

Drivers of Supervisory Capital Add-Ons in Banking Supervision

Signal versus Noise in Internal Ratings-Based Models



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Majority of RWA are calculated with IRB models

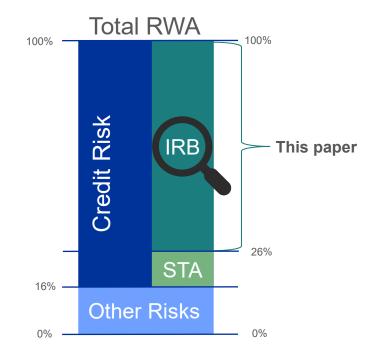
The facts

- 84 % of SSM SIs' RWA stem from credit risk.
- In our sample, 88 % thereof are computed with internal models.
- Risk underestimations in these models must be addressed by supervisory capital add-ons (Limitations).

The implications

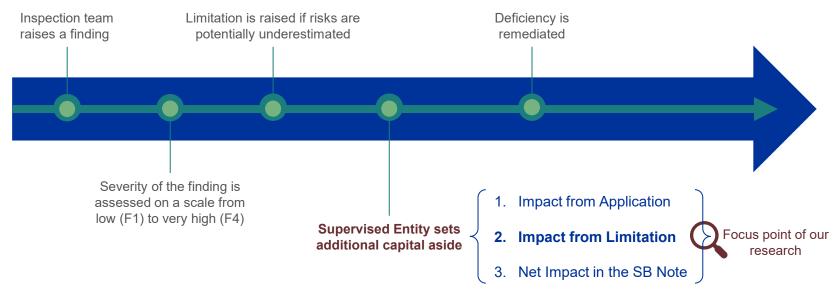
Limitations are a powerful supervisory tool:

- **267 Limitations** for a total of **EUR 64.29 bn** EUR CET1 capital-equivalent.
- **20 Sanctions** for a total of **EUR 0.06 bn** CET1 capital-equivalent.
- **SREP:** SREP P2R impact can be less than a single internal model decision.



How do we govern those RWA?

Lifecycle of a Limitation: the supervisory data generating process



Note: Abbreviated for illustrative purposes. Individual steps, such as quality assurance, and Supervised Entity's right to comment and object omitted.

Variable of interest: supervisory action

Overview ta	able ³								
Banking group name								Country	<u></u>
General details	IMI number								
détails	Responsible								
	JD process	Not applicable.							
Model related	Risk type	Credit Risk							
details	Model type	Internal Ratings Based Approach - Foundation							
	Model name								
	Exposure class	Institutions Central banks and central governments Corporate – Other							
Approval request details	Type of procedure	Approval of material change							
uetans	Legal basis	Art. 143(3) CRR - IRB - Credit Risk							
	Date of initial approval								
	Date of application								
Mission dates &	Kick-off me	etina	Exit me	etina	Report f	inalised	Mission	n duration	weeks
duration		oung	Exit inc.	sting	Report	manoca	28 w		, HOOKS
Materia-									
lity and impact,	RWA cover	ed by	model	RWA im	pact of de	cision		npact of d	ecision
based on 2019-Q3 figures ⁴	absolu in EUF	_	group in %	absolute in EUR ற		to model be, in %	abs. change, in bps	nev in 9	v ratio, %
				-384.16			l		
Legal entities affected	Legal entition	es (na	mes)			Model	usage	Country Code	OUID

Misleading figure because it looks at the aggregate model change.

Impact of the decision

The quantitative impact of this decision is caused by the model change application as well as the change of the limitation proposed with the draft decision.

The application of the Supervised Entity provided an impact calculation that reflects the model change with regard to (i) the exclusion of obligors without exposures, and (ii) the inclusion of additional years in the calibration based on the portfolio data Q3 2019. These two aspects reduce the RWA of the rating system by EUR 721.90 million, which translates to an additional 13.25 bps of CET1 supply such that the final CET1 ratio is 14.78 %.

Based on these figures, the proposed Limitation 1 (multiplier of 1.15 to the PD estimates) of this mission is estimated by adding an additional third of the factor of the RWA of performing exposures in scope of the PD model of EUR 8,810.49 million. This corresponds to an impact of EUR +337.74 million RWA.

The combination of these figures, based on portfolio figures provided in the application package as of Q3 2019, yields an overall reduction of the RWA by EUR 384.16 million, equivalent to an improvement of the CET1 ratio by 7.03 bps on consolidated level of the Supervised Entity, such that the final CET1 ratio is 14.72 %.

Distilling the actual impact of the limitation Different effects are disentangled.



RWA Impact					
Model Change	-721.90				
Limitation	337.74				
Overall	-384.16				

What do we investigate?

- Relationship between RWA impact from an ECB limitation on internal models¹⁾, and the number of findings with respective severities (i.e. F1 – F4).
- **Research question:** does the stock of findings explain the quantitative RWA impact of the limitation?
- **Identification** by looking for each bank at each quarter at the stock of open findings and associated CRR articles.
- **Result:** Statistically significant impact only from F4 findings.

