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## THE TREATMENT OF CREDIT RISK IN POST-CRISIS REFORM OF BASEL RULES: MODIFICATION OF THE STANDARDISED AND FOUNDATION IRB APPROACH

Tretman kreditnog rizika u post-kriznoj reformi Bazelskih pravila – modifikacija standardizovanog i osnovnog IRB pristupa

### Abstract

The framework for credit risk from Basel II standard failed to provide an adequate response in periods of crises, so the necessity of its revision is an imperative placed before the Basel Committee. A comprehensive reform of approaches used to determine risk-weighted assets is particularly focused on the rules relating to credit risk, because it is its largest constituent. The directions of evolution of approaches for credit risk can be anticipated in consultative documents of the Basel Committee, and this paper is primarily aimed at presenting a critical review of their upcoming changes, particularly focusing on Standardised approach (SA) and Foundation IRB approach (F-IRB). In that sense, key points of revision are emphasised, and comparative analysis regarding current regulations has been done. As additional benefits of research, certain suggestions are presented with a view to upgrading the architecture in an analytical sense, especially in the part relating to F-IRB approach, where correlation issues, application of models and their validation have been identified. One of interesting solutions proposed for improving the credit risk system would be the third hybrid approach, which implies the development of models by the national regulators and implementation in their jurisdictions. The dominant conclusion of the entire evaluation is the need for radical modification of the credit risk framework, because the empirical analyses have demonstrated major deficiencies and anomalies in calculating risk-weighted assets. Therefore, the proposals referred to in the Basel Committee consultative documents cannot be seen as a step in the right direction, because there is an obvious lack of power for radical changes of the approaches which are used to describe the positions of the exposure to credit risk.

**Keywords:** *credit risk, Basel standards, Basel rules reform, standardised approach (SA), F-IRB approach, CRA ratings, probability of default (PD), risk-weighted asset (RWA)*

### Sažetak

Okvir za kreditne rizike Bazel II standarda nije uspeo na adekvatan način da pruži odgovor u uslovima krize zbog čega je neminovnost njegove revizije imperativ koji se postavlja pred Bazelski komitet. Sveobuhvatna reforma pristupa koji determinišu rizikom-ponderisanu aktivu u svom fokusu imaju upravo pravila vezana za kreditni rizik, jer je on njen najveći konstituent. Pravci evolucije pristupa za kreditni rizik naziru se iz konsultativnih dokumenata Bazelskog komiteta, i ovaj rad ima prvenstveno za cilj kritički osvrt na njihove nastupajuće promene sa primarnim aspektima na standardizovani pristup (SA) i osnovni IRB pristup (F-IRB). U tom smislu, apostrofirane su ključne tačke revizije i urađena je komparativna analiza u odnosu na trenutno aktuelnu regulativu. Kao dodatni benefiti istraživanja predstavljeni su predlozi koji treba da analitički nadograde aparaturu, posebno u delu F-IRB pristupa, gde su identifikovana pitanja korelacije, primene modela i njihove validacije. Jedno od zanimljivih rešenja koje se predlaže za unapređenje sistema kreditnih rizika bi predstavljao treći, hibridni pristup, koji bi podrazumevao konstrukciju modela od strane nacionalnih regulatora i primenu u njihovim jurisdikcijama. Dominantni zaključak celokupne evaluacije je potreba za radikalnim promenama okvira za kreditne rizike, jer su empirijske analize dokazale velike manjkavosti i anomalije obračuna rizikom-ponderisane aktive. Zbog toga se predlozi u konsultativnim dokumentima Bazelskog komiteta ne mogu smatrati korakom u pravom smeru jer je očigledna nedovoljna snaga za korenitim promenama pristupa koji se koriste za opisivanje pozicija izloženosti kreditnom riziku.

**Ključne reči:** *kreditni rizik, Bazelski standardi, reforma Bazelskih pravila, standardizovani pristup (SA), F-IRB pristup, CRA rejtinzi, verovatnoća default-a (PD), rizikom-ponderisana aktiva (RWA)*

## Introduction

A comprehensive reform of regulatory rules relating to banking supervision, the standardisation of which is embodied in the Basel Accords, emerged as one of the necessary procedures in banking industry. Some evident mistakes integrated within their structures were directly revealed upon the outbreak of the last financial crisis in the course of 2007. The reactions were directed against the segments with the major discrepancies identified, and these were reflected in the revision of rules for market risks<sup>1</sup> [3], and in an entirely new accord, Basel III [4], [5], primarily addressing capital and liquidity.

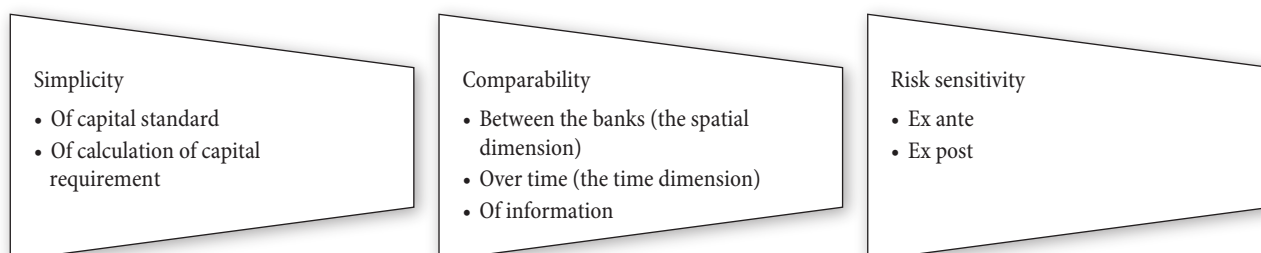
Following these reforms which served as a quick response to the problems, a question arose relating to the overall system and thorough revision of the approach for describing the risk positions, that is, the approach based on which risk-weighted assets (RWA) is determined. In other words, the focus is now on the denominator of the capital adequacy, as a single indicator of the financial position of a bank. The new reform, therefore, encountered three ultimate objectives that the new set of rules was to meet [6]:

The above principles constitute the basis which requires finding an adequate balance, as it is evident that the principles are in mutual collision. In theory, higher sensitivity to risk can only be achieved by increasing the complexity of the framework, which has an adverse effect on the remaining two principles, and vice versa. This is why it is necessary to perform their optimum trade-off in order to achieve the maximum effects of supervision.

