BANCA D'ITALIA

EUROSISTEMA

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Reforming the prudential treatment of banks' sovereign exposures

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EASIER SAID THAN DONE? REFORMING THE PRUDENTIAL TREATMENT OF BANKS' SOVEREIGN EXPOSURES

by Michele Lanotte, Giacomo Manzelli, Anna Maria Rinaldi,[1]
Marco Taboga and Pietro Tommasino[2]

Abstract

In the aftermath of the euro-area sovereign debt crisis, several commentators have questioned the favourable treatment of banks' sovereign exposures allowed by the current prudential rules. In this paper, we assess the overall desirability of reforming these rules. We conclude that the microeconomic and macroeconomic costs of a reform could be sizeable, while the benefits are uncertain. Furthermore, we highlight considerable implementation issues. Specifically, it is widely agreed that credit ratings of sovereigns issued by rating agencies present important drawbacks, but sound alternatives still need to be found; we argue that consideration could be given to the use of quantitative indicators of fiscal sustainability, similar to those provided by international bodies such as the IMF or the European Commission.

Keywords: sovereign risk, prudential regulation, sustainability of public finances
JEL classification: E580, G210, G280, H630.

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[1] Bank of Italy, Directorate General for Financial Supervision and Regulation.
[2] Bank of Italy, Directorate General for Economics, Statistics and Research.

1. Introduction[3]

Until the euro-area sovereign debt crisis, sovereign defaults were regarded as a problem of emerging economies. According to Reinhart and Rogoff's (2011) dataset, no OECD country defaulted on its domestic debt between 1950 and 2010. Therefore, it is not surprising that sovereign exposures benefit from a special treatment in the current prudential banking regulation, being de facto subject to no concentration limits (i.e. there are no limits on the size of banks' sovereign exposures as a share of their capital) and to a zero risk weight regime (i.e. there are no explicit capital requirements vis-à-vis credit risk related to exposures to the government).

The sovereign debt crisis has sparked an international debate on the close relationship between sovereign risk and banking crises. It has been argued that since sovereign exposures cannot be considered risk-free, their preferential prudential treatment should be amended accordingly.[4] Some commentators (e.g. Gros, 2013) have pointed out that the problem is particularly acute in the euro area, where governments can no longer order their central banks to inflate away public debt by creating money and purchasing government securities (an option that is instead available to countries that do not belong to monetary unions and retain full monetary sovereignty).

This paper contributes to the debate, focusing on a set of questions that we believe are crucial for progress in this field: what are the benefits to be expected from a reform of the prudential rules on banks' sovereign exposures? Is it possible, by using regulation, to sever the link between domestic banks and their governments? What are the potential costs of a reform for banks, governments and the economy as a whole? How should the new regulation be designed in order to minimize these costs?

Looking at the recent literature as well as at real world experience, we find reasons to be cautious about the balance between the expected benefits of a tighter regulation of banks' sovereign exposures and the related costs.

First of all, there are several mechanisms that link banks to their domestic sovereigns, and that make their fates strictly intertwined independently of banks' holdings of sovereign bonds (CGFS, 2011; Angelini et al., 2014).

[3] The opinions expressed in this paper are the authors' and do not necessarily reflect those of the Bank of Italy. We thank Paolo Angelini for reading several preliminary drafts, providing at each stage many insightful comments. We also thank Alessia Angelilli, Giuseppe De Martino, Vincenzo Cuciniello, Alessio De Vincenzo, Andrea Generale, Giorgio Gobbi, Giuseppe Grande, Francesco Mauro, Emanuela Piani, Andrea Pilati, Paolo Sestito, Federico Signorini, and Maurizio Trapanese. All remaining errors are our own responsibility.

[4] For example, Nouy (2012), argued that 'More capital charge against sovereign risk and less incentives for the purchase of sovereign debt should especially be considered in a context where this asset class can no longer be considered as a low-risk or risk-free asset class'. Weidmann (2013) observed that 'a reassessment of the regulatory treatment of sovereign exposures of financial institutions is crucial' in order to break the inter-linkage between sovereigns and banks and to complement European banking union, and that 'the current regulation's assumption that government bonds are risk-free has been dismissed by recent experience'.

Second, the fact that banks' sovereign exposures tend to be large, concentrated and biased towards the domestic sovereign is not necessarily an inefficiency to be corrected; instead, it could be explained by hedging motives or transaction costs (Coeudarcier and Rey, 2013). In other words, it could just be a manifestation of the home country bias, a pervasive phenomenon that is present across countries, sectors and asset classes. Furthermore, regulation is not a key driver of changes in banks' home bias. The degree of home bias in sovereign bonds changes over time. In most European countries it decreased significantly from the inception of the euro to the beginning of the financial crisis, and it increased afterwards. More recently it has begun to decline again. By contrast, throughout the entire period European regulation has remained broadly unchanged (indeed, it has already been tightened somewhat).

Third, in a phase of tensions in the sovereign debt market, banks and other domestic intermediaries may have a stabilizing role, counteracting the effects of short-termism and panic selling: their contrarian role in the sovereign bond market may actually contribute to financial stability and reduce the probability of self-fulfilling crises. The Italian and Spanish experiences in recent years are two cases in point.

Fourth, it is too often overlooked that recent regulation has gone a long way towards breaking the perverse banks-sovereign loop that motivates the proposals of prudential regulation reform. The rules on leverage ratios and – in Europe – the supervisory exercises (e.g. the EBA Recommendation on Capital of December 2011 and the 2014 EU-wide stress tests) have already tightened, de facto, the prudential treatment of sovereign exposures. In Europe, the Bank Recovery and Resolution Directive (BRDD) imposes losses on private creditors before ailing banks can resort to any external financial support, substantially reducing the likelihood of government intervention, and several measures have been taken to strengthen the fiscal framework in order to reduce the likelihood and costs of sovereign crises.

In the paper, we provide estimates of the costs of amending the current regulation, both from a microeconomic perspective, by analysing the impact on banks' balance sheets, and from a macroeconomic one, by considering the effects on sovereign bond markets. We find that the most significant negative unintended effects could stem from the revision of the large exposures regime. The introduction of binding limits on sovereign exposures (at today's levels) could force banks to sell sizeable amounts of government bonds. While this supply could, in principle, be absorbed by other players (e.g. insurance companies and funds), the sheer magnitudes involved could make the exercise a daunting and risky one (see e.g. Constancio, 2015).[5] In the new equilibrium, in which banks hold significantly smaller sovereign exposures, there might be a higher risk of self-fulfilling crises, non-linear dynamics, and abrupt re-pricings of sovereign risk with adverse macroeconomic effects.

[5] Furthermore, new regulation could exacerbate the shortage of safe assets owing to the fact that the financial crisis has increased the demand for them and reduced their supply (e.g. Caballero and Fahri, 2014). In Europe, this could prolong the current slowdown. Indeed, while in normal conditions one could hope that banks would reinvest the resources obtained by selling government bonds in loans to firms and households, this would be no longer true in a 'safety trap' à la Caballero and Fahri (2014): banks would instead simply strive to hoard the fewer safe assets that are left in the market.

Concerning implementation, an obvious difficulty, often overlooked in the literature on this subject, is that, should the regulator decide to abandon the zero risk weight regime for sovereign exposures, it would need to find a method to assess sovereign risk. Finding an operational risk measure would be anything but simple because resorting to credit rating agencies is not in our view – for reasons discussed below – a viable option.

Should the need to address this last problem arise, we argue that a central role could be given to the fiscal sustainability measures released by several major international organizations. These measures, which we discuss in more detail below, are not perfect but they do have strong advantages: they capture the fundamental state of a country's public finances, they are based on sound economic theory, they are well-established and they rely on transparent methodologies.

Finally, in order to avoid pro-cyclical effects, any new regulation should be enforced in 'normal times'; in a situation in which risks for financial stability are still material, such as the current one in the euro area, one should be wary of taking action that may end up weakening the economy and re-igniting the bank-sovereign loop that we saw in action in 2011-13. The adoption of long phase-in periods may not be sufficient to assuage these concerns, as markets have shown a strong tendency to front-load any regulatory changes.

The paper is structured as follows: first we provide an overview of the special role given to sovereign debt in prudential regulation (Section 2). We then review the reasons put forward in the debate in favour of tighter regulation of sovereign exposures (Section 3), as well as its micro-prudential (Section 4) and macroeconomic impacts (Section 5). Section 6 discusses alternative ways to assess sovereign creditworthiness. Section 7 concludes.

2. The prudential treatment of sovereign exposures[6]

2.1 Definition of the sector

An important preliminary issue concerns the definition of the sovereign sector, which is sometimes controversial. The sector always includes central governments and central banks, but there are also other counterparties, notably public sector entities (PSEs), that are treated as central governments for prudential purposes.

The treatment of PSEs differs across jurisdictions. Normally, PSEs are categorized as sovereigns if they have revenue-raising powers. However, there are also other ways of determining the different treatments applicable to different types of PSEs, for instance, by focusing on the extent of the guarantees provided by the central government (in some jurisdictions implicit guarantees are also considered).

[6] In this paragraph, we review the more important issues of the regulatory framework of sovereign exposures in the banking sector. Other aspects, relating to particular items of banking regulation (i.e. counterparty risk) or other financial sectors (e.g. insurance companies) are dealt with in the Appendix.

The definition of PSEs used in the Basel Framework encompasses 1) regional governments and local authorities; 2) administrative bodies responsible to central governments, regional governments or local authorities, and other non-commercial undertakings owned by governments or local authorities; and 3) commercial undertakings owned by central governments, regional governments or local authorities.

In this paper, whenever the term 'sovereign exposures' is used, we refer to central governments, central banks, regional governments, local governments, and PSEs guaranteed by central governments.

2.2 Regulation affecting the banking sector

The Basel rules[7] envisage a special treatment of sovereign exposures, in terms of capital requirements, limits on large exposures, as well as liquidity and leverage requirements. This preferential treatment was motivated by a broad perception that the riskiness of sovereign exposures was relatively low, on account of the specific powers of sovereigns (taxation, seigniorage, etc.).

In what follows, we review the main prudential rules concerning sovereign exposures by analysing separately the capital requirements for market and credit risk (2.2.1), the limits on large exposures (2.2.2), the leverage framework (2.2.3), and the liquidity requirements (2.2.4).

In the Appendix we briefly outline other regulatory aspects that are less directly relevant to our argument.

2.2.1 Capital regulation

How capital requirements vis-à-vis sovereign exposures are set depends on whether banks classify the exposures in the trading book or in the banking book. The requirements for exposures classified in the trading book are determined by their market risk, while the requirements for exposures in the banking book are a function of their credit risk.

Treatment of sovereign credit risk. - According to the Basel rules, the capital requirements for credit risk can be determined either with i) a standardized approach or ii) an Internal Ratings-Based (IRB) approach developed by the bank and authorized by the supervisory authority (the IRB approach can in turn be either 'Advanced' or 'Foundation').

In the standardized approach, the risk weight assigned to a given sovereign exposure depends on the rating assigned to the sovereign by a credit rating agency that is a recognized external credit assessment institution (ECAI) or by an export credit agency (ECA; for instance, COFACE in France, SACE in Italy); if a bank chooses not to use available ratings, or if no rating is available, a 100% risk weight is assigned.

However, there is a specific provision (the carve-out rule) for domestic sovereign exposures: banks are allowed to assign a zero risk weight 'to exposures to central governments and central banks denominated and funded in the domestic currency of that

[7] BCBS, *International Convergence of Capital Measurement and Capital Standards*, June 2006.

central government and central bank'.[8] This reflects the absence of risks relating to the availability and transfer of foreign exchange on such claims.[9]

Thus, domestic sovereign exposures are treated more favourably than foreign ones. The latter receive a zero risk weight only under specific circumstances (e.g. if their external rating is between AAA and AA-, or if the ECA risk score is between 0 and 1).

Moreover, subject to national discretion, claims on certain domestic PSEs may also be treated as claims on the sovereigns in whose jurisdictions they are established.

In the advanced IRB approach, each individual bank computes the capital requirement for the credit risk of sovereign exposures using its own estimates of the probability of default (PD) and loss given default (LGD). The Foundation IRB approach differs from the Advanced IRB in that the LGD parameter is fixed at 45%. In either case, these parameters are fed into a regulatory formula provided by the Basel Committee, which yields the risk weight. Table 1 provides the mapping between PDs and risk weights for banks using the Foundation IRB approach.

Finally, there is no preferential treatment of sovereign exposures in the framework employed to determine whether a bank is a global systemically important bank (G-SIB).[10] In the G-SIB framework, some large cross-border banks – identified according to a specific methodology developed by the Financial Stability Board and the Basel Committee on Banking Supervision[11] – are required to meet an additional capital requirement varying between 1% and 2.5% in order to reduce the systemic risk, moral hazard and negative externalities associated with institutions that are perceived as too big to fail.[12] The value of sovereign securities held by a bank contributes to its complexity, one of the criteria used to identify G-SIBs.

