
CRR III implementation: Impact on capital requirements, performance and business models of European banks

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Abstract The European Banking Package II finalises the implementation of the final Basel III standards, which the industry refers to as 'Basel IV'. It entails many changes to the methods used to determine capital requirements and represents a significant challenge for the European banking sector. Based on the Capital Requirements Regulation (CRR) III draft, this paper provides an overview of the main implementation issues in the European Union, discusses the potential impact on banks' capital requirements and makes policy recommendations. This paper uses primary sources such as the Basel Committee on Banking Supervision, the European Banking Authority and the European Commission. Secondary sources, academic articles or analyses from various stakeholders are also included in the analysis. This paper also provides an analysis of the impact of the new prudential regulations on banks based on 30 detailed Basel IV impact studies conducted over the past two years in consulting projects with banks from almost all EU countries. The impact analysis covers a wide range of different business models, bank sizes and countries. We believe the anonymised data we use is far more representative of the EU banking system and other jurisdictions than the impact studies performed by the European Commission or the BCBS. The new CRR III regulations will pose strategic, operational and regulatory challenges for the banks concerned. The paper concludes that the European implementation of the reforms will not burden a specific group of banks, but banks with different business models and of different size will be impacted differently but still significantly. This makes Basel IV and CRR III unique compared to previous reforms of the Basel framework. The EU Commission's goal of proportionality of regulations will not provide much relief in

this regard. The paper provides an up-to-date and comprehensive overview of the planned changes in CRR III, ie in capital adequacy requirements. It analyses the implementation of the standards and compares them with the Basel IV requirements. Recommendations for supervisors, risk management practitioners and other interested parties conclude the paper.

Keywords: *Basel III finalisation, Basel IV, credit risk standardised approach (SA-CR), internal ratings-based approach (IRBA), operational risk*

INTRODUCTION

On 27th October, 2021, the European Commission published a package of proposals to amend EU banking regulations — the so-called EU Banking Package II. It completes the European implementation of the Basel IV recommendations of the Basel Committee on Banking Supervision (BCBS). The most comprehensive package of regulatory changes ever — Basel IV — is also somewhat confoundingly called ‘Basel III: Completing Post-Crisis Reforms’ by banking regulators. The new rules are designed to ensure that banks in the European Union (EU) become more resilient to possible future economic shocks. It is also intended to contribute to Europe’s recovery from the COVID-19 pandemic and a transition to climate neutrality.

The Banking Package II includes the revision and supplementation of the central banking supervisory works Capital Requirements Directive (CRD),¹ Capital Requirements Regulation (CRR),² and Bank Recovery and Resolution Directive (BRRD).³ These three documents form the basis of subsequent negotiations with the EU Parliament and the Council as well as allow for preliminary insight and outlook on the regulatory challenges for the institutions in the coming years. In terms of content, the amendments in the CRR mainly concern the implementation of Basel IV in EU law. Changes in the CRD also relate to the treatment of sustainability risks (ESG — Environmental, Social and Governance) in the supervisory review process (SREP) and a harmonisation of the treatment of branches of banks from third countries. The new regulations of the BRRD make up only a tiny part of the banking package.

The present paper reviews the core of Banking Package II, which are the amendments to the CRR (hereinafter referred to as CRR III).⁴ The CRR was last amended in 2020 by the so-called CRR Quick fix to reduce the impact of the COVID-19 pandemic

on banks.⁵ Our paper makes three main contributions to the literature on financial regulations: firstly, it provides a comprehensive and up-to-date review of theoretical and practical implications of CRR III regulations in the context of banking risk management principles. Secondly, it undertakes an in-depth examination of the implementation of CRR III and states important derivations from Basel IV. Finally, it provides policy implications for policymakers and practitioners.

The structure of our paper is as follows: in the next section, we discuss the crucial contents of CRR III. The conceptional framework and the implementation analyses with respect to the potential impacts of CRR III on the capital requirement and business models of European banks are discussed in the section that follows. The last section concludes with a summary and the policy implications that emerge from this paper.

THE KEY NEW CRR III REGULATIONS⁶

CRR III contains several modifications to the current prudential rules — such as in the area of consolidation — that may have an impact on the level of capital requirements and potentially on an institution’s existing business model. The changes in regulatory consolidation are partly due to the recent Wirecard scandal. Art. 4 CRR III contains expanded definitions of companies included in the regulatory scope of consolidation. The amendments to the CRR ensure that financial groups headed by fintech companies or which, in addition to institutions, also include other companies that directly or indirectly carry out financial activities are subject to appropriate supervision on a consolidated basis. To this end, in addition to the definitions in Art. 4 CRR III, several detailed amendments are made to Art. 6, 10a, 11 and 18.

In the area of own funds, the CRR only contains minor adjustments, such as Art. 27 CRR III in connection with Brexit or the extension of the requirements for direct and indirect investments pursuant to Art. 72e CRR III to instruments meeting the criteria to set the minimum requirement for own funds and eligible liabilities (MREL). Furthermore, according to Art. 36 CRR III, the threshold deductions from Common Equity Tier 1 (CET1) are slightly revised to achieve consistency with the new requirements and the non-performing loans (NPL) backstop. Clarifying amendments were also made to consider minority interests in own funds under Art. 84 *et seq.* CRR III, clarifying amendments have been included. Let us take a closer look at the CRR III changes in the primary methods for determining the capital requirement for credit, market price and operational risks.

The revised standard approach to credit risk

Most institutions in the EU use the standard approach for credit risk (SA-CR) to calculate the capital requirements for their own exposure. The new CRR III rules are based on the BCBS recommendations, particularly on the BCBS 424 standard, and intended to increase risk sensitivity to several key aspects. The current SA-CR has proven insufficiently risk-sensitive in some areas, sometimes leading to an inaccurate or inappropriate measurement of credit risk (either too high or too low) and thus to an inaccurate or inappropriate calculation of capital requirements.

The already existing Art. 79 (b) of the CRD must be considered in a new form for all exposure classes when deriving risk weights based on external ratings. Accordingly, institutions must apply internal procedures for credit risk analysis even if external ratings are available and the credit or investment decision may not be based solely on the external rating. If an institution determines in its own assessment of credit risks that the risks are higher than induced by the external rating, a higher risk weight must be applied. Let us look at the changes in the various asset classes in detail.

Institutions' exposure class

In the institutions' exposure class, the risk weight continues to be derived from external credit assessments. In addition to a recalibration of the mapping between the external ratings and the risk weights in the 'external credit risk assessment approach' (ECRA), new regulations were introduced for the creditworthiness analysis. Even if an external rating is available, a detailed creditworthiness analysis must be carried out and, if the result is appropriate, the risk weight must be adjusted conservatively. It must be considered that the external rating can only be used at the individual level of the respective debtor; use at the group or association level is not permitted. Furthermore, Art. 120 CRR III is amended in line with the Basel standards to reduce the risk weight for exposures to institutions for which a Level 2 credit assessment by a nominated ECAI is available, and to include as short-term exposures those arising from cross-border trade in goods with an original maturity of six months or less.

A new risk weighting in the 'standardised credit risk assessment approach' (SCRA) is introduced by amending Art. 121 CRR III for unrated banks. Depending on whether all minimum regulatory requirements, including capital buffers, are met, banks are classified into three risk tiers with risk weights ranging from 40 to 150 per cent. Positions with an original maturity of less than three months and trade finance positions with an original maturity of less than six months receive lower risk weights. Thus, institutions must classify under the SCRA their exposures to unrated institutions into one of three grades (A, B and C), based on several quantitative and qualitative criteria. Unrated banks with exceptionally high creditworthiness and a CET1 and Tier 1 leverage ratio of more than 14 and 5 per cent, respectively, may be assigned a risk weight of 30 per cent. With these new provisions, in line with the Basel standards, the current possibility of weighting risk exposures to institutions based on their sovereign ratings is abolished (see Table 1).

To avoid a mechanical application of the quantitative and qualitative criteria, institutions for which there is no credit assessment by a nominated 'external credit assessment institution' (ECAI) are subject to the due diligence requirements set out in Art. 79 CRD when determining risk weights for

Table 1: CRR III risk weights for bank, corporate and specialised lending exposures

SA-CR exposures classes	Risk weight (in %)					Unrated (SCRA): External rating not available or allowed
	Bank regulatory credit rating (ECRA)					
	1	2	3	4/5	6	
	Corresponding S&P rating					
	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	
Institutions (banks)						Grade A, B and C
– Risk weights according to ECRA	20	30	50	100	150	40 (30) / 75 / 150
– Risk weights for short-term exposures	20	20	20	50	150	20 / 50 / 75
Corporates	20	50	75	100	150	100 / 65 / 85 /
Specialised lending						
– Project Finance	20	50	75	100	150	80 / 100 / 130
– Object Finance	20	50	75	100	150	100
– Commodities Finance	20	50	75	100	150	100

ECRA=External credit risk assessment approach

SCRA=Standardised credit risk assessment approach

exposures to institutions for which there is a credit assessment by a nominated ECAI. This ensures that the own-funds requirements appropriately and conservatively reflect the credit quality of the institutions' counterparties, regardless of whether the exposures have an external credit assessment or not. Art. 138 CRR III is amended in line with the Basel standards to break the link between bank and sovereign for rated institutions by prohibiting credit ratings of a designated credit rating agency from containing assumptions about implicit sovereign support unless the ratings relate to public sector institutions.