A particular role in the process of developing new Basel rules lies with the modifications relating to credit risks, as the most important type of risks encountered by the banks in their operations, and whose participation in RWA is by far the highest. This has been presented, therefore, as one of the goals of the remaining reforms, as highlighted in the report of the Basel Committee for Banking Supervision (the Basel Committee) for G20 [9]. This paper investigates the proposed changes of the Standardised approach (SA) and Foundation Internal Ratings-Based approach (F-IRB) for credit risk, in a form of a critical overview of potential directions of their evolution. In this respect, one radical move is particularly interesting and was proposed during the initial revision of the SA, and refers to the complete removal of credit ratings provided by external rating agencies (CRA) in the process of determining the risk weights. This can be interpreted as a response to increasing criticism of CRA ratings and their contribution to deepening the negative effects during periods of stress. It was proven that credit ratings are unable to predict the defaults in a proper manner and that they are inferior to the relatively straightforward scoring models which can be developed on the basis of publicly available information [16]. On the other hand, it was evident that certain manipulations had occurred, with respect to reallocation of portfolio in the classes which had been, in the eyes of regulators, perceived as less risky, and which were accordingly treated with lower risk weights. This is also reflected in the implementation of internal model approach, as the banks made use of the opportunities provided to reduce RWA [21]. It is evident that the issue of moral hazard in IRB approach further emerged in the situations when the banks were provided

1 After a long and exhaustive consultation period, in January 2016, the Basel Committee adopted an entirely new set of rules for market risks.

**Figure 1: Principles of revision of regulatory rules**



Source: Basel Committee

the opportunity to choose between the approaches for the calculation of RWA [14], which is not the case when the approach is mandatory for all. These are just some of the issues that need to be brought out in the process of revision of the overall framework, in order to analyse its further direction.

The focus of the research is solely on the calculation of RWA, while some other segments have not been addressed, primarily concerned with the credit risk mitigation techniques and the issues relating to off-balance sheet exposures (the credit conversion factors). The second part of the paper addresses the topics relating to the reform of the SA approach. The third part presents the future of F-IRB and the changes indicated in the Basel Committee consultative documents. The introduction of the so-called capital floor will establish the relation between these two approaches, which is also one of the topics in the third section. The fourth part is a substantive part of the paper which offers a critical perception of the proposed changes of Basel rules and provides a comparative analysis of the current regulations with the proposed guidelines for their modification referred to in previous sections. The conclusion is the final, fifth part and it summarises all the results based on the previous analyses and research.

## The new rules of standardised approach for credit risk

According to the announced modifications in the consultative documents of the Basel Committee, the main architecture of the SA is to remain unchanged. The rationale will retain the principles of the so-called Cooke ratios [17], laid down during the introduction of Basel I, which implies the use of risk weights for exposures. The foundations laid down at the time are, so far, unsurpassed and the perception that

the use of different risk weights for different exposures, depending on their generic characteristics, results in risk sensitivity still remains in effect. In other words, the main changes which are subject to modifications relate exactly to these risk weights and the methods of their determination, whereas the mechanism of their use is unchanged.

## The initial proposal for SA revision

The Basel Committee presented its initial proposals for the revision of the SA approach in its 2014 consultative document [8]. The first major change, which was anticipated at the time, was the complete removal of the CRA ratings, which would constitute a significant modification of the existing approach, in line with Basel II. Exactly at that time, during the implementation of Basel II, the introduction of CRA ratings was highlighted as one of its most important modifications, as it enables the fine grading of risk weights based on credit quality of an entity/transaction, which tended to be one of the key deficiencies of Basel I. The decision for the removal of CRA ratings was underpinned by the relevant principles of the Financial Stability Board, desiring to reduce their impact and role in a financial system. They were labelled as one of the main causes of the so-called “cliff effects” and “herding behaviour”, therefore multiplying the adverse effects during the financial crisis [13]. The decision was thus reached that CRA ratings should be entirely removed for banks and corporates exposure classes. Exposure classes based on the credit ratings of a country (sovereigns) are not included in the scope of the current discussion, as the Basel Committee is preparing for them a broader scope of reforms.

The consultative document presented a proposal of new parameters to be used for determining the risk weights. These were designated as risk drivers and identified in

**Table 1: Risk drivers for exposures to banks and corporates**

Exposure class	Risk drivers	Calculation method	Discriminant direction	
			Defaulters	Non-defaulters
Banks	CET 1 ratio		↓	↑
	Net NPA ratio		↑	↓
Corporates	Leverage		↑	↓
	Revenue	Income from business activities	↓	↑

Source: Basel Committee and author's illustrations

accordance with the above general principles of regulatory reform for banking supervision (simplicity, comparability and risk sensitivity).

It is important to point that the determination of risk drivers was done after conducting the procedure rather similar to the development of internal rating system in banks. Statistical analyses were performed based on the empirical data, along with the complementary expert support, after which the risk drivers referred to in Table 1 proved to be the parameters with the strongest power of prediction for defaults. Their discriminant directions define the features which distinguish between “good” and “bad” entities. In the course of the procedure, the calibration of the risk weights was performed by integrating the calculated probability of default for each of the critical values into the formula used for the calculation of IRB approach. The new weights are presented in Tables 2 and 3.

The proposed risk weights follow the discriminant direction of the risk driver, thereby distinguishing between “good” and “bad” clients. There are extreme cases which, in effect, may serve as unique knock-out criteria, and they automatically result in the use of a maximum risk weight value of even 300%, as in these examples, the probability of default is assessed as very high. The proposed maximum risk weight value is doubled compared to the current regulations, in line with Basel II. In cases of exposures to banks, this may arise when the capital adequacy indicator, in the form of CET1 ratio, is below the minimum set forth

by Basel III standard, which suggests very poor financial image and the situation of undercapitalisation of a bank. On the other hand, in exposures to corporates, the solvency requirement is the most relevant one, because in case the accumulated losses have exceeded the total capital of an entity, the entity’s liabilities in such case exceed its assets, and consequently, the entity is in the insolvency zone. An important change in exposures to corporates is that now it explicitly includes the cases of specialised lending, which has been taken over from the IRB approach in Basel II, with minor modifications.

The class of exposure to retail was not subject to major changes, except for the additional clarification relating to cases when the exposure generically belongs to this class, but for the reasons of the imposed exposure limits, the class may not be eligible for the preferential risk weight of 75% for retail. In such a case, the exposure is categorised as the so-called other retail exposures<sup>2</sup>. The most significant changes are also seen in the class of exposures secured by real estate. The class is still divided into the exposure secured by the residential real estate and the one where the collateral is the commercial real estate, due to its different treatment.

Considering that the point is about the exposures secured by real estate and that the collateral in these cases has much more important role than in other exposure classes,

<sup>2</sup> Exposures to SMEs which fail to meet the criteria for the so-called retail segment are treated as exposures to corporates.

