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Analysing revisions to the standardised approach in credit risk. Evidence from sovereigns

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Abstract

In December 2015, the Basel Committee on Banking Supervision issued an updated consultative paper that proposes new standards for the standardised treatment of credit risk exposures in the banking book. Reviewing the proposed changes to calculating risk weights, this paper advises on areas that require further improvements from regulators and policymakers, and immediate attention from practitioners. The paper empirically tests for a trade-off between various methodologies of calculating risk weights for sovereign exposures under the standardised approach for credit risk. In doing so, the paper highlights large discrepancies in the risk-weighted capital caused by choosing different calculation methods prescribed by the revised standards. The paper concludes that the standards for the standardised treatment of credit risk require further amendments to address the issues revolving around different capital levels for the same exposure.

Keywords: standardised approach, credit risk, sovereign exposures, risk weights, capital charge

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1 Introduction

In December 2015, the Basel Committee on Banking Supervision issued an updated consultative paper that proposes new standards for the standardised treatment of exposures in the banking book (BCBS 2015). The updated proposal is significantly different to the initial suggestions for the standard published in December 2014 and issued for comments in March 2015 – BCBS (2014). The former consultative paper scrapped all links to agency ratings. The redesigned proposal reintroduces the reliance on external credit ratings by providing alternative measures of risk where possible (KPMG 2016). In addition to this, the new consultative document introduces updated risk weights and risk drivers. The revision also proposes to categorise all exposures related to real estate.

Firstly, set against the changing regulatory background, this paper aims to explain the proposed revisions to the standardised approach for credit risk (sovereign exposures). Secondly, bridging theory and practice, this paper provides practical insights into ways of calculating sovereign risk weights. Setting a hypothesis, it is assumed in this paper that practitioners can benefit from lower capital charges by adjusting their ways of calculating risk weights. Therefore, the recommendations are supported by simple empirical simulations for the banking book exposures.

Building on policy suggestions made by previous research into regulatory change management (Prorokowski, Prorokowski 2014a, 2014b; Jackson 2016) this study is motivated by the assumptions that the financial industry and credit institutions require regulations that would ensure the stability of the financial system. At this point, the paper shows whether the shortcomings of the standardised approach to credit risk under Basel I and Basel II are addressed by the recent revisions. Furthermore, the paper discusses potential macroeconomic, regulatory and financial consequences of the proposed new standards by analysing the consequences of adjusting the ways of calculating risk weights.

The current paper is organised as follows. The next section (Section 2) highlights key regulatory changes with a focus on their implications for the standardised approach for credit risk. This section reviews and critically assesses the most recent regulatory changes, advising both the policymakers and practitioners on the treatment of sovereigns. The review of the proposed regulatory framework serves to answer the question of whether the new standards for calculating specific risk weights under the standardised approach for credit risk are clear, consistent and result in the overall improvement of risk management. Where necessary, upon the review of the forthcoming standards, this paper attempts to indicate room for improvement for policymakers and flag areas of potential ambiguity for practitioners.

Sections 3 and 4 empirically test the calculation of the risk weightings under various scenarios proposed by the regulators. The empirical tests attempt to advise on the consequences of choosing different risk calculation methods, as permitted under the revised standards. In doing so, this study becomes important for credit risk analysts and relationship managers, who will benefit from understanding what transactions are driving the capital charges and what ways of calculating the risk weights remain least punitive for the bank.

The last section of this paper (Section 5) concludes the study and provides practical implications for the banking industry and policymakers based on the empirical findings from Sections 3 and 4 and recommendations from Section 2. Section 5 discusses suggestions for further improvements to the analysed regulations. At this point, the study focuses on the consequences of manoeuvring between various risk weights calculation methods under the revised standards beyond the regulatory-

-cost implications for the banking industry by analysing the impact of the proposed regulations on the overall stability of the financial system. This section also proposes new theoretical avenues that can be pursued by future studies in the researched area.

The empirical test is limited to one exposure class, namely claims on the sovereigns. This is due to the fact that the Basel Committee proposes two approaches to calculating risk weights for the sovereign exposures. Therefore, the test aims to check whether a capital trade-off is achievable from manoeuvring between the two approaches.

2 Regulatory background review

Given the nascence of the investigated issues and the lack of the academic literature on the topic of the revised standards for the credit risk standardised approach, this study is not deeply rooted in the scholarly literature. However, where possible, references to previous academic work are made. The study of Benzin et al. (2003) provides an overview of the history of the Basel capital standards for credit risk. The studies of Ojo (2015) focus on the Basel regulations and complement the findings of Benzin et al. (2003) with insights into the most recent regulatory developments in this space.

The regulatory background is reviewed in this paper through the prism of highlighting the weaknesses of the former credit risk calculation approaches (Basel I) that introduced standardised rules to calculating risk weights and checking whether the proposed revisions adequately address the recognised regulatory flaws. As evidenced by the studies of Ferguson (2003), Jones (2000) and Jackson (1999), the early regulatory frameworks (Basel I) posed macroeconomic threats to the financial systems and allowed for increasing regulatory arbitrage. According to Jackson (2001), the inadequate use of the external agency ratings as the basis for risk weight calculations was especially detrimental to the stability of the financial system.

The study of Le Lesle and Avramova (2012) explains that the detrimental inadequacy in the use of agency ratings causes biased asset selection motivated by the opportunity to choose favourable risk weights. According to Van Roy (2005), this problem has not been addressed by Basel II. Therefore, as noted by Ojo (2015), the latest revisions for the standardised approach in credit risk are underpinned by the principles of increasing risk sensitivity.

While enhancing the existing weaknesses of the current standardised approach, the Basel Committee introduces the revised standards in order to ensure the following objectives:

1 Following the generally accepted principles for reducing reliance on agency ratings propagated by the Financial Stability Board (FSB 2010) and the European Central Bank (Van Roy 2005), the Basel Committee sketches alternative measures for credit risk assessment.

2 Acknowledging that certain exposures provide inadequate risk weights (Hagendorff, Vallascas 2013) and recognising the insufficient number of risk weight buckets (Vallascas, Hagendorff 2013), the Basel Committee takes action to appropriately calibrate the standardised approach to the riskiness of exposures.

3 Recognising the lack of comparability by the European Banking Authority (EBA 2015) and misalignment of the internal risk-based approach, the Basel Committee aims to increase the comparability of capital requirements between banks by promoting the standardised approach and reducing national discretions.

4 Focusing on striking a balance between risk sensitivity and simplicity of the rules, the Basel Committee builds a risk weight calculation framework for an extensive set of exposure classes.

All in all, the revised standardised approach attempts to provide a risk weight calculation framework that is intuitive and readily available, as well as capable of explaining risk variations across different countries. Testing these objectives, this paper discusses all the regulatory proposals with reference to following exposure classes – sovereign exposures.

The scope of this study is limited to a review of the regulatory proposals for the standardised treatment of credit risk exposures. As publicly stated, the Basel Committee on Banking Supervision welcomes any comments of the proposed standards. With this in mind, upon the review, this study serves to inform the policymakers about any shortcomings in the proposed regulatory framework. Furthermore, prior to finalising the updated standards, this paper aims to provide sufficient information for practitioners to make informed decisions about the transition and implementation of the new requirements.

2.1 Sovereign exposures

There are no revisions to the standardised treatment of sovereign exposures. As shown in Figure 1, the regulatory treatment of exposures to sovereigns remains unchanged, allowing banks to choose between the risk weights based on the ECA scores or agency ratings. There is also a list of supranational institutions that would receive a preferential risk weight.

