ESG rating as input for a sustainability capital buffer

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Martin Neisen

Partner, PricewaterhouseCoopers, Germany

Martin Neisen is a Partner in the Risk & Regulation division and the Global Basel IV Leader at PricewaterhouseCoopers GmbH (PwC) in Frankfurt am Main, responsible for coordinating PwC's initiatives with respect to Basel IV implementation. These initiatives cover all aspects regarding the impact and execution of Basel IV, including strategic implications, standardised approaches, internal models, business implications, IT (information technology) and knowledge management. In addition, he leads the Regulatory Management department in PwC Europe.

Friedrich-Ebert-Anlage 35-37, 60327 Frankfurt am Main, Germany
Tel: +496995853328; E-mail: martin.neisen@pwc.com

Benjamin Bruhn

Manager, PricewaterhouseCoopers, Germany

Benjamin Bruhn is a Manager in the Risk & Regulation division and a senior ESG and rating expert at PricewaterhouseCoopers GmbH (PwC) in Frankfurt am Main, focusing on the integration of sustainability risks into financial institutions' risk management, as well as on quantitative risk models and data analytics.

Friedrich-Ebert-Anlage 35-37, 60327 Frankfurt am Main, Germany
Tel: +496995857736; E-mail: benjamin.bruhn@pwc.com

Dieter Lienland

Director, PricewaterhouseCoopers, Germany

Dieter Lienland is a Director in the Risk & Regulation division and leads the ESG risk cluster at PricewaterhouseCoopers GmbH (PwC) in Düsseldorf, focusing on the integration of sustainability risks into financial institutions' risk management, as well as on climate risk stress testing and reporting.

Moskauer Str. 19, 40227 Düsseldorf, Germany
Tel: +492119814929; E-mail: dieter.lienland@pwc.com

Abstract In this paper, we give a state of the art overview of what ESG ratings are, which different types of these ratings can be distinguished and how they could be used in banking regulation to adjust banks' capital requirements with the goal to promote green finance and reduce climate-related risks within the investments of banks. Based on experience collected with other supporting factors within banking regulation, like the SME supporting factor, we show how a Green Supporting Factor or a Brown Penalty Factor could be implemented to promote green finance or punish brown finance, respectively, and include climate risk into Pillar I capital requirements. We also discuss an approach combining these two binary factors and conclude with a proposition to use ESG ratings to derive capital requirements add-ons. After all, ESG ratings take a broader perspective on sustainability and provide a more granular scale ranging from sustainable to non-sustainable rating classes. This approach ensures that green finance investments can be promoted via adjustments of capital requirements without a significant

decrease of the total capital in the banking sector and, therefore, without the reduction of the stability of the financial market.

Keywords: *Basel IV, ESG Ratings, Green Supporting Factor, Capital Buffer, SREP, Sustainability Buffer*

INTRODUCTION: SUPPORTING GREEN FINANCE THROUGH CHANGES IN THE BANKS CAPITAL REQUIREMENTS

With the consequences of climate change and environmental deterioration becoming ever more apparent, sustainability has become a global hot topic in society. Financial experts believe that climate change could put US$43tn worth of assets at risk by the end of the century. That is why the Task Force on Climate-Related Financial Disclosures (TCFD), set up on behalf of the G20 finance ministers, recommends expanded reporting on climate risks by the real and financial economy.[1] Banks identified climate risk as a new risk that should be considered in any kind of business decision. Over the last two years, the instrument of ESG ratings has become more and more of an industry standard that is used to consider climate-related and other environmental (E) risks and social (S) and governance (G) risk in business decisions (especially in credit risk). Also, bank regulators are paying increasing attention to this issue. For example, the European Central Bank (ECB) explicitly requires the inclusion of climate and environmental risks in banking processes for Pillar II procedures.[2] The European Banking Authority (EBA) also clarifies that methods for dealing with sustainability risks should be included in the Supervisory Review and Evaluation Process (SREP).[3] With Article 501a Capital Requirements Regulation (CRR) for the first time, climate-related topics can indirectly influence the capital requirements of banks. There are intense discussions among banks, regulators, politicians and other stakeholders, whether green finance could be promoted by directly adjusting capital requirements for credit risk. While we observe worldwide efforts[4] to include ESG considerations in politics and economics and mitigate sustainability risks, in this paper we shall focus mainly on EU regulatory guidance for our arguments' sake.