**Table 2: Risk weights for exposures to banks**

	CET1 ratio $\geq 12\%$	12% > CET1 ratio $\geq 9.5\%$	9,5% > CET1 ratio $\geq 7\%$	7% > CET1 ratio $\geq 5.5\%$	5.5% > CET1 ratio $\geq 4.5\%$	CET1 ratio < 4.5%
Net NPA ratio $\leq 1\%$	30%	40%	60%	80%	100%	
1% < Net NPA ratio $\leq 3\%$	45%	60%	80%	100%	120%	300%
3% < Net NPA ratio	60%	80%	100%	120%	140%	

Source: Basel Committee [8, p. 31]

**Table 3: Risk weights for exposures to corporates**

	Realisation $\leq \text{€}5\text{m}$	$\text{€}5\text{m} \leq \text{Realisation} \leq \text{€}50\text{m}$	$\text{€}50\text{m} \leq \text{Realisation} \leq \text{€}1\text{bn}$	Realisation $\geq \text{€}1\text{bn}$
Leverage: 1x-3x	100%	90%	80%	60%
Leverage: 3x-5x	110%	100%	90%	70%
Leverage > 5x	130%	120%	110%	90%
Negative capital	300%			

Source: Basel Committee [8, p. 33]

the main risk driver is LTV ratio, regardless of whether the residential or commercial property is in question. What occurs here, in effect, is the substitution between the client's risk weight and the property risk weight, and additionally, in cases of residential property the client's financial position is also considered through DSC ratio. An exception may be the Option A with commercial real estate which foresees the treatment of exposure as if unsecured and weighting is done based on the client's generic type (corporate or retail). Such position is underpinned by the fact that commercial real estate was one of the reasons for intensifying the crisis, for the reasons of its high level of volatility, followed by a sharp decline in value and reduced marketability in periods of stress. Only in developed and deep markets there is room to recognise the preferential treatment, in terms of risk weight of 50%, provided that the generated LTV ratio does not exceed 60%.<sup>3</sup>

LTV ratio and risk weights are in positive correlation, as the higher value of LTV implies lower margins of safety, due to the fact that the value of property increasingly amounts to the value of the exposure. In order to categorise an exposure within this class with the risk weights referred to in Table 5, such exposure would need to meet a taxonomy

<sup>3</sup> The preferential treatment requires the fulfilment of other requirements listed in the document [8, p. 37].

of requirements, with respect to finished property, legal enforceability and prudent (adequate) valuation.

Another interesting development in the consultative document is the introduction of the so-called add-on (additional) factor for currency mismatch, in a sense that a client earns his/her income in one currency, and has the liabilities in a form of a loan, in some other currency. This implies adding an additional percentage for such a mismatch to the risk weight, for the classes of exposures to retail and exposures secured by residential real estate.

### Second consultative proposal for revision to the SA for credit risk

Following the initial proposal for revision to the SA for credit risk, in late 2015 the Basel Committee published its second consultative document [10], incorporating the responses of all interested stakeholders, primarily the representatives from the banking industry, to the proposed changes from the first consultative document. The document again reintroduces the use of CRA ratings, yet insists on their non-mechanistic use, which implies the mandatory internal credit risk management procedure. This is primarily reflected in the mandatory establishment of due diligence system and performance of internal

**Table 4: Risk drivers for exposures secured by real estate**

Exposure class	Risk drivers	Calculation method	Discriminant direction	
			Defaulters	Non-defaulters
Secured by residential real estate	LTV ratio		↑	↓
	DSC ratio		↑	↓
		Option A: treating as unsecured		
Secured by commercial real estate		-		
	Option B: LTV ratio	Same as with the residential real estate	↑	↓

Source: Basel Committee and author's illustrations

**Table 5: Risk weights for exposures secured by real estate**

Residential real estate	LTV ≤ 40%	40% ≤ LTV < 60%	60% ≤ LTV < 80%	80% ≤ LTV < 90%	90% ≤ LTV < 100%	LTV ≥ 100%
DSC ≤ 35%	25%	30%	40%	50%	60%	80%
Other loans	30%	40%	50%	70%	80%	100%
Commercial real estate	LTV < 60%		60% ≤ LTV < 75%		LTV ≥ 75%	
	75%		100%		120%	

Source: Basel Committee [8, pp. 36, 38]

risk assessment. The imparity principle is established as due diligence may result only in higher risk weight if overreliance on CRA ratings is identified. In other words, the flexibility exists only “in upward direction” when the level of risk weight is in question.

A new development is that each supervisor now needs to identify explicitly whether his jurisdiction allows the use of CRA ratings or not. Accordingly, in cases of exposures to banks, the two following approaches are offered:

- 1) External Credit Risk Assessment (ECRA) – the approach based on CRA ratings and incorporated in jurisdictions that allowed their use
- 2) Standardised Credit Risk Assessment (SCRA) – used in exposures with no CRA ratings in jurisdictions which allow their use; all exposures in jurisdictions which do not allow the use of CRA ratings

ECRA is grounded upon the current rules for the SA, in line with Basel II. The external credit rating is used to determine the so-called “base” risk weight which may be one level higher if it is identified during the internal risk assessment that the external credit ratings failed to reflect the actual risk level (due diligence). Short-term exposures with an original maturity of three months or less again have the preferential treatment.

SCRA approach has somewhat taken over the concept of the initial revision which introduced the risk drivers. They are very broadly established here and primarily refer to the compliance with regulatory requirements. The key arrangement relates to the evaluation of generating of cash flow for the settlement of liabilities and their dependence on macroeconomic elements, however, the explicit classification is done based on the following features:

In accordance with the grading from Table 6, the following risk weights were identified:

An important change for SCRA approach is that the Basel Committee is announcing the integration of macroeconomic risks through OECD country rating. This proposal is still in the early development stage and the integration method has not been defined yet. ECRA approach implies that within CRA rating, there is a perception of macroeconomic risks.

CRA ratings have also been reintroduced for exposures to corporates and their use is defined by the regulators. However, unlike exposures to banks, a single risk driver has not been designated here, in order to determine the risk weight in cases when external credit ratings are not applied. This implies that the risk weight remains the same as in the current regulations of the SA, that is, 100%. The only change is that for some exposures which could be considered as the “investment grade”, 75% weight is assigned.<sup>4</sup> These exposures are seen as the entities which have the adequate capacity to meet their financial commitments in a timely manner, irrespective of the economic cycle and macroeconomic conditions, however, they must have the securities outstanding on a recognised securities exchange. In the systems where CRA ratings are applied, there are principally no changes with respect to Basel II, with the fact that the “base” risk is determined using the same grading method. Such base risk may be changed, but solely towards a higher risk weight, on the basis of due diligence performed.

<sup>4</sup> SMEs which meet the eligibility criteria for the corporate segment are assigned the weight of 85%, not 100%.