Analysing Figure 1, it should be noted that the recent proposals to the treatment of sovereigns under the standardised approach in credit risk have not been finalised. However, given the lack of material changes to the discussed rules in the timeline and the fact that the calculation of the risk weights for sovereigns is out of the scope for the second revisions, it is correct to assume that the methodology will be accepted in its current form. Table 1 presents the methodology of calculating the sovereign risk weights as outlined in the updated consultative paper of the Basel Committee on Banking Supervision (BCBS 2015).

Under the proposed methodology for calculating risk weights, the Basel Committee allows for two approaches of calculating sovereign risk weights to be made. In the first case, banks can rely on external ratings mapped to specific risk weights. In the second case, banks can use scores assigned to sovereign exposures by export credit agencies (ECA). However, the methodology of calculating the ECA scores must be aligned to the OECD-agreed principles and approved by the supervisor. Against this backdrop, only a limited number of sovereigns are assigned the ECA scores. On the other hand, there are sovereign exposures that lack external ratings. Concerns also arise with the treatment of exposures to chosen supranational institutions (e.g. the European Central Bank) that receive a 0% risk weight. In 2014, the Governing report (Governing 2014) highlighted possible economic and financial repercussions stemming from the regulator's attempt to channel investments into the chosen supranational institutions. Given the current political and economic developments within the European Union, this paper also questions the rationale behind assigning zero risk weights to the selected EU institutions.

Overall, the weaknesses of the analysed approach to calculating sovereign risk weights boil down to several important issues:

1 Reliance on the external agency ratings that are politically motivated, and hence are not a true reflection of the economic situation and credit quality of the sovereign borrower. A recent example

of a politically motivated rating is the credit downgrade action for Poland made on 15 January 2016 by Standard & Poor's (Reuters 2016).

2 Reliance on the external agency ratings that have insufficient validation standards and calibration techniques, as required of banks under the internal risk-based approach (IMF 2010). This persistent lack of comparability between the two approaches fails to address the misalignment between the standardised approach and the internal risk-based approach.

3 Reliance on the ECA scores that are limited only to certain qualifying methodologies and countries (BCBS 2015).

4 The ability toggle between the two methods of calculating risk weights in order to decrease the capital charge. There is a risk that banks would deliberately engage in regulatory arbitrage by choosing the least punitive methodology. The ECA scores do not have the same coverage of the countries as the external agency ratings and *vice versa* (Van Roy (2005). This may results in the possibility to rely on the fallback values assigned to countries under one methodology, when the fallback values yield lower risk weights.

Addressing the aforementioned weaknesses, this paper advises a new approach to calculating sovereign risk weights that can be drafted by the regulators. At this point, the regulators may consider implementing various add-ons and adjustments to the base risk weights that would increase the risk sensitivity of the standardised approach.

Rating stability adjustment. Exposures to sovereigns with a stable rating would benefit from a decrease in the risk weight. For example, if a chosen sovereign *i* has received the same rating/score *ER* during three different rating events *T*, the risk weight *RW* assigned to this claim would be decreased by the rating stability adjustment *RSA*. This would ameliorate the *ad hoc* (politically motivated) changes to the agency rating that would affect the risk weights:

$$RW_{i,T0} = RW_{i,T0} - RSA \text{ if } ER_{i,T0} \neq ER_{i,T-1} = ER_{i,T-2} = ER_{i,T-3} \quad (1)$$

A visual inspection of Table 2 reveals that the rating stability adjustment is not applicable to previous rating events of a given example. This is due to the fact that the condition of having three previous ratings at the same level has not been met until 6 February 2015. Only the rating from 15 January 2016 is underpinned by three historical ratings of the same value.

It should be noted that this paper does not set a fixed value for the rating stability adjustment. Focusing on suggesting regulatory improvements, the paper is limited to drafting a concept that requires further quantitative analysis and empirical testing. However, as evidenced in the case study shown in Table 2, the concept of addressing *ad hoc* rating decisions should be considered by the regulators. Another adjustment proposed in this paper would account for the eligible collateral.

Eligible collateral adjustment. Claims on sovereigns fully collateralised by cash or other high quality and highly liquid assets would benefit from lower risk weights. With this in mind, the regulators are advised to decide on the eligible types of collateral (e.g. cash held at the bank, gold) to which the adjustment would apply. For example, if an exposure to a chosen sovereign *i* is fully funded by cash or a combination of cash and gold, the risk weight *RW* assigned to this claim would be decreased by the eligible collateral adjustment *ECR*. This would reflect the true riskiness of the exposure and facilitate a better comparison of the standardised approach in credit risk to the internal risk-based approach that allows for various add-ons and adjustments to the base loss given default (LGD) calculations:

$$RW_{i,T0} = RW_{i,T0} - ECR \tag{2}$$

if eligible collateral provided.

The application of the proposed add-ons to the base risk weights is not regarded as computationally burdensome for banks. The data on historical ratings for the sovereigns is readily available in order to be seamlessly used for the computation of the rating stability adjustment. Moreover, various regulatory add-ons exist within the internal risk-based approach (e.g. low default portfolio benchmark, unfunded credit protection add-on, financial collateral adjustment, currency mismatch adjustment) that are incorporated into the base calculations of the LGD models. In the process of refining the revised standards and aligning them with the internal risk-based approach, the regulators are advised to consider adopting a layered structure of calculating the standardised risk weights for sovereigns. A conceptual framework for this structure is shown in Figure 2.

It should be noted that the considerations presented in Figure 2 are theoretical and not supported by empirical evidence. However, they retain some informative value by indicating a possible theoretical avenue that regulators can pursue in order to improve the standardised approach in credit risk. For instance, the revised standards allow local regulators to decrease the risk weight on claims on domestic sovereigns denominated in the domestic currency (BCBS 2015). For simplicity and clarity, this process can be transformed into a standard adjustment applicable to the layered structure of calculating the sovereign risk weights.

3 Empirical tests: hypothetical portfolio

Having discussed the Basel Committee's revisions to the standardised approach for credit risk, the paper continues to empirically test for the existence of a trade-off between the following regulatory scenarios of sovereign exposures:

– reliance on external agency ratings;
– reliance on ECA scores.

Given the choice of the two proposed approaches for calculating risk weights (Table 1), this paper tests several possibilities of achieving different risk weights under the revised standardised treatment of credit risk. First, a scenario where a bank relies only on external ratings is simulated. Second, a scenario where a bank relies only on ECA scores is simulated. The second scenario imposes limitations on the availability of the data, as not every sovereign exposure is rated on the ECA scale. Therefore, to facilitate a meaningful comparison, the data consists only of the exposures that have ECA scores. This assumption can be justified by the fact that more sovereigns are rated by external rating agencies than by export credit agencies. Third, a scenario is simulated where a bank toggles between the two aforementioned approaches in order to achieve favourable risk weights and report the lowest possible capital charge. This scenario is possible because the regulator allows banks to pick different approaches to different sovereign claims. This scenario is called 'liberal' by the academics (Banks 2016), as it allows for a high degree of tolerance for credit risk. However, if a bank decides to retain conservatism in its approach to calculate risk weights, the fourth scenario simulates a case where a bank behaves in an ultra-conservative way and always chooses the higher risk weight. This scenario is expected by

the regulators who recommend in the revised standards that banks develop a conservative bias towards the analysis of the risk weights (BCBS 2015). Finally, this paper proposes a scenario that smoothens the liberal and conservative approaches to calculating risk weights for sovereign exposures by taking an average between the two extreme results. All simulated scenarios are described in Table 3.