General Introduction to ESG Rating

In general, ESG ratings are an aggregated representation of sustainability risks. They can be used in a wide range of applications like strategic decision making, investment portfolio management or sustainability-focused internal and external reporting. The overall ESG rating consists of three *pillars* representing environmental (E), social (S) and governance (G) risks. Climate risks currently assume a unique role within the environmental risks pillar, as they have received much attention in media coverage[5] and regulatory activities.[6] Each pillar contains numerous thematic groups referred to as *criteria* or *topics*, which in turn entail several so-called *indicators*. Indicators represent individual risk factors and are concrete data points. The structure of such a typical ESG rating model is schematically shown in Figure 1. A collection of widely used criteria is displayed in the lower section of the figure. Sometimes, a criterion is split into several elements; to state one example, the criterion 'pollution' may be divided into 'greenhouse gas emissions', 'water pollutant emissions', 'land pollution' and others. The criterion 'greenhouse gas emissions' might then contain, among others, the indicators 'CO_2 emissions', 'methane emissions' and 'nitrous oxide emissions'.

As shown in the top right section of Figure 1, data points (indicators) are collected, processed where necessary and then transformed into a score. For the latter step, three approaches can be observed in the market, as schematically shown in Figure 2. First, the value can be compared to a target value. When investments are, for example, to be aligned with a global temperature rise limit like the Paris Agreement,[7] then specific values of the amount of greenhouse gas emissions, normalised to a suitable

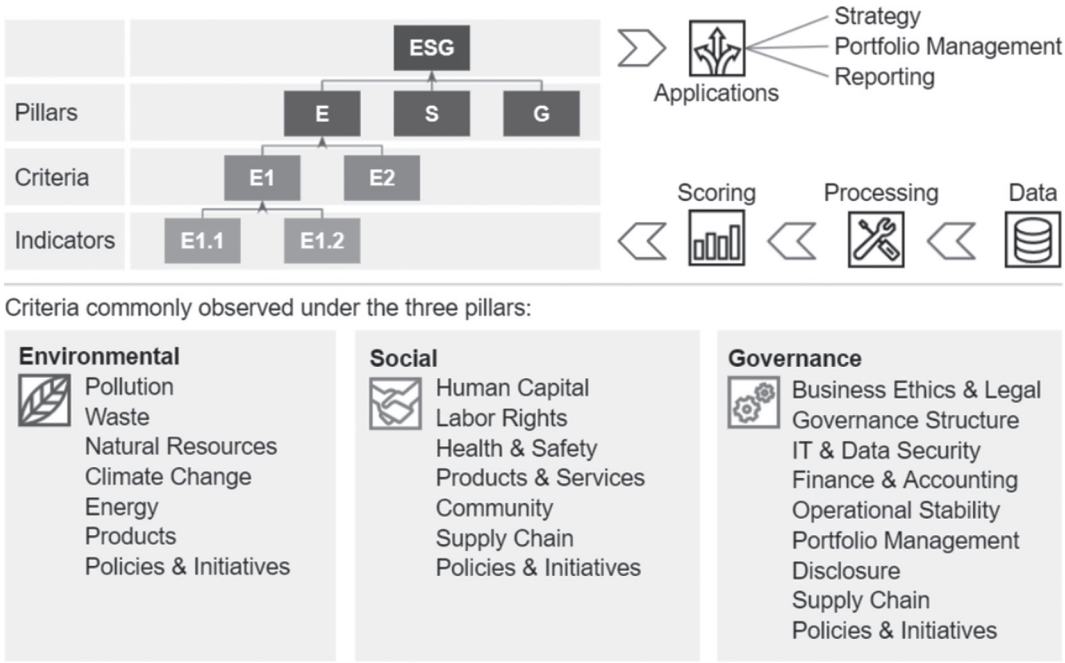

Figure 1: Schematic depiction of a typical ESG rating model

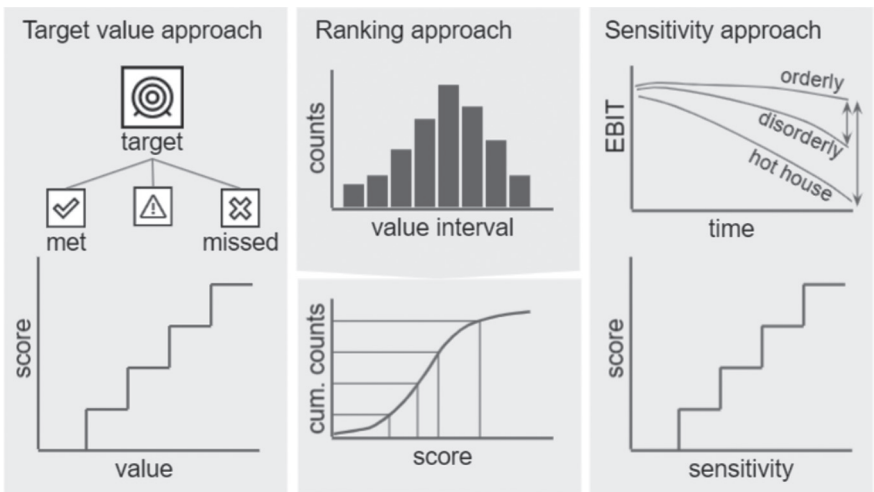

Figure 2: Three scoring approaches for indicators

reference, may serve as thresholds for different scores. Secondly, a ranking approach could be used, where indicator values of organisations are ranked with respect to each other, either within the same industry (best-in-class approach) or throughout all economic activities, so that scores can be assigned based on the relative position within the distribution. Thirdly, sensitivity analyses can be performed. In the schematic example in Figure 2, the financial impact of different transition paths for limiting climate change[8] is simulated. Then, using the variability between different scenarios, the organisation's

sensitivity with respect to climate change risks can be derived and used to assign a score representing the extent to which the organisation is exposed to this type of risk.