'Corporates' and 'specialised lending' exposure classes

For exposures to corporates, several changes compared to the current rules must be considered. First, the risk weights for rated companies were recalibrated, leading to a reduction on average. Second, Art. 122 CRR III is amended in line with the Basel recommendations to reduce the risk weight for exposures to corporates for which a Level 3 credit assessment by a nominated ECAI is available

(see Table 1). Finally, the European Banking Authority (EBA) monitors the application of the transitional treatment and the availability of credit assessments by designated ECAIs for corporate exposures. The Commission is empowered to extend the transitional treatment for up to three years based on the EBA's report. Through amendments to Art. 135 CRR III, measures are proposed to improve the availability of external credit assessments for corporates. The rules for exposures to small and medium-sized enterprises (SMEs) revised with CRR II are retained unchanged.

Regulations have been included for the 'specialised lending' sub-asset class, which is again subdivided into project, object and commodities finance. If an issue rating is available for specialised lending, this can be used for risk weighting analogous to ordinary corporate receivables. In all other cases, the risk weighting is based on the type (project, object or commodity financing), the degree of completion — a project is considered completed if it generates positive cash flows and can repay liabilities — and the creditworthiness of the special financing (taking into account detailed specifications as to when specialised financing is of

Table 2: CRR III risk weights for subordinated debt and equity

SA-CR exposures class	Risk weight (in %)
	Unrated external rating not available or allowed
Subordinated debt, equity and other capital instruments	
– Equity investments within the scope of government subsidy programme	100
– Subordinated debt and TLAC positions	150
– Stocks and other equity instruments	250
– Speculative unlisted equity instruments	400

exceptionally high quality). The risk weights can range from 80 to 130 per cent.

Art. 465 CRR III is amended to avoid disruptive effects on banks' lending to unrated entities and to allow sufficient time for public and/or private initiatives aimed at taking greater account of ratings to provide for a special transitional regime for exposures to unrated entities in the calculation of the output floor. The Basel IV standards do not provide for such a regime. During the transitional period, institutions are allowed to apply a preferential risk weight of 65 per cent to their exposures to unrated entities, provided that these exposures have a probability of default (PD) of no more than 0.5 per cent. Such a PD is equivalent to an investment-grade rating. This treatment applies to all unrated entities, whether listed or not.

'Subordinated debt instruments' and 'equities' exposure classes

Art. 128 CRR III is completely reworded and includes the new 'risk positions consisting of subordinated debt instruments' exposure class. In the future, subordinated positions will receive a risk weight of 150 per cent. Subordinated positions are defined as positions that are subordinated to other exposures. This is a very broad definition that also includes positions that qualify as 'total loss-absorbing capacity' (TLAC) or MREL eligible liabilities according to Art. 72b CRR but are not subject to the deduction rules according to Part 2 of the CRR.

After extensive revisions to the deduction and risk weighting of equity exposures for banks and other

financial sector entities were already introduced in 2010, the Basel Committee also revised the regulations on other subordinated and equity exposures that are not subject to the deduction rules. This includes both direct and indirect positions subject to direct deduction as well as positions risk-weighted at 250 per cent based on the threshold rules. The term 'equity position' is defined in detail in Art. 133 CRR III and broken down into three subcategories. Unlisted equity exposures receive a risk weight of 400 per cent. Excluded are equity exposures in connection with a long-term customer relationship or an intention to hold such exposure for greater than three years.

Equity exposures entered within the framework of a state support programme can be risk-weighted at 100 per cent based on a national option. All other equity exposures receive a risk weight of 250 per cent. The risk weight can thus be between 100 and 400 per cent for participation positions. All risk weights not equal to 100 per cent are subject to a five-year phase-in rule to alleviate the burden on capital ratios caused by these revisions (see Table 2).

'Real estate financing' exposure class

The most far-reaching changes concern the area of 'real estate financing' (see Table 3). In the future, the risk weight will depend on the type of financed real estate, the degree of collateralisation and the type of product (Art. 124 *et seq.* CRR III). New definitions are introduced in Art. 4 CRR III for this purpose. One innovation is introducing special treatment for loans secured by real estate for 'income-producing

Table 3: CRR III risk weights for risk positions fully collateralised by real estate mortgages

SA-CR exposures class	Risk weight (in %)					
	Classification based on ETV ratio in six regulatory rating classes, provided certain criteria are met					
	1	2	3	4	5	6
Residential real estate financing						
— Repayment not significantly dependent on cash flows	20	25	30	40	50	70
for ETV ratios	ETV ≤ 50%	50% < ETV ≤ 60%	60% < ETV ≤ 80%	80% < ETV ≤ 90%	90% < ETV ≤ 100%	ETV > 100%
— Repayment largely dependent on cash flows	30	35	45	60	75	105
for ETV ratios	ETV ≤ 50%	50% < ETV ≤ 60%	60% < ETV ≤ 80%	80% < ETV ≤ 90%	90% < ETV ≤ 100%	ETV > 100%
Commercial real estate financing						
— Repayment not significantly dependent on cash flows	Min[60; RiskWeight _{Counterparty}]			RiskWeight _{Counterparty}		
for ETV ratios	ETV ≤ 60%			ETV > 60%		
— Repayment largely dependent on cash flows	70		90		110	
for ETV ratios	ETV ≤ 60%		60% < ETV ≤ 80%		ETV > 80%	

real estate' (IPRE). This refers to real estate financing whose repayment depends significantly on the cash flows generated by the real estate that secures these loans. A further distinction is made between financing for the 'land acquisition, development and construction phases of residential or commercial real estate' (ADC). In principle, a risk weight of 150 per cent is to be applied to ADC real estate financing, which can be reduced to 100 per cent under strict criteria. The detailed conditions for a 100 per cent risk weight are to be elaborated by the EBA in accordance with Art. 126a CRR III in a Regulatory Technical Standards (RTS) document.

The BCBS envisaged two ways of deriving risk weights for non-IPRE and non-ADC real estate exposures: real estate credit splitting (RCS) and loan-to-value (LTV) approaches. The leading approach at the EU level remains the RCS approach. The LTV approach — renamed the 'exposure-to-value' (ETV) approach in CRR III — only serves as a fallback approach if the requirements for using the RCS approach are not met. The ETV approach is generally used for IPRE real estate loans unless the so-called hard test is met in the member state in which the property is located. The RCS approach can be applied if the hard test is deemed to be met.

If the RCS approach may be applied to residential real estate, the fully collateralised part of the loan (up to 55 per cent of the real estate value) receives a risk weight of 20 per cent. The remaining part of the loan receives the individual risk weight of the borrower. If the RCS approach may not be applied to residential real estate, the risk weight is between 30 and 105 per cent, depending on the ETV ratio.

The risk weighting for commercial real estate financing is analogous to residential real estate financing. This means that if the RCS approach may be applied, then the fully secured part of the financing (up to 55 per cent of the property value) receives a risk weighting of 60 per cent. The ETV approach is again considered a fallback approach if the RCS approach may not be applied. The risk weights for the RTV approach for commercial real estate financing are between 70 and 110 per cent.

When calculating the collateral values, detailed requirements on the conservative determination of the collateral value, the consideration of prior charges, the aggregation of all loans covered by the

collateral agreement and the definition of the loan amount must be taken into account. If specific minimum requirements are not met (completed property, legal enforceability, collateral claim against the property, creditworthiness and valuation), the position must be considered unsecured.

'Retail' exposure class and aligned 'credit conversion factors'

There are minor changes to its definition in the 'retail' exposure class (Art. 123 CRR III). The granularity criterion of 0.2 per cent, known from Basel II, was explicitly reinstated as an option. Otherwise, the risk weight remains at 75 per cent. With 'transactors', there will be a new sub-category in the retail business to which, for example, credit card receivables are to be assigned. A risk weight of 45 per cent can be assigned to this risk position class, provided that the receivables assigned to this risk position class have always been serviced on time within the last 12 months.

According to Art. 123a CRR III, another noteworthy new feature is the introduction of a new risk weight multiplier of 1.5 for unsecured currency mismatches for retail positions. A currency mismatch exists if the loan was granted in a currency that does not correspond to the currency in which the borrower generates their primary income. A value of 150 per cent is set as the maximum upper limit for the resulting risk weight (cap). Furthermore, the regulations regarding risk weights for defaulted positions according to Art. 127 CRR III were adjusted (see Table 4).