Analysing Table 3, it should be noted that Scenario 5 is the equally weighted average of the risk weight results obtained from Scenario 3 and Scenario 4:

$$S_{5,i} = \frac{S_{3,i} + S_{4,i}}{2} \tag{3}$$

where $S_{5,i}$ is the risk weight under Scenario 5 for a sovereign exposure i; and $S_{3,i}$ and $S_{4,i}$ are risk weights obtained for the same exposure under Scenario 3 and Scenario 4 respectively.

The primary data used for the scenarios comes from the country risk classifications of the participants to the arrangement on officially supported export credits (OECD 2016). The ECA scores utilised in the simulations are valid from 29 January 2016 and had not been updated or changed at the time of the empirical tests that took place on 22 April 2016. Therefore, this paper assumes that the ECA scores remain valid for the simulation scenarios in their current forms. However, one should note that some of the ECA scores may change in the future. For all sovereign exposures that have valid ECA scores an attempt has been made to find an external rating assigned by the agency. For the purpose of consistency with the Basel Committee's second consultative paper, the ratings from Standard & Poor's (S&P) have been chosen as the primary source of data. Only the external agency ratings that were valid at the time of the simulation (22 April 2016) are used in the empirical test. At this point, withdrawn ratings and ratings that were put on the "not on watch" status were not considered. Similarly to the ECA scores, it is assumed that the external ratings may change in the future.

Table 4 lists all countries with the OECD approved ECA scores and external ratings for which the scenarios are simulated. Due to the aforementioned limitations and the characteristics of the data source for the ECA scores, the sample consists of 137 sovereign exposures. The utilised data does not include sovereign exposures to advanced countries of Western Europe. This is due to the fact that the OECD approved ECA scores are not assigned to the euro area countries (e.g. Spain, Slovenia, Germany). Furthermore, high income OECD countries are not classified for the ECA scores. Therefore, countries such as Poland, the United Kingdom, the United States, Switzerland, Norway and Sweden are excluded from the country risk assessment under the OECD approved methodology. The risk-weighted exposure (RWE) is calculated based on the following formula:

$$RWE_i = E_i \times RW_i \tag{4}$$

where *RWE* is the risk-weighted capital calculated for the exposure i based on the amount of the initial exposure E multiplied by the risk weight *RW*.

For the purpose of retaining clarity and ensuring comparability of the empirical results, the initial amount of the capital E is set to EUR 1,000 equally distributed across the data sample exposures.

The naïve diversification of credit risk across the sovereigns in Table 4 allows for the trade-off between different scenarios to be captured.

Analysing Table 4, it should be noted that the sample is biased towards exposures of low ECA scores (ECA = 7; ECA = 6). This is due to the fact that, as already mentioned, advanced economies from Western Europe are not encompassed by the OECD ECA ranking. Figure 3 shows the distribution of the OECD ECA scores and the distribution of the S&P ratings across the analysed data.

Figure 3 shows a significant proportion of unrated exposures that receive a fallback value of a 100% risk weight. The large fraction of the unrated sovereigns gives room to potential abuse of the standardised approach. As it transpires, 29% of the sample countries with the lowest ECA scores (ECA = 7) remain unrated by the external agencies. The difference between the two risk weights in this case is 50%, with the choice of assigning either a 150% risk weight aligned to the ECA score = 7 or retaining a fallback value of 100% for the unrated exposures. The discrepancies lead to a bias where exposures of poor quality or in default are treated under the revised standardised approach as exposures of medium credit quality (ECA score = 4; or rated BB+). To put it in perspective, a visual inspection of Table 4 reveals that the revised approach allows to assign the same risk weight of 100% to Hungary (rated BB+; ECA = 4) and Tajikistan (unrated; ECA = 7).

The aforementioned discrepancies in the obtained credit risk weights lead to a potential trade-off in choosing the most optimal method of calculating capital charges. Figure 4 shows the aggregated results of simulating the five scenarios (see Table 3 for the description of the scenarios) on the available data (see Table 4 for the data sample). A visual inspection of Figure 4 suggests that a capital trade-off is possible with substantial savings achieved under the most liberal scenario.

The difference in the simulated level of capital charge between the liberal and conservative approaches to calculating risk weights under the revised standardised approach for credit risk becomes significant. The liberal approach (Scenario 3) gives a capital charge that is 15% lower than the original exposure. Interestingly, there is only a limited gain of toggling between the ECA scores and external ratings to obtain the lowest risk weights versus relying on the sovereign ratings only. At this point, Scenario 1 and Scenario 3 return similar capital charges that fall below the original exposure value. On the other hand, relying on the ECA scores (Scenario 2) appears to be more conservative. With this in mind, the smoothed approach scenario (Scenario 5 based on the formula (1)) results in lower capital charges, but retains the required level of conservatism for regulatory purposes. However, there is no fixed measure of the required level of conservatism, but the regulators expect that banks take steps to ensure that their treatment of credit risk is appropriately conservative (PRA 2013). The conservative approach would constitute the assignment of cautious and justifiable risk weights to the sovereign exposures.

4 Empirical tests: realistic portfolio

It is very unlikely that any bank would have an equally distributed portfolio across the 137 sampled sovereigns. Therefore, the empirical tests are aligned to reflect the realistic portfolios reported by tier-1 global banks. With this in mind, this paper uses elements of the qualitative query to obtain insights into the real sovereign portfolios of the banks that agreed to participate in the study. The details of the banks that agreed to share their credit portfolio compositions are included in Table 5.

A visual inspection of Table 5 reveals that, in contrast to the universal banks, the total exposure is significantly lower for investments banks. This can be explained by the fact that investment banks provide limited credit facilities that usually take the form of the overnight overdrafts. Moreover, the differences in the reported exposures are caused by the fact that the total credit exposure is provided for separate legal entities (e.g. branches of institutional banking) of the global investment banks that are consolidated within a larger banking group.

Table 6 details the portfolio compositions of the banks participating in this study. It should be noted that the exposure values reported by the surveyed banks are not limited to the sovereigns and encompass other exposure classes (e.g. banks). More granular data was not provided by the participating banks. Nonetheless, it is assumed in this paper that the exposures to the sovereigns would follow a similar fashion with one exception of the 'brass plate' countries.[1] It remains very unlikely that a bank would invest billions of EUR in the sovereign bonds issued by Jersey, Guernsey, the Cayman Islands or Bermuda (brass plate countries). Due to the lax regulatory frameworks, these countries serve as the hubs for investment funds and other financial services firms that are involved in shadow banking activities or financial activities that are prohibited under the prudential regulations – FSB (2015). Thus, the individual portfolios are aggregated to derive the relative significance of each country that is later applied to the hypothetical portfolio to reflect a plausible distribution of sovereign exposures:

$$R_i = \frac{\sum RE_i}{P_j} \tag{5}$$

$$P_j = \sum RE_j \tag{6}$$

where the relative significance R_i of a sovereign i is calculated as a percentage of the aggregated exposure to that sovereign RE_i in relation to the total exposure to all sovereigns across all participating banks – P_j.

The calculated relative significance is applied to the initial exposures of the hypothetical portfolio in order to construct a more realistic risk profile of banks. Therefore, in contrast to the naïve portfolio distribution presented in Section 3, the new portfolio can be regarded as a more realistic reflection of banks' exposures to sovereigns. Scenarios described in Table 3 are applied to the realistic portfolio. The initial capital for a sovereign i in the realistic portfolio is calculated based on the following formula:

$$E_i = R_i \times 1{,}000 \tag{7}$$

Furthermore, the 'brass plate' countries that serve as hubs for activities of investments banks are removed from the realistic portfolio in order to eliminate the bias towards the non-sovereign exposures of entities domiciled in Jersey, Guernsey, Bermuda, the British Virgin Islands and the Cayman Islands. At this point, Bank 7 reports EUR 305 million (15% of all exposures) booked in Jersey. In the case of exposures to the 'brass plate' countries reported by investment banks, the exposures take the form of the overnight and daylight overdrafts and short-term credit facilities to serviced investment funds and trusts. This fact justifies the removal of the 'brass plate' countries from the simulated sample.