In general, as indicated by arrows in the schematic model in the top left section of Figure 1, the indicator scores are aggregated into criteria scores, those are in turn aggregated into the three pillar scores and, finally, the aggregation of those yields the overall ESG score. A common simple approach for aggregation is a weighted average as in Equation (1), where S_{crit} is the score of a specific criterion, S_{ind} are the scores of the indicators assigned to that criterion and w_{ind} are the weights assigned to the indicators (the sum of weights equals unity). Aggregations to higher levels in the model are performed accordingly.

$$S_{crit} = \sum w_{ind} \cdot S_{ind}. \quad (1)$$

Depending on the actual model, the method described above might vary to a certain degree. For example, weights do not have to be fixed. They may be adjusted according to attributes like the industry that a rated organisation operates is part of, or scores can get re-normalised with respect to peers in order to obtain an industry-internal rating.

Different ESG rating providers take into account different indicators, use different weights for aggregation and even combine indicators or topics differently. In addition, time horizons considered and time-series compression approaches might differ from model to model and even from indicator to indicator. Especially when considering climate change-related risks, a rather long impact time horizon (>30 years) has to be taken into account; average changes within 12 months might be much smaller than short-term variability and thus seem to be negligible as an input factor for financial risk models; however, long-term trends can have a significant impact and should therefore be taken into account. Later in this paper, we will suggest a separation between a capital buffer for the financial impact of ESG risks and established capital requirements, with this time frame issue in mind. The effects of climate change, for example, can already be observed today to some extent. However, they will become much more evident and severe in the future,[2,9] very likely exhibiting a superlinear growth. Other ESG factors might focus more on current and near-term issues and are less likely to automatically become much bigger issues in the far future, such as labour conditions, discrimination against minorities or corruption. Eventually, any ESG rating model has to compress all that information into one single score.

Indeed, the demand for and use of ESG ratings has risen dramatically,[10] and so has the number of ESG rating providers. This, in conjunction with little to no regulatory guidance and a great variety of model designs, yields a great heterogeneity of ESG ratings. For example, in several studies, correlation analyses between ESG ratings of different rating providers for a fixed set of companies yielded correlation coefficients as little as 50–70 per cent.[11,12]

Regulators acknowledge the possibility of using ESG ratings for sustainability risk management purposes,[2,13] however, they are thus far providing little to no guidance on the construction of ESG ratings. If reliable results are supposed to be obtained from ESG rating models, harmonisation efforts have to be undertaken by the regulators, similar to the development observed in credit ratings in 2004 with the introduction of Basel II. These include methodological recommendations on which indicators to use, how to group and weigh them, as well as how to condense time series into scalar values. In addition, minimum requirements for quality assurance similar to those regarding credit risk models expressed in the capital requirements regulation (CRR) are needed to establish the reliability of and trust in ESG ratings. Only with the above-mentioned conditions fulfilled, ESG ratings can be used for regulatory purposes. In the European Securities and Markets Authority's (ESMA) correspondence to the European Commission on the convergence of ESG ratings, ESMA describes its view on the main challenges in the area of ESG ratings and ESG assessment tools. The perhaps most important criticism is the unregulated and unsupervised nature of ESG ratings.[14]

Almost equally important as the much needed regulatory requirements is the availability and quality of relevant data. ESMA also raises this point, but it is a relatively widespread point of criticism and a

common hurdle for model developers and the reason why 'the European Banking Federation, together with five other financial industry associations, is calling for the European Commission to establish a common ESG data register in the European Union (EU) to enhance the availability of relevant and reliable ESG data.[15] Significant challenges in this respect are that relevant data has not been collected consistently and over sufficiently long periods on the one hand and that historical observations, as opposed to the cases of credit ratings and credit loss estimations, are often — especially when dealing with climate risks — not representative of future development at all, so that high-quality data, reasonable assumptions made by experts, advanced models with high predictive power and massive computational power for running the models are required in order to estimate risks correctly. This massive data acquisition and processing effort is an undertaking that should not and cannot be shouldered solely by financial institutions and other companies but should extensively be supported by governments and public institutions. As a rough temporary solution, current values of widely used risk indicators might be regarded as correlated with, perhaps even proportional to, future risks. For example, CO_2 emissions as a major driver of climate change are very likely to be increasingly penalised through legislation, increasing future costs and, thus, future financial risk of CO_2 intensive ventures. Under the assumption that no mitigation measures are taken, the current amount of greenhouse gas emissions can be regarded as representative of future financial risks. The same argument can, of course, be applied to other risk factors, as well.