In line with the Basel IV recommendations, the applicable 'credit conversion factors' (CCFs) were aligned (Art. 111 CRR III). This concerns, in particular, the elimination of the CCF factor of zero per cent for unconditionally cancellable credit lines. In this context, the term 'commitment' is defined first in Art. 5 (see Table 5). The negative definition of commitment includes contractual arrangements where no fees or interest are collected, the customer must apply for each drawdown, has full control over the execution of each drawdown, the institution is required to assess the customer's creditworthiness immediately before deciding on each drawdown, and contractual arrangements offered to an entity

Table 4: CRR III risk weights for retail exposures

SA-CR exposures class	CRR III	Risk weight (in %)
		Unrated external rating not available or allowed
Retail business	Art. 123	
— Regulatory retail		75 (45)
— Other retail		100
New risk weight multiplier of 1.5	Art. 123a	
Granularity criterion option		
Adjusted risk weights for defaulted positions	Art. 127	

Table 5: CRR III credit conversion factors (CCF) for off-balance sheet exposures

Exposures	CCFs (in %)
Unconditionally cancellable commitments (UCCs)	10
Short-term self-liquidating trade letters of credit	20
Commitments other than UCCs	40
Note issuance facility, revolving underwriting facility and certain contingent items	50
Direct credit substitutes and other exposures	100

that is closely monitored on an ongoing basis. Contractual arrangements that meet the negative definition are not considered commitments and do not constitute an exposure.

The revised internal ratings-based approach

The changes to the ‘internal ratings-based approach’ (IRBA) can be divided into three groups and will probably have a significant impact on the future level of banks’ RWAs. The first group consists of changes to the scope of the IRB approach and its sub-approaches. Changes to the minimum risk parameters constitute the second group of adjustments. The last group includes some other changes and clarifications to the following parameters: the probability of default (PD), loss given default (LGD), the credit conversion factor (CCF) and maturity of the exposure (M).

The three groups of changes mentioned are intended to address the weaknesses of the IRB approach that became apparent in the financial market crisis of 2007–8. The weaknesses included the high complexity, lack of comparability of the

RWAs determined with the IRB approach and low reliability of some parameter estimates. Also, all types of rating systems — i.e. PD, LGD and CCF procedures — can be developed based on expert opinions or estimates and loss data. The experience of recent years has shown that the reliability of rating systems decreases when access to sufficient loss data is not available, and that expert estimates have a greater influence on the overall result of the rating process.

With regards to parameters, it must especially be taken into account that parallel initiatives by the European Central Bank (ECB) and the EBA have been in place for several years to improve and harmonise the methods for parameter estimation. With this in mind, the fundamental changes within the IRB approach have been referred to as ‘IRBA 2.0’. Let us examine the central CRR III changes for this supervisory risk measurement method.

Changes to the scope of application

The Basel Committee’s original proposal in the first BCBS 362 consultative paper in 2016 was to reduce

the variability in credit risk-weighted assets (RWAs) by excluding portfolios from the scope of the IRB approach where there is generally no or very little loss data. If this regulation had been adopted, the IRB approach could no longer have been used for the ‘institutions’, ‘large corporates’, ‘equities’ and ‘specialised lending’ exposure classes. For exposures to medium-sized companies, only the basic IRB approach would have been available for determining the capital requirement, in which only the PD of the institution itself may be estimated.

In the final BCBS 424 standard as part of Basel IV, the BCBS 362 proposals have been toned down, so that in future the IRB approach may no longer be used only for equity exposures. Hereafter, only the basic IRB approach may be used for exposures to institutions and medium-sized/large companies with a group turnover of more than €500m. This means that only the PD, but not the LGD, the CCF and M may be estimated by the institution itself. For all other exposures, the institution may continue to estimate all risk parameters itself, provided it has approval from the competent supervisory authority.

An essential deviation of the EU rules from the otherwise adopted proposals of the BCBS (Art. 150 and Art. 151. para. 8 CRR III) concerns the exposures to other public sector entities. The IRB approach assigns these to the ‘institutions’ exposure class. However, it should be avoided that the financing of public sector entities is made more difficult due to increased risk weights. Therefore, according to Art. 147 para. 2 CRR III, these positions will in future be assigned to a separate exposure class analogous to the standardised approach, for which the application of the advanced approach will continue to be possible.

In addition to the limitation of the scope of application, there is another small but very important change regarding the coverage of bank portfolios with IRB procedures. According to paragraph 256 of the Basel II framework, it was an important goal of the Basel Committee that banks roll out the IRB approach as far as possible to all risk positions of a bank. The new rules do not go that far. The requirement to roll out the IRB approach further only refers to the individual asset classes and no longer to all risk positions of a bank.

Changes to the minimum risk parameters

There are changes to the risk parameters in both the basic and advanced IRB approaches following CRR III Art. 160 (1), 161 (4), 164 (4) and 166 (8c). In the advanced IRBA, minimums (input floors) are set for the parameters PD and LGD, and minor adjustments are made to the requirements for estimating the CCF and M values. The general lower limit for estimated PDs will be 0.05 per cent in future (instead of 0.03 per cent as before). The only exception is the sub-requirement class ‘qualifying revolving positions’, for which a minimum PD of 0.1 per cent is to be taken into account. For the self-estimated LGDs, minimum values are to be observed in the future for both the unsecured (partial) positions and secured (partial) positions. Art. 153 para. 1 and 154 para. 1 CRR III were adjusted in accordance with the Basel requirements to remove the existing ‘scaling factor’ (SF) of 1.06. This factor is currently used to increase the institution’s risk-weighted exposure amounts by a flat rate of 6 per cent within the framework of the IRB approaches.

The LGD floors always reference the fully collateralised or unsecured portion of a risk position. If positions are only partially collateralised, a weighted floor must be determined. For example, a retail position is collateralised with a car whose market value is 100 per cent of the loan amount (E) ($H_E=0$). The LGD floor for the unsecured part (LGD_{UFloor}) of 25 per cent and the LGD floor for the secured part (LGD_{SFloor}) of 15 per cent must be considered. The LGD_{SFloor} is included in the LGD_{Floor} at 60 per cent, as a haircut (H_S) of 40 per cent is to be applied to the market value of the collateral (S_M). The H_S is analogous to the haircuts for collateral eligibility in the foundation IRB approach. Using the following formula prescribed by the banking supervisory authorities, the value for the total LGD floor of 19 per cent can be calculated:

$$\begin{aligned} LGD_{Floor} &= LGD_{UFloor} \frac{E - (S_M(1 - H_S))}{E(1 + H_E)} + LGD_{SFloor} \frac{S_M(1 - H_S)}{E(1 + H_E)} \\ &= 0.25 \cdot \frac{40}{100} + 0.15 \cdot \frac{60}{100} = 0.19 \end{aligned}$$

The credit conversion factors (CCFs) may now only be estimated for undrawn loan commitments themselves, for which the CCF in the basic IRB approach is less than 100 per cent. According to the basic IRB approach, the CCF is to be applied for all other off-balance sheet transactions. In the future, self-estimated CCFs will also be given a floor corresponding to 50 per cent of the CCF in the basic IRB approach. Otherwise, according to SA-CR, the CCF values in the basic IRB approach have been aligned with the CCFs of the Basel recommendation.

In the Basel framework, the CCF floor is defined indirectly via an EAD floor. It is assumed that the EAD is always the sum of the EAD for the on-balance sheet position (EAD_B) and the off-balance sheet position (EAD_{Off}),

$$EAD_{FLOOR} = EAD_B + 0.5 \cdot EAD_{Off} \cdot CCF$$

In the EU implementation of Basel II, however, a separate calculation of EAD for the on and off-balance sheet parts has prevailed.

Clarifications on parameter estimation

In addition to the changes in the IRB approach already described above, various explanations have been made regarding the requirements for risk parameter estimation. These clarifications are in line with the guidelines published in recent years within the framework of the IRBA Repair, or IRBA 2.0 programme of the EBA. The contents of these guidelines are in part of great importance for the banks and have resulted in extensive adjustments to the existing IRB approaches. These topics include, for example, the definition of default according to the CRR, margin of conservatism and the estimation of PD, LGD and the downturn effect. In particular, the proposed changes to the default definition are relevant for all CRSA institutions, as the SA-CR 'defaulted exposures' exposure class (Art. 127 CRR) refers to the default definition in the IRB approach.