[1] The term 'Brass plate' is commonly used by banks with reference to countries that serve as hosts for companies that do not have an operational presence in these countries (e.g. the Cayman Islands).

Table 7 shows the construction of the realistic portfolio with the calculated risk-weighted capital across the simulated scenarios.

Upon simulating the realistic portfolio across the scenarios described in Table 3, it has emerged that the differences in the level of capital charge between the liberal and conservative approaches continue to exist. Furthermore, as evidenced in Table 7, the differences in the risk-weighted capital obtained from relying on the external agency ratings and the ECA scores are magnified. At this point, relying on the agency ratings yields a similar level of the risk-weighted capital as toggling between both the agency ratings and ECA scores to receive liberal risk weights. For the simulated portfolio, the reliance on the agency ratings results in a capital charge that is 81% lower than the initial exposure and 83% lower than the capital level returned by utilising ECA scores as a base of risk weight calculations. The discrepancies are caused by the fact that high income countries are not assessed under the OECD's approved ECA methodology. Therefore, the reliance on the ECA scores results in the punitive fallback values being assigned to the sovereign exposures with very good external ratings.

The aforementioned discrepancies in the risk-weighted capital lead to a potential trade-off in choosing the most optimal method of calculating capital charges. Since the reliance on the external agency ratings yields similar results as the liberal method of calculating the sovereign risk weights, banks are advised in this paper to retain the utilisation of external agency ratings for the purpose of achieving a capital charge trade-off. On the other hand, the regulators are advised to clarify the revised standards by introducing rigorous rules around the possibility of toggling between the two ways of calculating sovereign risk weights.

5 Conclusions

Reviewing the second revisions to the standardised approach in credit risk and acknowledging the existing studies that highlighted macroeconomic threats to the financial system posed by the inadequate regulatory framework for calculating the standardised risk weights, this paper has also pointed to the weaknesses in the revised standards. The discussed weaknesses of the sovereign risk weights boil down to the reliance on the external agency ratings that have been criticised by both the academics and practitioners for being inadequate and politically motivated. With the examples shown in this paper, it appears that the sovereign ratings do not reflect the economic situation or the credit quality of the borrower. Moreover, the ECA scores cannot constitute an alternative to the agency ratings due to the limited coverage of countries and restrictions on the eligible methodologies.

Considering the discussed weaknesses, the paper concludes that the current revisions do not address the regulatory shortcomings of the standardised approach in credit risk that continued to exist under the Basel I and the Basel II regulatory regimes. As suggested by the quoted studies in this area, the persisting weaknesses may have consequences to the stability of the financial system. Therefore, this paper advises on the necessary improvements to the flawed regulatory framework. In doing so, the paper provides a conceptual framework for calculating the sovereign weightings that utilises various add-ons and adjustments applied to the base risk weights. In addition to ensuring greater risk sensitivity, these adjustments serve to remove the inadequacy of the agency ratings. Furthermore, while remaining computationally easy for banks, but becoming similar to the solutions used under

the internal risk-based framework, the adjustments allow for a better alignment of the standardised approach to the advanced models.

This paper has empirically tested for a trade-off between various approaches to calculating risk weights for sovereign exposures on both the hypothetical and realistic portfolios. In doing so, the paper highlights the risk that banks would deliberately engage in a regulatory arbitrage by toggling between the two methods of calculating the sovereign risk weights. The empirical simulations conducted on the hypothetical portfolio show that the difference in capital charges derived from the liberal approach vs. the conservative treatment of sovereign exposures is significant and banks may experience problems explaining to their regulators the capital charge that is 15% below the original exposure to sovereigns representing developing countries. Furthermore, the reliance on the external agency ratings returns liberal risk weights, as opposed to the use of the OECD approved ECA scores.

Recognising the limitations of the empirical tests on the hypothetical portfolio that relate to the naïve distribution of sovereign exposures across developing countries in Africa and advanced economies in the Asia Pacific region, this paper simulates different risk weight calculation methodologies on a more realistic credit portfolio generated from the input of seven global banks that agreed to participate in this study. At this point, the empirical tests carried on the realistic portfolio revealed greater discrepancies between the calculated levels of the regulatory capital under different scenarios.

The trade-off derived from choosing different ways of calculating risk weights for the sovereign exposures should be addressed by the regulators. With this in mind, this paper suggests more rigorous rules that would clearly specify the eligible circumstances for the use of either the ECA scores or the external agency ratings. For instance, under the improved regulatory framework, the banks would be allowed to use the ECA scores only for the sovereign exposures to developing countries without the possibility to choose external agency ratings. Furthermore, given the lack of ECA scores and the ensuing punitive fallback values, only the agency ratings would be applicable to the sovereign exposures to the advanced economies. However, these recommendations should be empirically tested by another study. Future research in this area should be built on a case study that utilises a real dataset provided by a more diversified group of banks in order to test for the efficiency of different regulatory solutions in decreasing the highlighted trade-off, and hence the incentives for regulatory arbitrage.

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Appendix

Table 1
Sovereign risk weight calculation

Reliance on external agency ratings						
Rating:	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Fallback
Risk weight:	0%	20%	50%	100%	150%	100%
Reliance on ECA scores						
Score:	0 to 1	2	3	4 to 6	7	
Risk weight:	0%	20%	50%	100%	150%	

Note: presentation of the permitted methodologies for calculating risk weights for sovereign exposures.

Table 2
Rating stability adjustment (case of Poland)

Agency	Rating	Outlook	Date of rating	RW	RW – RSA
S&P	BBB+	Positive	22 March 2005	50%	Not applicable
S&P	A-	Positive	21 February 2008	20%	Not applicable
S&P	A-	Stable	27 October 2008	20%	Not applicable
S&P	A-	Positive	6 February 2015	20%	Not applicable
S&P	BBB+	Negative	15 January 2016	50%	50% – RSA

Note: application of the rating stability adjustment (RSA) in practice based on the example of Poland and S&P ratings.

Table 3
Simulated scenarios for sovereign exposures

Scenario	Script	Description
Scenario 1	S1	Bank relies only on the agency ratings when calculating risk weights
Scenario 2	S2	Bank relies only on the ECA scores when calculating risk weights
Scenario 3	S3	Bank toggles between the agency ratings and ECA scores to achieve the lowest risk weights (liberal approach)
Scenario 4	S4	Bank toggles between the agency ratings and ECA scores to achieve the highest risk weight (conservative approach)
Scenario 5	S5	Smoothed approach proposed in this paper

Note: description of the simulated scenarios applied to the sovereign exposures that have OECD ECA scores available.