Types of ESG Ratings

When ESG rating models are devised, the selection of indicators to include and the weighting of different elements in the model depends on the underlying philosophy, as well as the purpose, ie, the area of application.

Specific Risk Type Ratings

Some ESG ratings focus on one specific risk type. One prominent example is Fitch's ESG rating, which focuses solely on probability of default (PD)-relevant factors. Such ratings are designed with the purpose of being taken into account in credit ratings. Utilisation as a qualitative adjustment factor in credit ratings or as an input factor in the PD model could be considered, as long as the assumption holds that most factors taken into account in the ESG rating are indeed relevant for the use case, and double counting of risk factors is avoided. Another very specialised ESG rating is provided by RepRisk, which puts a strong emphasis on reputational risks. Here, news items are analysed with respect to organisations, ESG topics and sentiment, yielding an estimate of potential reputational risks regarding the organisations covered within the news. Naturally, the rather narrow purpose of these ratings can lead to significant differences in indicators being used and weights assigned.

General Sustainability Ratings

Many ESG ratings are based on risk considerations, taking into account risk factors that lead to a financial impact for the rated organisation in some way, without being restricted to any specific risk type. They give a broad impression about how exposed an organisation is to different ESG risks and how it deals with those risks. Some ESG ratings even include aspects that can be classified as predominantly belonging to the 'outside-in' perspective, where the impact of the organisation on the outside world is in focus rather than risks acting on the organisation from the outside ('outside-in' perspective). Many of these factors would not be material for one single organisation but do impose a collective cost on society and the economy as a whole. Very broadly scoped ratings, including numerous factors not related to material risks for the individual organisation, are sometimes also referred to as a *moral compass* for obvious reasons.

Segment Ratings

The application scope of an ESG rating might be limited to certain segments. A segment can be defined along different dimensions. Probably the most common differentiator is the industry an organisation is predominantly active in. However,

geographical areas, groups of counterparties or features of financial instruments can act as segmentation criteria, as well. Both specific risk types and general ratings may be adjusted for use in specific segments. This approach has already been well established for credit risk models. As discussed previously in this paper, segmentation ratings can be constructed by taking into account different segment-specific indicators or changing the weights in the model.

Specific Investment Ratings

The ratings mentioned above are typically evaluated on counterparty level. Counterparty ratings are the type of ratings that can be purchased from different rating providers on the market. In contrast, there is also the concept of investment ratings, which are evaluated on a credit facility or collateral level. Those ratings are used to describe the sustainability performance of objects (eg, vehicles, real estate, machinery, energy production units, etc) or immaterial investments (eg, software, knowledge, etc). Especially for the purpose of driving change towards a more sustainable economy and greening the credit portfolio of financial institutions through more sustainability-focused loan origination, such ratings are the option of choice. As opposed to the utilisation of counterparty ratings for this purpose, historically non-sustainable companies would not be discriminated against when attempting to improve their ESG performance by investing in sustainable solutions. In fact, the EU taxonomy[16] takes precisely this direction, requiring the classification of individual economic activities and their 'greenness'; as this description already suggests, the EU taxonomy focuses on environmental issues. However, a social taxonomy is already under construction,[17] and eventually, all pillars are expected to be covered. Financial institutions that want to analyse the ESG performance of their credit portfolio are advised to resort to investment ratings, as they provide much more accurate information than an average estimate for a counterparty as a whole. Still, counterparty ratings provide a viable option as a fallback rating if sufficient information is unavailable to construct an investment rating or a loan is not bound to any specific purpose. The same, of course, applies to investments in bonds or shares, where the investment can be assumed to be used in line with current operating standards.

When the utilisation of ESG ratings as a tool to derive a capital buffer is discussed in the following sections of the paper, we suggest considering the arguments made in the context of investment-specific ESG ratings, with counterparty ratings merely used as fallback values, as discussed above. Furthermore, we would like to promote the concept of a rating that can assume more than two rating classes (sustainable/non-sustainable) in order to enable a fair and detailed depiction of sustainability performance, as well as a more uncertainty-tolerant tool for regulatory applications.

