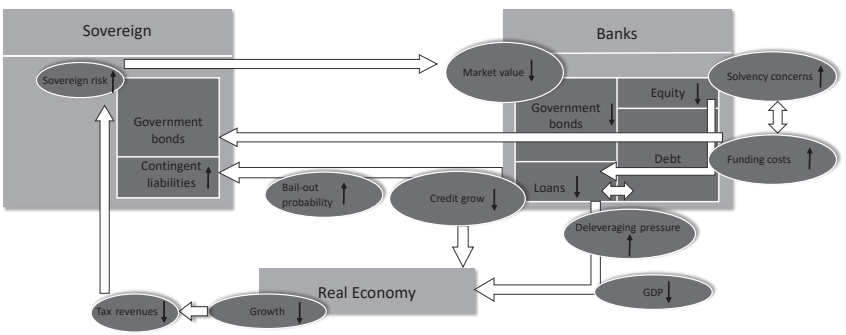
[15] In recent years several regulatory reforms have been adopted to reduce government interventions in the case of a bank insolvency. One of the reforms is the European Banking Union. Especially the second pillar, the SSM, ensures the efficient resolution of failing banks with minimal costs for the taxpayers.

2011), following a sovereign downgrade in Greece, Ireland and Portugal, lies between 58 % and 83 %. The potential government support contributes to the strong link between sovereign and banks' ratings.[16] Moreover, the deterioration of banks' credit ratings can limit banks' access to external financing (*CGFS*, 2011, p. 20). The reason is that institutional investors might be restricted in their investment decisions, so that they have to sell bank bonds when their ratings fall below a ratings-based threshold.

5. Sovereign-Bank Nexus

All channels discussed above are illustrated in Figure 6. These channels in isolation as well as in combination make banks vulnerable to sovereign risk. The figure also shows that contagion can run in the opposite direction, i. e. from the banking sector to the sovereign. This is the case when a weak banking sector strains public finances. Contagion effects in this direction can have two triggers. First, troubled banks usually reduce their lending to the real economy, leading to lower economic growth and therefore to lower tax revenues for the sovereign. Second, a weak banking sector strains public finances when a sovereign provides financial support to troubled SIB (bank bailout) (*BCBS*, 2017, p. 4).

The contagion channels from sovereign to banks and vice versa can reinforce each other. These reinforcing contagion effects are often referred to as "sover-



Source: Based on ESRB (2015)

Figure 6: Contagion Channels Between Sovereign and Banks

[16] Note that the sovereigns' creditworthiness influences the probability that domestic banks will receive financial support from their domestic sovereigns in times of distress (ESRB, 2015, p. 62). This is taken into account by the CRAs when they assess the banks' long-term ratings. Sovereign downgrades thus indicate that the sovereigns' ability to bail out troubled banks decreases, which will lead to a deterioration of banks' credit ratings.

eign-bank nexus" or "diabolic loop" (*BCBS*, 2017, p. 4). However, banks can also absorb sovereign risk when they act as stable investors in a sovereign crisis (see Section 4). Then, domestic banks act as buyers of last resort. In doing so, banks can avoid an increase in bond yields and relax the sovereign's financing conditions. Whether the buyer-of-last-resort strategy will dampen or amplify the sovereign-bond nexus depends on a number of factors such as, for example, the dimension of the existing dependence between sovereigns and banks and the magnitude of the crisis (*BCBS*, 2017, p. 5).

V. Discussion of Regulatory Reforms

Since the European sovereign debt crisis several reforms have been proposed to weaken financial contagion between sovereigns and banks. These reforms include the idea of revising the preferential sovereign bond treatment in banking regulation (see, for example, *Weidmann* (2016)). Sovereign bonds receive a preferential treatment in banking regulation most notably in three areas (see Section II): First, under the capital regulation framework sovereign bonds receive a zero risk weight. Second, sovereign debt exposures are not included in the large exposure framework. Third, under the liquidity regulation framework government bonds are classified as level 1 HQLA, and in addition they do not have to be diversified within asset classes. In the following, policy options regarding the abolishment of the preferential sovereign bond treatment are discussed.

1. Positive Risk Weights for Government Bonds

There are several proposals discussed in the literature on how to address sovereign credit risk in bank capital regulation (Pillar 1 of the Basel framework). The *ESRB* (2015) investigates three policy options of how to reform the regulatory treatment of sovereign exposures in this field. These policy options include: (i) removing the domestic carve-out in the standardised approach, (ii) introducing a non-zero risk-weight floor for sovereign exposures in the standardised approach, and (iii) setting a minimum (regulatory) floor in the IRB approach.[17] Basically, the aim of positive risk weights for government bonds is to increase the banks' resilience to sovereign risk and thus weaken the sovereign-bank nexus.

Removing the carve-out for sovereign bonds in the standardised approach implies that sovereign exposures would not automatically receive a zero risk weight. Instead, the risk weights would be based on external ratings, going from

[17] For further ideas relating to the regulatory treatment of sovereign exposures in capital regulation see, for example, BCBS (2017).