Table 4
Scenario simulation for sovereign exposures (hypothetical portfolio)

Country name	Capital (E) EUR	Risk drivers		Risk weights (RW)		Simulated scenarios (S)				
		ECA score	S&P rating	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Afghanistan	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Albania	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Algeria	1,000	4	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Angola	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Antigua and Barbuda	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Argentina	1,000	7	SD	150	150	1,500	1,500	1,500	1,500	1,500
Armenia	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Aruba	1,000	4	BBB+	100	50	500	1,000	500	1,000	750
Azerbaijan	1,000	5	BBB-	100	50	500	1,000	500	1,000	750
Bahamas	1,000	3	BBB	50	50	500	500	500	500	500
Bahrain	1,000	4	BBB-	100	50	500	1,000	500	1,000	750
Bangladesh	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Belarus	1,000	7	B-	150	100	1,000	1,500	1,000	1,500	1,250
Benin	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Bhutan	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Bolivia	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Bosnia and Herzegovina	1,000	7	B	150	100	1,000	1,500	1,000	1,500	1,250
Botswana	1,000	2	A-	20	20	200	200	200	200	200
Brazil	1,000	4	BB	100	100	1,000	1,000	1,000	1,000	1,000
Bulgaria	1,000	4	BB+	100	100	1,000	1,000	1,000	1,000	1,000
Burkina Faso	1,000	7	B	150	100	1,000	1,500	1,000	1,500	1,250
Burundi	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Cape Verde	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Cambodia	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Cameroon	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Central African Republic	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Chad	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
China	1,000	2	AA-	20	0	0	200	0	200	100
Colombia	1,000	4	BBB	100	50	500	1,000	500	1,000	750
Congo	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Costa Rica	1,000	3	BB	50	100	1,000	500	500	1,000	750

Table 4, cont'd

Country name	Capital (E) EUR	Risk drivers		Risk weights (RW)		Simulated scenarios (S)				
		ECA score	S&P rating	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Cote d'Ivoire	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Croatia	1,000	5	BB+	100	100	1,000	1,000	1,000	1,000	1,000
Cuba	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Curacao	1,000	5	A-	100	20	200	1,000	200	1,000	600
Dem. People's Rep. of Korea	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Democratic Republic of the Congo	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Djibouti	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Dominican Republic	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Ecuador	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Egypt	1,000	6	B-	100	100	1,000	1,000	1,000	1,000	1,000
El Salvador	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Equatorial Guinea	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Eritrea	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Ethiopia	1,000	7	CCC	150	150	1,500	1,500	1,500	1,500	1,500
Fiji	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Gabon	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Gambia	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Georgia	1,000	6	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Ghana	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Guatemala	1,000	4	BB	100	100	1,000	1,000	1,000	1,000	1,000
Guinea	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Guinea-Bissau	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Haiti	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Honduras	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Hong Kong	1,000	1	AAA	0	0	0	0	0	0	0
Hungary	1,000	4	BB+	100	100	1,000	1,000	1,000	1,000	1,000
India	1,000	3	BBB-	50	50	500	500	500	500	500
Indonesia	1,000	3	BB+	50	100	1,000	500	500	1,000	750
Iran	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Iraq	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Jamaica	1,000	7	CCC+	150	150	1,500	1,500	1,500	1,500	1,500

Table 4, cont'd

Country name	Capital (E) EUR	Risk drivers		Risk weights (RW)		Simulated scenarios (S)				
		ECA score	S&P rating	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Jordan	1,000	5	BB	100	100	1,000	1,000	1,000	1,000	1,000
Kazakhstan	1,000	6	BBB+	100	50	500	1,000	500	1,000	750
Kenya	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Kosovo	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Kuwait	1,000	2	AA	20	0	0	200	0	200	100
Kyrgyzstan	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Lao People's Democratic Republic	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Lebanon	1,000	7	B	150	100	1,000	1,500	1,000	1,500	1,250
Lesotho	1,000	5	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Liberia	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Libya	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Macau	1,000	2	Unrated	20	100	1,000	200	200	1,000	600
Madagascar	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Malawi	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Malaysia	1,000	2	A-	20	20	200	200	200	200	200
Maldives	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Mali	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Mauritania	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Mauritius	1,000	3	Unrated	50	100	1,000	500	500	1,000	750
Mexico	1,000	3	BBB+	50	50	500	500	500	500	500
Moldova	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Mongolia	1,000	6	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Montenegro	1,000	7	BB-	150	100	1,000	1,500	1,000	1,500	1,250
Morocco	1,000	3	BBB-	50	100	1,000	500	500	1,000	750
Mozambique	1,000	7	B+	150	100	1,000	1,500	1,000	1,500	1,250
Myanmar	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Namibia	1,000	3	Unrated	50	100	1,000	500	500	1,000	750
Nepal	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Nicaragua	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Niger	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Nigeria	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Oman	1,000	3	A	50	20	200	500	200	500	350
Pakistan	1,000	7	B-	150	100	1,000	1,500	1,000	1,500	1,250

Table 4, cont'd

Country name	Capital (E) EUR	Risk drivers		Risk weights (RW)		Simulated scenarios (S)				
		ECA score	S&P rating	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Panama	1,000	3	BBB	50	50	500	500	500	500	500
Papua New Guinea	1,000	5	B+	100	100	1,000	1,000	1,000	1,000	1,000
Paraguay	1,000	5	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Peru	1,000	3	BBB+	50	50	500	500	500	500	500
Philippines	1,000	3	BBB	50	50	500	500	500	500	500
Qatar	1,000	3	AA	50	0	0	500	0	500	250
Romania	1,000	3	BBB-	50	50	500	500	500	500	500
Russia	1,000	4	BB+	100	100	1,000	1,000	1,000	1,000	1,000
Rwanda	1,000	6	B	100	100	1,000	1,000	1,000	1,000	1,000
Saudi Arabia	1,000	2	A+	20	20	200	200	200	200	200
Senegal	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Serbia	1,000	6	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Seychelles	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Sierra Leone	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Singapore	1,000	0	AAA	0	0	0	0	0	0	0
Somalia	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
South Africa	1,000	4	BBB-	100	50	500	1,000	500	1,000	750
South Sudan	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Sri Lanka	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Sudan	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Suriname	1,000	6	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Swaziland	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Syrian Arab Republic	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Chinese Taipei	1,000	1	AA-	0	0	0	0	0	0	0
Tajikistan	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Tanzania	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Thailand	1,000	3	BBB+	50	50	500	500	500	500	500
Timor-Leste	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Togo	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Trinidad and Tobago	1,000	2	A	20	20	200	200	200	200	200
Tunisia	1,000	4	BB-	100	100	1,000	1,000	1,000	1,000	1,000
Turkey	1,000	4	BB+	100	100	1,000	1,000	1,000	1,000	1,000

Table 4, cont'd

Country name	Capital (E) EUR	Risk drivers		Risk weights (RW)		Simulated scenarios (S)				
		ECA score	S&P rating	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Turkmenistan	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Uganda	1,000	6	B+	100	100	1,000	1,000	1,000	1,000	1,000
Ukraine	1,000	7	B-	150	100	1,000	1,500	1,000	1,500	1,250
United Arab Emirates	1,000	2	AA	20	0	0	200	0	200	100
Uruguay	1,000	3	BBB-	50	50	500	500	500	500	500
Uzbekistan	1,000	6	Unrated	100	100	1,000	1,000	1,000	1,000	1,000
Venezuela	1,000	7	CCC	150	150	1,500	1,500	1,500	1,500	1,500
Yemen	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250
Zambia	1,000	5	B+	100	100	1,000	1,000	1,000	1,000	1,000
Zimbabwe	1,000	7	Unrated	150	100	1,000	1,500	1,000	1,500	1,250

Note: list of countries with different risk drivers (OECD ECA scores and S&P external ratings) and risk weights, and the results of simulating five different scenarios described in Table 3 (risk-weighted exposure).