First Proposals: Green Supporting Factor or Brown Penalty Factor

In March 2018, the European Commission published its Sustainable Growth Action Plan.[18] The Action Plan builds on the recommendations of the High-Level Expert Group on Sustainable Finance[19] and sets out an EU strategy for sustainable finance. One of the potential policy tools to encourage banks to promote green finance is a Green Supporting Factor (GSF), which should be used to modify capital requirements for credit risk. The rationale behind this is that a GSF may be able to align banks' investment decisions more closely with the green finance objectives set by the EU. This would be achieved by lowering capital requirements for investments that are designated as green, thereby treating them as less risky than other investments or more carbon-intensive ('brown') investments. The idea of using a supporting factor on credit risk capital requirements is not new. Since 2014, the small and medium-sized enterprises (SME) factor has been used to anchor the political will to support SMEs in banking supervision law.[20] Another example for such a supporting factor is the infrastructure supporting factor (ISF).

The capital requirement regulation provides for the preferential treatment of claims on SMEs in terms of capital adequacy. SMEs are defined following EU Commission recommendation 2003/361/EC of 6th May, 2003.[21] The SME factor (SMEF) is set to 76.19 per cent for SME exposures

of up to 1.5m euros. Positions above this amount receive an SME factor of 85 per cent. The SME factor is applied to the risk weights (RW) under the standardised credit risk approach (SA) as well as the internal ratings-based approach (IRBA).[22] The ISF is applied in the same way as the SMEF, but calibrated at 75 per cent.

The calculation of the risk-weighted assets for an SME (RWA_{SME}) follows Equation (2):

$$RWA_{SME} = RW_i \cdot (SMEF). \quad (2)$$

No detailed proposal on the mechanism of a GSF nor the value of the GSF has been proposed yet, but it can be assumed that the EU Commission will use a similar approach as for the SME factor. If an exposure were to fulfil a given definition of green finance, then the individual risk weight of an exposure would be multiplied by the GSF. Thus, the GSF would be applied regardless of the chosen approach (SA or IRB) to calculate the capital requirements for credit risk. Equation (3) shows how the RWA of a position that fulfils the definition of green finance could be calculated.

$$RWA_{GF} = RW_i \cdot (GSF). \quad (3)$$

Based on the experience with the above mentioned SMEF and the ISF the value of the GSF can be expected to be between 0.85 and 0.7.

Contrary to the GSF, a Brown Penalty Factor (BPF) is also under discussion and could lead to a similar result as a GSF. However, instead of decreasing the capital requirements like the GSF, a BPF would increase the capital requirements as soon as a brown finance definition is fulfilled. Therefore, banks would be motivated to avoid brown exposures. Therefore, the calculation of the RWA for a position that fulfils the definition of brown finance would follow Equation (4):

$$RWA_{BF} = RW_i \cdot (BPF). \quad (4)$$

Could a GSF/BPF weaken the Capital Base of Banks?

It can be assumed that irrespective of whether a GSF or a BPF was used to promote green finance, a supporting factor would be heavily opposed by banks and bank regulators, a reaction similar to the one following the introduction of the SME factor.[23] The support of green finance is driven by political will and societal expectations rather than a large body of data providing irrefutable evidence for green finance being exposed to lower risks than brown finance. Capital requirements are used in banking regulation to measure and limit risks. In several studies, no historical data was found that gave evidence that green finance is less risky or brown finance is riskier.[24] On the other hand, it is clear that climate risk in the context of global warming will have an impact on the profitability of companies and, therefore, their default risk.[25] The report 'Recommendations of the Task Force on Climate-related Financial Disclosures' shows on a detailed level that in the future, climate-related risk will have financial implications.[26] A GSF or BPF is also criticised because of the different time horizons of climate risk compared to traditional banking risks like credit risk or market risk. The typical time horizon for credit risk is one year and for market risk ten days. Climate-related risks consider, as above mentioned, a long term horizon of, eg, 30 years. Nevertheless, these additional risks should be considered in banks minimum capital requirements to assure a sound capital basis of banks in the long term because credits that are originated now will face climate-related risks in the future.

Caution should be exercised before introducing a GSF or a BPF. Capital requirements are to ensure financial soundness and stability. Only higher or lower risks justify higher or lower capital requirements.[27] It can also be expected that especially the BPF will be heavily opposed by companies and industry associations, as higher capital requirements could lead to higher interest rates for certain companies or industries that are mainly considered brown industries. A higher interest rate could lead to a shortage in credit supply for the real economy and, therefore, is not desired by the European Commission.

Combination of GSF and BPF

The dilemma of the political will to promote green finance and sustain sound capital requirements could

be mitigated by the combination of both factors. If a position fulfils the definition of green finance, a GSF could be applied, while if the definition of brown finance is fulfilled, a BPF could be applied. With this principle, the reduction of capital requirements and, therefore, a weakening of a bank's capital base could be offset. The RWA for a relevant position could be calculated according to Equation (5):

$$RWA_i = RW_i \cdot \left(BPF \vee GSF\right). \quad (5)$$

Currently, calibration of a GSF of 0.8 to 0.7 per cent is discussed unofficially between the EU Commission, the banking industry and other stakeholders. A BPF would be calibrated in a similar range at 1.15 to 1.3, but only as an additional capital charge. To keep the range of a capital reduction/add on of about 25 to 30 per cent, a combined GSF/BPF could be ranging between 0.85 and 1.15.