In the European Union, the Basel rules have been implemented through the Capital Requirements Regulation/Directive (CRR/CRD) packages. [13] These packages, the

[8] This approach can be extended to the risk weighting of collateral and guarantees (Section II.D.3 and II.D.5 of the Basel rule text).

[9] Basel Committee, *International convergence of capital measurement and capital standards* (July 1988).

[10] Basel Committee on Banking Supervision, *Global systemically important banks: assessment methodology and the additional loss absorbency requirement*, November 2011.

[11] Financial Stability Board, *2014 Update of List of Global Systemically Important Banks (G-SIBs)*. On 6 November 2014 the FSB and the Based Committee on Banking Supervision (BCBS) updated the list of G-SIBs using end-2013 data and the updated assessment methodology published by the BCBS in July 2013 and identified 30 institutions.

[12] The banks are classified according to the following parameters: size, interconnectedness, lack of readily available substitutes or financial institution infrastructure for the services they provide, global (cross-jurisdictional) activity, and complexity. One of the criteria used to assess complexity is the financial securities held for trading and available for sale. Banks classify their sovereign exposures mainly in the available for sale portfolio. The systemic impact of a bank's distress or failure is expected to be positively related to its overall complexity – that is, its business, structural and operational complexity. The larger this portfolio is, the greater are the costs and the time needed to resolve the bank and the higher is the capital surcharge to be met.

[13] For Basel III, Capital Requirements Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 and Capital Requirements Directive 2013/36/EU of the European Parliament and of

provisions of which are applicable to banks and investment firms regardless of size, mirror the special treatment developed at the international level.

Table 1 – Foundation IRB: PDs, risk-weights and capital charges for sovereign exposures (percentage points)

PD	Risk weight	Capital charge
0.01	7.53	0.60
0.02	11.32	0.91
0.03	14.44	1.16
0.05	19.65	1.57
0.10	29.65	2.37
0.25	49.47	3.96
0.40	62.72	5.02
0.50	69.61	5.57
0.75	82.78	6.62
1.00	92.32	7.39
1.30	100.95	8.08
1.50	105.59	8.45
2.00	114.86	9.19
2.50	122.16	9.77
3.00	128.44	10.28
4.00	139.58	11.17
5.00	149.86	11.99
6.00	159.61	12.77
10.00	193.09	15.45
15.00	221.54	17.72
20.00	238.23	19.06

Source: Basel Committee on Banking Supervision.
Note: The Foundation IRB approach assumes an LGD of 45% and a maturity of 2.5 years. The PD refers to a horizon of 1 year. The column 'Capital charge' gives the amount of capital to be held as a percentage of the nominal value of the sovereign exposure.

the Council of 26 June 2013. Basel rules apply to large active international banking groups and need to be implemented at the national level through appropriate legal instruments.

However, the EU framework diverges partly from the Basel rules in order to take into consideration some specificities of the European market. The two most important differences concern the carve-out rule, for banks using the standard approach, and the permanent partial use rule, for banks adopting the IRB approach.

As to the carve-out rule, the European framework allows banks to assign a zero risk-weight not just to sovereign exposures denominated and funded in the currency of the corresponding member state, but also to the sovereign exposures denominated and funded in the currencies of *any other* member state. Consequently, the preferential treatment envisaged for domestic sovereign exposures is applicable to all other European member states. In this way, a Eurozone bank using the standard approach will not be required to hold capital against euro-denominated exposures versus any Eurozone sovereign, as well as for exposures versus non-Eurozone member countries denominated in local currencies.

The 'permanent partial use rule' (Article 150, CRR) allows banks adopting the IRB approach to apply the standardized approach to their sovereign exposures – subject to prior authorization by the competent authorities – provided that these exposures are assigned a 0% risk-weight under the standardized approach.

The rule's rationale lies in the following considerations: i) member states are considered bankruptcy remote counterparties (their PDs are considered so low that no internal estimate is required); and ii) models developed by banks would in any case be based on judgmental and qualitative elements because sovereign defaults have been so infrequent in Europe as to make any meaningful statistical analysis impossible.

As to local governments and the G-SIB rules, the European framework is substantially aligned with the Basel rules text.

Treatment of sovereign market risk. - In the Basel framework, the treatment of market risks too depends on whether a bank uses internal models or a standardized approach to determine capital requirements.

In the standardized approach, financial assets held in the trading book are subject to two separately calculated charges: i) a capital charge for 'general market risks', namely interest rate risks, which is calculated at the portfolio level (where long and short positions in different securities or instruments can be offset); and ii) a capital charge for 'specific risks', which is calculated separately for each individual security and is designed to protect against an adverse movement in the price of an individual security owing to factors relating to the individual issuer. In measuring the risk, offsetting is restricted to matched positions in the identical issue (including positions in derivatives).

As far as general market risk is concerned, sovereign exposures are not subject to special treatment; concerning specific risk, the risk-weight factor is identified using two risk-drivers: 1) external rating (Table 2); and 2) residual maturity.

Furthermore, carve-out rules also apply to specific risks. Paragraph 711 of the Basel rules states that 'when the government paper is denominated in the domestic currency and funded by the bank in the same currency, at national discretion a lower specific risk charge may be applied'. This provision mirrors exactly the carve-out rule for sovereign credit risk. Accordingly, the risk-weight for these exposures is normally zero.

Table2 – Market risk: specific risk capital charge for sovereign exposures

External credit assessment	Specific risk capital charge
AAA to AA-	0%
A+ to BBB-	0.25% (residual term to final maturity 6 months or less)
	1.00% (residual term to final maturity greater than 6 and up to and including 24 months)
	1.60% (residual term to final maturity exceeding 24 months)
BB+ to B-	8.00%
Below B-	12.00%
Unrated	8.00%

The rules mentioned above concern the standardized approach. Instead, IRB banks face no pre-set regulatory ratios and use their own internal models to compute the capital requirement for the market risk of sovereign exposures.

The Basel trading book framework is currently under review. A key aim of the revisions is to ensure that capital charges are broadly consistent with the risks held by banks.

The European framework is aligned to the Basel framework as to the treatment of sovereign exposures. Unlike for credit risk, the permanent partial use approach is not applicable to positions classified in the trading book.

2.2.2 Large exposures

In 2014 the Basel Committee on Banking Supervision (BCBS) introduced harmonized rules on large exposures in order to reduce concentration risk (limiting the potential losses stemming from the default of a single client or a group of interconnected clients), overcome the existing divergences between the different national jurisdictions and complement the risk-based rules with a backstop.

The large exposures regime was introduced into European regulation in the 1990s by Directive 89/299/EU. Currently, the European discipline is set out in the CRR. Banks are required to limit their exposures to a single counterparty at 25% of their 'eligible capital'. As a general rule, exposures are weighted at 100%.

However, sovereign exposures are exempt from the application of this limit, provided they receive a 0% risk-weight in the standardized approach for credit risk.

2.2.3 Leverage ratio

One of the causes of the recent global financial turmoil has been the build-up of excessive (on- and off-balance sheet) leverage by several banking groups that apparently maintained strong risk-based capital ratios. Realizing the imperfect nature of the available risk weighting methods, the Basel Committee has introduced a non-risk-based minimum leverage ratio to supplement and backstop the risk-based capital requirements. Note that

the leverage ratio equals Tier 1 capital divided by a measure of exposures (therefore a higher ratio implies a safer balance sheet).[14]

Under the leverage framework, sovereign exposures are considered at their nominal value; no specific derogation is envisaged.

This amounts to introducing capital requirements against these positions: if a capital ratio of 8.5% is assumed, a leverage ratio of 3% is approximately equivalent to a 35% risk weight.

Since January 2015 banking groups disclose their leverage ratio according to specific templates. The final calibration and any further adjustments to the definition will be completed by the Basel Committee by 2017, with a view to migrating to a Pillar 1 (minimum capital requirement) treatment on 1 January 2018.

In the EU, the European Commission's delegated act on the leverage ratio, published on 10 October 2014, identifies all the components needed for its calculation.[15] The monitoring period began on 1 January 2015 and will last 3 years before the final calibration.

2.2.4 Liquidity requirements

Sovereign bonds are the main source of collateral for banks. Primary examples of their use are monetary policy operations with the central bank and repos with other commercial banks, including those cleared with a central counterparty (CCP). Therefore, the impact of sovereign strains on banks' conditions has also to be assessed with respect to liquidity and funding risk.

The Basel Committee has introduced two minimum standards to strengthen the liquidity of banks: i) the Liquidity Coverage Ratio (LCR),[16] which aims to increase the short-term resilience of a bank's liquidity profile by ensuring that it has sufficient unencumbered high-quality liquid assets to withstand a 30-day stress scenario in the form of a severe net cash outflow;[17] and ii) the Net Stable Funding Ratio (NSFR),[18] which supplements the LCR and aims to provide a sustainable maturity structure of assets and liabilities.

The special treatment of government bonds first arises in connection with the liquidity buffer: under the Basel III rules on the LCR, sovereign bonds with a standardised

[14] The exposures under the leverage ratio framework encompass on-balance and off-balance sheet assets, with special rules on derivatives and securities financing transactions (see Committee on Banking Supervision, Basel III leverage ratio framework and disclosure requirements, January 2014).

[15] Commission delegated act of 10.10.2014 amending Regulation (EU) No 575/2013 of the European Parliament and of the Council regarding the leverage ratio. It should be taken into account that the delegated act has not introduced a minimum requirement so far.

[16] It is the ratio of the stock of high quality liquid assets to total net cash outflows in a 30-day stress scenario. Basel Committee on Banking Supervision, *Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools*, January 2013.

[17] It must be strictly larger than 100%.

[18] Basel Committee on Banking Supervision, *Basel III: The Net Stable Funding Ratio*, October 2014.

risk weight of 0% under the Basel framework (i.e. those rated AAA to AA-) will be eligible to classify as Level 1[19] liquid assets, without limits or haircuts.

In the EU, where the LCR was introduced as a minimum standard in 2015,[20] the delegated act of the European Commission on the LCR classifies as Level 1 liquid assets all securities issued or guaranteed by EU governments, without limitations or differentiations based on rating.[21]

Within the monetary policy framework, government bonds are the most accepted and valuable type of collateral. In the Eurosystem collateral framework the credit quality of government bonds is considered sufficient if they have been rated by a recognized ECAI above the minimum threshold of BBB-. Following their acceptance as collateral, government bonds are priced and risk control measures apply (i.e. haircuts) in order to determine the amount of liquidity to give to the counterparty that is collateralizing its financing operation. Due to their high degree of liquidity, sovereigns fall into the best liquidity category and benefit from lower valuation haircuts compared with other marketable assets. In any case, as for all eligible assets, haircuts for government bonds differ according to the financial characteristics of the asset and its residual maturities, as well as on the basis of the credit quality (haircuts for bonds rated below A- are higher).[22] Although ECAI's ratings are the most common instrument for assessing the creditworthiness of sovereigns, under the ECB's rules on collateral the Eurosystem retains the right to determine whether an issue, issuer, debtor or guarantor meets its credit standards on the basis of any information it may consider relevant.

***

Before concluding this section, it should be pointed out that sovereign risk is already considered – although not fully – in prudential regulation. The December 2011 formal Recommendation adopted by the EBA's Board of Supervisors asked national supervisory authorities to require banks to strengthen their capital positions by building up a capital buffer against sovereign debt exposures to reflect market prices as at the end of September 2011, at the peak of the sovereign crisis.[23] Similarly, the exercise run in 2014 required

[19] Certain assets not eligible to be included as Level 1 can be computed as Level 2. Level 2 assets consist of higher-liquidity 'Level 2A' assets, which are highly-rated corporate and covered bonds (subject to a 15% haircut), and lower-liquidity 'Level 2B' assets, which can be included at supervisors' discretion and consist of lower-rated corporate bonds, high-rated residential mortgage-backed securities (RMBS) and certain equities (subject to haircuts of 20% to 50%). Level 2B assets may not account for more than 15% of a bank's total stock of high-quality liquid assets.

[20] The LCR will be introduced in October 2015, but the minimum requirement will begin at 60%, rising in equal annual steps of 10 percentage points to reach 100% on 1 January 2019.

[21] Special rules also apply to liquidity outflows: outflows resulting from liabilities such as sale and repurchase agreements, secured loans and similar agreements are subject to a preferential outflow of 0% if they are collateralized by assets that qualify as liquid for the purpose of the liquidity buffer.

[22] If multiple and possibly conflicting ECAI assessments are available for the same issuer, the first-best rule applies.

[23] EBA, *Capital buffers for addressing market concerns over sovereign exposures*, 26 October 2011.

banks to hold capital against sovereign positions classified in the banking book.[24] Concerning the Basel and European rules, the introduction of the leverage ratio – which requires banks to consider sovereign exposures in full – will amount to a non-zero risk weight on sovereign exposures.