Table 3

Standardised Risk Weights on Euro Area Sovereign Exposures Based on Ratings from Standard & Poor's, January 2019

Germany	AAA	0 %	Slovenia	A+	20 %
Netherlands	AAA	0 %	Latvia	A	20 %
Luxembourg	AAA	0 %	Lithuania	A	20 %
Austria	AA+	0 %	Spain	A–	20 %
Finland	AA+	0 %	Malta	A–	20 %
Belgium	AA	0 %	Italy	BBB	50 %
France	AA	0 %	Cyprus	BBB–	50 %
Estonia	AA–	0 %	Portugal	BBB–	50 %
Ireland	A+	20 %	Greece	B+	100 %
Slovakia	A+	20 %			

0 % to 150 % (see Table 1). With respect to the EMU, it should be noted that high sovereign ratings are the rule rather than the exception. Table 3 shows that eight (out of 19) countries within the EMU would retain a zero risk weight, seven would retain a low risk weight of 20 %, and only four countries would retain a risk weight ≥ 50 %. Accordingly, for bank exposures to highly rated sovereigns, the abolishment of the carve-out in the standardised approach would only have a low impact on risk weights, while for bank exposures of sovereigns with lower credit ratings, the effects would be quite large. The overall regulatory effects in the stressed countries would be amplified as they have the largest home bias in their sovereign holds (see Section 3).

The *BCBS* (2017) proposes an alternative calibration of standardised risk weights, depending on CRA ratings. In this proposal sovereign exposures assign: (i) a 0 % risk weight if sovereign debt is rated between AAA to A–, (ii) a 4 % risk weight if the debt is rated between BBB+ and BBB–, and (iii) a 7 % risk weight if sovereign debt is rated BBB– or below. Given credit ratings as of January 2019, sovereign bonds issued by 15 euro area Member States would assign a zero percent risk weight under this calibration. Debt issued by Italy, Cyprus and Portugal would receive a risk weight of 4 % and only debt from Greece would be subject to a risk weight of 7 %. Obviously, the effects for sovereign risk weights under this proposal would be considerably lower than abolishing the preferential treatment completely under the standardised approach as shown above.

However, the dependence only on ratings from CRAs within the standardised approach could be inappropriate for sovereign bonds (*Lenarčič* et al., 2016; *ESRB*, 2015). This is because CRA ratings tend to be backward-looking, they

might be too optimistic in upswings and too pessimistic in economic downturns, and in case of rating-adjustments they are often abrupt. It is also criticised that the standardised approach follows a bucketing approach. This implies that a sovereign downgrade from one credit-quality step to a lower one, could lead to a significant increase in risk weights for the respective sovereign bonds ("cliff effects"). Overall, these shortcomings could amplify the impact of procyclical-regulatory effects[18] (*Lenarčič* et al., 2016; *Lanotte* et al., 2016). To reduce the reliance on external ratings and to mitigate their shortcomings, the *BCBS* (2017) discusses the role of additional non-rating indicators to assess the creditworthiness of sovereign exposures. Moreover, in contrast to the standardised approach, which bundles credit risks in buckets, the IRB approach has the advantage of being based on a continuous function (depending on the estimations of credit risk parameters). Hence, "cliff effects" which could be an issue under the standardised approach, do not arise under the IRB approach.

Introducing a non-zero risk-weight floor for sovereign exposures in the standardised approach implies that banks would have to back all of their sovereign exposures with some capital. This regulation would mainly affect the risk weights of highly rated sovereign exposures (with risk weights below the floor), and the risk weights of sovereign securities which benefit from the domestic carve-out (*ESRB*, 2015, p. 120). The resulting effects from the regulatory change would depend on the level of the risk-weight floor. An advantage of the risk-insensitive floor is that it could reduce the excessive build-up of banks' sovereign exposures, and that it could make banks more resilient to sovereign risk over the economic cycle. Furthermore, the floor system would align the favourable treatment of sovereign exposures with respect to other asset classes, as it would bring the risk weights of sovereign bonds and other asset classes closer together. In a way, the leverage ratio, introduced under Basel III (see Section 2), can be seen as a risk-weight floor for sovereign exposures. A leverage ratio of 3 %, for example, implies a risk weight for sovereign bonds of approximately 37.5 %, for a bank with a targeted capital ratio of 8 %. However, note that the leverage ratio is only binding for banks with a risk-weighted capital ratio which is below the required leverage ratio.