Table 5
Participating banks' characteristics

Bank	Type	Tier	Headquarters	Dominant region of exposure	Total credit exposure (EUR)
Bank 1	Universal	1	London	UK; East Asia & Pacific	1,979,297,399,923
Bank 2	Universal	1	London	UK; Western Europe	684,909,040,987
Bank 3	Universal	1	London	MENA; Western Europe	200,280,097,572
Bank 4*	Investment	1	Amsterdam	UK; Western and Central Europe	41,788,795,473
Bank 5*	Investment	1	Frankfurt	Germany	7,149,046,742
Bank 6*	Investment	1	Luxembourg	Luxembourg	1,259,807,206
Bank 7*	Investment	1	Dublin	Dublin; Brass plate countries	2,129,959,566

Notes:
Firm-level characteristics of the banks participating in the study: classification, global significance (tier), location of the headquarters, dominant region of exposure, and total of initial exposure. Reporting period is the fourth quarter of 2015 (Q4 2015).
* Legal entity of a global bank consolidated in a banking group under prudential regulations.

Table 6
Portfolio compositions of the participating banks

Country of exposure	Exposure (EUR)						
	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7
UK	508,475,186,839	524,530,595,099	20,208,620,774	7,118,924,288	340,430,797	17,955,919	24,666,917
Albania	–	1,000,250	3,045,500	–	–	–	–
Algeria	1,027,418,550	–	577,341,545	–	–	–	–
Argentina	4,932,350,319	–	–	–	–	–	–
Armenia	444,856,601	471,542,827	205,845,632	–	–	–	–
Australia	31,692,892,055	–	–	889,865,536	–	–	–
Austria	–	80,560,852	–	667,399,152	226,953,865	–	–
Azerbaijan	–	–	65,000	–	–	–	–
Bahrain	2,753,920,194	–	–	444,932,768	–	–	–
Bangladesh	3,691,309,312	–	–	–	–	–	–
Belgium	74,812,445	74,116,736	30,521,655	2,892,062,992	–	12,968,163	–
Bermuda	8,320,552,800	–	93,000,255	–	–	–	–
Brazil	27,550,146,630	–	–	1,112,331,920	–	–	292,561,104
Brunei	1,527,516,870	–	–	–	–	–	–
Bulgaria	–	320,412,566	405,045,254	222,466,384	–	–	–
Canada	63,830,063,154	–	360,512,288	–	–	–	–
Chile	1,307,131,411	–	–	–	–	–	–
China	289,534,597,111	–	5,547,562,124	–	–	–	–
Croatia	–	–	–	–	113,476,932	–	–
Czech Republic	2,040,417,835	2,346,250,238	4,548,562,516	211,508,882	–	–	–
Denmark	–	62,000,522	–	11,123,319,199	–	–	–
Egypt	8,266,511,051	–	1,842,364,548	242,001,352	–	–	–
Estonia	–	–	360,247,200	–	–	–	–
Finland	–	–	60,584,326	–	–	–	–
France	75,975,153,347	80,517,867,355	40,684,294,121	1,055,224,950	–	4,189,714	–
Georgia	–	–	6,745,005	–	–	–	–
Germany	23,868,031,310	30,835,755,402	11,224,568,416	1,305,300,500	6,127,754,350	99,755	–
Greece	452,054,731	614,769,006	301,268,244	–	–	–	–

Table 6, cont'd

Country of exposure	Exposure (EUR)						
	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7
Guernsey	405,000	805,000	125,565	–	–	–	–
Hong Kong	402,688,056,743	45,517	2,245,556,937	236,445,852	–	–	10,325,686
Hungary	–	715,065,883	1,048,652,497	201,554,506	–	–	–
India	18,441,479,615	489,512,366	5,476,154,247	–	–	–	–
Indonesia	8,647,073,991	–	1,548,574,157	–	–	–	–
Ireland	432,696,731	152,096,657	284,584,239	1,334,798,304	–	3,690,939	845,558,955
Israel	1,771,097,808	1,483,127,010	436,684,658	–	–	–	–
Italy	2,650,420,177	2,431,784,737	2,554,842,167	1,390,542,200	–	23,043,429	–
Japan	10,490,335,928	–	2,457,254,177	640,875,182	–	–	–
Jersey	4,414,291,847	3,077,208,052	1,566,274,201	501,001,514	–	399,020	305,755,036
Kazakhstan	–	5,025,144	15,762,140	–	–	–	275,351,627
Korea	11,421,501,050	–	1,416,541,836	–	–	–	–
Kuwait	1,335,024,384	–	–	270,301,705	–	–	–
Latvia	–	32,000,410	320,254,810	200,000,520	–	–	–
Lebanon	824,349,737	–	655,324,542	–	–	–	–
Liechtenstein	–	10,584,123	–	–	–	–	–
Lithuania	–	–	215,249,568	201,541,621	–	–	–
Luxembourg	58,324,790	75,773,853	1,500,000	889,774,536	108,300,856	1,188,881,327	55,643,975
Macao	3,186,275,841	–	–	–	–	–	–
Macedonia	–	–	1,541,265	–	–	–	–
Malaysia	20,923,642,345	–	2,487,369,214	–	–	–	–
Maldives	350,385,410	–	–	–	–	–	–
Malta	3,293,422,155	3,281,449,113	–	–	–	–	–
Mauritius	4,708,728,415	–	1,504,621,845	–	–	199,510	–
Mexico	20,172,599,177	–	2,452,841	–	–	–	17,209,477
Moldova	–	–	25,050	–	–	–	–
Montenegro	–	–	5,021,241	–	–	–	–
Morocco	32,733	–	–	–	–	–	–
New Zealand	3,668,719,638	–	–	–	–	–	–

Table 6, cont'd

Country of exposure	Exposure (EUR)						
	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	Bank 7
Netherlands	9,619,754,862	9,173,078,439	4,247,214,547	–	–	399,020	–
Norway	–	–	27,052,354	222,566,380	–	–	–
Oman	5,343,439,475	–	5,264,841,633	–	–	–	–
Panama	–	–	–	–	–	–	2,294,597
Philippines	3,997,781,495	–	398,451,028	–	–	–	–
Poland	1,270,487,054	2,146,230,238	2,504,621,891	402,999,887	–	–	–
Portugal	–	3,000,505	504,247,354	657,401,204	–	–	–
Qatar	5,634,530,258	–	4,321,425,632	–	–	–	155,458,939
Romania	–	628,769,384	1,054,584,245	222,466,384	–	–	–
Russia	565,072,119	679,803,836	320,000,654	–	–	–	–
Saudi Arabia	22,900,613,533	–	30,654,214,200	1,174,834,877	–	–	77,442,645
Singapore	46,656,050,166	–	3,245,165,241	215,841,662	110,544,336	–	14,341,231
Slovakia	–	1,107,532,911	1,562,894,218	–	–	–	–
Slovenia	–	508,998,899	402,674,264	266,847,215	–	–	–
South Africa	2,848,521,255	3,088,900,911	65,547,520	–	–	–	–
Spain	2,993,516,216	3,029,154,985	2,481,456,224	640,907,133	125,555,805	–	–
Sri Lanka	2,509,220,174	–	–	–	–	–	–
Sweden	–	72,566,201	30,547,628	435,705,874	156,852,522	–	–
Switzerland	28,985,229,033	2,942,061,528	–	1,501,999,999	250,823,400	1,097,306	–
Taiwan	21,728,252,855	–	2,148,294,134	–	–	–	–
Thailand	4,937,495,655	–	37,241,654	–	–	–	–
Turkey	8,599,260,725	9,550,331,707	8,654,224,984	–	–	–	–
UAE	30,177,254,088	369,262,725	20,641,844,002	–	–	–	37,287,200
Uruguay	1,258,333,504	–	–	–	–	–	1
USA	200,896,472,460	–	1,008,992,565	2,224,663,840	–	6,883,102	16,062,178
Venezuela	–	–	–	670,387,155	–	–	–
Vietnam	3,120,666,061	–	–	–	–	–	–
WB & Gaza	11,662,855	–	–	–	–	–	–

Note: data for credit exposures is for the Q4 2015, reported in euro (EUR), S&P agency rating.