The ECB has also repeatedly published more detailed requirements for the use of the IRB approach in recent years. The most prominent example is the 'targeted review of internal models' (TRIM) project. This multi-year project aims to review a more extensive selection of already

approved internal models (particularly rating procedures) to comply with the IRB requirements under the CRR to strengthen internal models' quality and confidence. Within the framework of this project, the ECB has prepared a 'TRIM handbook' in which it presents its requirements for internal models in detail. Here, reference is often made to the ongoing work of the EBA and used as a uniform interpretation of the CRR rules. Since many IRB requirements were interpreted differently by national supervisors in the past, this approach of the ECB can lead to different effects on the institutions and the need for adjustments already mentioned above.

Credit risk mitigation techniques

The amended Art. 224 to 230 CRR III implement the new Basel IV requirements to consider collateral and guarantees in the SA-CR and advanced IRBA. In particular, the supervisory haircuts for financial collateral under the comprehensive method for financial collateral are revised. In addition, the values of collateralised LGDs and the haircuts for exposures in the advanced IRBA are adjusted.

The eligibility criteria for guarantees are clarified by the amended Art. 213 (1c) (iii) and 215 (2) CRR III. The scope of application also includes guarantees granted under mutual guarantee schemes or for guarantees granted or counter-guarantee by certain undertakings. The public guarantee schemes set up in the context of the COVID-19 crisis thus fall under the heading of credit risk mitigation techniques to the extent that they meet the eligibility criteria.

The changes to the market risk framework

In addition to the fundamental changes in credit risk, the CRR III also contains some changes in the area of market price risks. The most important change concerns the definition of the trading book. Although the so-called fundamental review of the trading book (FRTB) of the BCBS was already implemented at the European level within the framework of CRR II, the new trading book definition will only be implemented within the framework of CRR III. The reasoning behind this is

likely to have been due to ongoing discussions on specific regulations at the time as well as those discussions that are still ongoing in the Basel Committee currently. The CRR III draft provides for the introduction of a trading book derogation known from the Basel framework as well as subjects existing CRR II requirements to further revision. Art. 104 CRR contains a new version of the trading book definition based on the requirements of the BCBS. The existing regulations are specified by three additional articles (Art. 104a to 104c CRR III).

According to CRR III, the trading book definition continues to be based on the trading intention of the institution. However, positions/transactions are included that are either always to be allocated to the trading or banking book. Certain positions and transactions are also listed that are generally to be allocated to the trading book but can be allocated to the banking book if certain requirements are met. This is intended to make the allocation of positions to the trading book more objective. It is also intended to prevent regulatory arbitrage by the institutions. To this end, very strict conditions and supervisory approval of exceptions for reclassifications are introduced.

Another more important change is contained in Art. 102 CRR III, according to which institutions must calculate their capital requirements in the market risk area from 1st January, 2025 using either the new standardised approach ('alternative standardised approach') or the new internal model approach ('alternative approach based on an internal model'). In CRR II, the FRTB rules have so far only applied to reporting requirements. In CRR III, the latest developments at the level of the Basel Committee are also taken into account, and various detailed regulations are included in Art. 325 *et seq.* This concerns further requirements for funds in the trading book and adjustments to the alternative standard and internal model approach.

The credit value adjustment risk

The Credit Value Adjustment Risk (CVA risk) describes the danger that the positive replacement value of derivative OTC financial instruments is reduced because the risk premium for the counterparty has increased without the counterparty

defaulting. The special relevance of this type of risk goes back to the experiences in the financial crisis of 2007–8, in which extensive losses in derivative transactions did not arise from the actual defaults of contract partners, but from their deterioration in creditworthiness. The specific way of the banking supervisory procedure to estimate the counterparty risk in a derivative based on the exposure-at-default value (EAD) could not recognise market value losses due to deterioration in the creditworthiness of the counterparty. For this reason, the Basel Committee introduced the CVA risk category as early as 2010 as part of its Basel III recommendations (BCBS 189, revised version June 2011), which was then incorporated into the CRR in 2013.

In December 2017, the Basel Committee published its new rules for capital requirements in the CVA risk area (BCBS 424, pp. 109–27) and further adjusted the calibration of the model approaches in a revised publication in July 2020 (BCBS 507). With the extensive changes, the Basel Committee wants to ensure that the actual CVA risk of the institutions is adequately captured. The methods for determining the capital requirement are to be sufficiently risk sensitive. The CVA models developed by the banks for accounting purposes are also recognised.

Art. 382a CRR III specifies, analogously to the Basel provisions, the three approaches, including the conditions of application, with which the minimum own-funds requirement for CVA risks can be determined. Institutions can use either the CVA Standardised Approach (SA-CVA) or CVA Basic Approach (BA-CVA). The Internal Model Approach (IMA-CVA), which was originally also proposed as an alternative in the Basel Consultative Document from 2015 (BCBS 325), has been removed from the CVA framework. The application of the BA-CVA — in contrast to the SA-CVA — does not require the approval of a supervisory authority. Institutions that deliberately do not hedge their CVA risks are provided by the supervisory authority with a reduced and thus simplified BA-CVA formula. In this formula, risk-reducing hedging transactions are not considered. In addition, a simplified CVA approach (SI-CVA) is also provided.

With the SA-CVA according to the new Art. 383 CRR III, an approach for banks with a sophisticated

derivatives portfolio is introduced, which is strongly based on the methodology of the new standardised approach for capital adequacy for market price risks (FRTB) and the economic CVA calculation. The central element of the new SA-CVA are sensitivities for various risk factors — in particular interest rate curves, exchange rates, credit spreads, share prices and commodity prices — which makes it significantly more risk-sensitive but also methodologically and technically more complex to implement. Art. 383a to 383x CRR III are inserted to further specify the technical elements of the standardised approach.

The BA-CVA approach according to the new Art. 384 CRR III is a comparatively simple approach that is probably easy to implement. It uses data that must also be available for determining the counterparty risk of OTC derivatives. The Basel Committee has taken the results of the impact study conducted in February 2016 as an opportunity to adjust the calibration of the final BA-CVA. On the one hand, the risk weights specified in the framework of the aforementioned study, which are significantly lower than those of the consultation paper, are retained and an additional bucket for querying 'other sectors' is introduced. On the other hand, the so-called beta factor was adjusted, which leads to a further reduction of the capital requirements. Credit hedges are only recognised under certain conditions. Market hedges, on the other hand, cannot be taken into account in the calculations in a risk-reducing manner.

A materiality threshold for the simplified determination of the regulatory CVA minimum own-funds requirement for institutions with non-significant derivative portfolios considers the proportionality principle of supervision in the SI-CVA according to Art. 385 CRR III. Institutions whose non-centrally cleared on and off-balance sheet derivative transactions do not exceed the thresholds based on a monthly assessment using data as of the last day of the month may set their minimum CVA own-funds requirement at a flat rate equal to the risk-weighted capital amount determined for counterparty credit risk. The two thresholds for the nominal volume (gross) of derivative transactions must be complied with in accordance with Art. 273a para. 2 CRR — 5 per cent of the total assets of the institution and €100m. If this option is exercised, risk-reducing effects from hedging may not be considered.

Furthermore, when exercising the option, the entire portfolio is subject to the treatment described. The capital requirements based on the lump sum approach are significantly higher than with the BA-CVA. Banks will need to conduct detailed cost/benefit analyses to identify the optimal approach for their needs.

For the institutions, the CRR III changes in CVA risk have a variety of implications, with a slight overall increase in risks calculated according to the SA-CVA compared to the current standard approach and a significant increase when applying the BA-CVA. In addition, the application of the new CVA standard approach will entail a significant computational effort in determining CVA sensitivities.

The new standardised measurement approach for operational risk

With the new 'standardised measurement approach' (SA) for operational risk, all existing procedures — the 'basic indicator', 'current standardised' and 'advanced measurement' approach — will be abolished in accordance with the Basel requirements. For the implementation (ie introduction of the SA), the existing Part Three, Title III of the CRR will be replaced. The SA is based on the basic principle introduced in the first Basel consultative document (BCBS 291) of estimating potential operational risk using a business indicator whose components can be determined from a bank's income statement and balance sheet. The indicator is divided into three size classes (buckets).

In addition to the business indicator (BI), the business indicator component (BIC) is an important parameter. Pursuant to Art. 314 and 315 CRR III, the BI is the sum of the interest, commission and financial components, whereby the supervisory authority prescribes different algorithms for determining the three component values. BI values up to €1bn are considered in Bucket 1, larger than €1bn up to €30bn in Bucket 2 and larger than €30bn in Bucket 3. The BIC value of an institution is calculated according to a predefined formula pursuant to Art. 313 CRR III depending on the size of the BI value.

The minimum own-funds requirement for operational risk corresponds to the BIC value in accordance with Art. 312 CRR III. In principle, the

Basel requirement in Buckets 2 and 3 provides for an additional adjustment of the own-funds requirement by means of an ‘internal loss multiplier’ (ILM). However, the EU Commission exercises discretion and disregards historical loss data for all institutions. Thus, it sets the ILM to the value of one. An ILM smaller than one would otherwise have lowered the minimum capital requirement, and an ILM greater than one would have increased it. To counteract possible regulatory arbitrage using insurance, the EBA is also mandated by Art. 519d CRR III to prepare a report on their use in the OpRisk area.