Within the IRB approach, banks are allowed to calculate the risk weights for given asset classes on their own internal rating systems. The *ESRB* (2015) dis-

[18] Procyclicality exists when regulatory adjustments deepen a crisis (German Council of Economic Experts, 2015). With respect to the introduction of positive risk weights for sovereign bonds, banks in stressed countries could be forced to sell sovereign exposures due to this regulatory change. In an economic crisis this effect could be larger owing to a melt down in banks' equity capital. The low demand for sovereign bonds would increase the funding costs of the respective sovereign. As a result the sovereign rating could deteriorate, implying higher risk weights for the sovereign bonds which worsens the adverse effects of the economic crisis.

cusses the effects of a hard floor rule for sovereign risk weights, and (regulatory) floors for the PDs and LGDs of sovereign exposures under the IRB approach. Sovereign bonds would assign positive risk weights under both proposals. A hard floor rule for risk weights in the IRB approach has similar advantages and disadvantages as under the standardised approach discussed in the previous paragraph. Regulatory floors for the PDs and LGDs of sovereign exposures would limit the freedom of banks to calculate sovereign credit risks with their own internal rating systems. The estimation of sovereign credit risk parameters are in general difficult for banks due to the poorness of data regarding sovereign defaults in the near past (*ESRB*, 2015, p. 124). The *ESRB* (2015) describes two experiments in which banks had to assign PDs and LGDs for sovereigns. The results show significant variations across banks in their estimations of the credit risk parameters for the same sovereigns. Owing to the estimation difficulties, the *BCBS* (2017) proposes the removal of the IRB approach for sovereign exposures. Nevertheless, regulatory floors for the PDs and LGDs would restrict banks from underestimating sovereign default risk.

Impact on Banks and Financial Stability

The introduction of positive risk weights for government bonds – either determined under the standardised approach or under the IRB approach – would induce an increase in the risk-weighted assets of banks which are affected by this regulation (*Lenarčič* et al., 2016, p. 18 f.). If due to the regulatory change their capital ratio becomes binding, banks will have four options to cope with this regulation: (i) they can substitute their sovereign holdings with zero-risk-weighted assets and keep their liability structure unchanged, (ii) they can sell excess sovereign bonds and reduce their outstanding debt, (iii) they can substitute their sovereign holdings with other positive risk-weighted assets and increase their amount of equity funding, (iv) they can keep their investments unchanged and raise more equity.

According to *Lenarčič* et al. (2016), banks would choose one of the first two options (or a combination of both) to deal with the regulatory change, i. e. they would substitute their sovereign holdings with zero-risk-weighted assets (in order to keep the original riskweighted assets constant), or they would sell sovereign bonds with positive risk weights and reduce their outstanding debt simultaneously. The advantage of these two strategies would be that both are not accompanied by raising equity capital, which is costly and would be difficult for some banks to implement. In the short run or during the transition period, it would be likely that banks substitute high risk-weighted government bonds with zero-risk-weighted assets (for example, zero-risk-weighted sovereign bonds, central bank reserves or cash).[19] However, this strategy would reduce banks'

profitability as high riskweighted sovereign bonds usually yield higher returns than zero-risk-weighted assets. Therefore *Lenarčič* et al. (2016) expect that, in the longer run, more banks would shed high risk-weighted sovereign bonds and reduce their debt simultaneously. This strategy would be hard to implement in the short run, as the banks' funding structure could limit the ability to deleverage immediately. Banks which do not have issues over increasing their own funds could fulfil the capital ratio with the third and/or the fourth policy option, i. e. they could substitute their sovereign holdings with non-zero risk-weighted assets and increase their amount of equity capital, or they could keep their investments unchanged and only raise additional equity. *Lenarčič* et al. (2016) emphasise that these two options are only likely for banks which could increase their amount of equity capital via retained earnings. In all policy options (except the first one) the banks' equity ratio would increase.

There are studies for the euro area quantifying consequences of positive risk weights for government bonds in capital regulation. Based on data from the European Banking Authority (EBA) transparency exercise published in 2013, *Lenarčič* et al. (2016) show that by using standardised risk weights, banks in Italy and Spain have the largest sovereign bond holdings for which positive risk weights would apply (with € 200 billion exposures and € 170 billion exposures respectively). The third and the fourth highest amount of sovereign bond holdings that would have positive risk weights are held by banks in Germany and France (with amounts around € 60 billion to € 70 billion). The results from *Schneider*/*Steffen* (2018) based on data provided in the EBA stress tests 2016 are in line with the results from *Lenarčič* et al. (2016). They also find in their sample that Italian and Spanish banks would face the highest additional capital requirements in case of repealing the preferential sovereign bond treatment under the standardised approach. In particular, UniCredit, Banco Bilbao Vizcaya Argentaria (BBVA), and Santander would have to increase their Tier 1 capital by € 2.810 billion (6.26 % of Tier 1 capital), € 2.216 billion (4.56 % of Tier 1 capital), and € 2.208 billion (2.99 % of Tier 1 capital), respectively. In a similar way, *Lanotte* et al. (2016) and *Andritzky* et al. (2016) show that the strongest reduction in the banks' capital ratios would be for Portuguese, Italian and Spanish banks. The reason is that banks in these countries are heavily exposed to their national sovereigns and the risk weights which would apply to these sovereign bonds would be quite high (see Table 3).

[19] Whether for all sovereign bonds positive risk weights would apply is dependent on the reform. The abolishment of the domestic carve-out in the standardised approach would induce that they were still sovereign bonds from the EMU countries with zero-risk weights. However, a regulatory floor for sovereign exposures would imply that all sovereign bonds have to be backed with some capital.