**Table 6: Classification of exposures to banks - SCRA**

Group / grade	Compliance with regulatory requirements	Compliance with capital buffers	Auditor's opinion on financial statements
A	✓	✓	Unqualified
B	✓	×	Unqualified
C	×	×	Disclaimer or qualified

Source: Basel Committee and author's illustrations

**Table 7: Risk weights for SCRA approach**

Risk assessment	Grade A	Grade B	Grade C
“Base” risk weight	50%	100%	150%
Risk weight for short-term exposures	20%	50%	150%

Source: Basel Committee [10, p. 29]

In retail exposures, there have been no changes in relation to the first consultative document, and the “other retail exposures” is still in use. The class of exposures secured by real estate again underwent some more significant changes. The rationale remained whereby the key risk driver is LTV ratio, whereas in the residential real estate class, DSC ratio has clearly been excluded. Some classes of specialised lending from corporates have now been integrated into this class for the purpose of a more systematic classification (ADC – land acquisition, development and construction and IPRE – income producing real estate). The most fundamental change relates to the fact that the key classification now depends on whether the client’s creditworthiness is dependent on collateral or not. In other words, the purpose of property is defined depending on whether it generates the cash flow for the repayment of the loan or not. A more rigorous treatment is for the loans whose repayment is in positive correlation with the cash flows generated by the property which is subject to mortgage, whether in the form of sale or renting. A commonly accepted perception is that such exposures, following *ceteris paribus* assumption, are always more risky than the exposures whose repayment is not materially dependent on the property.

Additional (add-on) factor for currency mismatch has been expressly defined to stand at 50%, as an add-on to a certain risk weight, whereby the maximum level of total risk weight, including the add-on, may not exceed 150%. The use of add-on was proposed to include the corporate clients as well. The second consultative document mentions for the first time the revision of defaulted exposures. The main development constitutes the introduction of additional eligibility criteria for this type of exposures,

in line with the IRB approach. Additionally, the past due concept now relates not only to the loans, but to all types of exposures owned by the bank.

## The future of F-IRB approach

Some evident deficiencies existing within the F-IRB approach are being discussed by the Basel Committee [11], attempting to seek the modalities for its improvement. The ultimate goal is reducing the variability of RWA due to the degree of discretion provided to banks. The means to achieve this is the convergence of the SA and F-IRB approaches in a sense that there should be no major discrepancies between these two, thereby mitigating the moral hazard effect. The consultative document above is based on the restrictions being introduced or modified in the application of the F-IRB. The first among a number of key changes anticipated from the consultative document refer to the complete prohibition of using the F-IRB, that is, its restriction for certain classes:

- exposures to banks and other financial institutions (including insurance companies)
- exposures to corporates belonging to consolidated groups with total assets exceeding EUR 50bn
- exposures to equities
- exposures to specialised lending

RWA for these classes will be defined solely based on the SA approach. The reason for such decision was the empirical evidence of high variability of parameters used for calculation in the F-IRB. The focus is here on PD as the only input calculated by the banks on internal basis. The analysis noted that the banks have a rather similar grading of same clients and the assessment of their relative

**Table 8: Risk weights for exposures secured by real estate (the second consultative document)**

Exposures secured by RESIDENTIAL real estate					Exposures secured by COMMERCIAL real estate		
Repayment not materially dependent on the cash flows generated by the property							
LTV ≤ 40%	40% < LTV ≤ 60%	60% < LTV ≤ 80%	80% < LTV ≤ 90%	90% < LTV ≤ 100%	LTV > 100%	LTV ≤ 60%	LTV > 60%
25%	30%	35%	45%	55%	RWc*	Min (60%, RWc)	RWc
Repayment materially dependent on the cash flows generated by the property							
LTV ≤ 60%		60% < LTV ≤ 80%		LTV > 80%	LTV ≤ 60%	60% < LTV ≤ 80%	LTV > 80%
70%		90%		120%	80%	100%	130%

\* RWc – client’s risk weight  
Source: Basel Committee [10, pp. 36-37]

risk, that is, the comparative aspect of one client's risk compared to the other clients' risk. This implies that the applied models managed to exercise their main function of discrimination of clients based on their creditworthiness, however, the estimates of PD provided by them vary considerably. The issue here is that classes, banks and large corporations, due to the nature of their portfolio, have an exceptionally low percentage of defaults, which precludes the construction of the model due to insufficient information for developing a pool of "bad" clients. In statistical terms, the impartial assessment of parameters in the model is significantly affected, therefore, the SA emerges as the necessary alternative.

Another major modification relates to changes in and introduction of new limitations of components of risk in RWA function (PD, LGD and EAD). For the F-IRB, the most relevant changes relate to PD, while the introduction of restrictions for other components of risk is associated with the A-IRB approach.

The third part of changes also targets the assessment of parameters produced through internal models and the modification of fixed parameters defined by the supervisor. All major proposed changes are presented in Table 9.

Alongside the consultations on the modification of approach for credit risk runs the consultation on introducing the capital limitations [7], the so-called capital floor, as a mandatory relation between the SA and IRB approaches.

The main motivation is the recurring intention of the Basel Committee to reduce the variability of RWA. Capital floor is considered only in case the IRB approaches are used when calculating the RWA. The concept implies that the SA approach is the bottom limit for the RWA, whereas the use of IRB may only result in its higher value. It is evident that the key differences between the two concepts are seen in the denominator of capital adequacy ratio (RWA), however there are some minor differences which affect its numerator (regulatory capital), and are associated with the correction of CET1/T2 capital, with respect to provisions for credit risks. Therefore, two options were proposed for the correction of numerator and denominator, whereby the use of the IRB approach is transformed into the SA resulting in a comparative basis for comparison. The multiplication factor, that is, the floor factor, needs to be determined and will be subsequently calibrated. The comparison procedure is shown in Figure 2.