For reasons of proportionality, the new Art. 316 to 323 CRR III contain provisions on data collection and management for all institutions, on the one hand, and only for institutions that also have to disclose historical loss data on the other. Thus, all institutions must collect data according to Art. 323 CRR III to comply with the provisions on the operational risk management framework. Only institutions with a BI value greater than €750m will be required to maintain a loss database and disclose loss events pursuant to Art. 316 CRR III. The threshold can be raised to €1bn upon request. The highest BI value reported in the last eight years is used as the relevant BI value in this context.

Institutions that disclose historical loss data pursuant to Art. 446 para. 2 CRR III must also maintain a loss data set pursuant to Art. 317 para. 2 CRR III. Specifications for the calculation of the annual gross and net loss from operational risks are explained in Art. 318 to 321 CRR III. The relevant thresholds for loss data of €20,000 and €100,000 are set out in Art. 319 CRR III. Certain exceptional operational risk events that are no longer relevant to an institution’s risk profile may be disregarded following approval by the institution’s competent supervisory authority under Art. 320 CRR III. Similarly, an institution may have to include additional losses (Art. 321 CRR III). Pursuant to Art. 322 CRR III, the supervisory authorities must regularly review the quality of an institution’s loss data.

The new output floor

An output floor (OF) for risk-based capital requirements is introduced through amendments to both

the CRR and the CRD to increase comparability of capital requirements across banks and strengthen credibility in banks’ risk-weighted assets (RWA) calculations based on their internal models. The capital floor restricts the use of internal models. In Europe, the current capital floor — called the Basel I floor — has been implemented in a variation where own funds may not fall below 80 per cent of the Basel I own-funds requirements. This variation does not limit the differences between RWAs under standardised approaches and internal models.

The OF is an aggregated output floor that — unlike the Basel I floor — includes all risk types of Pillar 1. In contrast, the Basel I floor only takes into account the effects of internal models in credit risk and operational risk. The new floor ensures that the RWAs of all risk categories calculated with internal models are not lower than a certain percentage of the RWAs calculated using the standardised approaches. This limits the leeway that banks have in determining capital requirements based on internal models.

Art. 92 CRR III regulates the calculation of the imputed RWAs, whereby the amended para. 3 specifies which total risk exposure amount (TREA) — with or without flooring — is to be used for the calculation of the minimum own-funds requirements in Pillar 1. The floored TREA according to para. 5 is only to be used by the EU parent institution, the financial holding company or the mixed financial holding company of a banking group for the purposes of the group solvency ratio calculated at the highest level of consolidation in the EU. In contrast, according to para. 4 the TREA without floor continues to apply to each group entity for the calculation of own-funds requirements at the individual level.

The starting point for determining the floor RWA value must be calculated entirely using standard supervisory procedures, regardless of the particular component that is included in the RWA calculation. This means that, for example, the SA-CCR must also be applied when calculating the assessment basis for derivatives. This procedure also distinguishes the new floor from the Basel I floor.

Each parent institution, financial holding company or mixed financial holding company in a Member State (other than the location of the EU

parent undertaking) must calculate its share of the bottom TREA used for the own-funds requirement of the consolidated group. For this purpose, the own-funds requirement of the consolidated group shall be multiplied by the share of the sub-consolidated RWAs attributable to that undertaking and its subsidiaries in the same Member State.

According to Art. 92 (6) CRR III, the RWA of the consolidated group attributable to a parent undertaking/subsidiary are to be calculated as the RWA of the parent undertaking/subsidiary as if the OF applied to its TREA. This would recognise the benefits of risk diversification across the business models of different entities within the same banking group. At the same time, any potential increase in required own funds due to the application of the OF at the consolidated level would have to be fairly distributed among the subsidiaries located in Member States other than the parent company, according to their risk profile. Art. 92 (7) CRR III takes up the provisions of the former Art. 92 (7) and explains the calculation factors to be applied to the different types of risk covered by the own-funds requirements.

From 1st January, 2025, the OF pursuant to Art. 465 CRR III will initially be 50 per cent of the capital requirements according to the standard approaches. Between 2026 and 2029, it will be increased by 5 per cent annually to 70 per cent. In 2030 the OF will reach its final value of 72.5 per cent. The calibration of the output floor was one of the main difficulties in the negotiations within the Basel Committee, because a high OF has a material impact on capital ratios for some institutions.

CONCEPTUAL FRAMEWORK AND IMPLEMENTATION ANALYSES

The goal of Basel IV is to improve the resilience of banks. After implementing Basel III via the CRR, Basel IV will be implemented in two stages. Step one was via CRR II, and step two will be via CRR III. The goal of Basel III and IV is generally the same: the improvement of the resilience of banks. Nevertheless, the impact of Basel III and IV is very different. The changes of Basel IV focus mainly on calculating RWAs and increasing the risk sensitivity of capital requirements. Therefore, the

impact of the changes will be much more individual for banks as banks have all individual portfolios and risk appetites.

This is supported by the quantitative impact studies of the BCBS and the EBA. For example, in the latest publication of the EBA regarding the Basel III monitoring as of 31st December, 2020, the weighted average increase in total Tier 1 minimum required capital increased by 13.7 per cent. In contrast, for large and internationally active banks (Group 1), the increase is 14.4 per cent, and for other banks 8.1 per cent. It is essential to know that only 99 of more than 6,000 banks within the EU were included in this analysis. And that the results are not representative of many European banks. Primarily large and medium-sized banks are among the 99 banks. To increase the representativeness, the EU and EBA decided to make participation mandatory for a much larger group of banks from 2022 onwards. Nevertheless, the representative of this analysis will be still limited.

Considering the adjustments made in the EU Banking package, the EU Commission estimates the impact of Basel IV/CRR III to be significantly lower, especially during the transition phase. According to the EU Commission, the average increase in total minimum required capital will be between 0.7 per cent and 2.7 per cent in 2025, considering all transitional provisions. In 2030, when a major part of the transitional provision will be phased out, the increase will be between 6.4 per cent and 8.4 per cent. A summary of the impact analyses of the EU Commission can be seen in Figure 1.

Detailed impact analysis

As mentioned above, the BCBS and the EU Commission use highly aggregated, not fully representative, data for their impact assessments of the new banking supervisory regulations, the quality of which can be improved. For this reason, we use anonymised, rather than publicly available, data from 30 detailed Basel IV impact studies conducted in consulting projects with banks from almost all EU countries over the past two years for the analyses in this paper. The impact analysis covers a wide range of different business models, bank sizes and



Figure 1: Impact of CRR III regulation on capital according to EU Commission

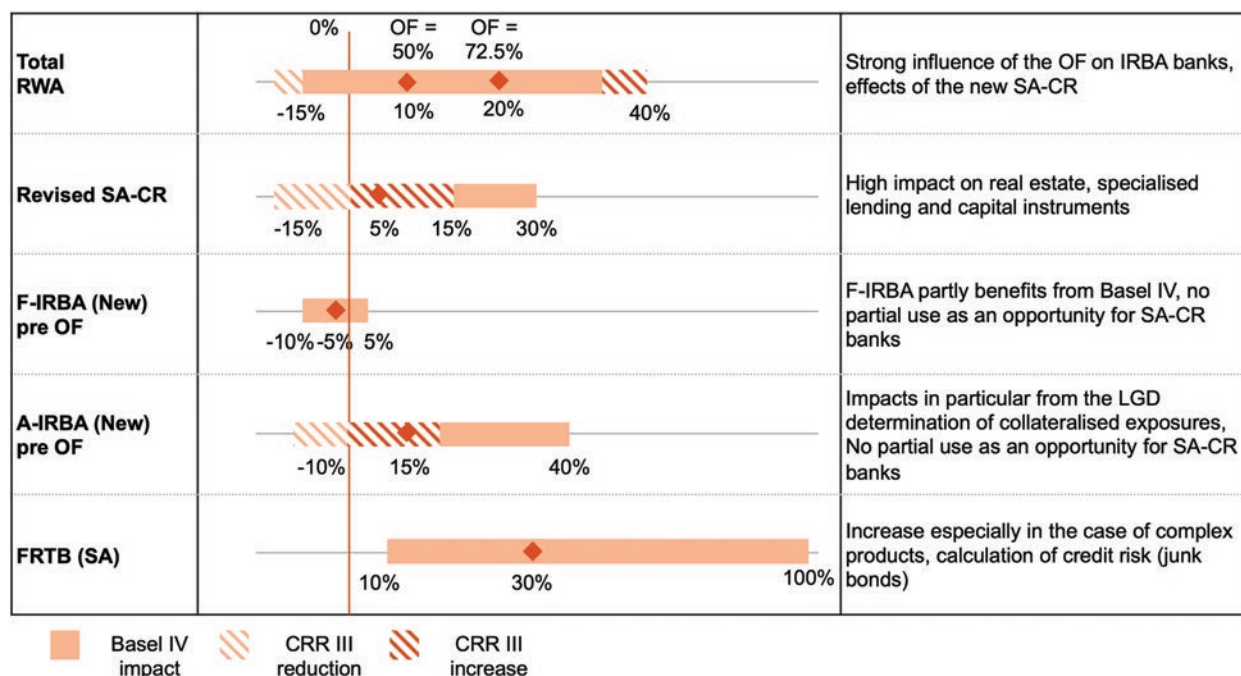


Figure 2: CRR III reduces the Basel IV impact – but still impacts RWA significantly depending on business model

countries. Figure 2 summarises the results of our Basel IV impact analyses. Compared to the sample of publicly available data, we believe the results are far more representative of the EU banking system and other jurisdictions. In contrast to the results of the BCBS's quantitative impact studies and the EU

Commission's estimated impact, the analyses are based on a very high level of granularity, mainly on a single exposure level.