To quantify the banks' reactions in response to an increase in risk-weighted assets, *Lenarčič* et al. (2016) simulate potential scenarios of banks' adjustment processes in the transition period. According to these simulations it is likely that banks in the euro area would meet the capital requirements with a combination of the options described before, depending on the level of the sovereign bonds' risk weights. In a simulation which is considered to be most realistic[20], *Lenarčič* et al. (2016) predict that banks would mainly sell sovereign bonds with the highest risk weights, i. e. Greek, Cypriot and Portuguese bonds, and they would increase their amount of equity capital (by € 25 billion) to cover for lower risk-weighted sovereign bonds. In this scenario, 10 % of the outstanding government debt in the affected countries would be sold (or reallocated) driven by the change in capital requirements for government bonds.

The overall quantitative impact of risk weights for government bonds on bank behaviour is difficult to predict. One of the main reasons is that there exists a range of motives for banks holding sovereign bonds (see Section 4). These motives would significantly determine bank behaviour if risk weights for government bonds were introduced (*ESRB*, 2015; *Lenarčič* et al., 2016). Note that sovereign risk weights would reduce the net yields of sovereign bonds. If banks hold sovereign bonds for investment reasons, only a small reduction in net yields would cause banks to make significant reallocations away from sovereign bonds. However, if banks hold sovereign bonds to fulfil the liquidity requirements, the reduction in sovereign bonds' net yields would only have a small impact on the banks' sovereign investments.

In a theoretical model, *Neyer*/*Sterzel* (2017) investigate the effects of positive risk weights for government bonds for bank investment and financing behaviour, and financial stability. They show that the introduction of positive risk weights for government bonds encourages banks to raise more equity capital and to adjust their investment structure. In particular, banks increase their investments in loans relative to their investments in government bonds. In this model, banks hold government bonds to manage their liquidity needs. Higher sovereign default risk may induce a price drop for government bonds, implying liquidity issues in the banking sector. Capital requirements themselves cannot prevent illiquid but per se solvent banks from going bankrupt. However, in combination with a lender of last resort (LOLR) the introduction of positive risk

[20] *Lenarčič* et al. (2016) simulate four potential scenarios of the banks' adjustment to positive risk weights for sovereign exposures. The first and the fourth scenario represent extreme scenarios: In the first scenario banks increase capital without selling sovereign bonds and in the fourth scenario banks sell all of their sovereign bonds with positive risk weights. The authors predict that non of these two scenarios seems to be a realistic outcome. Therefore, they predict that the second and the third scenario, where banks sell government bonds and also increase their amount of equity capital seems to be the most realistic ones.

weights for government bonds increases financial stability. The driving force is the regulation-induced change in bank investment behaviour.

Using a DSGE model, *Abad* (2018) shows that repealing the preferential treatment of government bonds in capital regulation has two effects for banks: First, it makes investing in government bonds less attractive. One, because equity funding is more costly than deposit funding, and two, due to the "skin-in-the-game" effect, meaning that the equity losses banks would suffer are higher in the case of a sovereign default. Second, it reduces banks' leverage and thus increases the resilience of the banking sector. Furthermore, *Abad* (2018) shows that capital requirements for government bonds are able to mitigate contagion effects from sovereigns to banks, hence making the banking sector more resilient to sovereign risk. Under the proposed calibration scheme of this model, a maximum social welfare exists at a government bond risk weight of 40 %, for a given capital ratio of 8 %.

With respect to financial stability, higher banks' equity ratios can reduce systemic risk in the banking sector as the expansion of shocks can be mitigated (*Adrian*/*Shin*, 2010). In fact, *Abad* (2018) as well as *Neyer*/*Sterzel* (2017) show that capital requirements for government bonds will make the banking sector more resilient to sovereign risk. *Alogoskoufis*/*Langfield* (2018) provide insightful quantitative assessments whether the introduction of positive risk weights for sovereign bonds (i) induce banks to reduce concentration in their sovereign debt holdings and (ii) reduce banks' exposures to sovereign credit risk. They conclude that there is a tension between lowering credit risk and lowering concentration risk, which are both crucial determinants for financial stability. In particular, positive risk weights for sovereign bonds are an appropriate instrument to target sovereign credit risk, however, they do not reduce concentration risk. The reason is that a significant number of banks in the euro area would not be affected by risk weights calculated under the standardised approach. Hence, these banks were not induced to restructure their undiversified sovereign bond holdings. *Gros* (2013) criticises that positive risk weights for sovereign bonds will not be enough to disentangle the solvency of banks from the solvency of their national sovereigns. He argues that sovereign defaults are rare events, however, in the case of a sovereign default, the losses are quite large for bondholders (above 50 %). Introducing a risk weight of 100 % for government bonds (for a given capital ratio of 8 %) would only cover losses of 8 % in the case of a sovereign default. Thus, *Gros* (2013) highlights that diversification is much more important than backing sovereign bonds with equity capital. The results from *Schneider*/*Steffen* (2018) and *German Council of Economic Experts* (2015) underline this result. They also highlight that the loss-absorbing capacity of the European banking sector would be relatively low even when positive risk weights for sovereign bonds would be introduced. Moreover, it is questionable whether banks could act as a buyer of

last resort with the aim to dampen the sovereign-bank nexus under this regulation.