3. Can the sovereign-banks loop problem be addressed via prudential regulation?

Recently, several criticisms have been raised – by both academics and policy makers – concerning the regulatory treatment of sovereign exposures. It has been argued that the current regulatory treatment induces banks to hold an 'excessive' amount of domestic sovereign bonds, exacerbating the perverse feedback loop between the sovereign's health and that of the domestic banking system. It has also been pointed out that regulation often grants a risk-free status to domestic sovereign exposures, while the crisis has shown that sovereigns can and do default. Either way, the conclusion is that the regulatory treatment of sovereigns should be revised.

In this section we argue that the home country bias observed in banks' sovereign exposures is not necessarily anomalous, and that in any case the role of the current regulation in inducing it may be overstated. We also argue that – at least in developed countries – banking regulation alone cannot shield banks from domestic sovereign risk. The risk of contagion from sovereigns to banks should be tackled at its roots, by decreasing the probability of sovereign default (through stronger fiscal discipline) and the cost eventually associated with such an event (through effective crisis management institutions).

(i) *The home country bias in banks' holdings of sovereign bonds is not necessarily undesirable.* – It is not clear, from a theoretical standpoint, what the 'appropriate' share of domestic sovereign exposure in a banks' portfolio should be. It is certainly true that, on average, banks tend to hold a disproportionate amount of domestic sovereign debt with respect to its weight in the world market portfolio, but this is just an instance of the more general home bias phenomenon, 'a perennial feature of international capital markets' according to Coeurdacier and Rey (2013). Economic theory provides several explanations for this phenomenon; in particular, it can be argued the home bias does not necessarily represent an inefficiency to be corrected, but instead can be seen as a 'second best' solution to other market failures. For example, investing in domestic securities may be justified by hedging motives, relatively low information acquisition costs, and a reduced degree of asymmetric information (Coeudarcier and Rey, 2013; Lewis, 1999).

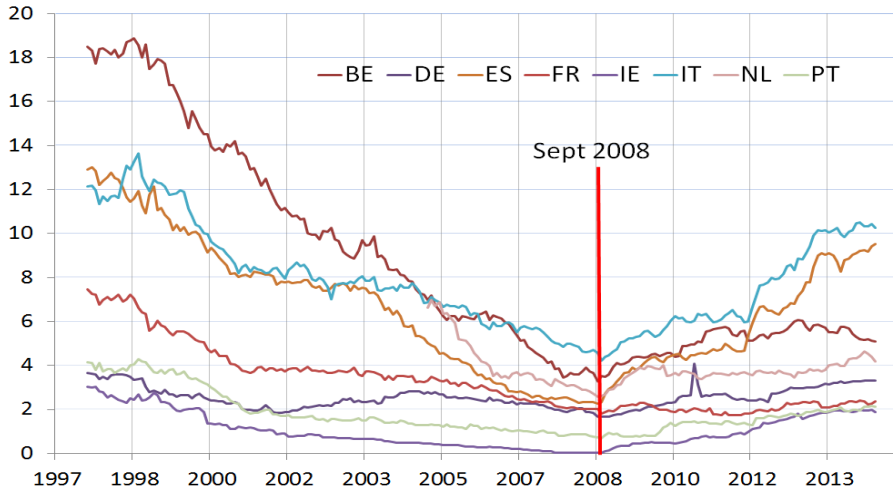
(ii) *There is no clear evidence that regulation is a driver of the banks' sovereign home bias.* – First, the home bias of domestic investors concerns several asset classes (most notably shares) and is by no means peculiar to sovereign bonds (Coudarcier and Rey,

[24] Paragraph 102 states that 'all banks participating in the exercise are required to apply stressed market risk factors and haircuts to exposures held in available for sale or designated at fair value through profit and loss portfolios (fair value option – including sovereign positions in these accounting categories'. EBA, *Methodological note EU wide Stress Test 2014,* 29 April 2014.

2013). Second, the degree of home bias in sovereign bonds changes over time, even if the prudential treatment of sovereign exposures remained constant. In most European countries the exposure decreased significantly from the inception of the euro to the beginning of the financial crisis, and it increased afterwards (Figure 1).

Remarkably, an increase in the home bias pattern among European banks occurred in September 2008, contemporaneously with the Lehman default. This suggests that such an increase was a consequence – rather than a cause – of the crisis. Angelini et al. (2014) and Battistini et al. (2014) argue that redenomination risk was among the key drivers of the pick-up in home country bias: fearing a break-up of the euro area, financial institutions began to hedge their positions by country rather than by currency. The asymmetry of information argument (the difficulty of assessing correctly the actual financial conditions of foreign sovereign borrowers) may also have plaid a role.

Figure 1 - Banks' holdings of domestic government bonds
(% of total assets)



Source: based on Eurosystem data

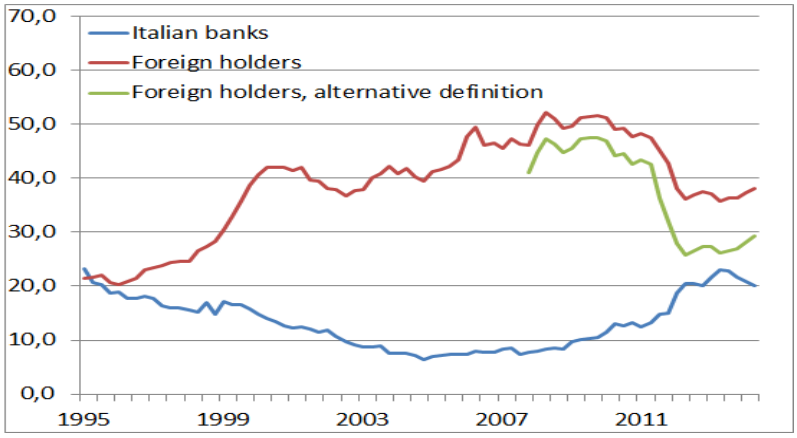
(iii) *There is no evidence that financial firms' purchases of domestic sovereign bonds during the crisis did cause or aggravate the Eurozone sovereign debt problems; in some countries, they may have helped to contain it.* – Figure 2 shows that the increase in Italian banks' exposure to the domestic sovereign coincided with a reduction of the share of Italian government bonds held by non-residents. This evidence, consistent with the redenomination risk hypothesis, prompts the following question: what would have happened if Italian banks and insurance companies had not absorbed the excess supply of sovereign paper generated by the market overshooting at the height of the crisis, in turn driven by self-fulfilling beliefs about the instability of the monetary union? A similar question can be asked for other countries that experienced financial stress over the crisis.

While we clearly lack a counterfactual, possibly if financial institutions in the financially weak countries had not purchased large amounts of domestic sovereign paper at a time when markets were clearly strongly under-pricing it, the euro area crisis could have been substantially worsened.

Remarkably, euro area banks' behaviour can be explained by pure market motives: they may have acted as 'fundamentalist' or 'contrarian' investors, making a profit and at the same time contributing to bring prices closer to their fundamental values.[25]

According to this interpretation, which is consistent with the timing and pattern of events documented in Figure 1, the increase in domestic sovereign exposures by banks in financially weak countries was a reaction to the crisis, and instrumental to preserving financial stability in the euro area.[26]

Figure 2 - Italian general government securities holdings by sector
(shares of total government securities outstanding; % points)



Source: based on Bank of Italy data obtained from the Italian financial accounts.

(iv) The link between sovereigns and their banks cannot be severed only by changing the prudential regulation. - The fate of banks will be most likely intertwined with that of their sovereign even if the link arising from banks' direct exposures to the domestic

[25] At that time the ECB was unable to stabilize sovereign debt markets, depriving the countries under attack of a powerful stabilization mechanism. Indeed, it can be argued that the lack of a central bank with such powers in the euro area was among the reasons for the market overreaction (De Grauwe and Yi, 2013). This interpretation is supported by the effectiveness of the mere announcement of the Outright Monetary Transactions (OMT) programme in bringing the crisis to an end.

[26] According to the European Systemic Risk Board (ESRB, 2015), the fact that banks' exposures to their domestic sovereigns became larger when sovereign risk increased helped to exacerbate the negative feedback loop between banks and sovereigns in the countries experiencing financial tensions. This, in turn, increased systemic risk. In our view, it is difficult to assess the validity of this interpretation because the observed correlation between banks' sovereign holdings and sovereign tensions does not allow any direction of causality between the two to be identified.

sovereign is severed, owing to the existence of multiple other indirect channels of contagion (CGFS, 2011; Angelini et al., 2014).[27] Sovereign distress is associated with macroeconomic turmoil, depresses the economy, and ultimately increases the insolvency rate of domestic households and firms (Bocola, 2015). According to Laeven and Valencia (2013), in the three years after a sovereign default, the median output loss with respect to the potential is over 40%. It is clear that an economic disruption of this proportion will inevitably have adverse consequences for the health of the banking system.[28] Therefore, the solution to the bank-sovereign loop problem is unlikely to be provided by micro-prudential tools.[29]

(v) *The problem must be tackled at its root, by reducing the likelihood of sovereign (and bank) distress*. Correcting fiscal imbalances and ensuring sound inter-temporal fiscal policy is a key precondition to financial stability and therefore the main route to severe the bank-sovereign link. On this front, important steps have been taken in Europe following the crisis. A threefold strategy has been adopted in order to 1) reduce fiscal imbalances; [30] 2) change the bank supervisory and regulatory framework by establishing the single supervisory mechanism (SSM) and the single resolution

[27] For example, fears concerning the solvency of a sovereign borrower affect banks' cost of funding by reducing the value of both explicit and implicit public guarantees on bank liabilities. Moreover, as sovereign securities are typically used as collateral in repos with central banks and other counterparties, the depreciation of those financial instruments reduces banks' funding availability. Finally, since the sovereign rating de facto often represents a ceiling on the rating of domestic companies, a sovereign downgrade is generally followed by a lowering of the ratings of other domestic borrowers (Adelino and Ferreira, 2014).

[28] Using their broad dataset (spanning 70 countries and more than two centuries of data), Reinhart and Rogoff (2011) show that sovereign crises do not tend to be followed by banking crises. However, this lack of correlation should be interpreted with caution. For example, in their regressions the authors do not distinguish between externally-held and domestically-held public debt. Most default episodes in their sample concern the former, which is arguably easier for the domestic economy to withstand. The dataset includes only 8 domestic public debt default episodes in western Europe, none of which happened after 1948.

[29] One could argue that macro-prudential instruments would be more useful. For example, one could impose a macro-financial capital buffer, which is independent of the sovereign bond holdings of each institution, but is proportional to some measure of the country's fiscal sustainability. While this approach appears promising, discussing and developing it is clearly outside of the scope of the present paper.

[30] The European fiscal framework has been enhanced in several dimensions: for example, the Stability and Growth Pact has been amended, reinforcing both its preventive and its corrective arm (most notably, the 'Six pack' has given operational content to the debt rule already present in the Maastricht treaty). Furthermore, member countries have strengthened their national budgetary processes and institutions by means of the 'Fiscal compact' and the 'Six Pack' (see European Commission, 2013). Then, taking stock of the recent crisis, which showed that the sudden and disorderly unwinding of severe macroeconomic imbalances can pose problems for sovereign debt sustainability and ultimately be a source of sovereign risk, the member countries have also put in place a surveillance mechanism to identify potential risks early on and correct the imbalances that are already in place (the Macroeconomic imbalances procedure, MIP). The procedure is based on a scoreboard consisting of a set of indicators, with thresholds set for each of them; based on this scoreboard, the Commission and the Council may adopt preventive recommendations and an Excessive Imbalance Procedure may be opened for a member state if it experiences excessive imbalances in the sense of the MIP regulation.

mechanism (SRM); and 3) establish a sovereign crisis management system to safeguard financial stability within the euro area.[31]

Furthermore, there have been important steps, in Europe, in order to decrease the probability of bank failure - and protect the sovereign from liabilities in case of bank failure. The CRDIV/CRR is the main piece of legislation aimed at making banks more resilient: it introduces, among other things, strengthened capital and liquidity requirements. Besides the regulatory side, banks in the EU have been subject to heightened supervision, with initiatives such as EU-wide stress tests and the creation of the Single Supervisory Mechanism (SSM). A number of measures are aimed at reducing the size of a public intervention in the event of a bank failure. The relevant pieces of legislation are the Bank Recovery and Resolution Directive (BRRD), the revision of the Deposit Guarantee Scheme Directive and the Single Resolution Mechanism at the Euro-Area level. The BRRD requires that, in case recovery or resolution is needed, private creditors have to be subjected to losses before the firm can resort to any external financial support. Also, this external financial support does not (or at least not exclusively) come from the public sector. The national resolution funds and national deposit guarantee schemes, privately funded, will play an important role in providing financing in the event of resolution. In the case of the Euro-Area countries, a mutualised, privately funded single resolution fund has been created.