A Sustainability Factor (SF) based on ESG Ratings

The combined GSF/BPF approach is a relatively simple binary approach. Positions will receive a preferential or disadvantaged capital requirement treatment based on whether they fulfil a not yet defined criterion. This approach could certainly lead to the promotion of green finance, but how 'green' a green finance position is, is not taken into account. Moreover, cliff effects present another issue. As currently many companies and industries are in the process of fundamentally changing their business model to become 'greener', a more detailed approach should be used in order not to provide the wrong incentive.

As described above, ESG ratings become more and more important in the decision-making process of banks. As the environmental component within ESG ratings is often dominant, the use of ESG ratings to derive a GSF/BPF could be a significant improvement.[28]

ESG ratings offer an evaluation entailing both extremes ('green' and 'brown') while at the same time providing a much more refined distinction by inserting intermediate classes between these extremes. The above-discussed dilemma of green finance promotion versus sound capital requirements could therefore be avoided.

Table 1: Example for a mapping of ESG ratings to the sustainability factor

ESG Rating	SF
A	0.9
B	0.92
C	0.95
D	0.97
E	1
F	1
G	1.02
H	1.05
I	1.07
J	1.1

Sustainability Factor based on a harmonised ESG rating definition, a 'Sustainability Factor' (SF) instead of a GSG or BPF could be derived. This could lead to a much more differentiated promotion of green finance, as the 'greener' a position is, the lower the capital requirements could become, and the 'browner' a position is, the higher capital requirements could become.

Table 1 shows an example of how such a mapping of ESG rating to SF could look like:

It is crucial that the mapping between ESG ratings and SF must be based on a harmonised definition of ESG ratings and set by the European Commission in cooperation with bank regulators to avoid wrong consequences for both a sound capital base for banks and the promotion of green finance. As described above, there is a trade-off between both goals. Also, the above-mentioned minimum requirements for the design of ESG ratings should be considered and eventually defined by the EU commission/bank regulators. Furthermore, as capital requirements are one of the most important instruments in banking supervision, banks should need approval from the competent authorities if they want to use ESG ratings to derive their SF, or the ESG ratings should undergo an initial and ongoing review of an independent party such as the statutory auditor.

Supporting Green Finance by using a Sustainability Capital Buffer

The SF, as described above, is linear and applied to the individual risk weight of a debtor or position. This means that the change of the capital requirement due to the SF depends on the credit quality of the debtor or position. For example, a position of an AA rated company would receive a risk weight of 20 per cent, while an unrated corporate would receive a risk weight of 100 per cent. Assuming the exposure of both positions is the same, the ESG rating is the same and leads to the same GF, the increase or decrease in capital requirements due to the SF would be 80 per cent higher for the unrated position than for the rated position. There is currently no historical data available to justify such a direct relationship between credit quality and green promotion eligibility. Instead of a SF, we suggest that a sustainability weight (SW) should be introduced. A SW would determine a separate capital requirement for green finance independent of any debtor's credit quality or position. Unlike a supporting factor approach, the SW would receive a positive value in the case of brown finance or low ESG ratings and a negative value in green finance. Therefore, a netting of positive and negative capital requirements due to SW should be permitted. The calculation of Sustainability Weighted Assets (SWA) would be calculated using Equation (6):

$$SWA_i = SW_i \cdot \left(EAD_i\right). \tag{6}$$

Table 2 shows an example of a mapping between ESG ratings and SW:

Capital requirements and capital ratios are important input factors for the management decisions of banks. Due to the above-described mechanism to promote green finance, lower capital requirements could lead to less resilient banks and weaken the financial sector. On the other hand, higher capital requirements could lead to a lower credit supply and economic growth. These undesired effects could be avoided by using a capital buffer instead of a capital requirement to promote green finance. A capital buffer is not a binding requirement like the minimum capital ratio. A capital buffer can be breached temporarily without direct consequences for a bank but still motivate banks to invest more in green finance. The sustainability buffer could be easily integrated into the capital ratio system of current banking regulation. It would be the sum of the minimum capital ratio (eg, CET1 capital ratio), risk buffers (eg, capital conservation buffer, countercyclical buffer, etc) and the sustainability buffer. The application of the Sustainability and Risk-Weighted capital ratio (SRR) would follow Equation (7):

Table 2: Example for a mapping of ESG ratings to Sustainability Weights

ESG Rating	SW
A	-0.1
B	-0.08
C	-0.05
D	-0.025
E	0
F	0
G	0.025
H	0.05
I	0.08
J	0.1

$$CET1 > \left(\sum RWA + \sum SWA\right) \cdot \text{SRR}. \tag{7}$$

This means that a bank should always have more CET1 capital than the sum of risk-weighted assets as defined in current banking regulation and the SWA times the SRR.