2. Sovereign Exposure Limits

Both sovereign exposure limits and capital requirements for government bonds have the same objective, i. e. to increase the shock-absorbing capacity of the banking sector with respect to sovereign risk, and thus weaken the sovereign-bank nexus. Although the objective is the same, both regulation approaches differ from each other in the sense that large exposure limits address concentration risk, whereas positive risk weights address counterparty credit risk (*Lenarčič* et al., 2016, p. 3). There are proposals discussed in the literature which combine elements from sovereign exposure limits with elements from positive risk weights for government bonds (see, for example, *BCBS* (2017), *ESRB* (2015), *Andritzky* et al. (2016), *German Council of Economic Experts* (2015) or *Matthes*/*Rocholl* (2017)). In this paper, the regulation approaches are discussed in isolation.

Regarding the sovereign bond treatment under the large exposure framework, banks' exposures to sovereigns and their central banks are exempted from this regulation (see Section 3). The *ESRB* (2015) discusses a full and a partial removal of this exemption. A full removal implies that a bank's exposure to one sovereign is not allowed to be higher than 25 % of its own funds. A partial removal implies that only a share of a bank's exposure to one sovereign is considered under the large exposure framework and the remaining share is still exempted. This is the case if, for example, sovereign exposures are considered for only 20 % of their face value, implying that 80 % of the sovereign exposures are exempted. Then, 20 % of a bank's sovereign exposure is not allowed to be higher than 25 % of its own funds.

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If sovereign exposure limits were introduced (either fully or partially) and became binding for banks, they would have four options to meet this requirement (*Lenarčič* et al., 2016, p. 30): (i) they could substitute their excess sovereign holdings with other zero-risk-weighted assets (for example, sovereign bonds from other countries, central bank reserves or cash) and keep the funding structure unchanged, (ii) they could sell excess sovereign bonds and reduce their outstanding debt simultaneously, (iii) they could substitute their sovereign holdings with non-zero-risk weighted assets and raise equity capital, or (iv) they could keep their investments unchanged and raise more equity.

As these policy options are similar to the options when sovereign bonds had to be backed with equity capital, the argumentation of *Lenarčič* et al. (2016) is also similar. They argue that banks would fulfil the sovereign exposure limit either by the first or the second adjustment strategy, i. e. they would substitute their sovereign holdings with other zero-risk-weighted assets and keep their funding structure unchanged, or they would sell excess sovereign bonds and reduce their outstanding debt simultaneously. In the short run, it is expected that banks would try to diversify their sovereign bond holdings by replacing (domestic) sovereign bonds with sovereign bonds of other countries with similar risk profiles. However, it is questionable whether banks would find enough government bonds with similar risk profiles on the government bond market (*Lenarčič* et al., 2016, p. 30). If there were insufficient close substitutes on the government bond market, banks could deposit the liquidity generated by selling the excess sovereign bonds at the central bank or they could hold more cash. As both options usually yield a lower return than government bonds, this strategy would reduce banks' profitability. Banks could also fulfil the sovereign exposure limit by selling excess sovereign bonds and reducing their outstanding debt simultaneously (*Lenarčič* et al., 2016, p. 30). However, this could be problematic for some banks as, in the short run, the rigid banks' funding structure could limit the ability to deleverage immediately. Similar to the argumentation in the previous section, it is unlikely that banks would choose the third or fourth adjustment strategy, as these two strategies are accompanied by an increase in equity capital. In all adjustment strategies (except the first one) the banks' equity ratio increases, which would increase the banks' funding costs. However, in the long run, it is expected that banks' funding costs will decrease again as banks' balance sheets become more diversified and therefore less risky.

To quantify the effects of a full removal, *Lenarčič* et al. (2016) simulate the rebalancing needs in EU banks based on data from the EBA transparency exercise 2013. It is shown that banks in high-rated small countries (between AAA and A–, for example, Austria and Belgium), would satisfy their government bond rebalancing needs with sovereign bonds from other high-rated small countries (for example, Luxembourg). Banks in Greece and Portugal would need to substitute their excess sovereign bonds with higher rated sovereign bonds, as their domestic sovereign bonds have the lowest ratings within the EMU. The highest rebalancing needs would arise for German and Italian banks (with € 273.41 billion and € 177.32 billion respectively). Banks in these two countries would not find enough government bonds with similar risk levels in order to substitute their large domestic sovereign holdings. *Lanotte* et al. (2016) reach similar results in their quantitative assessments. They also show that the application of large exposure limits for sovereign bonds would have the largest impact for banks in Germany and Italy. Hence, German and Italian banks would have to sell excess sovereign bonds, or they could keep their investments unchanged

and raise more equity. The latter option is less likely, at least in the short run. Another quantitative analysis from *Schneider*/*Steffen* (2018) which is based on more recent data from 2016 underline the results from *Lanotte* et al. (2016) and *Lenarčič* et al. (2016). They find that banks in Germany, Spain and Italy would be affected the most by sovereign exposure limits. In particular, German banks would have excess exposures of € 181.463 billion (58.55 % of German sovereign exposures), banks in Spain would have excess exposures of € 174.537 billion (65.92 % of Spanish sovereign exposures), and banks in Italy would have excess exposures of € 168.281 billion (60.75 % of Italian sovereign exposures).