## Comparative analysis of proposed modifications of the SA and F-IRB approaches

### Modification of the SA approach

The first observation regarding the evolution of the SA approach is the lack of any indication about changing the classes of exposures. There are certain reallocations

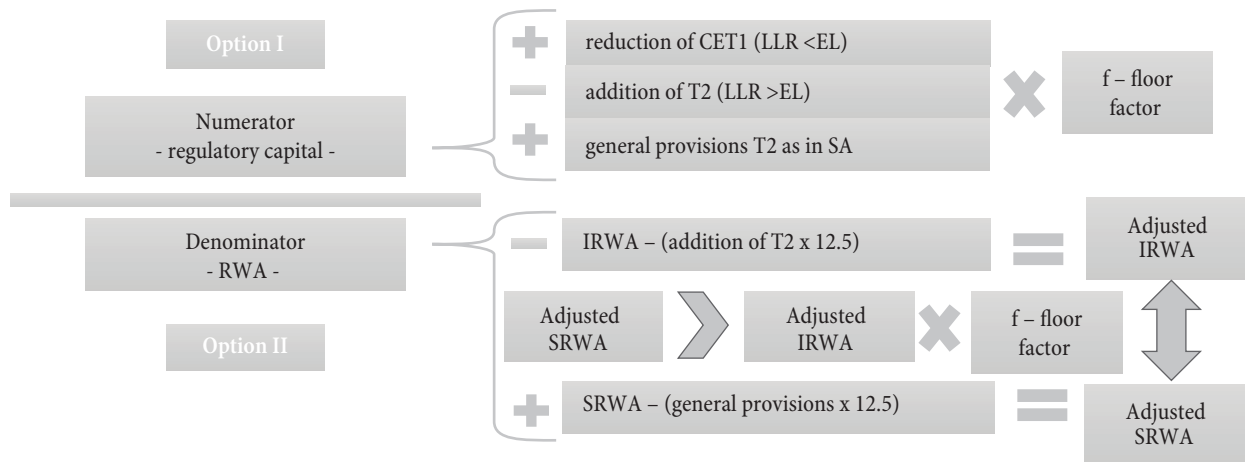
**Table 9: Proposed changes of F-IRB approach**

Risk component	Consultative document	Basel II	Difference
<b>PD</b>			
Corporate	5 bps	3 bps	↑ 2 bps
Retail			
Mortgages	5 bps	3 bps	↑ 2 bps
QRRE transactors	5 bps	3 bps	↑ 2 bps
QRRE revolvers	10 bps	3 bps	↑ 7 bps
Other retail	5 bps	3 bps	↑ 2 bps
<b>LGD</b>			
Haircut			
Receivables	20%	50%	↑ 30%
CRE/RRE	28.6%	50%	↑ 21.4%
Other physical collateral	28.6%	50%	↑ 21.4%
Secured exposures			
Receivables	35%	20%	↓ 15%
CRE/RRE	35%	20%	↓ 15%
Other physical collateral	40%	25%	↓ 15%

Source: Basel Committee and author's illustrations



**Figure 2: Corrections for adjusting the IRB approach within the capital floor**



CET1 – Common Equity Tier 1; LLR – Loan Loss Provision; EL – Expected Loss; T2 – Tier 2; IRWA – RWA calculated through IRB; SRWA – RWA calculated through SA

Source: Basel Committee and author's illustrations

in place (between the exposures secured by real estate and exposures to corporates) and some more detailed definitions (the introduction of specialised lending into the class of exposures to corporates and introduction of other retail exposures), however, there is no mention of any substantial change in terms of elimination or addition of some entirely new classes.

The pillar of the initial proposal for the modification of the SA approach was the original opinion that the CRA ratings needed to be entirely removed from use within credit risks. Such procedure may be justified on a number of grounds. In their paper, Hilscher and Wilson [16] provide a number of arguments which are not in favour of CRA ratings. Above all, even a very straightforward model developed by logistic regression, based on publicly available information and market indicators, remains superior in comparison to CRA ratings. The two dimensions are highlighted, which a perfect measure of risk should integrate in itself, and these are raw default probability (PD) and systematic risk. CRA ratings are failing to predict the first dimension in a proper manner, which is particularly an issue due to the fact that PD is a backbone of RWA calculation in the credit risk process. It may be concluded that even a very simple internal model developed in banks is a better alternative than CRA ratings. On the other hand, a systematic risk is very well reflected in CRA ratings, as the principal component analysis has proved that there is a single factor which dominates and accounts

for even 70% of default variations. This is the so-called “failure beta”, and is being particularly highlighted as a measure of systematic risk.

Creditworthiness is perceived from two aspects, at a point in time (PIT) and through the cycle (TC). Considering that the capital calculation horizon based on both regulatory requirements and the ICAAP system is one year, in order to calculate the capital adequacy, PIT aspect is more appropriate. In the process of awarding the rating, rating agencies are focused on TC aspect, which is why its inflexibility and seldom changes are so insisted on. Only in cases when firm evidence is provided on the substantial change in an entity’s creditworthiness is his rating changed. An issue in the use of CRA ratings for the calculation of RWA lies exactly with this imbalance. Ratings actually reflect TC aspect, yet are used within the framework focused on PIT aspect. Such controversial position is even more intensified by the fact that in the prediction of defaults, the discriminant power of PIT approach is much stronger than TC approach [19]. Procyclicality is also one of the issues arising with respect to the use of CRA ratings. Such issue is particularly relevant in stress scenarios, that is, during the outbreaks of crises, as this is the period when the procyclicality becomes relevant. Contrary to the commonly accepted informal attitude that CRA ratings are explicitly procyclical and follow the reactions to changes in general business terms after such changes occur, it was confirmed that procyclicality is in

place only to follow the investment grade ratings and is particularly strong in changes of rating, but not changes in their level [2].

Based on all the above, it is evident that CRA ratings do not constitute the perfect indicator in the calculation of RWA, but they are certainly an alternative in such an approach. The original intention of the Basel Committee to replace them with risk drivers is indeed an interesting approach, as it largely reminds of the application of internal assessment of credit risk in banks. Consistent with the principle of simplicity, it was required to use only very few indicators, the combination of two, to describe a bank's risk position, which proves to be extremely inconvenient due to the heterogeneity of entities. This is particularly visible in the corporate class, as it is very much certain that various business activities affect the different values of financial analysis indicators. In exposures to banks, CET1 ratio has been largely standardised owing to the application of procyclicality, however, the question remains relating to NPA ratio which is to a greater extent subject to different accounting rules. The Basel Committee undertook to consider all these issues during the implementation, yet it is evident that such an approach would encompass all the clients in a uniform manner. CRA ratings are reserved only for large corporate systems, which excludes their use for great majority of calculations of exposures in the banks' portfolios. It is also noticeable that much finer grading method is proposed, through the application of risk drivers, including as many as 16 weights for exposures to banks and 13 weights for exposures to corporates, unlike the Basel II method which, however, remained in the second consultative document, and contains only 5 weights for banks and 6 risk weights for corporate segment. A more rigorous treatment is observed for the clients who meet the criteria based on which they are assigned the risk weight of as much as 300%, which is doubled in comparison to Basel II. Even though it has been reiterated that the intent of the Basel Committee is not, under the proposed changes, to increase the capital requirements through increased calculation of RWA, the Quantitative Impact Study (QIS) of the proposed changes confirmed that it had inevitably occurred. The main motivation was to increase the risk