Table 7
Scenario simulation for sovereign exposures (realistic portfolio)

Country name	Risk drivers	Capital (E)	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Albania	B+/6	1	100	100	1	1	1	1	1
Algeria	–/4	46	100	100	46	46	46	46	46
Argentina	SD/7	141	150	150	211	211	211	211	211
Armenia	–/6	32	100	100	32	32	32	32	32
Australia	AAA/–	930	150	0	–	1,395	–	1,395	698
Austria	AA+/–	28	150	0	–	42	–	42	21
Azerbaijan	BBB-/5	1	100	50	1	1	1	1	1
Bahrain	BBB-/4	91	100	50	46	91	46	91	68
Bangladesh	BB-/5	105	100	100	105	105	105	105	105
Belgium	AA/–	88	150	0	–	132	–	132	66
Bermuda	A+/–	240	150	20	48	360	48	360	204
Brazil	BB/4	827	100	100	827	827	827	827	827
Brunei	–/–	44	150	100	44	65	44	65	55
Bulgaria	BB+/4	27	100	100	27	27	27	27	27
Canada	AAA/–	1,833	150	0	–	2,749	–	2,749	1,374
Chile	AA-/–	37	150	0	–	56	–	56	28
China	AA-/2	8,424	20	0	–	1,685	–	1,685	842
Croatia	BB+/5	3	100	100	3	3	3	3	3
Czech Republic	AA-/–	261	150	0	–	392	–	392	196
Denmark	AAA/–	319	150	0	–	479	–	479	239
Egypt	B-/6	295	100	100	295	295	295	295	295
Estonia	AA-/–	10	150	0	–	15	–	15	8
Finland	AA+/–	2	150	0	–	3	–	3	1
France	AA/–	5,659	150	0	–	8,489	–	8,489	4,244
Georgia	BB-/6	1	100	100	1	1	1	1	1
Germany	AAA/–	2,094	150	0	–	3,142	–	3,142	1,571
Greece	B-/–	39	150	100	39	59	39	59	49

Table 7, cont'd

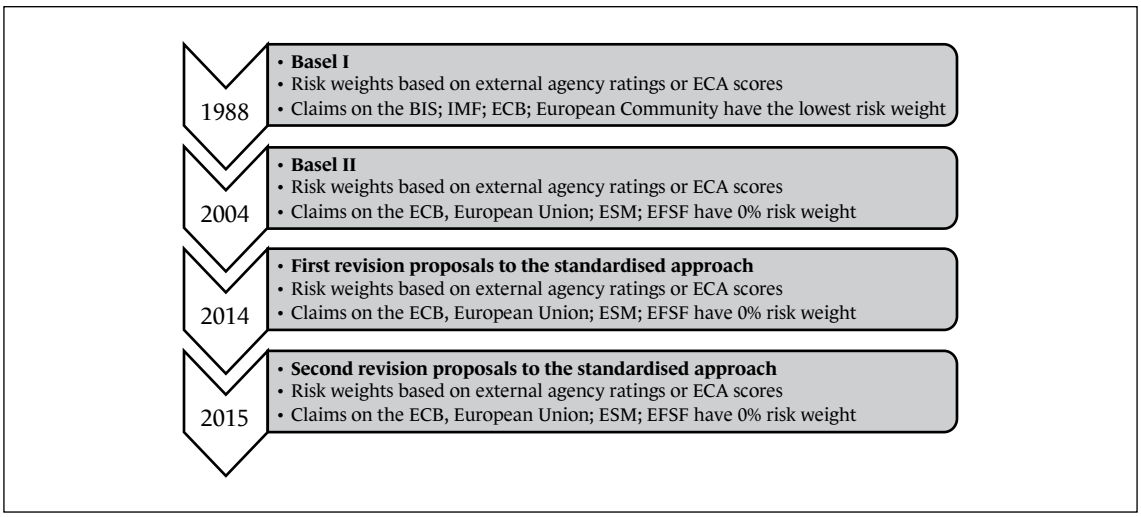
Country name	Risk drivers	Capital (E)	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Hong Kong	AAA/1	11,567	0	0	–	–	–	–	–
Hungary	BB+/4	56	100	100	56	56	56	56	56
India	BBB-/3	697	50	50	348	348	348	348	348
Indonesia	BB+/3	291	50	100	291	146	146	291	218
Ireland	A+/–	87	150	20	17	131	17	131	74
Israel	A+/–	105	150	20	21	158	21	158	90
Italy	BBB-/–	258	150	50	129	388	129	388	258
Japan	A+/–	388	150	20	78	582	78	582	330
Kazakhstan	BBB+/6	8	100	50	4	8	4	8	6
Korea	–/–	367	150	100	367	550	367	550	458
Kuwait	AA/2	46	20	0	–	9	–	9	5
Latvia	A-/–	16	150	20	3	24	3	24	13
Lebanon	B-/–	42	150	100	42	63	42	63	53
Liechtenstein	AAA/–	1	150	0	–	2	–	2	1
Lithuania	A-/–	12	150	20	2	18	2	18	10
Luxembourg	AAA/–	68	150	0	–	102	–	102	51
Macao	–/–	91	150	100	91	136	91	136	114
Macedonia	BB-/–	0	150	100	0	0	0	0	0
Malaysia	A-/2	668	20	20	134	134	134	134	134
Maldives	–/6	10	100	100	10	10	10	10	10
Malta	A-/–	188	150	20	38	282	38	282	160
Mauritius	–/3	177	50	100	177	89	89	89	89
Mexico	BBB+/–	576	150	50	288	865	288	865	576
Moldova	–/7	1	150	100	1	2	1	2	1
Montenegro	B+/7	1	150	100	1	2	1	2	1
Morocco	BBB-/3	1	50	50	1	1	1	1	1
New Zealand	AA/–	105	150	0	–	157	–	157	79
Netherlands	AAA/–	658	150	0	–	987	–	987	493
Norway	AAA/–	7	150	0	–	11	–	11	5

Table 7, cont'd

Country name	Risk drivers	Capital (E)	ECA RW (%)	S&P RW (%)	S1 RWE	S2 RWE	S3 RWE	S4 RWE	S5 RWE
Oman	BBB-/3	303	50	50	151	151	151	151	151
Panama	BBB/3	1	50	50	1	1	1	1	1
Philippines	BBB/3	126	50	50	63	63	63	63	63
Poland	BBB+/–	181	150	50	90	271	90	271	181
Portugal	BB+/–	33	150	100	33	50	33	50	42
Qatar	AA/3	289	50	0	–	144	–	144	72
Romania	BBB-/3	54	50	50	27	27	27	27	27
Russia	BB+/4	45	100	100	45	45	45	45	45
Saudi Arabia	A-/2	1,565	20	20	313	313	313	313	313
Singapore	AAA/0	1,434	0	0	–	–	–	–	–
Slovakia	A+/–	76	150	20	15	114	15	114	65
Slovenia	A/–	34	150	20	7	50	7	50	29
South Africa	BBB-/4	171	100	50	86	171	86	171	129
Spain	BBB+/–	265	150	50	132	397	132	397	265
Sri Lanka	B+/6	72	100	100	72	72	72	72	72
Sweden	AAA/–	20	150	0	–	30	–	30	15
Switzerland	AAA/–	962	150	0	–	1,442	–	1,442	721
Taiwan	AA-/–	682	150	0	–	1,022	–	1,022	511
Thailand	BBB+/3	142	50	50	71	71	71	71	71
Turkey	BB/4	765	100	100	765	765	765	765	765
UAE	–/2	1,462	20	100	1,462	292	292	1,462	877
UK	AA/–	30,282	150	0	–	45,422	–	45,422	22,711
Uruguay	BBB/3	36	50	50	18	18	18	18	18
USA	AA+/–	5,828	150	0	–	8,742	–	8,742	4,371
Venezuela	CCC/7	19	150	150	29	29	29	29	29
Vietnam	BB-/–	89	100	100	89	89	89	89	89
WB & Gaza	–/–	1	150	100	1	2	1	2	1
Total		**83,008**	**×**	**×**	**7,295**	**85,755**	**5,891**	**87,070**	**46,481**