With respect to financial stability, *Lenarčič* et al. (2016), ESRB (2015) and the *European Political Strategy Centre* (2015) predict that large exposure limits for sovereign bonds would make banks less vulnerable to sovereign risk due to their better diversified sovereign bond portfolios. *The European Political Strategy Centre* (2015, p. 4) concludes that: "A straightforward exposure regime would greatly limit systemic risk in the banking system, result in a well-diversified government debt portfolio and considerably weaken the doom loop between sovereigns and their banking systems." However, *Alogoskoufis*/*Langfield* (2018) come to different results. Their simulations highlight a tension in regulatory design between credit and concentration risk. In particular, sovereign exposure limits would reduce portfolio concentration more effective than other forms of regulation, however, they do not reduce banks' credit risk. The reason is that this type of regulation permits banks to invest a large amount in bonds of the same sovereign (mostly domestic sovereign bonds). Nevertheless, a binding sovereign exposure limit would not prevent banks from reinvesting a fraction of their (domestic) sovereign bonds into high-risk sovereign bonds, which would increase overall banks' credit risk. Hence, concentration risk could be mitigated by sovereign exposure limits whether another form of contagion could be created.

Moreover, it is emphasised from the *ESRB* (2015) that the implementation of sovereign exposure limits could significantly restrict important bank activities and that it could interfere with other forms of regulation. Considering that banks have an important role as primary dealers for issuing sovereign bonds, and also acting as market-makers, the large exposure limits for sovereign bonds could seriously restrict these functions. This regulation would restrict banks from holding large amounts of the same sovereign bonds, which is however necessary for these activities. Moreover, the introduction of sovereign exposure limits could interfere with other forms of regulation as liquidity requirements (*ESRB*, 2015, p. 162). Within the LCR and the NSFR government bonds are classified as level 1 HQLA and banks are strongly incentivised to hold sovereign bonds rather than other liquid assets. Hence, the close relationships between regulatory tools should be carefully considered when reforming the large exposure regulation.

In order to avoid adverse effects for the banking sector and the whole economy, regulation should not have procyclical effects (*German Council of Economic Experts*, 2015, p. 21). With respect to sovereign exposure limits this could be an issue. The quantitative studies described before have shown that banks might be forced to sell excessive domestic sovereign bonds with adverse effects for the sovereign financing condition. In an economic crisis this effect would be much stronger as losses would reduce the amount of banks' equity capital, so that they had to sell even more sovereign bonds. Against this background, it would be also unlikely that banks act as buyers of last resort in an economic crisis when a sovereign exposure limit exists.

3. Haircuts for Government Bonds

Within the Basel III Accord, two minimum standards for funding liquidity were introduced, the LCR and the NSFR. The LCR gives sovereign bonds preferential treatment in the sense that they are assigned as level 1 HQLA and that they do not need to be diversified within asset classes (see Section 4). The classification as level 1 HQLA implies that sovereign bonds are not subject to either quantitative limits or haircuts. Since sovereign bonds are considered to be level 1 HQLA under the LCR, they are also given preferential treatment under the NSFR. Repealing the preferential treatment in liquidity regulation would induce that sovereign bonds are not automatically classified as level 1 HQLA and that they have to be diversified within their asset class. This removes the assumption that sovereign bonds always entail less liquidity risk than private sector bonds (*ESRB*, 2015, p. 143). If sovereign bonds were classified as "less-liquid", and thus as level 2 HQLA, quantitative limits and haircuts would apply to respective sovereign bonds, they would also assign a higher RSF factor under the NSFR.

In order to define the market liquidity of eligible HQLA properly, the *ESRB* (2015) proposes that the HQLA should be assessed based on market indicators of liquidity. These market indicators should be independent of whether bonds are public or private, that would make the assessment approach more market-oriented than the current one. The European Commission tasked the EBA with developing appropriate uniform definitions of liquid assets (*EBA*, 2013). An empirical analysis in the report shows that there is "some degree of differentiation in the liquidity features of different sovereign bonds". From a regulatory perspective, the different market liquidity of sovereign bonds should be taken into account. However, the *ESRB* (2015, p. 143) stresses that sovereign bonds' liquidity issues should be analysed further before changing the rules in liquidity regulation. In particular, it should be investigated whether the illiquidity of sovereign bonds is driven by fundamental characteristics of the respective sovereign or rather by the general market situation.

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In this research area there is very little literature addressing regulatory changes in liquidity regulation with respect to sovereign risk. *Bonner* (2016) does not deal directly with regulatory reforms, but he emphasises that the preferential sovereign bond treatment in liquidity regulation encourages banks to overinvest in sovereign bonds. *Buschmann*/*Schmaltz* (2017) underline that this preferential treatment in liquidity regulation endangers financial stability in sovereign crises. They advocate in favour of abolishing the preferential sovereign bond treatment in liquidity regulation.