Summing up, the benefits to financial stability that could stem from a tightening of the prudential treatment of sovereign exposures appear overstated. Furthermore, the idea that the bank-sovereign nexus can be severed in this way is questionable.

4. How large is the potential impact of tighter regulation? Micro-prudential effects

The international debate on the revision of prudential regulation on exposures towards central governments is currently under way and concrete proposals on this issue have not yet been put forward. In what follows we focus on possible revisions of the current regulation in three main fields: 1) capital requirements on credit risk; 2) large exposure discipline and 3) sovereign exposures and leverage ratio.

We consider public data on sovereign exposures, referring to June 2013, for 39 European banking groups,[32] belonging to 8 countries (Austria, France, Germany, Italy,

[31] In particular, the European Stability Mechanism (ESM) will provide financial assistance to euro-area Member States experiencing or threatened by financing difficulties. The ESM raises funds by issuing money market instruments as well as medium and long-term debt with maturities of up to 30 years. ESM issuance is backed by a paid-in capital of €80 billion. Under certain circumstances a ESM programme may also be backed by ECB operations in secondary sovereign bond markets, with the goal of "safeguarding an appropriate monetary policy transmission and the singleness of the monetary policy" (Outright Monetary Transactions; OMTs). No ex ante quantitative limits are set on the size of Outright Monetary Transactions.

[32] The sample is composed of the following 39 European banking groups: Austria: Erste Group Bank, Raiffeisen Bank International; Germany: Deutsche Bank, Commerzbank, Landesbank Baden-Württemberg, Deutsche Zentral-Genossenschaftsbank, Bayerische Landesbank, NORD/LB Norddeutsche Landesbank Girozentrale, Hypo Real Estate Holding, HSH Nordbank, Landesbank Hessen-Thüringen Girozentrale,

Netherlands, Portugal, Spain and United Kingdom). We include all exposures (loans and bonds) towards central governments, regional and local entities.[33] Finally, we concentrate on banks' exposures exclusively towards euro-area countries and the United Kingdom.

Before considering the effects on banks' capital ratios stemming from the above revisions, it is worth looking at some preliminary descriptive information (Table 3).

Table 3 - Sovereign risk exposure of the main European banks

Millions of euros - June 2013	**Total sovereign exposures**	**Sov. exp. / tot. assets (%)**	**Domestic sov. / tot. sov. (%)**
Austrian banks	22,323	6.6	51.5
German banks	376,231	8.4	76.7
Spanish banks	191,313	8.0	92.5
French banks	172,099	2.8	58.8
UK banks	183,238	2.9	61.6
Italian banks	260,594	13.1	79.8
Dutch banks	119,543	6.0	41.1
Portuguese banks	28,515	8.7	85.8
Total	1,353,856	5.6	71.8

Note: exposures are exclusively towards euro-area countries and the UK.
Source: SNL Financial on EBA data.

Italian banks had the highest share of sovereign exposures in total assets (13.1%, more than twice the European average); Portuguese, German and Spanish banks follow, though at a distance (respectively 8.7%, 8.4% and 8%). Furthermore, for the banks in these countries, the share of 'domestic' sovereign to total sovereign exposure was especially high, ranging from 77% (Germany) to 93% (Spain), compared with the EU weighted average (72%).

4.1 Tighter capital requirements

As explained above, the European rules on banks' capital requirements (CRR) allow banks to set aside no capital against sovereign exposures denominated and funded in the currencies of any member state (sovereign carve-out). To explore possible alternatives we

Landesbank Berlin Holding, DekaBank Deutsche Girozentrale, Westdeutsche Genossenschafts-Zentralbank; Spain: Banco Santander, BBVA, Caja de Ahorros y Pensiones de Barcelona, Banco Popular Español; France: BNP Paribas, Crédit Agricole, BPCE, Société Générale; United Kingdom: RBS, HSBC, Barclays, Lloyds; Italy: Unicredit, IntesaSanpaolo, MPS, Banco Popolare, UBI; Netherlands: ING Bank, Rabobank, ABN AMRO, SNS Bank; Portugal: Caixa Geral de Depósitos, Banco Comercial Português, Espirito Santo Financial Group, Banco BPI.

[33] Local entities may warrant a different prudential treatment to that of central governments and regional entities; anyway, considering the negligible impact of their inclusion for the result of this analysis, we decided not to remove them.

carry out our analysis both on the standardized approach, by assuming different risk weights, and on the Foundation IRB methodology.

As regards the standardized approach, two alternative options are explored: (1) removing the sovereign carve-out. This would force banks to apply a risk weight, for the calculation of RWA, which reflects the actual rating assigned to that country by an official ECAI;[34] for instance, Italian sovereign exposures would have a risk weight of 50%. (2) Applying a flat 10% weight to banks' sovereign exposures towards all countries, regardless of rating. [35]

Table 4 gauges the effect of the two alternative policy options on capital ratios. We start from the Tier 1 ratio as of June 2013 and then assess the effects stemming from the application of risk weights linked to effective ratings (hypothesis i) or a common flat weight of 10% (hypothesis ii).

On an aggregate basis, both options would imply a modest reduction in the weighted average Tier 1 ratio (40 and 20 basis points, respectively).[36] However, aggregate figures hide significant cross-country heterogeneity. Under the first option, Portuguese, Italian and Spanish banks' average Tier 1 ratio would be reduced by 130, 120 and 80 basis points, respectively. Other jurisdictions would face smaller effects (for instance, Germany -30 basis points) or no effect at all (Netherlands, United Kingdom, France and Austria). The results for Portugal, Italy and Spain are due to their sovereign's rating, combined with the 'home bias' issue.

The alternative hypothesis (10% flat risk weight) would entail a large decrease in capital ratios for those banks whose sovereign exposure is higher in absolute amount; in particular, German and Italian banks would face a reduction in their average capital ratios of 50 and 30 basis points respectively.[37]

As regards internal models approach, we simulated the effects of IRB methodology approach on a subsample of Italian banks and – under different hypotheses of LGD and maturity – the results are quite similar to those under the standardized approach. However, the concrete adoption of an IRB model to the sovereign portfolio for regulatory purposes should be carefully considered, due to the intrinsic features of the latter.

[34] We considered the ratings assigned by Standard & Poor's as of June 2013 (the same reference date as the data).

[35] This hypothesis has been taken from ESRB (2015).

[36] Consistent results have been found by the ESRB (2015) though data refer to end-2011.

[37] Data from the ECB Comprehensive Assessment, updated as of June 2014, show that the average Tier 1 ratio for the 15 main Italian banking groups would be reduced by 160 basis points under the first option and 40 basis points under the second. These effects are broadly in line with those displayed in Table 3.

Table 4 - Sovereign risk prudential treatment revision: effects on the main European banks

Per cent *June 2013*	**Tier 1 ratio (actual)**	**Tier 1 R HP i) sovereign rating**	**Tier 1 R Hp ii) weight 10%**
Austrian banks	11.2	11.1	11.1
German banks	15.1	14.8	14.6
Spanish banks	10.6	9.8	10.5
French banks	12.6	12.5	12.5
UK banks	13.4	13.4	13.3
Italian banks	11.9	10.7	11.6
Dutch banks	15.1	15.1	14.8
Portuguese banks	11.4	10.1	11.2
Weighted average	12.9	12.5	12.7

Note: exposures are exclusively towards euro-area countries and the UK.
Source: SNL Financial on EBA data

4.2 A tighter large exposures regime

To assess the impact of the large exposures rules on sovereigns we consider the same dataset used in paragraph 4.1, focusing on banks' domestic sovereign exposure.

Before simulating the effects of a revision of the current regulatory framework, we should take into consideration the peculiar nature of a sovereign portfolio. Notably, it does not seem reasonable to apply the usual limits envisaged for a private counterparty; rather, we considered the nominal value of sovereign exposures and calculated the excess with respect to 100% (first option) and 200% (second option) of Tier 1.

Table 5 - Large exposures rules on sovereign exposures: effects on a sample of European banks
(millions of euros)

Banking group	**Domestic sovereign**	**Tier 1**	**Dom sov. / Tier1**	**Excess exposure option i): 100% T1**	**Excess exposure option ii): 200% T1**
Austrian banks	11,504	21,064	55%	-	-
German banks	288,612	159,216	181%	157,362	81,342
Spanish banks	176,943	119,838	148%	57,105	3,935
French banks	101,114	223,193	45%	-	-
UK banks	112,841	287,482	39%	-	-
Italian banks	207,830	107,772	193%	100,058	33,567
Dutch banks	49,091	95,691	51%	-	-
Portuguese banks	24,452	23,106	106%	4,660	-

Source: SNL Financial on EBA data as of 30 June 2013.

As shown in table 5, the application of large exposures limits would have a sizable impact for some countries. Notably, under the most restrictive option, German, Italian and Spanish banks would have to reduce their holdings of sovereign bonds by 157, 100 and 57 billion euros respectively[38] (note that these figures concern only the largest banks; section 5 provides estimates for the whole banking system).

However, the general idea of imposing a binding ("hard") large exposure limit on sovereign exposures should be carefully evaluated. In fact, such a regime could exacerbate procyclicality: during a financial crisis, the contribution of "contrarian investors", who buy assets when markets are excessively bearish, becomes pivotal. The role of banks as shock absorbers, who proved crucial during the euro sovereign debt crisis, could be seriously hampered should a hard large exposure limit for sovereign be introduced.

Instead, a lighter limit, based on a low flat risk weight to be applied on the exposure exceeding a certain threshold, could provide the right incentives for banks' resources allocation, without having potentially disruptive effects.

4.3 Sovereign exposures and leverage ratio

As explained in paragraph 2.2, sovereign exposures are already considered under the leverage ratio (LR) framework. This means that they are de facto subject to capital requirements: assuming a Tier 1 ratio of 8.5%, a minimum leverage ratio of 3% (Tier 1 capital/exposures) is equivalent to a 35% risk weight of the sovereign exposures (where binding). Clearly, this weight does not discriminate between sovereigns of different creditworthiness.

Table 6 shows the effects of Italian banks' sovereign exposures on their leverage ratio: on average, sovereign exposures account for about 60 basis points of their leverage ratios.

Table 6 - Sovereign exposures and leverage ratio

(%)

Banking group	Leverage ratio (LR)	LR without sov. exposures	Sov. exposures impact on LR
Min	2.5	3.0	0.3
Max	7.9	9.4	1.5
Median	5.5	6.4	0.8
Total (weighted avg.)	**5.0**	**5.6**	**0.6**

Note: consolidated data as of June 2014. Supervisory data and QIS reporting.

[38] The excess exposures refer to some banks in the national banking system involved.

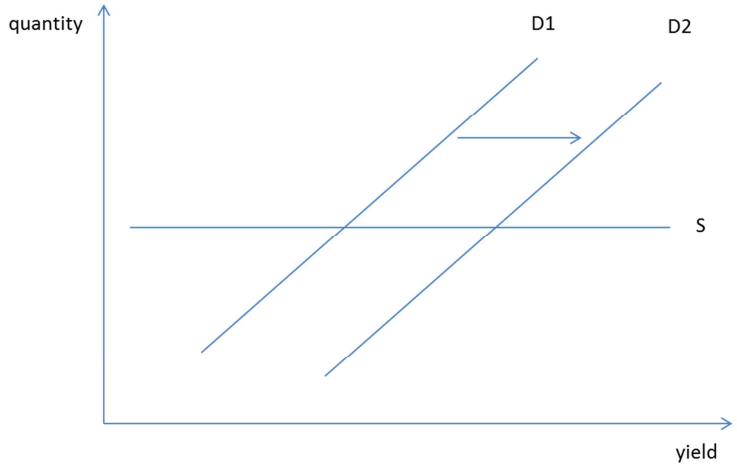
5. How large is the potential impact of tighter regulation? Macroeconomic effects

5.1 A revision of risk weights

In this section we estimate how an increase in the prudential risk weights applied to sovereign exposures could impact on the sovereign bond market.

We conduct our analysis through a stylized partial equilibrium model of supply and demand for sovereign bonds. On the demand side, we posit that sovereign bonds behave as a normal good, that is, the higher their yield (*ceteris paribus*) the higher the quantity demanded. This is an important assumption: experience gained during the sovereign debt crisis suggests that it may hold in normal times, but it may break down under exceptional circumstances. We also postulate that the supply of sovereign bonds is perfectly inelastic. This is plausible over the short run because institutional and political constraints often make it difficult for governments to adjust significantly their budgets and their cash needs within a short period of time. Recent empirical evidence suggests that, in any case, the supply of government bonds has a low interest rate sensitivity (Grande, Masciantonio and Tiseno 2014).