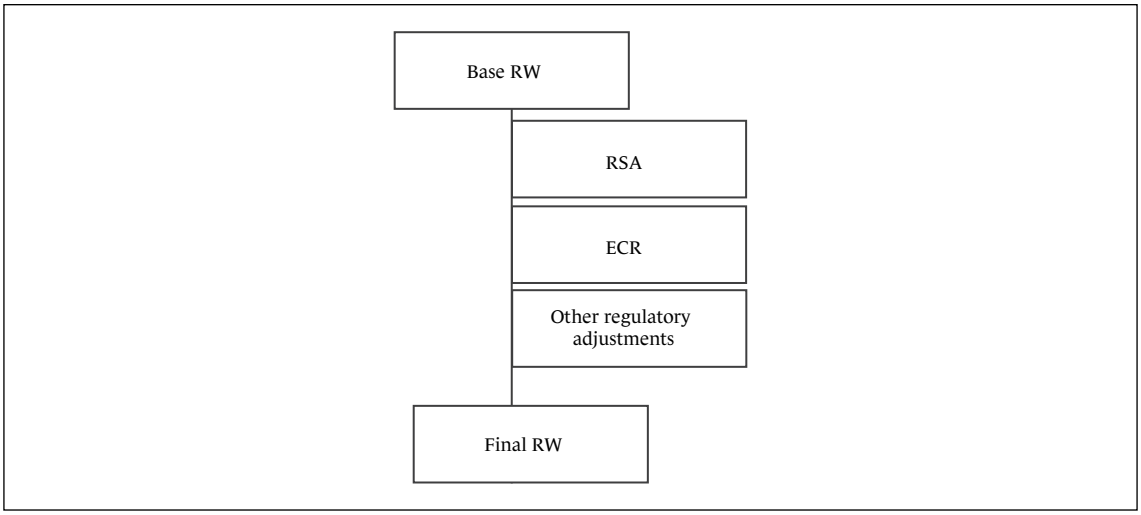
Note: list of countries with different risk drivers (OECD ECA scores and S&P external ratings) and risk weights, and the results of simulating five different scenarios described in Table 3 (risk-weighted exposure).

Figure 1
Standardised approach timeline (sovereigns)



Note: presentation of the regulatory background with insights into the treatment of sovereign exposures under Basel I and Basel II, and the recently proposed revisions.

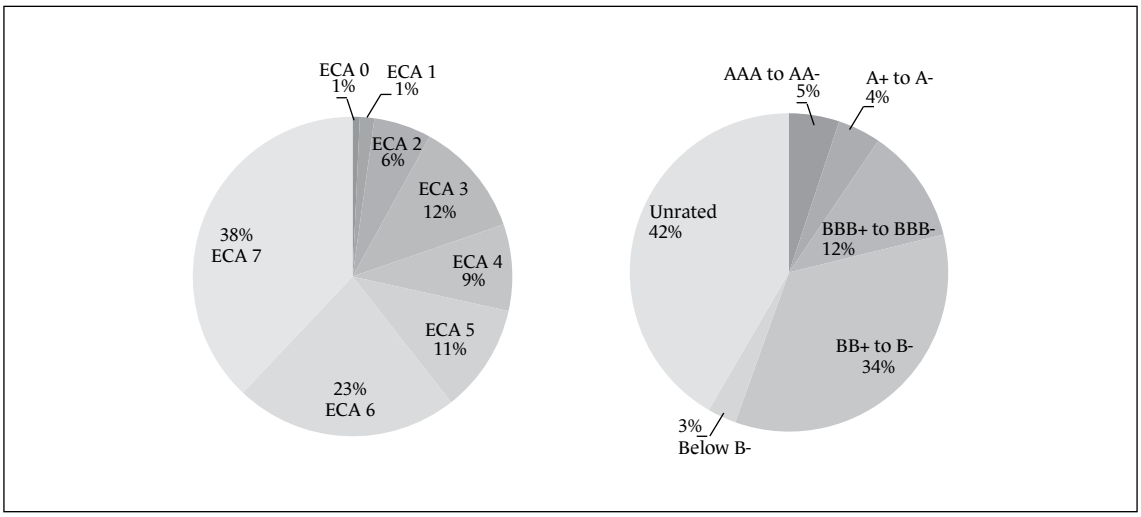
Figure 2
Risk weight calculation process



Note: conceptual framework for the calculation of the risk weights for sovereign exposures under the standardised approach in credit risk.

Figure 3

Distribution of the OECD ECA scores and S&P sovereign ratings

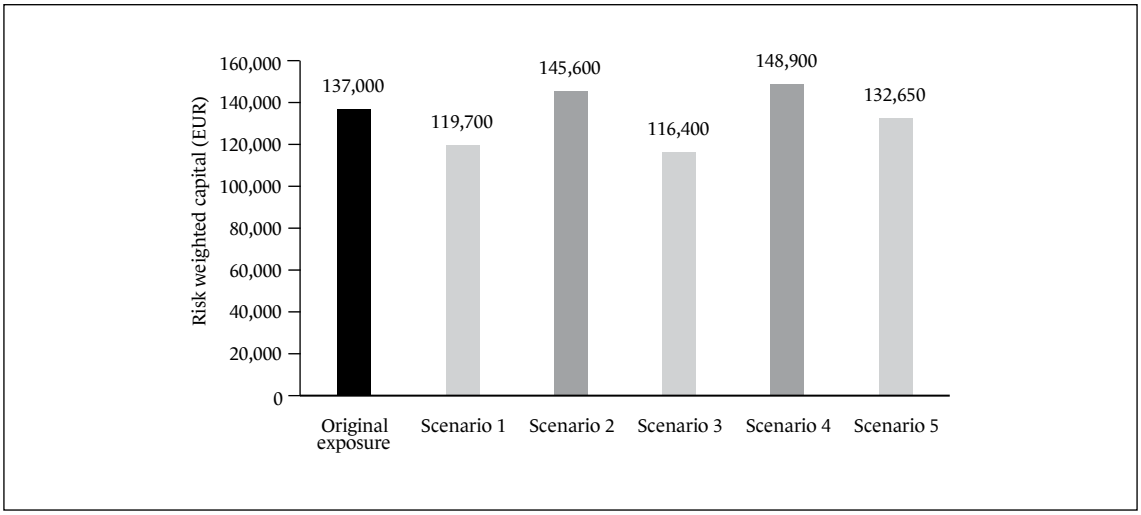


Notes:

Proportion of the ECA scores and the S&P ratings assigned to the sovereign exposures in the data sample. The best credit quality receives ECA = 0 or a rating of AAA; exposures of poor credit quality (or in default) receive ECA = 7 or ratings below B- (SD = default).

Figure 4

Scenario simulation results



Notes:

Aggregated results of the capital charges achievable under different scenarios: Scenario 1 – use of agency ratings; Scenario 2 – use of ECA scores; Scenario 3 – liberal approach; Scenario 4 – conservative approach; Scenario 5 – smoothed approach. The currency used in this simulation is euro. The original exposure to the entire data sample is EUR 137,000.