According to these analyses, the impact varies significantly depending on banks' business models and to the extent internal models are used. The

higher the risk appetite of banks, the higher the increase of RWA. And the impact of the new output floor increases with the use of internal models. This observation shows that the aggregated publicly available impact studies might be misleading, as the real impact of Basel IV/CRR III is always bank individual. For example, banks with a low-risk credit portfolio that use mostly the IRB approach for most of their portfolios will face a significant increase due to the OF. To make the example more detailed: one bank in this analysis, with a strong focus on retail mortgage lending, has an average risk weight of 44 per cent in the IRB approach. The increase of the average risk weight due to the OF would be 65 per cent, not considering the possible increase of the RW in the SA-CR and other subsidising effects from other risk types. In the following section, we will analyse the impact of Basel IV/CRR III and the results of its European translation for some important selected examples, focusing on credit risk and the OF.

Implementation of SA-CR in the EU

The SA-CR will play a prominent role in all institutions in the future. Even institutions that use internal procedures to determine the capital requirements for credit risk must calculate the SA-CR for the entire banking book in parallel. This is required to calculate the new OF. As the relation between the SA-CR and the OF is linear, the increased average RW in the SA-CR will directly lead to a higher average RW for the IRB approach. For example, a bank that faces an increase of average RW from 70 per cent to 75 per cent in the SA-CR faces an increase due to the OF of 20.83 per cent instead of 12.78 per cent if the SA-CR did not change.

The 'institutions' exposure class

The CRR III changes in the 'institutions' exposure class may reduce RWAs for individual rated institutions. However, a significant increase in risk weights is expected for unrated banks with high creditworthiness in countries with excellent external ratings. For countries such as the Federal Republic of Germany, this corresponds to an increase in the risk weight of 100 per cent (from 20 to 40 per cent) and

for the A+ rating category of 50 per cent (from 20 to 30 per cent). Regardless of the existence of a rating, the preferred treatment of covered bonds remains. Additionally, it should be considered that most of the small unrated institutions belong to an institutional protection scheme. Banks that belong to such an institutional protection scheme can assign an RW of 0 per cent among each other. Depending on if a bank belongs to such an institutional protection scheme and the amount of business that falls under this rule, the impact can vary between 0 and 100 per cent. As the impact on RW can differ so much, there will also be an individual impact on banks' business models as the cost of capital is an essential component of pricing.

'Corporates' and 'specialised lending' exposure classes

The impact on corporate exposure is relatively moderate considering the changes on the RW based on external ratings. The EU follows the proposal of the BCBS. The critical difference for corporate exposures results from introducing the specialised lending (SL) sub-exposure class. The definition is new for banks that only used the SA-CR until now. Our analysis realised that applying the SL definition can be challenging and surprising. Moreover, an automated deviation of the definition is often impossible as credit contracts are very individual, and the needed information is not available in the banks' systems.

We observed that banks did not expect that the definition of SL is so often fulfilled, and therefore the RW impact is higher than expected and used for QIS. Especially in the SME portfolio, unexpected cases of SL can occur. But, again, the impact of Basel IV is very individual. Our analysis shows 10 to 20 per cent for a diversified corporate portfolio due to the SL treatment.

'Subordinated debt instruments' and 'equities' exposure classes

The RWA impact of the new regulations in the newly introduced 'subordinated debt instruments' exposure class is to be assessed as very large since — in the context of many corporate financings, especially with

SMEs — individual agreements are made, leading to subordination in the sense of this article. Similar to the SL sub-exposure class, the increase in RW surprises banks, as they did not expect that the definition was so often fulfilled. Subordinated and non-subordinated claims have been given the same risk weights; information on subordination is often unavailable in the institutions' systems. And as the cost of capital was the same, banks were not reluctant to grant subordinated loans. In one of the portfolios analysed by us, the part of SME loans that fulfilled the definition of SME was almost 10 per cent.

Given that the rest of the SME portfolio was unrated, the average RW for corporate loans increased by 5 per cent. The impact of the changes on equity exposures was relatively limited in our analysis. Only banks with more significant investments in Collective Investment Undertakings (CIU) that invest in equities might face a higher increase in RWA as the application of the look-through approach is mandatory. We also observed that start-up financing quite often fulfilled the definition of private equity. Therefore, banks with a business model that focusses on start-ups can dramatically increase their RWA for this portfolio. The EU proposal mitigates this impact as the 400 per cent risk weight must not be applied if the equity exposure is based on a long-term relationship with the client.

'Real estate financing' exposure class

The proposals of the EU Commission in the 'real estate financing' exposure class deviate relatively strongly from the recommendations of the Basel Committee. Surprisingly, the loan credit splitting approach is retained as the primary approach for determining risk weights for real estate financing. It is also noteworthy that the hard test condition is to play an important role, although only a few EU member states currently fulfil this requirement.

Our analysis shows that the credit splitting approach leads to lower risk weights in the first years after the origination of the loans, as the ETV is relatively high. Moreover, the more a loan is paid back over the loan lifetime, the whole loan approach would be more beneficial for banks. We identified banks with a conservative business model based on

low ETVs that face an increase in RWA compared to the current rules, while banks tend to grant high ETV loans. Another interesting observation is that ETVs in more rural areas were lower than in urban areas. Therefore, banks with a portfolio concentration in metropolitan areas often have an increase in terms of RWA than banks in more rural areas.

The proposal of the BCBS to increase risk weights for income-producing real estate (IPRE) is one of the biggest RWA drivers. Based on the BCBS proposals, the average increase in our sample was 10 to 20 per cent for a diversified real estate portfolio, based on the part of 30 per cent of both commercial and residential IPRE. As the definition of IPRE is new, no indicator for this definition is already available in the systems. Also, our calculation is based on a sample extrapolated to the entire portfolio. An overall survey within the portfolios of the banks will take years. The impact of IPRE will be eliminated mainly by the EU proposal.

The biggest lever for real estate exposure is the real estate value. Art. 229 CRR gives requirements on how the valuation of the asset should be done — current practices between banks and EU countries notwithstanding. Our analysis showed us practices from general haircuts of 40 per cent in one EU country to a several hundred pages long detailed regulation on how to value real estate in another EU country. Without more detailed guidelines given by the EBA, the variation of RWs will stay huge. Hence, the European regulation will not archive the original goal of BCBS.

'Retail' exposure class and aligned 'credit conversion factors'

A rather inconspicuous change is the CCF floor in the SA-CR and IRBA for credit lines that can be terminated. Banks that have extended such credit lines on a larger scale must expect significant increases in capital requirements. A reaction to this change is likely to be a 'dance on the tightrope', whereby line cuts and commissions on unused credit lines will not meet with the approval of bank customers.

However, the newly introduced definition of the term commitment does not correspond to the commonly used definition and will motivate banks

to develop new product variants and optimise RWAs. One example of our analysis shows how significant the increase of the BCBS rule can be for a bank and how much optimisation potential lies within the new definition of commitment. A bank had 15 per cent of its retail and corporate exposures falling under the definition of the new CCF floor. Considering an average RW of 73 per cent for retail, the increase of RWA was 2.35 per cent and for corporate, 0.36 per cent based on an average RW of 87 per cent. Expert estimates showed that by changing the product properties, up to 60 per cent of the RWA increase could be again eliminated.

Implementation of the revised IRB approach in the EU

The impact on RWA in the IRB approach without considering the OF depends very much on the banks' business model and if the foundation or advanced IRB approach is used. Particularly well-collateralised positions are likely to experience an RWA boost from the new LGD floor rules for banks using the advanced IRB approach. In contrast, over-collateralisation of loans under the foundation IRB approach will lead to significant relief compared to today.