The value of such a SRR must be calibrated carefully by the European Commission. It could be used flexibly over time as the shift from a brown to a green economy continues.

Case Study: The Impact of GSF, GPF and ESG Buffer on Banks' Corporate Portfolio Capital Requirements

In this case study, we analyse how the currently discussed proposals on how green finance could be promoted via adjustments in capital requirements impact banks' RWA and compare it with our recommendations.

Table 3: Overview sample portfolio

PD Rating Class	PD Range within Rating Class	RW	EAD	RWA
1	0.00 to < 0.15	12.47%	2,080 €	259.34 €
2	0.15 to < 0.25	12.75%	2,664 €	339.62 €
3	0.25 to < 0.50	26.88%	2,622 €	704.95 €
4	0.50 to < 0.75	38.89%	50 €	19.63 €
5	0.75 to < 2.50	49.88%	1,719 €	857.34 €
6	2.50 to < 10.00	79.37%	544 €	432.15 €
7	10.00 to < 100.00	153.98%	152 €	234.67 €
8	Default	97.57%	168 €	164.04 €

The underlying data is based on a corporate portfolio of an internationally active bank within the EU that uses the IRB approach for credit risk. The normalised credit portfolio is shown in Table 3.

The ESG ratings used are derived from an ESG scorecard developed based on the above-described methodology and qualitative requirements, using a data set containing 9,500 data points of a different institution's portfolio. The distribution of the ESG score is shown in Table 4:

We mapped the ESG scores to 10 ESG rating classes, denoted from A to J, to make the analysis clearer. The distribution of ESG ratings is assumed to be independent of the credit quality and, therefore, the same for each PD rating class.

Applying the GSF to the portfolio, a definition of green finance is needed. As this definition is not available yet, we defined green finance as all exposures that would be assigned to the ESG rating classes A to C. This equals 50 per cent of the portfolio. As the definition of brown finance, we used all exposures assigned to the ESG rating classes G to J, which equals 16 per cent of the total portfolio.

The calibration for GSF and BPF used in this case study is not based on a detailed analysis and only for illustration purposes.

Only using a GSF of 0.8, the RWA would decrease by 300 €. On the other hand, only applying the BPF would lead to an increase of 94 €.[29]

If both factors were combined, the total capital requirement reduction would equal 206 €, see Table 5:

Table 4: Portfolio share for each ESG rating

ESG Rating	Portfolio share
A	0%
B	19%
C	31%
D	27%
E	6%
F	2%
G	6%
H	7%
I	2%
J	0%

By using the ESG ratings directly for deriving the SF or SW, banks' motivation to invest in green finance and avoid brown finance could be even increased as the penalty for slightly brown finance would be not so high and the promotion of very 'green' investments could be higher.

Table 6 shows the change in RWA by using the suggested ESG to SW mapping of Table 2.

By applying this mapping to the analysed portfolio, the decrease in capital requirements would be 3.4 per cent. The calibration of the mapping between ESG ratings and GF is not based on a detailed analysis and only for illustration purposes.

The results of the case study show that the calibration of the mapping between GSF, BPF and the ESG ratings to SW is crucial to the total

Table 5: RWA changes due to GSF and BPF

1	2	3	4	6	7	8	9	10	11	12
PD Rating Class	**RW**	**EAD**	**RWA**	**ESG ratings A to C**	**Effective GSF 0.8*(6) + 0.2*(1-(6))**	**RWA after effective GSF (4)*(7)**	**ESG ratings A to D**	**Effective BPF 1.2*(9) + (1-9)**	**RWA after effective BPF (4)*(10)**	**RWA after combined GSF and BPF**
1	0.125	2,080 €	259.34 €	49.79%	90.04%	233.51 €	15.68%	103.14%	267.47 €	241.64 €
2	0.128	2,664 €	339.62 €	49.79%	90.04%	305.80 €	15.68%	103.14%	350.27 €	316.44 €
3	0.269	2,622 €	704.95 €	49.79%	90.04%	634.74 €	15.68%	103.14%	727.05 €	656.85 €
4	0.389	50 €	19.63 €	49.79%	90.04%	17.67 €	15.68%	103.14%	20.24 €	18.29 €
5	0.499	1,719 €	857.34 €	49.79%	90.04%	771.96 €	15.68%	103.14%	884.22 €	798.84 €
6	0.794	544 €	432.15 €	49.79%	90.04%	389.12 €	15.68%	103.14%	445.70 €	402.66 €
7	1.540	152 €	234.67 €	49.79%	90.04%	211.30 €	15.68%	103.14%	242.03 €	218.66 €
Default	0.976	168 €	164.04 €	49.79%	90.04%	147.70 €	15.68%	103.14%	169.18 €	152.85 €
Sum		10,000 €	3,012 €			2,712 €			3,106 €	2,806.22 €
Change in RWA						-300 €			94 €	-206 €