Results and their interpretation

	Dependent vari	able: EUR i	mpact of li	mitation ove	er total asse	ts
		(1)	(2)	(3)	(4)	(5)
	F1 (#)	0.0002	0.0002	0.0002	0.0001	0.0001
	F2 $(\#)$	0.0001	0.0001	0.0001	0.0000	-0.0000
	F3 (#)	-0.0001	-0.0001	-0.0001	-0.0000	-0.0000
1.	F4 (#)	0.0005**	0.0006*	0.0006*	0.0005*	0.0005^{*}
	low severity \times F3 (#)		-0.0000	-0.0000	-0.0000	-0.0000
	low severity \times F4 (#)		-0.0000	-0.0000	-0.0000	-0.0000
	ROA (%)			-0.0451	-0.0716	-0.0206
	Size (ln)			-0.0026	-0.0025	-0.0029
2.	Headroom (%)			0.1339**	0.1051**	0.1004**
	COR (%)			-0.2213*	-0.2191*	-0.2069*
	$\underline{\text{ROID}}(\epsilon[0;1])$			0.0004*	_0.0002	0.0002
3.	CRR-prevalent $(\epsilon[0; 1])$				0.0071*	0.0067*
4.	TRIM $(\epsilon[0;1])$					0.0044**
	Intercept	-0.0020	-0.0030	0.0507	0.0483	0.0582
	Bank-fixed effects	Yes	Yes	Yes	Yes	Yes
	Ν	1,180	1,180	1,130	1,130	1,130
	\mathbb{R}^2	0.3337	0.3486	0.3927	0.4199	0.4334

Story 1: F4 findings are the biggest drivers of RWA

• Focus supervisory resources to where they have the biggest impact (i.e. F4 findings).

Story 2: ECA: "[...] ECB did not impose proportionately higher capital requirements on higher-risk banks."

- Seems that ECB is stricter with well-capitalised banks.
- Conversely, less strict with riskier banks.
- Alternatively: riskier banks observe more defaults of obligors but yield more reliable models due to more data.

Story 3: Possible early warning signal

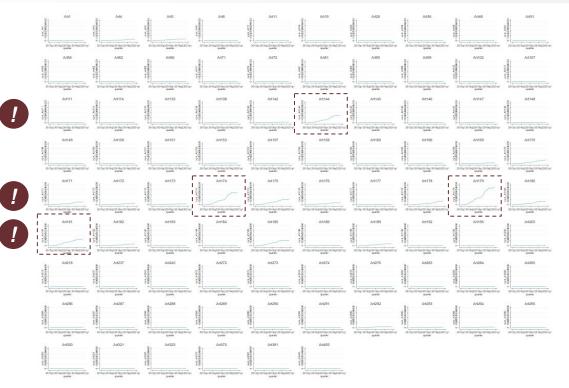
• There is a subset of references to CRR articles that has a stronger impact than all other references.

Story 4: Missions after TRIM are associated with a higher impact of limitations.

• Playing field was levelled after material models were systemically reviewed by the ECB.

N.B.: A coefficient of 0.0005 for the F4 findings translates to a marginal impact of EUR 800 mn additional RWA across the sample of SSM banks. Significance is denoted at the 5 % (*), 1 % (**), and 0.1 % (***) level.

Zooming-in highlights particular CRR articles

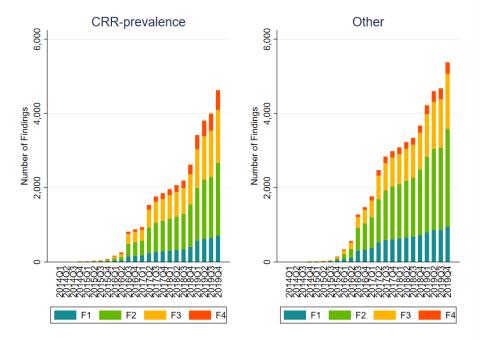


Four CRR articles with prevalent contribution stand out

- Article 144: Assessment of an application to use an IRB Approach
- Article 174: Use of models
- Article 179: Overall requirements for estimation
- Article 181: Requirements specific to own-LGD estimates.

Cluster of CRR articles drives finding severity

Could the explanation come from the severity?



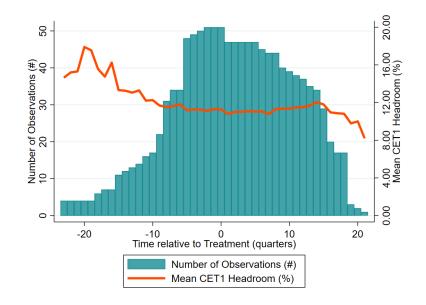
• These four prevalent articles contribute less frequently to F1/2/3 findings, but significantly more to F4s.

	Average Findings					
	CRR-prevalence	Other	p-value			
F1	351.0556	574.0000	0.0000			
F2	$1,\!001.0560$	1,465.7220	0.0000			
F3	757.6944	839.0833	0.0001			
F4	260.2778	175.4444	0.0002			

• F2 finding is a "standard severity".