In the following, consequences of introducing haircuts for "less-liquid" sovereign bonds within the LCR are discussed.[21] To keep the analysis simple, it is assumed that there are three categories of liquid assets after the regulation: liquid assets which are not subject to haircuts with zero risk weights in capital regulation (for example coins, banknotes, central bank reserves and "high-liquid" sovereign bonds),[22] "less-liquid" sovereign bonds with low haircuts and zero risk weights, and other liquid assets with high haircuts and positive risk weights (for example, corporate debt securities or covered bonds). Banks holding "less-liquid" sovereign bonds would be affected by this regulation in the sense that their eligible amount of liquid assets would decrease. If banks can then no longer fulfil the LCR, they have the following options to increase their amount of liquid assets: (i) they can increase their liquid-asset exposures with no haircuts or low haircuts ("less-liquid" sovereign bonds) but no capital charges, (ii) they can increase their exposures of other liquid assets with high haircuts and positive capital charges, or (iii) they can restructure their stock of liquid assets, meaning that they can sell liquid assets which are subject to haircuts and buy liquid assets which are not subject to haircuts. Note that the higher the haircuts, the more liquid assets are needed to fulfil the liquidity ratio.

As long as sovereign bonds receive a zero risk weight in capital regulation, it is likely that banks would choose the first and/or the third option to meet the liquidity ratio, i. e. they would increase their liquid-asset exposures with no haircuts or low haircuts but no capital charges, or they would restructure their stock of liquid assets. With respect to the first option, banks would prefer to increase their investments in sovereign bonds rather than to hold more cash or to depos-

[21] The abolishment of the preferential sovereign bond treatment would also imply that sovereign bonds had to be diversified in each asset class. However, diversification effects are not analysed in this but in the previous subsection.

[22] Whether for all sovereign bonds haircuts apply or not depends on the regulatory reform. In this paper it is assumed that there are two types of sovereign bonds: "high-liquid" sovereign bonds with no haircuts and "less-liquid" sovereign bonds with positive haircuts.

it a higher amount at the central bank, as sovereign bonds yield a higher return. Note that in the first option, banks would finance the liquid-asset investments only with debt, so that the banks' leverage ratio would increase. However, if the leverage ratio restriction is binding for banks, they could not increase their amount of liquid assets only with debt financing. The only option for banks to fulfil the regulation by keeping the funding structure unchanged is to substitute "less-liquid" sovereign bonds with no-haircut liquid assets (option three). Also in this case, banks would prefer to increase their sovereign exposures rather than their cash or central bank reserves. Banks could also increase their investments in liquid assets with positive risk charges to fulfil the liquidity ratio (option two). However, in this case banks would have to increase their amount of equity, which is unlikely for banks in the short run and especially difficult for stressed banks. In each of the options described above, the banks' profitability decreases as banks would be forced to hold more liquid assets which, in general, yield a low return. It is crucial that as long as sovereign bonds receive a zero risk weight in capital regulation, banks would be strongly incentivised to fulfil the changed regulation with sovereign bonds.

To the best of my knowledge, there are no studies quantifying the effects of haircuts for "less-liquid" sovereign bonds in liquidity regulation for the euro area. However, the BCBS-report of October 2018 gives an impression of the level and the composition of banks' LCRs. The BCBS periodically monitors and evaluates the impact of reforms introduced within the Basel III Accord. Regarding the Basel III LCR, the October 2018 report provides data for a total of 156 banks. The sample contains 87 large internationally active banks that have Tier 1 capital of more than 3 billion euro, "Group 1" banks. The other 69 banks are "Group 2" banks. The average LCR for "Group 1" banks is 133.0 %, of "Group 2" banks 180.0 %.[23] The report also shows the composition of banks' eligible liquid assets. Level 1 assets comprise the most significant proportions of the HQLA pool for "Group 1" banks ("Group 2" banks), they accounting for 91.2 % (95.6 %) of all eligible liquid assets. The share of level 1 assets which include 0 % and non-0 % risk-weighted securities issued or guaranteed by sovereigns, central banks, and public sector entities is 66.6 % (62.4 %), whereas the share of cash and central bank reserves is 24.6 % (33.2 %).

Obviously, on average all banks in the sample reported a LCR which significantly exceed a minimum requirement of 100 %. As a result, it is expected that low haircuts for government bonds would not become binding for the majority of banks. This implies that the effects of haircuts for "less-liquid" sovereign bonds would be limited. However, as there is no country specific data in this re-

[23] Note, that the sample does not only include banks in the euro area. However, the data shows that the average LCR for banks in Europe (Group 1) is the highest with over 135 % compared to banks in America and the rest of the world.

port, it is not possible to make more nuanced analyses. This highlights that further empirical research is needed to quantify the consequences for banks in the euro area of introducing haircuts for "less-liquid" sovereign bonds in liquidity regulation .