The already low margins will come under even more pressure in the wholesale business due to eliminating self-estimated LGDs. Is the IRB approach dead? We believe not. On the contrary, with the new roll out requirements and the much better plannability due to the much more detailed regulations by EBA and ECB, a renaissance of the IRBA can be expected.

Changes to the scope of application

In the case of exposure to institutions and large corporates, using the foundation IRBA approach can significantly increase RWAs if the institution previously used the advanced IRB approach. This is because large companies and banks often have comparatively significant insolvency holdings. This means that, in the event of insolvency, large parts of the defaulted claims can be serviced from these holdings. As a result, this leads to comparatively lower LGD values in the advanced IRB approach than the

LGDs prescribed by the supervisory authorities in the basic IRB approach (40 or formerly 45 per cent). We observed a lower increase in RW concerning bank exposures as the interbank business is often highly collateralised, and the rules for reducing the supervisory LGDs, especially for financial collateral, are relatively efficient.

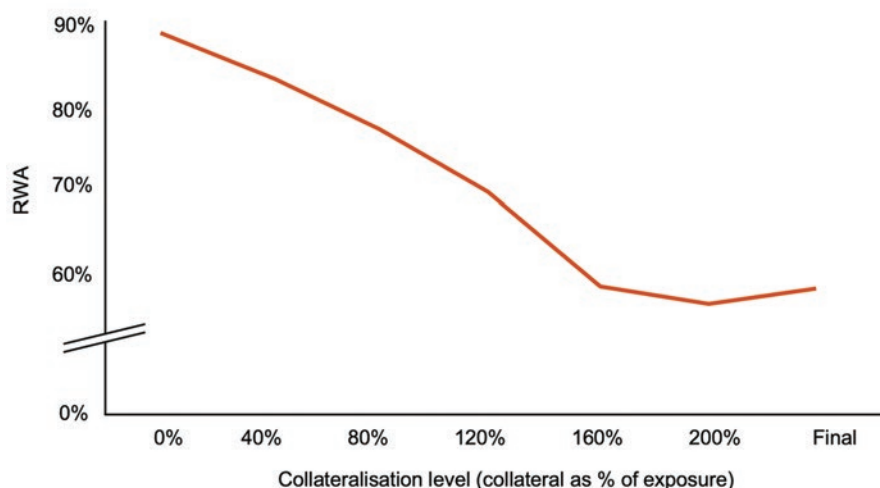
Banks that only use the IRB foundation approach will generally benefit from Basel IV. The removal of the scaling factor of 1.06 from the RW formula leads already to a reduction of 5.6 per cent. The decline of the supervisory LGD leads to a significant reduction of the RW as the LGD is a linear parameter in the RW formula. The LGD for senior exposures will be reduced by 11.1 per cent and is therefore directly reflected in the RW. The changes in the approach for credit risk mitigation can also lead to a significant reduction of RW as over-collateralisation can be considered much more adequate. Figure 3 shows how powerful the effect of the new risk mitigation techniques can be. But we observed in our analysis that banks often do not apply the risk mitigation even if the exposures are collateralised. This is because the qualitative requirements on risk mitigation are quite burdensome within the foundation IRBA. We expect the banks to use risk mitigation in the IRB foundation approach more often with the proposed changes.

The currently most discussed change for the IRBA is the new partial use philosophy. The requirement to roll out the IRB approach to all institutions' exposures has always been one of the biggest hurdles for banks to switch from the standardised approach to credit risk (SA-CR) to the IRBA. This is because the development of rating methodologies for individual asset classes is disproportionately more complex than for others. While many, especially small and medium-sized banks, that have stayed so far in the SA-CR, would have been able to fulfil the IRB requirements on rating systems for high default exposure classes, for low default portfolios, the effort and complexity were too high.

The BCBS proposed a much more flexible partial use of the IRBA, which was now even made more elastic by the EU. According to CRR III, the IRBA can be applied already only for at least one exposure class. Our analysis showed that many SA-CR banks started or will start projects soon for implementing

Impact on RWAs – Example of corporate portfolio with RRE collaterals

CRR III RWA expressed as a percentage of CRR II RWA at various collateralisation levels

**Figure 3:** Impact of over-collateralisation in the foundation IRBA

the IRBA and benefiting from lower RWA. As the flexibility of the partial use will be so high, our analysis shows a very high range of RWA relief by moving to IRBA. We observed RWA relief between 20 to 60 per cent without considering the OF.

But not only it will be easier for banks to move from SA-CR to IRBA, but the costs of implementation will be lower as well. Better IT systems, IFRS 9, better guidelines from regulators and a well-developed industry standard lead to lower implementation costs. As the advantage for SA-CR banks to move to IRBA with well-chosen portfolios is so big, there will be a simplified approach to move out of IRBA for specific portfolios on the EU level. This is to avoid market injustice for existing IRBA banks. Like the increase in IRBA implementation projects, we also observe that many banks plan to use this new discretion to move out of IRBA for specific portfolios.

Changes to the minimum risk parameters

The impact of the new PD floors will be minimal, as most PDs of counterparties are higher than the new PD floor of 0.05 per cent. The LGD floors for the

advanced IRBA are the opposite. As mentioned above, the LGD is a linear factor in the RWA formula. Therefore, every change in the LGD will be reflected directly in the RWA. Our analysis showed examples of high collateralised exposures. Residential mortgage loans in well-developed real estate markets, eg currently receive LGDs that are 50 per cent lower than the proposed LGD floors. This means that RWA for these exposures will rise by 50 per cent.

Another fundamental change is the collateral haircuts that must be applied before the weighted average LGD floor can be calculated. This requirement is very unclear in the BCBS proposals as the reference to the haircuts for the foundation IRB approach is not precise. However, within the CRR III, this reference is made clear. We observed in our analysis that this change could have a considerable impact. The following normalised example from our sample mentioned above shows the significance of this often in the QIS overseen requirement. Table 6 gives an overview of the collateral haircuts.

A residential mortgage loan with an ETV of 80 per cent (exposure value= $E=100$) receives an estimated LGD of 4 per cent today. The LGD under

Table 6: Collateral haircuts in the advanced IRBA

Type of collateral	Haircut (in %)
Financial collateral	SA haircuts
Eligible receivables	40
Eligible residential real estate (RRE)	40
Eligible commercial real estate (CRE)	40
Other physical collateral	40
Ineligible funded credit protection (FCP)	100

CRR III would increase to 5 per cent due to the parameter floors ($LGD_{Floor, collateral}$). This means that the bank faces an RWA increase of 25 per cent due to the new parameter floors, as the LGD is a linear factor in the RWA calculation formula. If the collateral haircut ($H_{collateral}$) of 40 per cent (collateral value $= C = 125$) is considered additionally (collateral value after haircut $= C_h = 75 = C \cdot (1 - H_{collateral}) = 125 \cdot 0.6$), the LGD raises to 10 per cent as the LGD equals the weighted average LGD floor ($= LGD_{Floor, collateral} \cdot C_h / E + LGD_{unsecured} \cdot (E - C_h) / E = 0.05 \cdot 0.75 + 0.25 \cdot 0.25$). This is an increase of 150 per cent compared to the original LGD estimation and 100 per cent compared to the LGD floor without considering the collateral haircut.

Implementation of the market risk framework

The Basel Committee's work on the FRTB is still not fully completed. Thus, it is currently unclear when, how and whether the FRTB will be implemented in the large member countries of the BCBS. With this in mind, Art. 461a CRR III contains an authorisation for the EU Commission to make further substantive adjustments to the European implementation and to change the effective date of the new FRTB approaches.

Implementation of the credit value adjustment risk approaches

Institutions will have several approaches to choose from when calculating credit value adjustment risk, with the complexity of the approaches correlating negatively with the level of capital requirements. For banks with very small derivatives portfolios, the

simplified approach could double the capital requirements for counterparty risk. The two basic CVA approaches also have too high a capital requirement. It is to be expected that smaller banks will also tend to use the reduced basic CVA approach. The standardised approach will also be a challenge for larger banks, but this approach is the only one that sets the capital requirements in relation to the risk in a reasonably appropriate manner.

EU implementation of the new operational risk standard approach

The effective alpha factor, in the range of 12 to 18 per cent, is the average capital adequacy ratio relative to the business indicator in the new operational risk standardised approach (like the alpha of 15 per cent in the current basic indicator approach). Thus, in Bucket 1, the minimum own-fund requirement is obtained by multiplying the BI value (less than or equal to €1bn) by the effective alpha-factor of 12 per cent. The internal loss multiplier proposed by the Basel Committee is not introduced in CRR III. This factor would have allowed the respective capital adequacy ratio to be increased or decreased concerning the BI value and depending on the individual loss history of an institution. An SA with a loss multiplier would have been more risk sensitive.