Figure 3 - Increased risk weights are a demand shifter akin to a tax



An increase in sovereign risk weights reduces the net yield a bank obtains on a sovereign bond. Such an increase forces the bank to hold more capital, that is, to tilt the composition of its liabilities towards more expensive sources of financing. The added cost of capital can be thought of as a parallel demand shifter: if a bank demanded a certain amount of sovereign bonds for a given gross yield before the rise in sovereign risk weights, it will keep demanding the same quantity of bonds only if their gross yield rises by an amount equal to the added cost of capital. In other words, the increase in risk weights will behave like a tax, as illustrated in Figure 3, where S is the inelastic government supply, D1 is the demand for bonds before the increase and D2 is the demand after the increase. As is well known from the microeconomic theory of taxation, the burden of a tax is higher for the more inelastic side of the market. In our case, the burden is by assumption entirely absorbed by the government.

Note, however, that the demand curve shifts by less than the increase in the tax because the tax is applied only to a part of the demand, that is, government bonds demanded by banks. In formal terms, suppose that the quantity demanded by banks is

$$q^B = \alpha^B + \beta^B y$$

where y is the bond yield, and that the quantity demanded by all other investors (non-banks) is

$$q^{NB} = \alpha^{NB} + \beta^{NB} y$$

An increase in risk weights leaves q^{NB} unaffected, but changes q^B as follows:

$$q^B = \alpha^B + \beta^B (y - c)$$

where c is the additional yield required by banks to compensate for the increase in their cost of financing government bond holdings.

Denote the fixed supply of bonds by q^S. Given that $q^S = q^B + q^{NB}$, the equilibrium yield shifts from

$$y = \frac{1}{\beta^B + \beta^{NB}} q^S - \frac{\alpha^B + \alpha^{NB}}{\beta^B + \beta^{NB}}$$

to

$$y = \frac{1}{\beta^B + \beta^{NB}} q^S - \frac{\alpha^B + \alpha^{NB}}{\beta^B + \beta^{NB}} + \frac{\beta^B}{\beta^B + \beta^{NB}} c$$

Thus, the shift is proportional to c, but with a coefficient of proportionality lower than one. The constant of proportionality depends on the coefficients β^B and β^{NB}, which in turn can be seen as the product of the quantities demanded in equilibrium by the two sectors and their respective elasticities of demand: the higher the quantities held in equilibrium by the non-bank sector and the higher its elasticity of demand, the lower is the impact of a revision of risk weights.

The last equation also makes it clear that there are two main sources of uncertainty in quantifying the impact of a revision of risk weights: on the one hand, one needs an estimate of the elasticities of demand for the two sectors, which to our knowledge are not available in the literature; on the other hand, one needs to estimate the increase in the cost of capital c. While there is an abundant policy-oriented literature on the estimation of c, any estimate is nonetheless surrounded by considerable uncertainty.

We assume that the elasticities of demand are equal across sectors, so that the ratio

$$\frac{dy}{dc} = \frac{\beta^B}{\beta^B + \beta^{NB}}$$

depends only on the shares of government bonds held by the two sectors.[39] Based on financial accounts data on holdings of Italian government securities (and on an estimate of

[39]Note that

the share of foreign banks), the ratio for Italy is estimated to be around 40% (this is only slightly higher than the estimate by Barclays, 2014). As stated above, this estimate of *dy*/*dc* is based on the assumption that demand by non-banks will be unaffected by the reform. However, there are reasons to believe that this assumption could prove excessively optimistic. In particular, the insurance sector could also be affected by prudential reforms and decrease its demand for domestic sovereign bonds, similarly to the banking sector (see below for more details). Furthermore, demand by other sectors could react very slowly to changes in yield. For example, there is ample empirical evidence that portfolio rebalancing by households is quite infrequent (e.g. Guiso et al., 2001). Consequently, the household sector could react to an increase in government bond yields only with a considerable lag. Overall, it is not possible to rule out that the demand by other sectors will be nearly inelastic, at least over the short-to-medium term. To take these risks into account we consider two scenarios: an optimistic scenario, in which *dy*/*dc* is equal 40% (according to the calculations above), and a stress scenario, in which the demand by other sectors is assumed to be inelastic, so that *dy*/*dc* is equal to 100%.

The additional yield is the product of three factors:

$$c = w \cdot \rho \cdot (r^E - r^D)$$

where w is the increase in the risk weight applied to sovereign exposures, ρ is the target capital ratio (which is usually higher than the minimum enforced by regulations), r^E is the cost of equity and r^D is the return on the costlier source of debt for the bank. The product is obtained as follows: each additional unit holding of sovereign bonds (i.e. each holding worth 1 euro) increases risk-weighted assets by w euros; since the bank needs to hold ρ euros of capital for each euro of risk-weighted assets, the increase in capital is $w \cdot \rho$ euros; finally, the bank increases capital by replacing debt with equity (and keeping the overall size of the balance sheet constant); because r^E is the cost of equity and r^D is the cost of debt, $r^E - r^D$ is the additional cost of each unit of capital and $w \cdot \rho \cdot (r^E - r^D)$ is the additional cost for each unit holding of sovereign bonds.

$$\beta^B = \frac{dq^B}{dy} = \frac{d\exp(\ln(q^B))}{dy} = \exp(\ln(q^B))\frac{d\ln(q^B)}{dy} = q^B\frac{d\ln(q^B)}{dy}$$

and, by the same token,

$$\beta^{NB} = q^{NB}\frac{d\ln(q^{NB})}{dy}$$

Hence, the assumption that the elasticities are equal across sectors, that is,

$$\frac{d\ln(q^B)}{dy} = \frac{d\ln(q^{NB})}{dy}$$

implies the stated result. This result carries over locally to non-linear specifications of the demand function as well (for example, to logarithmic demand) once the demand function is substituted with its linear approximation around the current equilibrium.

We present results for two different values of w (2% and 10%). Given that c is linear in w, it will suffice to rescale our figures to compute the effect of revisions with different magnitudes.

We assume that the target capital ratio is ρ=14%, in line with the existing evidence that banks target capital ratios well above the regulatory minimum for precautionary motives.

As already anticipated, in order to increase the amount of regulatory capital, banks need to finance more of their assets through equity rather than debt. This reflects a situation in which a bank's capital structure is changed by raising equity to retire the costlier forms of debt (approximated by unsecured bonds). Therefore, the incremental cost of regulatory capital is approximated by the difference between the cost of equity r^E and bond yields r^D.[40] The costs of equity and debt vary across the business cycle and particularly during financial crises, but estimates exist of their long-run equilibrium values based on historical data. A recent study (MAGD, 2013) suggests that the global average cost of equity faced by the banking sector is around 11% and the global average cost of debt is around 4.5%. While these numbers are based on specific techniques and assumptions, they are broadly in line with estimates obtained using other common techniques and estimates recently published in other studies (see MAGD, 2013 for details).

By putting these estimates together we obtain that the banks' demand shifter is

$$c = w\% \cdot 14\% \cdot (11\% - 4.5\%) = w\% \cdot 0.91\%$$

This figure needs to be multiplied by the ratio of elasticities (40% or 100% depending on the scenario: see above) in order to obtain the estimated impact on Italian government bond yields, which is reported in the following table.

Table 7 – Estimated impact of a revision of risk weights
(basis points)

	Increase in risk weight	
	2%	10%
Optimistic scenario	0.7	3.6
Prudential scenario	1.8	9.1

Several caveats concerning these estimates are in order.

[40] This difference overestimates the true cost of regulatory capital because it ignores the risk shifting effects of a change in capital structure. A shift in funding sources from debt to equity (i.e. a decrease in leverage) decreases risk for both debt and equity investors and in turn reduces the required return to both debt and equity so as to offset the increased cost of shifting from debt to equity funding. In the absence of financial frictions, this offset would be perfect and there would be no cost to increasing capital (Modigliani and Miller, 1958). But since some frictions exist, the cost of increased regulatory capital is not likely to be zero. As there is no consensus on how to estimate the appropriate offset (and the empirical evidence in favour of it is scant), a conservative approach is usually chosen and the risk offset is ignored (thereby overestimating costs).

First, the estimates are derived from a comparative static exercise and therefore represent a comparison between two steady states. Our framework is silent about the transitional dynamics. In the current circumstances, transitional dynamics might be highly non-linear. Especially for those countries whose banking systems hold a high share of domestic sovereign debt, the key risk is that a change in regulation might feed back on investors' beliefs about debt sustainability. In more technical terms, our comparative statics exercise assumes a partial equilibrium in which the riskiness of government bonds is exogenously given (does not change). This assumption would cease to hold if the reform and the ensuing portfolio adjustments increased the riskiness of government bonds. In this case, the impact of the reform could be much larger than in the prudential scenario.

Second, even after the transition phase, the new equilibrium would probably be less stable than under the current rules, as banks would have less incentives to act as long-term investors, keeping prices in line with fundamentals. The probability of self-fulfilling crises, which is inherent in government bond markets (Calvo, 1988; Ardagna et al., 2007; Giordano et al., 2013; De Grauwe and Yi, 2013) would also increase. Coeteris paribus, exogenous tensions in market conditions would cause larger increases in sovereign bonds. This additional effects are not included in our calculations.

Third, the assumption that the demand schedule of non-banks will be unaffected by the reform (in the optimistic scenario) or that non-banks will not alter their holdings of government bonds (in the prudential scenario) could prove wrong. In particular, the insurance sector, which also holds significant amounts of government bonds (especially domestic),[41] could be affected by the application of new rules (similar to those for banks) under the Solvency II regime (see Appendix). If this is the case, the bulk of the sovereign bonds sold by banks and insurance companies would have to be bought by the household sector, by foreign investors and by other financial intermediaries. This in turn could lead to a crowding out of households' demand for deposits and other bank liabilities, with negative effects on bank lending to the real economy – an effect that is not captured by the simple framework outlined above.

Fourth, estimates based on past data may be of limited help to forecast the impact of an increase in the supply of government bonds which is quite unprecedented in size.

As already mentioned, the burden of the increase in risk weights falls mainly on the government because of its inelastic supply schedule. However, there are also transitional costs, stemming from the capital losses that government bond holders incur when yields increase (and prices decrease). Furthermore, there could be significant macroeconomic implications if banks decide to deleverage in order to address at least part of the capital shortfall arising from the revision of sovereign risk weights. As a matter of fact, any significant deleveraging could cause further credit tightening, reduce economic growth, and eventually also have an impact on fiscal balances.

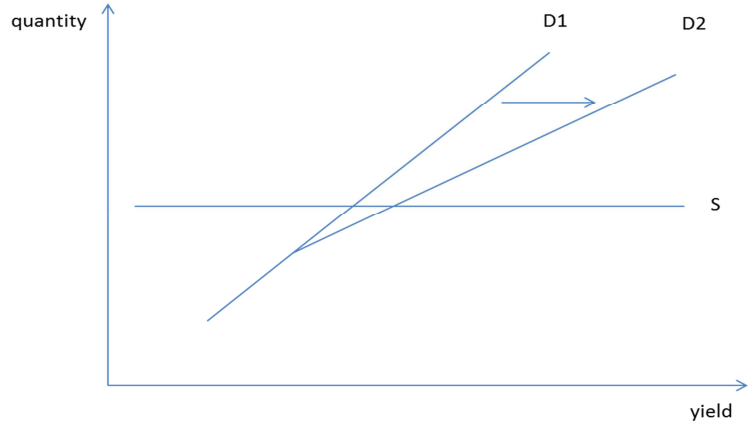
[41] Insurance companies held about 260 billion euros of Italian sovereigns bonds as of September 2014.

5.2 A revision of concentration limits

We now turn to the possible impact of the introduction of concentration limits on sovereign exposures. To do this we use the same conceptual framework as above and we analyse three hypothetical values for the cap on the ratio between the exposure towards a single sovereign and capital (100%, 150% and 200%).[42]

Conceptually, the fact that the concentration limit is binding means that a kink is introduced in the demand curve (the curve becomes less steep above the kink;[43] see Figure 4).

Figure 4 - Concentration limits introduce a kink in the demand curve



The exposure of Italian banks to Italian sovereign bonds is around 200% of Tier 1 capital (see previous sections). So, for example, with a 100% concentration limit (one of the values in the range we consider), the introduction of the cap would force the banks to shed 50% of their holdings of sovereign bonds.[44] This would amount to around 200 billion euros, or 13% of GDP.

To assess the impact of a reduction in bank holdings on sovereign yields, we use the demand elasticity estimated by Grande, Masciantonio and Tiseno (2014). They estimate that a 1% increase in the debt-to-GDP ratio raises yields by 0.02%, all other things being equal.

In our case, the elasticity needs to be scaled up by a factor to take into account the fact that bonds shed by banks will be bought by a reduced investor base, which, tautologically, excludes banks. In an optimistic scenario (see previous section), the demand of other sectors remains unaffected. Thus, the scaling factor is equal to the reciprocal of the

[42] The cap could be introduced on risk-weighted exposures rather than on raw exposures.