sensitivity, however, it was probably due to more rigorous risk weights that the RWA increased substantially. This issue is highly debatable as Mariathasan and Merrouche conducted an empirical analysis based on the data during the last banking crisis 2007-2010 and the resolution of banks, which implies recapitalisation, nationalisation, bankruptcy and forced merging, and proved that RWA ratio has no greater power of prediction and is inferior to the unweighted leverage ratio in periods of stress [21]. RWA ratio implies the relationship between the RWA and total assets, which suggests that the ratio shows how many RWA units there are to one unit of assets. In other words, the ratio reflects a bank's risk profile, determined in accordance with the credit risk calculation. On the other hand, the unweighted leverage ratio has the same function and the meaning as in corporate finance, as it is the ratio between the capital, and in this case the regulatory capital was defined with special calculations for T1 and T2, and total unweighted assets. RWA ratio has a better power of prediction of a bank's resolution in normal market conditions, however, it is useless in the periods when it should be the most useful, that is, during the outbreak of crisis. The fact is, however, that the regular leverage ratio may be used to better point to potential problems in a bank's operations in periods of stress in the market, and this is sufficient evidence that the overall Basel II framework for calculating the capital adequacy actually failed, which is also one of the main reasons for the modification of regulations. This includes the SA and IRB approaches as well. "If the decline in the RWA/TA ratio is the result of the change towards seemingly safe assets, regulators are consequently responsible for incentivising investment in what turned out to be the overly risky ("toxic") assets. If it is instead a matter of manipulated risk weights, regulators are to be held accountable for trusting the banks to adequately assess themselves for exposure to risk" [21, p. 16]. The essential conclusion is that the need exists for the comprehensive modification of RWA calculation framework, which is why the proposed changes in the initial document were, in some segments, perhaps the step in right direction. It is evident that the level of calculated RWA was significantly underrated through the implementation of Basel II.

The second consultative document relating to modification of the SA rejected the initial extreme move towards the removal of CRA ratings. The pressure and the responses of a large number of participants indicated that CRA ratings still had an important role in the overall functioning of financial markets and banking industry and may not be neglected in entirety. The due diligence concept is now proudly announced and the banks will need to perform it within their own internal credit risk management. Alongside due diligence, an issue of moral hazard has arisen integrated within such an attitude, as the banks are now expected to indicate that certain exposures are riskier than the ones assessed by external credit agencies. Therefore, its implementation in practice could create room for additional interpretation, because in such cases, the banks would feel encouraged just to confirm the base risk weight identified by CRA ratings. It is understood that large scale manipulations of risk weights are precluded by eliminating the possibility of improving the risk weight owing to due diligence, as the flexibility exists only “in upward direction”, however, the problem remains in cases if the CRA rating overestimates the actual entity’s creditworthiness, the banks then will not feel encouraged to prove that the actual risk exceeds the one assessed by the external rating agency. This implies that some major changes in the substantive framework for the focal exposure classes, such as banks and corporates, lack when compared to the current Basel II regulations. It is certain that the introduction of a finer grading method for exposures secured by real estate results in higher risk sensitivity, due to different LTV ratio levels. This is the key risk driver for such exposures and this is the reason why highlighting its discriminant power is so important.

### Modification of the F-IRB approach

F-IRB approach calls for additional attention as when applied, the banks assume the role of self-regulators. Therefore, the composition of its framework must be established very diligently and a minor change in the setup may result in major distortions in RWA calculations. The need for the modification of this approach was an imperative due to already proven theoretical and empirical deficiencies.

The very essence of the approach, the use of internally developed models for assessing credit risks in capital adequacy calculations, constitutes a solid basis for the setup of problem of moral hazard. Even though the laid down criteria and rules for the implementation tend to mitigate the issue, it is beyond doubt that banks are encouraged throughout the process to lower the perception of RWA level. The susceptibility to game theory is present particularly in the aspect of information asymmetry, with respect to rating identification, as during the process of internal rating identification, some information may be intentionally omitted or diverted, and yet such information may have the material impact on the actual loan risk [12]. Failure to use such information results in the illusion of more secure loans. In general, the examples of good practices of internal ratings should possess the feature of informational efficiency [18]. The analogy of internal ratings may be found with the functioning of financial markets and the theory of their efficiency which implies that the prices of securities should reflect within themselves all publicly available information. In the case of internal ratings, this is generally observed in a way that ratings should incorporate within themselves all the information about the issuer and the transaction the bank is concluding with it, so as to gain a realistic overview of the risk of such exposure.

The scope of discrepancy may be perceived through a common setup of regulatory rules wherein there is room to choose between the SA and IRB approach [14]. In such a case, only large banks would opt for IRB for its high implementation costs. By doing so, they gain competitive advantage by reducing the capital requirements. Higher profitability requires additional funds, due to which the interest rates for deposits are increased. The reaction of small banks is such that they can only attract inferior clients who are willing to accept the higher interest rates. The result of all these moves is higher systemic risk which may cause distortion in the market. The point here is that there exists the discretionary right to choose, which is to some extent conditioned by high fixed costs, while in the case of mandatory use of IRB approach only, some benefits are gained for the national economy, due to better allocation of capital in comparison to the SA approach. In other words, there is much greater risk sensitivity. The

previous claim is valid only in case the fixed costs of the IRB approach are not higher than the benefits gained by this approach with respect to allocation of capital.

The proof that the use of IRB approach lowers the RWA level has been empirically confirmed through the analysis of indicators of banks which underwent some form of resolution (recapitalisation, nationalisation, bankruptcy, forced merging) during the last crisis from 2007-2010 [21]. The manipulation of risk weights may be reasoned by concluding that the banks which adopted the Basel II rules at an early stage experienced the extreme reduction of RWA ratio. RWA ratio was shown to be losing its predictive power in periods of stress for the early adopters, which leads to another conclusion about the manipulation of risk weights. A particularly interesting case was in the USA market as the national supervisor ordered that advanced approaches (IRB) should be mandatory for large banks, while it was optional for other banks. In their paper, Mariathasan and Merrouche explored the relations between the banks which implemented IRB and the ones which did not, with respect to identifying the prediction indicators of their resolution. An important conclusion was that IRB had been adopted by the banks which were inferior, in terms of quality of assets. This implies that IRB approach was attractive to riskier banks which intended, through its implementation, to understate the actual value of RWA, and by doing so enable lower capital requirements. Such a setup causes serious concerns and points to a need for a more restrictive use of IRB approach.