Only on an institution-by-institution basis can meaningfully estimate the impact of the CRR III introduction of the SA on capital requirements. Nonetheless, the general observation in our impact analysis shows that large banks are more likely to face higher capital charges due to the discontinuation of the advanced measurement approaches (AMA) for determining operational risks. In contrast, our analyses have found that smaller and medium-sized

institutions are likely to report lower capital requirements under the SA than under the current baseline indicator or standardised approach.

Implementation of the new output floor

As discussed already above, the OF is the primary driver of RWA increase within Basel IV. The EU Commission decided to reduce the impact significantly by introducing additional transition rules until 2032. The original transitional phase-in of the OF is postponed in parallel to the delayed coming into force of the CRR III. Instead of 2023, the phase-in starts in 2025 and ends in 2029.

The impact of the OF is very individual and depends on various factors such as the business model and the degree of coverage with internal models. Banks whose business model is relatively low-risk and at the same time have a high degree of coverage with internal models are potentially more affected than banks with higher-risk business models. The differences between RWAs according to standardised approaches and RWAs according to internal models tend to be smaller for higher-risk business models. In addition, there are complex interdependencies between the newly introduced OF, the new CR-SA, the new regulations on the IRBA and the new standard and internal models for market price risk, which will make optimal capital management significantly more difficult in the future.

In this paper we will focus on the effects of the additional transition rules proposed by the EU Commission. The general impact of the OF is discussed elsewhere.⁷ The proposed additional transition rules allow banks to apply lower risk weights in the SA-CR as a basis for the OF. Banks that only use SA-CR to calculate RWA must not apply the rules. The relation between SA-CR RW, the OF and the applicable RW for the capital ratio is not linear. Thus, the transitional rules can have a strong indirect influence on the capital ratio in some cases, others not. For example, banks can apply an RW of 65 per cent instead of 100 per cent as a transitional rule for unrated investment-grade corporate exposures. This is a reduction of 35 per cent. The decline of the hypothetical RW in the SA-CR does not lead directly to a 35 per cent

reduction of the total RWA (see Table 7). The OF and its non-linearity are already a huge challenge for banks. The transitional rules make it even more complex and could lead to wrong investment decisions or at least higher project implementation costs.

The application of the OF is according to BCBS on a consolidated level. Traditionally, the EU banks must follow the capital requirements rules on a group and a consolidated level. The banking industry heavily opposed this. On the other hand, regulators from significantly smaller EU countries with many subsidiaries of large banking groups from other EU countries ask for an OF application and a single entity level.

As a result, the EU Commission developed a compromise summarised in Figure 4. The proposal of the EU Commission follows the proposed approach of Neisen/Schulte-Mattler (2021b) broadly about an originator-based distribution of the OF effect. Suppose the application of the OF stays only on a consolidated level. In that case, there will be a vast potential for regulatory arbitrage that otherwise would be limited only to the single entity level. The relatively complex rules for the distribution of the OF for EU subsidiaries will likely be changed in the upcoming triologue process at the EU level.

CONCLUSION AND POLICY IMPLICATIONS

According to the EU Commission, the majority of the CRR III regulations are to be applied by institutions for the first time on 1st January, 2025. This is a great relief for European institutions, because according to the BCBS the regulations are to be applied as early as 1st January, 2023. This date being the result of an earlier postponement of one year 'due to Corona'. When adopting the Basel regulations, the EU had the goal of adapting the regulations, which were only developed for internationally active banking groups, based on the proportionality principle in such a way that the core of the regulations remains while the special framework conditions of the European banking sector — and especially the small banks — are taken into account.

Therefore, some adjustments have been made to the Basel proposals and, in particular, generous transitional provisions have been included. However,

Table 7: Impact of additional transitional rules for the OF on EU level

	Line number / arithmetic operation	Example 1 without transitional rules	Example 1 with transitional rules	Example 2 without transitional rules	Example 2 with transitional rules	Example 3 without transitional rules	Example 3 with transitional rules
RWAs SA							
CR-SA risk-weighted assets	(1)	100	82.5	100	82.5	100	82.5
thereof investment grade unrated corporate		50	32.5	50	32.5	50	32.5
RWAs SA for market risk and opRisk	(2)	20	20	20	20	20	20
Sum SA RWAs	(3)=(1) + (2)	120	102.5	120	102.5	120	102.5
RWAs internal models (IM)							
IRBA RWAs	(4)	50	50	55	55	65	65
RWAs SA for market risk and opRisk	(5)	20	20	20	20	20	20
Sum IM RWAs	(6)=(4) + (5)	70	70	75	75	85	85
RWAs after consideration of the floor							
Floor calculation (rate=72.5%)	(7)=0.725*(3)	87	74.3125	87	74.3125	87	74.3125
Total RWAs	(8)=max[(6),(7)]	87	74.3125	87	75	87	85
Relief from transitional rules			14.58%		13.79%		2.30%

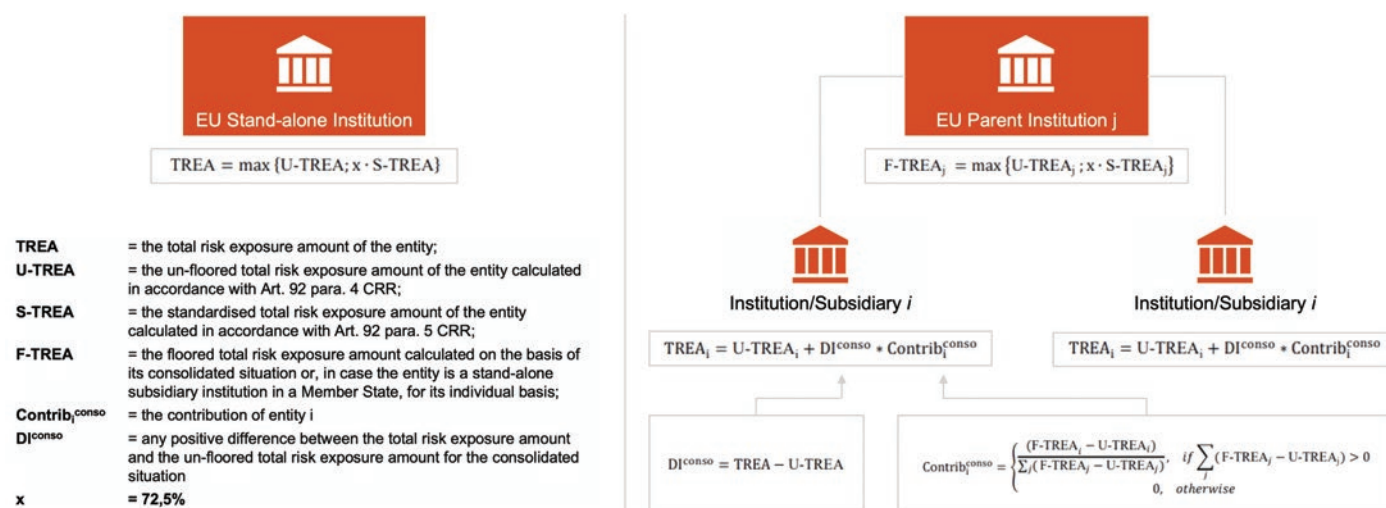


Figure 4: Output Floor – Application on single entity level

it must be considered that the drafts from October 2021 are the first drafts of the EU Commission, and that public consultation has taken place since then. Intensive negotiations have also been started between the EU member states and the Commission, with some member states demanding greater fidelity to the Basel proposal and in particular its timetable.

Despite the considerable relief provided, the effects of the CRR III new regulations are material in individual cases, even if they are not always apparent at first glance. In the credit risk area, it is to be welcomed from the banks' point of view that the new regulations in the SA-CR increase the risk sensitivity compared to the current procedure.

The high variability of RWA changes must be taken into account to finalise the negotiations at the EU level. Banks with different business models are affected differently by the proposed changes. Some of the adjustments proposed by the EU to the Basel proposals exacerbate this situation. This may result in some banks being disproportionately positively and others negatively affected by Basel IV/CRR III. Only if many diverse banks are obliged to conduct detailed impact analyses and send them to the supervisors can these undesirable effects be avoided.

Furthermore, it must be ensured that the European specifics of the banking market are considered when implementing the Basel proposals into European law, but that the deviations from the Basel

proposals do not become too great. Otherwise, there is a danger that other members of the BCBS will also deviate too much from the requirements. Ultimately, the goal of an internationally uniform supervisory regime can no longer be ensured.

New regulatory requirements have always had an impact on banks' business models. However, with the CRR III new regulations, a new level is reached. The influence on the business models of the institutions is very individual and can have both positive and negative effects. Other market participants such as insurance companies, pension funds or credit funds will closely observe these developments and seek their business opportunities where banks will hold back due to the new regulations. With the CRR III changes, 'regulation leads to innovation' applies once again.

AUTHORS' NOTE

The views expressed in this paper are those of the authors and are not necessarily endorsed by the authors' employers.

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