[43] Note that the slope is still positive after the kink because it is the sum of a flat demand by banks and an upward sloping demand by non-banks.

[44] This, of course, is an approximation. An exact calculation should be done on a micro level and then aggregated. However, the 50% figure is also obtained from the calculations done on a sample of large banks.

share of government bonds not held by Italian banks, that is, 1.28, and the rescaled elasticity is about 0.025%. As before, we also consider a stress scenario in which insurance companies do not buy bonds shed by banks and households' demand does not react to changes in yield in the medium-to-short run. In such a scenario, the scaling factor would be around 2 and the rescaled elasticity would be around 0.04%.[45]

By multiplying rescaled demand elasticities by the reduction in banks' demand (expressed as a percentage of GDP) we obtain the estimated impact of the introduction of the cap on government yields, which is reported in the following table.

Table 8 – Estimated impact of an introduction of concentration limits
(basis points)

	Concentration limit		
	100%	150%	200%
Optimistic scenario	32	16	0
Prudential scenario	51	26	0

As before, these estimates overlook potentially dangerous transitional dynamics and the increased risk – in the new equilibrium – of self-fulfilling changes in the riskiness of government bonds that could make the impact much greater.

Furthermore, there are factors that could bias the estimates, both to the upside and to the downside. On the one hand (positive bias), our partial equilibrium approach does not allow us to take into account the fact that introducing concentration limits would force banks residing in other countries as well to hold more diversified sovereign exposures and thus the demand for Italian bonds from abroad would probably increase and partially offset the decrease in domestic demand. On the other hand (negative bias), the estimated elasticity we have used could be too low. For example, Grande, Masciantonio and Tiseno (2014) highlight that under some model specifications the elasticity is estimated to be around 0.03% (instead of 0.02%); such an increase in elasticity would make the impact 50% greater.

If insurance companies as well, under the Solvency II regime, face a change in regulation similar to that of banks, they might also be forced to shed government bonds, contrary to our implicit assumption that they will be buyers of the bonds shed by banks, together with all the other sectors of the economy (in the optimistic scenario) or that they will not alter their holdings of government bonds (in the prudential scenario). In any case, it is unlikely that the additional demand needed to absorb the sales made by banks will come from insurance companies as they already hold about 280 billion euros in sovereign bonds, as of September 2014.

[45] In this scenario only central banks, foreign investors and non-bank and non-insurance financial institutions would buy the bonds shed by banks.

Finally, there could be risk-shifting effects: if banks replace government bonds with other assets that have a similar expected return, these assets may be riskier than government bonds, so that the overall riskiness of banks will eventually increase.

6. Implementation issues

Reforming current prudential rules on sovereign risk would require, among other things, the development of a new methodology for quantifying capital requirements. In this section, we analyse the shortcomings of the current methodology based on external ratings and explore a new approach, outlining an alternative proposal.

6.1 Limitations of credit ratings

There are a number of difficulties in relying on credit ratings to build plausible risk weights for sovereigns (IMF, 2010).

First of all, there is evidence that downgrades are not timely: rating agencies prefer not to change ratings frequently and, when the downgrade arrives, it is often sharp (two or more notches). This 'too-late too-much' behaviour reduces the information content of ratings and induces pro-cyclicality in prices.

Furthermore, using ratings for regulatory purposes itself creates well-known 'threshold effects', especially when a bond exits from the investment grade category. This adds to the pro-cyclicality of rating changes. Indeed, a downgrade may abruptly reduce institutional demand and market liquidity, triggering further sales.

Concerning the accuracy of ratings, these are not meant to be a quantitative risk measure (i.e. a default probability or an estimated monetary loss in case of default), but mostly an ordinal ranking (IMF, 2010). In the case of sovereign ratings, further caveats apply. First, their accuracy is undermined by the fact that a sovereign default is a rare event, so that extrapolation from the past is difficult. Second, in the case of a sovereign borrower not only the ability, but also the willingness to pay becomes a crucial element. Political and institutional considerations are therefore crucial to the rating decision. National and supranational authorities currently tend to reduce reliance on ratings in regulation, along the lines suggested by the Financial Stability Board as a follow up to a specific request of the G20 Leaders (Financial Stability Board, 2010). A final argument applies specifically to government debt. Whereas it may be argued that rating agencies reap sizeable benefits of scale in the case of ratings of firms as each lender would otherwise be forced to invest in information gathering, such considerations do not apply to sovereigns.

6.2 A possible role for fiscal sustainability indicators

Conceptually, a country's public debt is sustainable if it is not larger than the discounted value of the government's current and future primary surpluses, that is, if the

current level of debt and the current fiscal stance are such that the inter-temporal budget constraint of the government is satisfied.[46]

Several measures have been developed to capture the size of the change in public policies that is needed in order to achieve long-run fiscal sustainability. Some of them are endorsed by international institutions, such as the S2 indicator regularly computed by the European Commission (European Commission, 2012).[47]

Long-run fiscal sustainability indicators would have a series of advantages if used as a measure of sovereign risk: they are based on a country's fundamentals and they are not influenced by short-run fluctuations of financial markets or of the economy; some of them are firmly grounded in economic analysis;[48] they rely on very sophisticated and data-intensive long-run projections that take into account demographic developments and their interactions with current fiscal policies; and they are computed by independent bodies for several countries using a common methodology.

They also have their own shortcomings. First, they typically (even if not always) focus on a 'central' scenario, neglecting the risk that such a baseline scenario might not materialize. Among the more prominent risk factors are the negative shocks to growth or market interest rates, and the risks arising from a fragile and over-exposed financial sector (which could require financial support from the public sector in some circumstances). Even more difficult to quantify (but crucial in the case of sovereign borrowers, as noted above) is the political risk, which partly depends on institutional factors, including the presence, or otherwise, of appropriate budgetary rules and procedures.

Second, they are unable to capture liquidity risk. As remarked by the ECB (2014): 'governments can encounter the risk of a liquidity crisis even if they are not experiencing any solvency problems'. The events of 2011-13 have shown clearly that short-term fiscal risk may depend crucially on investors' beliefs. If investors coordinate on an 'unsustainability equilibrium', owing among other things to the perceived lack of a backstop by a central bank, the equilibrium may become self-fulfilling. A role may also be played by the maturity, indexation, and currency denomination of the outstanding debt (obviously, long-term domestic-currency-issued debt poses fewer refinancing risks in the short-to-medium run), as well as by the investor base (domestic lenders being probably a more stable source of funding than foreigners). These factors are not considered by standard sustainability indicators.

[46] A short introduction to the issue can be found in Balassone and Franco (2000), Balassone et al. (2009), and Cottarelli and Escolano (2014). Of course, the debt-to-GDP ratio per se is not a reliable sustainability indicator. As documented by Reinhart and Rogoff (2009), among others, several sovereign defaults happened at relatively low debt levels (e.g. below 50% of GDP) and there are cases in which very high debt levels (e.g. Japan today or in England in the 18th century) have been sustained without causing market tensions.

[47] Put simply, S2 is equal to the immediate and permanent increase in a government's structural budget balance that is just sufficient to satisfy its inter-temporal budget constraint. This constraint, in turn, requires that the sum of the outstanding public debt and of the net present value of government primary expenditures be less than or equal to the net present value of government revenues.

[48] For example, the S2 indicator is based on the inter-temporal budget constraint of the government, which has to hold in equilibrium in most theoretical micro-founded infinite-horizon macroeconomic models.

Early warning indicators of fiscal risk recently introduced by the IMF (for details on the methodology, see Baldacci et al., 2011; the latest application is in IMF, 2014) and by the EU commission (see Berti et al., 2012; European Commission, 2012) avoid the main pitfalls of credit ratings and may usefully complement the more established long-run fiscal sustainability indicators. Such indicators are supported by the ECB (2014), according to which 'early warning indicators for fiscal stress can be important tools for budgetary surveillance in order to allow economic policy time to counteract adverse developments and to help prevent the occurrence of major crises in the first place' and 'there is a strong case for the usefulness of such early warning indicators in general,' even if they have some limitations.[49]

Early warning indicators are based on a wide array of variables. The IMF indicators include variables that are frequently used in analyses of public debt sustainability: the cyclically-adjusted government deficit, the gross public debt, the gross financing needs of the public sector, the interest rate growth differential, and the long-run increase in pension and health spending. Compared with standard long-run sustainability analyses, the inclusion of the government's gross financing needs can be seen as providing a rough proxy of the short-term refinancing risks. The IMF indicator also includes measures of the impact on the debt-to-GDP ratio of lower than expected growth,[50] an increase in market interest rates,[51] and a bail-out of the banking sector multiplied by the probability of a banking crisis (computed from CDS prices).

For each variable, a threshold value is chosen to maximize the predictive power of the variable as a one-year-ahead leading indicator of a fiscal crisis. This is done by looking at the behaviour of the variable in the period before a crisis. A crisis is in turn identified as a period in which a default/restructuring happens, the country enters an IMF-supported programme, the inflation rate exceeds 35%, or the sovereign spread exceeds 1000 basis points or is more than 2 standard deviations from its historical country mean.

As a final step an aggregate indicator is built, which depends on how many variables are above their 'stress threshold' and by how much; variables with greater predictive ability have more weight in the final outcome. Table 9 shows the output of the procedure as taken from the IMF fiscal monitor of April 2014. The last column of the table displays the values for the aggregate indicator.

The IMF indicator and the related sub-indicators are continuous variables, taking values between 0 and 1, even if the IMF summarizes this information in its publications

[49] 'Several caveats need to be borne in mind. First, all predictions of early warning indicators are based on observations of historical crises, but future crisis events and their triggers might differ fundamentally from past crises. Second, the ex-post data employed in a system of early warning indicators are usually only available with a time lag and may be subject to revision. Data availability and quality can therefore greatly affect the signalling power of early warning indicators. Third, it should be noted that, even if impending fiscal crises are signalled correctly, there might not be enough time left to counteract the critical developments' (ECB, 2014).

[50] The adverse shock to growth is taken to be the difference between the IMF growth forecast and the average prediction of the professional forecasters who are more pessimistic than the IMF.

[51] A one-standard-deviation increase is assumed.

using three different brackets, with integer values from 1 to 3 denoting low, medium and high risk. Of course, the number of buckets could be increased.

Table 9 – IMF fiscal risk indicators

	Underlying indicators (1)								Overall index
	Gross financing needs	Interest rate-growth differential	CAPB	Gross Debt	Increase in health and pension spending 2014-2030	Sensitivity to growth	Sensitivity to interest rate	Sensitivity to a banking crisis	
Italy	3	2	1	3	1	2	3	3	**3**
Germany	1	1	1	3	2	2	1	3	**2**
France	2	1	1	3	2	3	2	2	**2**
Spain	3	2	1	3	2	2	3	3	**3**
Netherlands	2	2	1	3	3	3	2	3	**3**
Belgium	2	2	1	3	3	2	2	1	**2**
Austria	1	1	1	3	3	2	2	3	**2**
Finland	1	2	1	2	3	1	1	3	**2**
Greece	2	2	1	3	2	3	3	3	**3**
Portugal	3	2	1	3	2	3	3	3	**3**
Ireland	1	2	1	3	2	3	2	2	**2**
UK	1	1	2	3	2	2	2	3	**2**
USA	3	1	1	3	3	2	1	1	**2**
memo item:									
Threshold values (2)	*17.2% of GDP*	*3.60%*	*4.2% of GDP*	*72.2% of GDP*	*3% of GDP*				

Source: IMF, Fiscal Monitor, April 2014.

(1): **3** if the indicator is above the threshold; **2** if it is less than one s.d. below the threshold; **1** if it is more than one s.d. below the threshold. (2) Taken from Baldacci et al. (2011).