This was exactly one of the guiding ideas for the Basel Committee to entirely eliminate the IRB approach for certain classes, as described in section three, mitigating thereby the moral hazard effect to some extent. Modelling will be limited only to the classes which pretend to be retail-oriented, due to their scope, in terms of clients and default rate. In this way the efficiency of parameters is significantly increased, as the impartiality, as well as other relevant features of statistical assessment of model parameters, increases with the increase of clients in the samples which serve as the basis for model construction. By increasing the number, the assessments of parameters are nearing their actual value in an asymptotic manner. The problems with modelling were also pointed to by Helwig in

his paper [15], stating that insufficient amount of time series data, which in combination with their nonstationarities significantly affects the quality and usability of the model. The additional complication is present in credit risks, as defaults are rare events in practice. This claim may be used to justify the above attitude of the Basel Committee in its consultative document for complete elimination of modelling in the low-default portfolios.

In the above consultative document there is no mention of any radical changes in the very architecture of the F-IRB approach. The functional form for the calculation of RWA has remained unchanged and there are no indications about its modification. In the consultative document, the Basel Committee does not address this subject and its limitations in any of its aspects. The main model has remained the same, built on the foundations laid by Vasicek in his paper from 1987 [24]. This is the one-factor model built upon the Gaussian copula method. The model includes the systemic component which may not be diversified and an idiosyncratic component relevant for that very entity. An analogy may be found here with the famous Sharpe's CAPM model referred to in portfolio analysis, as there is a distinction between a systemic risk, common for all the clients in the portfolio, and a non-systemic risk, inherent only to an individual client in the portfolio. In essence, these models have emerged as a result of principal component analysis (PCA), the intent of which is to replace the series of data with a number of main components which constitute the valid representation. These models rely on the first component, in a sense that there is a single factor which has a dominant effect on the systemic portfolio risk to which all clients are exposed. The formula used in calculation of the F-IRB approach for corporate, sovereign and bank exposures is as follows:

$$\text{Capital requirement (K)} = [LGD \times N[(1-R)^{\wedge} - 0.5 \times G(PD) + (R(1-R))^{\wedge} - 0.5 \times G(0.999)] - PD \times LGD] \times (1 - 1.5 \times b)^{\wedge} - 1 \times (1 + (M - 2.5) \times b)$$

The main output of the F-IRB model is PD which constitutes the measure of raw client risk, and as such displays the measure of idiosyncratic risk. In their internal models, the banks make use of various techniques to calculate PD. The quality of such calculation is critical for all subsequent calculations which further affect RWA.

This particularly refers to the calculation of correlation parameter (R) as it represents the other aspect of risk, as mentioned above – the systemic risk of the market the client is operating on. There are no indications about the changes of the formula for calculating the correlation, and for the above classes, it is calculated as follows:

$$\text{Correlation (R)} = \frac{0.12 \times (1 - \text{EXP}(-50 \times \text{PD}))}{(1 - \text{EXP}(-50)) + 0.24 \times [1 - (1 - \text{EXP}(-50 \times \text{PD})) / (1 - \text{EXP}(-50))]}$$

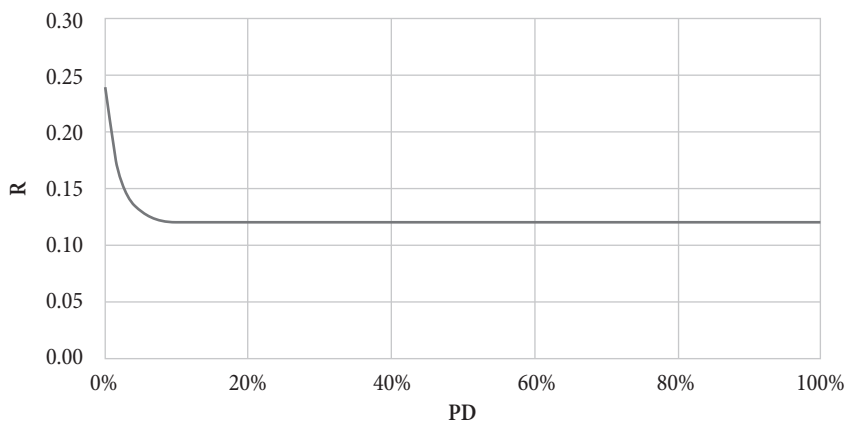
Correlation is expressed in the function relative to the calculated PD amount, whereby these two are in inverse correlation, in a sense that higher PD value requires lower correlation value, and vice versa. This is justified by the perception that if the company is in increasingly adverse financial situation, its PD will rise accordingly, and the dominant factor will include the operating features which are characteristic only for this company, whereas the systemic market impact is losing importance [20]. The correlation is shown in the figure below.

The above inverse correlation is evident, however, there is a range for the value of R which may not be lower than 0.12 or exceed 0.24. One of the reasons for the mentioned RWA anomalies during the last crisis may be identified within this calculation, as it is widely known that in periods of stress, the systemic factor is given a lot more relevance, while the calculation in accordance with Basel II relates to normal market conditions. The empirical analysis conducted by Lopez during the 2000s [20] on the calculation of correlation shows that the average values, at 99.9% confidence level, stood at 0.1625 for the U.S. market, 0.2625 for the Japan market and 0.1375 for the

Europe market. The Japan case is the most interesting one as the country was undergoing recession at the time of research, which was reflected in the higher amount of correlation parameter. These results could be a pathway for analytical improvement of the F-IRB approach, whereby the identification of the correlation parameter within the RWA calculation for one market could be conditioned by the status of the business cycle the market is going through. The range of potential values for R could be expanded towards higher ceilings in cases of periods of stress. Even though the proposal about the flexible value of R parameter would have an adverse effect on the simplicity principle, the national regulators would be able to identify the range of correlation of this parameter with the situation of the market under their jurisdiction. On the other hand, such procedure would significantly improve the sensitivity to capital calculation risks. Such type of correlation could be calibrated on the basis of realistic data available to the national supervisors for their own market.

For the economies with exceptionally developed financial markets, the best models are the ones which are based on the market value of the company, as the share prices in the capital market are the best indicator of the company’s operations and future perspective. The basis for these models was taken over from the option pricing theory and in essence, they can all be traced back to Merton or Black-Scholes model. The problem with this type of model is that they are inapplicable in practice in jurisdictions without developed capital markets. An alternative may be some statistical (econometric) model, also referred to as the actuarial model, the emergence of