Table 6: RWA and SWA impact

1	2	3	4	5	6
PD Rating Class	**RW**	**EAD**	**RWA**	**SWA**	**Sum of RWA and SWA (4)+(5)**
1	0.125	2,080 €	259.34 €	-63.38 €	195.96 €
2	0.128	2,664 €	339.62 €	-81.17 €	258.45 €
3	0.269	2,622 €	704.95 €	-79.91 €	625.04 €
4	0.389	50 €	19.63 €	-1.54 €	18.09 €
5	0.499	1,719 €	857.34 €	-52.38 €	804.96 €
6	0.794	544 €	432.15 €	-16.59 €	415.56 €
7	1.540	152 €	234.67 €	-4.64 €	230.03 €
Default	0.976	168 €	164.04 €	-5.12 €	158.92 €
Sum		10,000 €	3,012 €	-304.74 €	2,707.00 €

outcome and must be calibrated with caution. It also shows that the motivation to invest in green finance can be achieved by lowering capital requirements for green finance and increasing capital requirements for brown finance without weakening the capital base and, thus, the resilience of banks.

Using ESG ratings to derive capital add-ons or capital reductions can be used as a more granular and adequate tool for regulators to achieve the goal of promoting green finance investments of banks.

SUMMARY

ESG ratings are becoming an industry standard for the measurement of ESG risks. While especially large and internationally active credit institutions

already use ESG ratings to a certain extent in the decision-making process, medium and smaller banks have just started developing or are considering developing ESG rating systems. As opposed to credit rating models, ESG rating models contain a large number of qualitative factors, which might have at least as much impact on the rating as quantitative factors. As ESG ratings will be used for a wide range of applications, including loan origination and strategic decisions, regulators should set minimum standards. Moreover, if ESG ratings should be used to promote green finance via the adjustment of capital requirements for banks, these minimum standards would be even more critical and necessary.

Even if current research cannot prove or disprove a strong connection between credit risk and the sustainability of investments, partially due to the lack of relevant historical data, but also due to representativeness issues between past and future developments, many studies show that there will be a significant financial impact of climate risk and, therefore, on the performance of debtors of banks. Therefore, a systematic consideration of sustainability in Pillar I procedures is logical and must be considered by regulators in due time. This paper shows how Pillar I capital requirements could be derived based on a Green Supporting Factor or a Brown Penalty Factor.

Furthermore, as a more granular approach, the derivation based on ESG ratings is proposed, as the calibration could be much more granular, and the promotion of green finance could be achieved without having a negative impact on the overall capital base of banks and the stability of the financial sector.

AUTHORS' NOTE

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

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4 For example, China introduced new ESG disclosure regulation in 2021, as discussed by market data vendor IHS Markit ('Chinese regulators set ESG disclosure rules as financiers eye investment opportunities', available at https://ihsmarkit.com/research-analysis/chinese-regulators-set-esg-disclosure-rules-as-financiers-eye-.html, last accessed on 15th September, 2021), and under the new administration, the USA are also taking action, as discussed in a recent S&P article ('Thought Leadership: Why we need Biden's executive order on climate-related financial risk', available at https://www.spglobal.com/esg/insights/why-we-need-biden-s-executive-order-on-climate-related-financial-risk, last accessed on 15th September, 2021). There are numerous more examples, however, since an overview of regulatory guidance is not the focus of this paper, we refrain from providing further details.
5 An increasing number of news items are touching on climate change issues, especially global warming and the increasing frequency and severity of extreme weather events.
6 The ECB, for example, will conduct a climate stress test in 2022, for which preparations have already begun. This exercise serves to determine financial institutions' credit portfolio resilience with respect to risks related to climate change. Also, the EU Taxonomy developed by the European Commission initially focused on CO_2 emissions as a major driver of climate change.
7 The 'Paris Agreement' is an international, legally binding treaty with the goal of limiting global warming to below two (preferentially to 1.5) degrees Celsius compared to pre-industrial levels.
8 The figure applies the terminology of the three NGFS long-term scenarios.
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28 Instead of the ESG rating, a pure (E)-Environmental or climate risk rating could be used as well. The E component can be isolated in the ESG rating process, if the two other components should not influence the promotion of green finance. It could be considered, if the promotion of not only green finance but also investments that include the social and governance aspects should be promoted.

29 The different impacts of the GSF and the BPF result from the applied definitions of GSF and BPF based on the ESG ratings. This must be calibrated considering the goals discussed above.