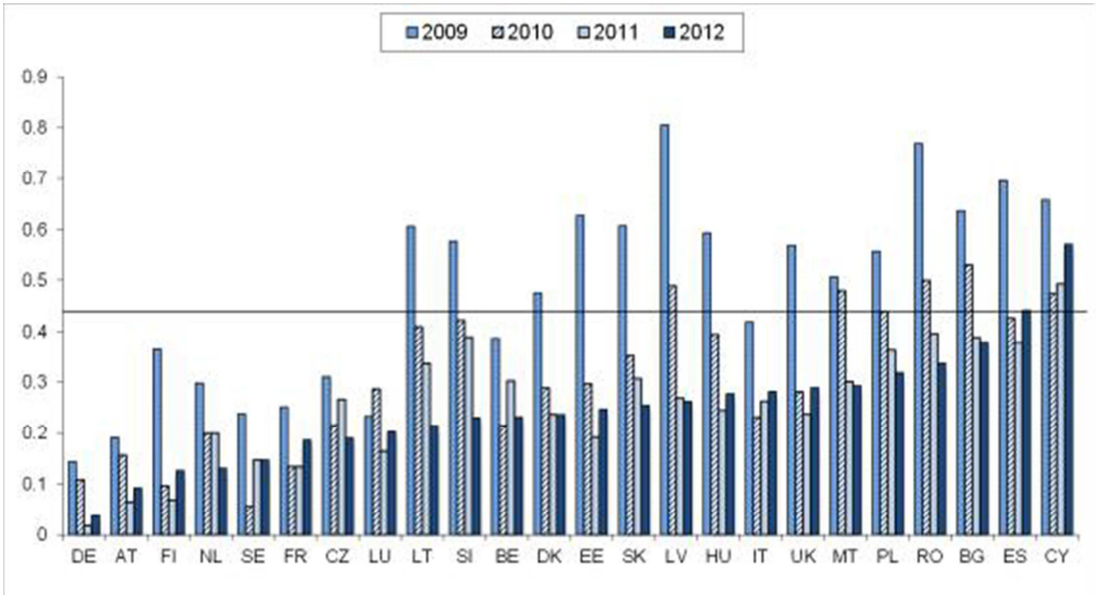
Figure 5 below reports a similar indicator for EU countries, called the S0, recently published by the European Commission (see Berti et al., 2012). The S0 adopts the IMF definition of what is a crisis episode, but considers many more (28) variables, aggregated in two sub-indices. The first includes fiscal variables, the second is a 'financial competitiveness' indicator that includes many variables from the macroeconomic imbalance procedure scoreboard.[52] However, in some cases the indicators included in the S0 overlap with one another, are some of them lack a bullet-proof justification in terms of economic theory.

Indicators in this family are promising because they are more transparent, more oriented towards fundamentals and therefore far less pro-cyclical than credit ratings; if used together with long-run fiscal sustainability indicators, they can provide useful additional information. Moreover, as the indicators generally do not change abruptly,

[52] The fiscal sub-index includes the deficit, the primary balance, the cyclically-adjusted balance, the stabilizing primary balance, the gross debt, the change in gross debt, the amount of short-term debt, the net debt, the gross financing needs, the change in expenditure, the change in final consumption, the average yearly change in projected age-related expenditure, the old-age dependency ratio 20 years ahead, and the interest rate growth rate differential. The financial sub-index includes the net international investment position, net savings of households, the credit flow to the private sector, leverage of financial corporations, short-term debt of non-financial corporations, short-term debt of households, the fraction of value added coming from the construction sector, the current account, the change in the real effective exchange rate, the change in nominal unit labour costs, the slope of the yield curve, real GDP growth, and GDP per capita in PPP.

relating risk weights to these factors should be much less destabilizing than linking them to ratings, which sometimes jump by several notches at once.[53]

Figure 5 - The S0 indicator for EU countries, 2009-12



Source: EC (2012)

Gros (2013) suggests a somewhat similar approach for the euro area, arguing that banks' risk weights could be linked to the stages of the Excessive Deficit Procedure (EDP): when the procedure is launched, the risk weight could be increased by a certain amount; for each additional stage that the EDP is ratcheted up, the risk weighting could be increased further. He also suggests that the ECB should adopt a similar tactic for the haircuts it imposes on sovereign debt in its collateral framework. While both the Commission's S0 and S2 and Gros's (2013) suggestions appear too focused on the European institutional framework, and connecting the weights on the EDP stages might be troublesome (partly owing to the somewhat 'political' dimension of the decision to start an EDP), one could envisage a sort of minimal set of indicators to be enshrined in the Basel principles, with the possibility of including other variables in national (or EU) legislation if they are considered relevant. The bottom-up methodology should of course remain the same (weights should be attached to indicators based on the same statistical procedure).

The IMF indicator is not perfect: first of all, as sovereign defaults in advanced economies are very rare events, the size and quality of the sample is very limited and statistical inference is quite difficult. Second, the indicator retains some elements of judgment when it comes to the last three indicators: these are based on definitions of 'negative shocks' with respect to the baseline that are somewhat arbitrary. Third, the

[53] Fiscal sustainability indicators are not more complex to compute than ratings; indeed, rating agencies use basically the same information and add difficult to assess qualitative judgments.

indicator of the cost of bank bailout is a function of market data and therefore risks being biased and pro-cyclical. Finally, the way in which these shocks are translated into a value between 1 and 3 is model based but not very easy to explain.[54]

Before concluding, we should mention that in some jurisdictions (most notably in the US after the approval of the Dodd-Frank Act) the OECD country risk classification (CRC) is adopted for regulatory purposes. The US agencies use the following mapping (Table 10).

Table 10 - Sovereign risk weights in the US

		Risk Weight
Sovereign CRC	0-1	0%
	2	20%
	3	50%
	4-6	100%
	7	150%
OECD member with No CRC		0%
Non-OECD member with no CRC		100%
Sovereign default		150%

Note: based on the OECD Country Risk Classification (CRC)

However, the OECD itself emphatically stresses that this classification aims to capture country risk and is not a sovereign risk classification.[55] Furthermore, the CRC index is by convention equal to zero for all high-income OECD countries.

7. Conclusions

The debate on the reform of the prudential rules on banks' sovereign exposures is still under way. While current rules are of course neither perfect nor written in stone, the

[54] The second and third limitations could be addressed by substituting the three 'fiscal risk' sub-indices with others that were included in a previous version of the indicator, namely, the fraction held by foreigners and the average maturity of debt. These variables are objective, publicly available, and clearly related to roll-over risk.

[55] OECD defines country risk as 'transfer and convertibility risk (i.e. the risk a government imposes capital or exchange controls that prevent an entity from converting local currency into foreign currency and/or transferring funds to creditors located outside the country) and cases of force majeure (e.g. war, expropriation, revolution, civil disturbance, floods, earthquakes).'

present paper provides a word of caution about the potential benefits and costs of tighter regulation in this area.

Concerning the benefits, one should keep in mind that increasing capital charges on sovereign exposures can hardly be a sufficient safeguard against 'tail events' such as sovereign defaults. Indeed, not only regulation does not seem to be a major cause of the observed 'home bias' of financial institutions, but also, at a deeper level, the role of the sovereign in a modern economy is so pervasive and crucial that sovereign debt turmoil inevitably translates into severe economic damage. Sovereign debt tensions usually cause widespread defaults in the household and corporate sectors, financial market tensions, and ultimately have a severe impact on the banking sector. Therefore, a change in regulation aiming at insulating a banking system from the default of its domestic sovereign is unlikely to achieve its target.

Furthermore, we highlight that there are already elements of the current prudential framework that take sovereign riskiness into consideration: the leverage ratio regime considers sovereign exposures; the 2011 EBA Recommendation on Capital asked banks to build capital buffers against their sovereign exposures; and stress testing exercises, such as those performed in 2014 in the European Union, explicitly considered stressed scenarios applied to sovereigns and asked banks to strengthen, where necessary, their capital buffers against sovereign exposures.

As to the possible costs, we provide estimates, for a wide sample of major EU banks and under different reform scenarios, of the possible effects of the revision of the current prudential treatment of sovereign exposures. We find that the effects of removing the current zero risk weight may be manageable if weights are moderate, but that imposing tight concentration limits on sovereign exposures could have significant effects.

The reduction in banks' sovereign exposures could lead to increases in sovereign yields. Our computations suggest that in normal times the effect could be moderate, but the estimates are highly uncertain, as they depend on several factors. First and foremost, we assume that the reaction of investors to the available supply of sovereign bonds is linear, whereas one cannot exclude (as highlighted by several empirical and theoretical contributions) the possibility of non-linearities and multiple equilibria. These could materialize in the presence of market tensions. Historical experience has shown that the demand curve can suddenly invert its slope: during the eurozone debt crisis foreign investors fled certain sovereign debt markets in spite of rising yields. This suggests that impairing domestic financial institutions' ability to purchase domestic sovereign bonds during a panic-induced crisis, when bond prices tend to move suddenly away from fundamentals, may make the financial system more fragile. Another factor affecting the estimates is the dimension of the base of investors buying the bonds shed by banks. The role of the insurance sector would probably be limited. In many EU countries this sector already holds significant amounts of domestic government bonds and it could be forced also to sell sovereign bonds if new rules similar to those for banks were introduced.

In terms of policy implications, this leads to the conclusion that the microeconomic and macroeconomic costs of a reform could be sizeable, while the benefits are uncertain. The main way to loosen the close ties between sovereigns and banks as much as possible is to strengthen the soundness of public accounts and, in Europe, to fully develop banking union. If, this notwithstanding, a revision of the current regulatory

framework is pursued, it should be based on a comprehensive approach that captures all the relevant aspects, and utmost attention should be paid to its implementation. As is commonly acknowledged, even by advocates of tighter regulation, any new rules should be phased in very gradually, but the tendency of markets to frontload regulatory changes could undo even a long phase-in period.

Should rules on sovereign exposures be revised, it would be necessary to identify methodologies alternative to credit ratings to assess sovereigns' creditworthiness. Not only are the credit ratings applied to sovereigns subject to the well-known problems common to ratings in general (Financial Stability Board, 2010), but they also suffer from specific limitations. We therefore suggest that a measure of sovereign creditworthiness be based on well-established and analytically sound fiscal sustainability indicators, already published on a regular basis – and with a methodology that it is consistent across countries – by several international institutions (such as the IMF and the European Commission). The literature on public debt sustainability suggests several different quantitative approaches to building metrics of sovereigns' creditworthiness. Such approaches are worth pursuing from a regulatory policy standpoint as well.

Appendix: other regulatory issues on sovereign exposures

A.1 Counterparty risk in the banking sector

The counterparty credit risk is defined as the risk that the counterparty to a transaction could default before the final settlement of the cash flows.[56]

The capital requirements for counterparty credit risk are calculated with reference to the following transactions: 1) securities financing transactions (repos, reverse repos, securities lending and borrowing transactions, margin lending transactions); 2) over the counter (OTC) derivatives; and 3) long settlement transactions. [57]

In this case, the capital requirement is calculated as the sum of the 'default risk requirement' and the 'migration risk' requirement of the counterparty. The counterparty credit risk capital requirement must be quantified for positions classified in both the banking book and the trading book.

Banks using the standardized approach assign a 0% risk weight to the instrument when the counterparty is a central government (e.g. a swap transaction) and the conditions for preferential treatment for credit risk under the standardized approach are met; banks permitted to use the IRB approach apply the risk weight calculated on the basis of PD and LGD internal estimates.[58]

While the Basel II standard covers the risk of counterparty default, it does not address the credit valuation adjustment (CVA), which assesses potential mark-to-market losses associated with a deterioration in the creditworthiness of the counterparty, including sovereign exposures.

During the financial crisis CVA was a greater source of losses than outright defaults. For this reason, in the case of OTC derivatives too the BCBS has developed a specific framework that requires banks to calculate a capital charge for CVA.

The EU rules are somewhat specific in this field too. The main difference between the Basel rules and the CRR/CRD IV package is probably that the CRR excludes transactions with counterparties such as 'the members of the ESCB and other member

[56] An economic loss would occur if the transactions or portfolio of transactions with the counterparty had a positive economic value at the time of default. Unlike a firm's exposure to credit risk through a loan, where the exposure to credit risk is unilateral and only the lending bank faces the risk of loss, the counterparty credit risk creates a bilateral risk of loss: the market value of the transaction can be positive or negative to either counterparty to the transaction. The market value is uncertain and can vary over time with the movement of underlying market factors.

[57] *Long settlement transactions* are transactions where a counterparty undertakes to deliver a security, a commodity, or a foreign exchange amount against cash, other financial instruments, or commodities, or vice versa, at a settlement or delivery date specified by contract that is later than the market standard for this particular type of transaction or 5 business days after the date on which the institution enters into the transaction, whichever is earlier.

[58] The banks using the IRB approach that are permitted to use the permanent partial use (PPU) for exposures to central governments apply the standardized approach risk weight (0% in the light of the preferential treatment set out in the CRR).

states' bodies performing similar functions and other Union public bodies charged with or intervening in the management of the public debt…'[59] from the own funds requirements for CVA risk. Since exposures to central governments fall within the above definition, OTC derivative transactions with central governments are not subject to the CVA risk requirement. Table A.1, at the end of the Appendix, summarizes the main findings of the regulation affecting the banking sector.

A.2 The treatment of sovereign risk in the insurance sector: Solvency II

The Solvency II project, which has evolved out of the Solvency I Directive,[60] is an EU specific prudential framework for insurance and reinsurance undertakings[61] that will enter into force on 1 January 2016. Solvency II makes extensive use of the fair value principle. The technical provisions to cover expected future claims from policyholders must be equivalent to the amount another insurer would be expected to pay in order to take over and meet the insurer's obligations to policyholders. In addition, insurers must have sufficient resources available to cover both a Minimum Capital Requirement (MCR) and a Solvency Capital Requirement (SCR).