In a theoretical model, *Neyer*/*Sterzel* (2018) investigate the consequences for banks' investment and financing behaviour, and financial stability of haircuts for sovereign bonds within the liquidity regulation framework. Basically, a binding liquidity ratio forces banks to increase their liquid asset holdings. In their model, liquid assets consist of short-term assets and government bonds. Banks hold these liquid assets to manage their liquidity needs. Considering sovereign bonds to be less liquid than the short-term asset within the liquidity ratio, forces banks to hold even more liquid assets. The regulation does not change the optimal composition of banks' liquid assets (the ratio between sovereign bonds and the short-term asset), meaning banks also hold more sovereign bonds. With respect to financial stability, they find that introducing liquidity requirements and repealing the preferential treatment of government bonds in particular does not contribute to a more robust banking sector in times of sovereign distress. The reason is that due to this regulation banks hold more sovereign bonds and are hence more vulnerable to increasing sovereign default risk.

In contrast to the other two reform proposals, the analysis shows that haircuts for "less-liquid" sovereign bonds alone do not contribute to a more robust banking sector. First, it is questionable whether low haircuts for sovereign bonds would imply that the LCR becomes binding for banks as they actually over-fulfil the LCR. Second, if the haircuts induced that the LCR becomes binding, the banks would be encouraged to hold even more sovereign exposures (which would not be covered with equity capital) as the results show. This in combination with a higher leverage ratio would make the banking sector more vulnerable to sovereign risk.

VI. Conclusion

Under the existing Basel framework, sovereign bonds are considered to be risk-free and highly liquid. The European sovereign debt crisis has shown that this is actually not the case. Neglecting sovereign risk in banking regulation endangers financial and macroeconomic stability. In the paper, an overview of regulatory reforms regarding the abolishment of the preferential sovereign bond treatment is given. It is discussed which effects these reforms would have for bank behaviour and financial stability. Three reforms are considered: (i) positive risk weights for government bonds in bank capital regulation, (ii) sovereign exposure limits, and (iii) haircuts for government bonds in bank liquidity regulation.

Concerning the banks' reaction in response to the reforms, it is pointed out that all reforms would hit the banks in the euro area differently. In order to avoid abrupt bank reactions, a special focus should lie on the design of the transition period when repealing the preferential sovereign bond treatment. Moreover, the implementation date should be well-selected since all reforms would reduce banks' profitability, at least in the short run. Hence, in times of low interest rates or during economic downturns the introduction of these regulatory reforms could endanger the banks' solvency.

With respect to financial stability, it is shown that two of the three reforms, namely positive risk weights for government bonds and sovereign exposure limits, would make banks more resilient to sovereign risk. In particular, capital charges for government bonds would address sovereign credit risk and sovereign exposure limits would address concentration risk. Hence, both regulatory instruments would be able to make banks more resilient to sovereign risk. In contrast to these reforms, haircuts for sovereign bonds in liquidity regulation could make banks more vulnerable to sovereign risk and would not contribute to a more resilient banking sector. This is because they would incentivise banks to hold even more sovereign bonds which could be financed only with debt (as long as sovereign bonds do not have to be backed with equity). As a result, banks' leverage ratio would increase and the already strong link between sovereign risk and banks would be reinforced.

Side effects of regulatory effects should also be considered in order to avoid adverse effects for the banking sector. The discussion shows that changing the sovereign bond treatment in one field of banking regulation, for example, the large exposure framework, could be in conflict with other fields of regulation, such as the liquidity regulation framework. This is because sovereign exposure limits would restrict banks' sovereign bond holdings, whereas the current sovereign bond treatment under liquidity regulation incentivise banks to hold large amounts of sovereign bonds. Considering that the existence of a risk-free asset is crucial for banking practice, changing the regulation in the sense that some sovereign bonds are considered to be risky and less liquid, would increase the banks' demand for risk-free assets. Against this background, it is questionable whether banks would find enough close substitutes in the financial market with a "risk-free" status. Moreover, the past crisis has highlighted that regulatory measures should not have procyclical effects. The analyses in this paper show that procyclicality would be a problem in case positive risk weights, and a large exposure limit for sovereign bond would be introduced.

Nevertheless, a first step toward a regulatory framework which considers sovereign risk has already been made with the introduction of the leverage ratio introduced under Basel III. Within the leverage ratio, sovereign exposures do not receive a favourable treatment, meaning that the banks' total exposures have

to be backed with equity capital – sovereign bonds also. However, this regulation is only binding for banks with a risk-weighted capital ratio below the leverage ratio.

Finally, the discussion points out that an increase in sovereign risk can severely strain the banking sector. Regulatory reforms such as the risk-weighting of sovereign exposures and the sovereign exposure limits could increase the resilience of the banking sector. However, it has also been shown that these reforms might lower the demand for sovereign bonds. This could lead to a decrease in sovereign bond prices and increasing yields which could be an issue for countries with large public debt. In this context, it should be noted that this paper does not discuss the effects of repealing the preferential sovereign bond treatment in banking regulation for sovereigns and their financing conditions – and it was also not the aim of the paper.

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