Robustness: Reverse Causality Refuted

Concern: Better capitalised banks only receive higher limitations, because they were only better capitalised from their underestimation of the actual risks.



Interpretation

- Capital Headroom before and after IMI (t = 0) does not differ significantly.
- Differences occur in the tails.
- Too far away to have causal relationship.
- Driven by lack of observations in the first place.

Observations and supervisory implications

1. Early warning: close attention to particular findings warranted

Despite being less frequent in the aggregate, a set of CRR articles is more likely to be associated with high severity findings. Against the constraint of supervisory resources, **missions with such findings may receive greater attention**.

2. Focus on being risk-sensitive when setting the limitation

All else equal, better capitalised banks appear to receive comparatively higher relative limitations than weakly capitalised banks (as evidenced by CET1 headroom and Cost of Risk) from an internal model-point of view. **This could contrast the idea of a level playing field.** At the same time, riskier banks can more reliably calibrate their models.

3. Simplification of the finding follow-up is backed-up by statistics

From the analyses, it shows that F1 and F2 findings have no statistically significant impact on the limitation. This may inform choices and decisions with regard to supervisory priorities.

Annex

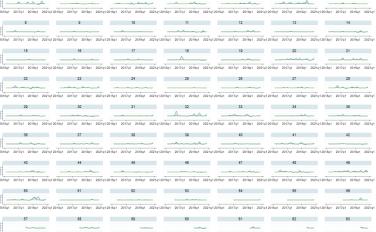
Constant inflow of new findings

- CRR Articles grouped into buckets based on similar topics;
 - Generally, a **monotonic increase in the stock of open findings** with reference to the respective articles.

Observation can be generalised

Net inflow of new findings on both, the country- and bank-level, respectively.

2015a1 2017a1 2019a1 2021a1



banks

2015q1 2017q1 2019q1 2027q12015q1 2017q1 2019q1 2017q1 2017q1 2019q1 2017q1 2019q1 2017q1 201

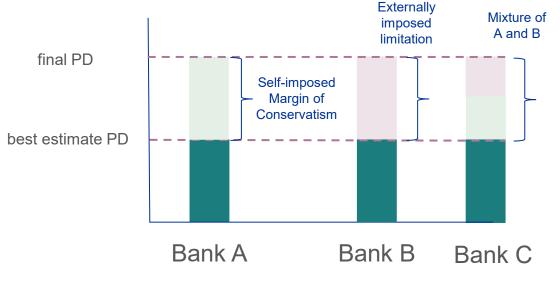
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countries

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What is the issue at hand?

Internal and external safeguards to ensure reliable estimates of Probabilities of Default

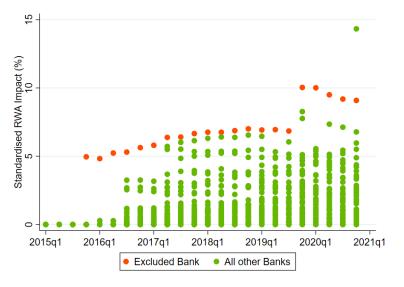


Note: For illustrative purposes only, assuming all else equal, for a common obligor with no constraints in data availability.

- Estimation of Probability of Default is subject to uncertainty;
- Margin of conservatism as an add-on to account therefore;
- Application however varies between banks;
- IMIs to enforce 'conservatism' alternatively through limitations;
- Ideal outcome: level playing field all else equal.
- Reality: bank-level heterogeneity

All banks are equal, but some are more equal

Growing dispersion of RWA impacts from limitations



Bank-level observations

- One bank always lies at the top of the curvature, i.e. is an outlier.
- It was thus excluded from the analysis, as it uniquely drives the results.

Robustness: Outliers

	(1)	(2)
F1 (#)	0.0001	0.0001
F2 $(#)$	0.0000	-0.0000
F3 (#)	-0.0000	-0.0000
F4 (#)	0.0005^{*}	0.0004*
low severity \vee F3 $(\#)$	0.0000	0.0000
low severity \vee F4 $(\#)$	-0.0000	-0.0000
ROA (%)	-0.0345	-0.0327
Size (\ln)	-0.0053	-0.0083
$\operatorname{COR}(\%)$	-0.2106^{*}	-0.1094
Headroom $(\%)$	0.1158^{*}	0.1011^{**}
ROID $(\epsilon[0;1])$	0.0052	0.0049
CRR-prevalent ($\epsilon[0;1]$)	0.0064^{*}	0.0070^{*}
TRIM $(\epsilon[0;1])$	0.0044^{**}	0.0044^{**}
Intercept	0.1128	0.1859
Bank-fixed effects	Yes	Yes
Ν	1,130	1,154
\mathbb{R}^2	0.4349	0.4638

Application of winsorization at the 1st and 99th percentile to not drop the outlier bank

Interpretation

- Column 1: Original results.
- Column 2: After winsorization.

Sign, Significance and Magnitude of coefficients remains similar, with the exception of COR.

Remains significant at the 10 % level though.