The SCR is based on a Value-at-Risk measure of technical provisions, calibrated to a 99.5% confidence level over a 1-year time horizon. The SCR covers all risks that an insurer faces (e.g. insurance, market, credit and operational risk) and takes full account of any risk mitigation techniques applied by the insurer (e.g. reinsurance and securitization). The SCR may be calculated using either a new European standard formula or an internal model validated by the competent supervisory authority.

As for market risks, Solvency II requires insurers to take into consideration the following risk categories: interest rates, equities, real estate, credit spreads, exchange rates, concentration risks, and illiquidity.

No provisions are required regarding credits spreads, [62] concentration and counterparty credit risk on European sovereign exposures in the standard formula. Insurers authorized to use internal models should take into account all risks, including those relating to sovereign exposures but, unlike the Basel III package, the framework does not provide for specific rules.

The MCR is the threshold below which the national supervisor (regulator) intervenes. It corresponds to an 85% probability of adequacy over a 1-year period and is bounded between 25% and 45% of the SCR.

[59] 'Other Union public bodies charged with or intervening in the management of the public debt' are regulated by Art. 1 (4) a) of the EMIR.

[60] Like the Basel Accords, it is made up of three pillars, providing quantitative capital requirements (Pillar I), qualitative corporate governance and risk management regulations (Pillar II), and disclosure and transparency rules (Pillar III).

[61] The Solvency II Directive was adopted by the Council of the European Union and the European Parliament in November 2009.

[62] The Solvency II standard formula SCR credit spread risk requirement depends on rating and on duration. EEA sovereign bonds (and equivalents) are zero rated irrespective of credit rating.

From a supervisory perspective the SCR and MCR can be regarded as a 'soft' and 'hard' floor. The regulatory ladder of intervention applies once the capital holding of the insurance undertaking falls below the SCR, whereas intervention is progressively stepped up as the capital holding approaches the MCR.

A.3 Other regulatory frameworks

The European Market Infrastructure Regulation (EMIR)[63] provides that certain OTC derivative contracts should be cleared through a central counterparty (CCP) and that the CCP, in collecting the initial and daily margins accepted as collateral, determines by means of internal procedures the haircut to be applied to those margins. The recent financial turmoil has shown that haircuts applied by CCPs have been very high in some cases and that this has profoundly affected the liquidity and collateral management of many banks since sovereign bonds are normally used as collateral in these transactions.

In the case of OTC derivative contracts not cleared by a CCP (bilateral transactions), the haircut applied to government bonds might be even more penalizing because of the credit rating. In these cases what regulators and banks have experienced so far is that there is no preferential treatment for sovereign bonds. Currently there is no harmonized regulation in this area. Accordingly, banks require different haircuts based on the strength of the counterparties and the quality of the financial collateral (i.e. the issuer). Finally, at European level, the EBA, the ESMA and the EIOSA are working on a 'Consultation Paper on draft RTS on risk-mitigation techniques for OTC-derivative contracts not cleared by a CCP under Article 11(15) of Regulation (EU) No 648/2012'. The rules set out in this document do not provide for a special treatment for sovereign bonds.

The EU Directive on harmonized collective investment schemes (UCITS IV[64]) sets specific limits on investments in financial instruments in order to ensure adequate diversification. However, a specific derogation is envisaged for sovereign exposures.

Concerning the link between investment funds transactions and government bonds, when the European regulation on credit rating agencies[65] was reviewed, with the objective of avoiding mechanical reliance on ECAI ratings, some amendments were made to the EU Directives on collective investment schemes. It was established that investment policies should not be based mechanically on ECAI ratings but on asset managers' assessments of the creditworthiness of issuers. Furthermore, reliance on ratings in the settlement of funds will be reduced gradually to avoid any rapid divestment of securities – including government bonds – and the consequent negative impact on market stability.

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[63] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories.

[64] Directive 2009/65/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS).

[65] Regulation (EU) No 462/2013 of the European Parliament and of the Council of 21 May 2013 amending Regulation (EC) No 1060/2009 on credit rating agencies.

Table A.1 – Main findings of the sovereign exposure regulation affecting the banking sector

	Credit risk		Market risk		Large exposures		Leverage ratio		Liquidity coverage ratio	
	Basel	CRD-CRR	Basel	CRD-CRR	Basel	CRD-CRR	Basel	CRD-CRR	Basel	CRD-CRR
Standard approach	Exposures to sovereigns are risk weighted according to an external rating	Exposures to sovereigns are risk weighted according to an external rating	General risk: sovereign exposures are included	General risk: sovereign exposures are included	No specific treatment currently envisaged. Treatment will be defined under the holistic approach	Exposures to sovereigns that receive a 0% risk weight under the standard approach are excluded from the large exposure limits	No specific treatment is envisaged for sovereign exposures	No specific treatment is envisaged for sovereign exposures	Securities risk weighted at 0% under the standard approach can be classified in level 1 buffer without limit	Securities risk weighted at 0% under the standard approach can be classified in level 1 buffer without limit
	Carve-out rule	Carve-out rule	Specific risk: sovereign exposures are risk weighted based on the nature of counterparty and maturity	Specific risk: sovereign exposures are risk weighted based on the nature of counterparty and maturity					Carve-out rule	Carve-out rule
	Applied to exposures vs the domestic sovereign, denominated in domestic currency	Applied to exposures vs any EU sovereign denominated in domestic currency	Specific risk: sovereign exposures are risk weighted based on the nature of counterparty and maturity	Specific risk: sovereign exposures are risk weighted based on the nature of counterparty and maturity					Applied to exposures vs the domestic sovereign, denominated in domestic currency	Applied to exposures vs any EU sovereign denominated in domestic currency
IRB approach	Permanent partial use rule	Permanent partial use rule	No special treatment	No special treatment						
	Not envisaged	IRB banks can apply the standardized approach, provided the exposures are assigned a 0% risk weight under standardized approach								

REFERENCES

Acharya, V.V. and Steffen, S. (2014), 'The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks', *Journal of Financial Economics*, forthcoming.

Adelino M. and M. Ferreira (2014) 'Bank ratings and lending supply: evidence from sovereign downgrades', mimeo.

Angelini P, Grande, G. and Panetta, F. (2014), 'The negative feedback loop between banks and sovereigns', Questioni di Economia e Finanza (Occasional Papers), 213, Banca d'Italia.

Ardagna S., Caselli, F. and Lane, T. (2007), 'Fiscal Discipline and the Cost of Public Debt Service: Some Estimates for OECD Countries', *B.E. Journal of Macroeconomics*, 7(1), pp. 1-35.

Barclays (2014) 'Sovereign risk weights for European banks', *Cross Asset Research*.

Balassone, F. and Franco, D. (2000), 'Assessing fiscal sustainability: a review of methods with a view to EMU', in *Fiscal Sustainability - Essays Presented at the Public Finance Workshop Held in Perugia*, 20-22 January 2000, Banca d'Italia.

Balassone, F., Cunha, J., Langenus, G., Manzke, B., Pavot, J., Prammer, D. and Tommasino, P. (2009), 'Fiscal sustainability and policy implications for the euro area', *ECB Working Paper*, No. 994.

Baldacci, E., I. Petrova, N. Belhocine, G. Dobrescu, and S. Mazraani (2011), 'Assessing Fiscal Stress', *IMF Working Paper* 11/100.

Battistini, N., Pagano, M. and Simonelli, S. (2014), 'Systemic risk, sovereign yields and bank exposures in the euro crisis', *Economic Policy*, 29(78), pp. 203–251.

Berti, K., Salto, M. and Lequien, M. (2012), 'An early-detection index of fiscal stress for EU countries', *European Economy - Economic Papers*, No. 475.

Bocola, L. (2015) 'The Pass-Through of Sovereign Risk', *Journal of Political Economy* (forthcoming).

Caballero, R.J. and Farhi, E. (2014), 'The Safety Trap', *NBER Working Paper*, No. 19927.

Calvo, G.A. (1988), 'Servicing the Public Debt: The Role of Expectations', *American Economic Review*, 78(4), pp. 647-61.

Castro, C. and Mencía, J. (2014), 'Sovereign risk and financial stability', *Estabilitad Financiera*, No. 26, Banco de España.

CGFS, Committee on the Global Financial System (2011), 'The impact of sovereign credit risk on bank funding conditions', *CGFS Papers*, No. 43.

Cottarelli, C. (2014), 'Fiscal sustainability and fiscal risk: an analytical framework', in Cottarelli, C., Gerson, P., Senhadji, A. (eds), *Post-crisis fiscal policy*, MIT press, Boston, Mass.

Cottarelli, C. and Escolano, J. (2014), 'Debt dynamics and debt sustainability', in Cottarelli, C., Gerson, P., Senhadji, A. (eds), *Post-crisis fiscal policy*, MIT press, Boston, Mass.

Coeurdacier, N. and Rey, H. (2013), 'Home Bias in Open Economy Financial Macroeconomics', *Journal of Economic Literature*, 51(1), pp. 63-115.

De Grauwe, P. and Ji, Y. (2013), 'Self-fulfilling crises in the Eurozone: An empirical test', *Journal of International Money and Finance*, 34(C), pp. 15-36.

European Commission – Directorate General for Economic and Financial Affairs (2012), *Fiscal sustainability report*, European Economy, No. 8, Brussels.

European Commission – Directorate General for Economic and Financial Affairs (2013), *Vade mecum on the Stability and Growth Pact*, European Economy Occasional Papers, No. 151, Brussels.

European Central Bank (2014), 'Early warning indicators for fiscal stress in European budgetary surveillance', *Monthly Bulletin*, November.

European Systemic Risk Board (2015), *Report on the regulatory treatment of sovereign exposures*.

Financial Stability Board (2010), *Principles for Reducing Reliance on CRA Ratings*.

Gande, A. and Parsley, D. C. (2005), 'News spill-overs in the sovereign debt market', *Journal of Financial Economics*, 75(3), pp. 691-734.

Giordano, R., Pericoli, M. and Tommasino, P. (2013), 'Pure or Wake-up-Call Contagion? Another Look at the EMU Sovereign Debt Crisis', *International Finance*, 16(2), pp. 131–16.

Grande, G., Masciantonio, S. and Tiseno, A. (2014), 'The elasticity of demand for sovereign debt. Evidence from OECD Countries (1995-2011)', Temi di Discussione (Working Papers), 988, Banca d'Italia.

Gros, D. (2013), 'Banking Union with a Sovereign Virus: The self-serving regulatory treatment of sovereign debt in the euro area', *CEPS Policy Brief No. 289*, Brussels.

Guiso, L., Haliassos, M., & Jappelli, T. (2001). 'Household portfolios: An international comparison', *Household Portfolios*.

Hannoun, H. (2011), 'Sovereign risk in bank regulation and supervision: Where do we stand?', Speech by delivered at the Financial Stability Institute High-Level Meeting, Abu Dhabi, UAE.

Hernández de Cos, P., Koester, G.B., Moral-Benito, E. and Nickel, C. (2014), 'Signaling fiscal stress in the Euro Area: an early warning system', *ECB Working Paper*, No. 1712.

IMF (2005), 'Haircuts: Estimating Investor Losses in Sovereign Debt Restructurings, 1998–2005', *IMF Working Paper*, No. 05/137.

IMF (2010), *Global Financial Stability Report*, October.

IMF (2014), *Fiscal monitor*, April.

Laeven, L. and Valencia, F. (2013), 'Systemic Banking Crises Database', *IMF Economic Review*, 61(2), pp. 225-270.

Lewis K. K. (1999), 'Trying to Explain Home Bias in Equities and Consumption', *Journal of Economic Literature*, 37(2), pp. 571-608.

MAGD (2013), *Macroeconomic impact assessment of OTC derivatives regulatory reforms*, Macroeconomic Assessment Group on Derivatives, Bank for International Settlements.

Modigliani, F. and Miller, M.H. (1958). 'The cost of capital, corporation finance and the theory of investment.' *The American economic review*, 261-297.

Nouy, D. (2012), 'Is sovereign risk properly addressed by financial regulation?', Banque de France Financial Stability Review, No.16, pp. 95-105.

Reinhart, C. M., Rogoff, K. S., Savastano, M. A. (2003), 'Debt Intolerance', *Brookings Papers on Economic Activity*, No. 1.

Reinhart, C.M. and Rogoff, K.S. (2011a), 'From Financial Crash to Debt Crisis', *American Economic Review*, 101(5), pp. 1676-1706.

Reinhart, C.M. and Rogoff, K.S.(2011b),. 'The Forgotten History of Domestic Debt,' *Economic Journal*, 121(552), pp. 319-350.

Weidmann, J. (2013), 'Stop encouraging banks to load up on state debt', *Financial Times*, 1 October 2013.