**Figure 3: Relationship between PD and R**



Source: Author’s calculations based on Basel II standard formula

which was marked by the revolutionary work of Altman [1], on which basis the famous Z-score was developed. This marked the introduction of quantitative metrics in assessing the company's financial position, with a view to determining the quality of its ability to "survive" and achieving the going concern principle. The main method applied in this work was the discriminant analysis, used to distinguish between "good" and "bad" clients. Further progress in developing the model for bankruptcy prediction was introduced by Ohlson [22] who, for the first time, used the logistic regression as technique. The upgrade of the model was developed by Shumway [23], introducing the improved analytical structure through hazard rate model, and it relies on the probability of survival in the non-default status. The major advantage of logistic regression is that it inherently and directly states PD. In addition to these approaches, the techniques in internal bank rating systems are sometimes the scorecards (rating patterns based on expert experience/opinion), fuzzy logic systems, and recently, the principles of behavioural finance have increasingly been introduced. Basel II does not prescribe any specific model/technique for the calculation of PD, but only the characteristic of the satisfactory model. This is due to the principle upon which the internal modelling approaches are based in general, which implies that the banks are not imposed the specific requirements with respect to selection of a model, as the general perception is that the banks are best familiar with their own portfolio and adjust their models to it. This position could be reconsidered in a sense that the Basel Committee should prescribe, in a clear and unambiguous manner, the techniques which may be used in the calculation of PD. A very short segment in the consultative document suggests that certain limitations for the assessment of PD are being considered. This could be done by analysing the existing models, with a particular emphasis on their results during the last crisis, in which case only the best practices regarding the models which proved to be appropriate would be integrated into the conditions for using the F-IRB approach. Likewise, the upgrade could also be done with respect to a more precise definition of validation that the models need to meet in order to be eligible to be used in the calculation of RWA. The quantitative parameters of validation would then have the

role to filter and determine in an objective manner whether the model meets the requirements or not. These parameters could be set in a manner which would expressly specify the minimum amounts of the tools used for assessing the validation of the model, such as, for example AR (Accuracy Ratio) or ROC curves (Receiver Operating Characteristic). This would result in a higher level of objectivity during the regulator's assessment of the appropriateness of the model. At the same time, some minimum standards would be specified for out-of-sample tests and the amounts of data which need to be used as inputs in model construction.

In addition to the prohibition of using the F-IRB approach for some classes of exposures, already referred to in the section The future of F-IRB approach, another major change refers to the introduction of differentiated minimum PD rate and the change of its value. The minimum rate was increased from 0.03% to 0.05% in all classes, except for QRRE Revolvers where the proposed minimum rate is 0.10%. A direct consequence of such proposal is the increase of the minimum risk weight.

The more rigorous approach complies with the described deficiencies identified in the application of the IRB, and this is the reason why the increase of minimum values is a welcome development. QRRE – Qualified Revolving Retail Exposures is divided into two sub-classes: QRRE transactors and QRRE revolvers. Table 10 shows that the proposed changes would not result in a significant increase of minimum risk weights (only in corporate segment, the increase would exceed 5 p.p.) and they would remain significantly below the values prescribed by the SA approach.

## Conclusion

Further evolution and improvement of approaches for credit risk is an inevitable step which needs to come to life in the forthcoming period. The identified deficiencies in the RWA calculation system must be eliminated through new modifications which would allow for a more realistic overview of risk for some positions.

The proposed modifications of the SA approach in the initial document started with a radical change which would imply the removal of CRA ratings. Risk drivers

**Table 10: Minimum risk weight in F-IRB approach (Basel II vs. consultative document)**

Class	LGD	Minimum risk weight		
		Basel II	Consultative document	Difference
Corporate (turnover 50 mil EUR)	45%	14.44%	19.65%	↑ 5.21%
Corporate (turnover 5 mil EUR)	45%	11.30%	15.39%	↑ 4.09%
Residential mortgages	45%	4.15%	6.23%	↑ 2.08%
	25%	2.30%	3.46%	↑ 1.16%
Other retail exposures	45%	4.45%	6.63%	↑ 2.18%
	85%	8.41%	12.52%	↑ 4.11%
QRRE transactors	45%	0.98%	1.51%	↑ 0.53%
	85%	1.85%	2.86%	↑ 1.01%
QRRE revolvers	45%	0.98%	2.71%	↑ 1.73%
	85%	1.85%	5.12%	↑ 3.27%

Source: Basel Committee and author's illustrations

emerged as a substitution for these ratings, and they could achieve much greater scope of application and increased objectivity. The issues relating to their implementation have been identified, however, it is evident that there exist numerous arguments which are not in favour of CRA ratings. The fact that they are inferior regarding the prediction of defaults, their focus on TC instead of PIT aspect, which is dominant in the capital adequacy process and their procyclicality, are more than sufficient reasons to call for the review of their further use. Furthermore, such a framework is not adjusted to a broader context of banking industry, even though external credit agencies are expanding the range of their estimates. On the other hand, it is understood that CRA ratings have an important role to play in the overall financial system and that their relevance in assessing the entity's financial position undoubtedly has an effect on investors. The Basel Committee has given up on these revolutionary ideas, and in the second consultative document, it resorted back to its original Basel II approach. This kind of wandering for the solution is sufficient evidence of the complexity of the issue. Some minor changes have been proposed which fail to achieve the substantial modification of the framework for the SA approach. An issue is in what way these minor changes would provide an adequate response to the confirmed abnormalities in RWA calculations during periods of stress. The key aspects of the resolution of banks during the turbulent period from 2007-2010 are sufficient evidence indicating that the modifications in the credit risk framework need to be fundamental. The introduction of due diligence principle cannot be a development which

is to contribute to a significant increase of risk sensitivity, as its very structure already has an integrated moral hazard issue.

F-IRB approach is particularly sensitive to changes as its theoretical and empirical deficiencies have been proven. In the proposed consultative document, the Basel Committee fails to address the core architecture of the F-IRB approach, but rather, remains focused only on the prohibition of its use for certain classes which need to be described through the SA approach, as well as the modification of certain limitations in risk components. The main motivation for all proposals is the reduction of RWA variations and increasing convergence of the IRB and SA approaches. An improvement of its analytical architecture would be an upgrade with respect to changing the range of potential values of correlation parameter, in accordance with the status of the business cycle. The aspect of validation and subsequent approval for the use of model could be further standardised by introducing the quantitative criteria. Only the models which are able to meet high and predetermined values for the validation techniques could be used in the F-IRB.

The above analysis addresses the major challenges to be faced by the Basel Committee, regarding the functioning of the credit risk framework. One of uncommon ideas regarding the approach to this issue would perhaps be the introduction of "the third direction", which would imply the hybrid approach, as a symbiotic form of the IRB and SA. Its basis would include the models developed by the regulators for their national markets. Due to the fact that regulators are in possession of the data for the entire

market on the default status of all bank clients, this would significantly improve the quality of parameters which would be uniform for all banks. The data would then be combined with the data from the register of companies' financial statements, in case of corporate segment, while for retail class, the model would be developed based on the qualitative and quantitative data submitted by the banks. The models would be developed only for the classes which are, by their nature, dominant in the regulator's jurisdiction, while the remaining classes would be subject to the SA approach. This is the way to achieve the uniform approach for all, and the clients' risks would be placed within the context of the market they are operating on.

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