

RISK MANAGEMENT MAGAZINE

Vol. 17, Issue 1
January – April 2022



IN THIS ISSUE

4	A Gentle Introduction to Model Risk Quantification in Commercial Banking Tiziano Bellini
12	AML Risk Adjusted Performance Indicators: Assumptions & Methodology Ivano Traina, Andrea Vivoli
ARTICLE SUBMITTED TO DOUBLE-BLIND PEER REVIEW	
25	Banks' governance and risk management frameworks: how to integrate ESG and climate risks Giuliana Birindelli; Michelangelo Bruno; Alberto Citterio; Umberto Fuso; Guido Luciano Genero; Andrea Magurano
36	COVID-19: managing a pandemic risk with a Non-physical Damage Business Interruption policy Valentina Lagasio, Fabrizio Santoboni, Davide Tremoglie
50	Capital adequacy in banks and sustainable finance: the Green Supporting Factor Mariantonietta Intonti, Annalisa Ceo, Giovanni Ferri

Risk Management Magazine

Volume 17, Issue 1, January - April 2022

Direttore Responsabile (Editor in Chief)

Maurizio Vallino (AIFIRM General Manager; Banca Carige, Italy)

Condirettore (Managing Editor)

Corrado Meglio (AIFIRM Vice President; Banca Credito Popolare, Italy)

Editorial Board

Giampaolo Gabbi - Chief Editor Business Economics Area (SDA Bocconi, Italy); Paolo Giudici - Chief Editor Statistical Economics Area (Università di Pavia, Italy); Daniel Ahelegbey (Università di Pavia, Italy); Raffaella Calabrese (University of Edinburgh, UK); Robert Eccles (Oxford University, UK); Franco Fiordelisi (University of Essex, UK); Pier Giuseppe Giribone (Università di Genova, Italy); Gulia Iori (City, University of London, UK); Richard M. Levich (New York University, USA); Michèle F. Sutter Rüdissler (University of San Gallen, Switzerland); Peter Schwendner (ZHAW Zurich University of Applied Sciences, Switzerland); Alessandra Tanda (Università di Pavia, Italy).

Scientific Committee

Arianna Agosto (Università di Pavia, Italy); Ruggero Bertelli (Università di Siena, Italy); Paola Bongini (Università Milano Bicocca, Italy); Anna Bottasso (Università di Genova, Italy); Marina Brogi (Università La Sapienza di Roma, Italy); Ottavio Caligaris (Università di Genova, Italy); Rosita Coccozza (Università Federico II di Napoli, Italy); Costanza Consolandi (Università di Siena, Italy); Simona Cosma (Università del Salento, Italy); Paola Ferretti (Università di Pisa, Italy); Andrea Giacomelli (Università di Venezia, Italy); Adele Grassi (Vice Presidente APB, Italy); Valentina Lagasio (Università La Sapienza di Roma, Italy); Duccio Martelli (Università di Perugia, Italy); Enrico Moretto (Università Insubria, Italy); Laura Nieri (Università di Genova, Italy); Adamaria Perrotta (UCD – University College Dublin, Ireland); Pasqualina Porretta (Università La Sapienza di Roma, Italy); Anna Grazia Quaranta (Università di Macerata, Italy); Enzo Scannella (Università di Palermo, Italy); Cristiana Schena (Università dell'Insubria, Italy); Giuseppe Torluccio (Università di Bologna, Italy).

Cartoonist: Silvano Gaggero

Ownership, Newsroom and Secretariat:

Associazione Italiana Financial Industry Risk Managers (AIFIRM), Via Sile 18, 20139 Milano

Registration number at Court of Milan n. 629 dated 10th September 2004

ISSN Print 2612-3665 – **ISSN Online** 2724-2153

DOI 10.47473/2016rrm

E-mail: risk.management.magazine@aifirm.it; Tel. +39 389 6946315

Printing

Algraphy S.n.c. - Passo Ponte Carrega 62-62r 16141 Genova

The authors bear sole responsibility for the opinions expressed in the articles.

MAILED TO AIFIRM SUBSCRIBERS WHO ARE RESIDENT IN ITALY AND DULY REGISTERED

Journal printed on 29th April 2022

Scientific journal
recognized by
ANVUR and AIDEA



Peer review process on papers presented for publication

The papers that are presented to our magazine for publication are submitted anonymously to a double level of peer review.

The first level is a review of eligibility, implemented on the paper by the members of the Editorial Board, who assess the adequacy of the paper to the typical topics of the magazine.

The second level is a review of suitability for publication, implemented on the paper by two referees, selected within the Editorial Board, the Scientific Committee or externally among academics, scholars, experts on the subject who assess the content and the form.

Editorial regulation

“Risk Management Magazine” is the AIFIRM (Italian Association of Financial Industry Risk Managers) magazine, fully dedicated to risk management topics.

The organization includes the managing editor, a joint manager and an Editorial Board and a Scientific Committee composed by academics.

The magazine promotes the diffusion of all content related to risk management topics, from regulatory aspects, to organizational and technical issues and all articles will be examined with interest through the Scientific Council.

The papers shall be presented in Microsoft Word format, font Times New Roman 10 and shall have between 5.000 and 12.000 words; tables and graphs are welcome.

The bibliography shall be written in APA format and shall accurately specify the sources.

An Abstract in English is required (less than 200 words) highlighting the Key words.

The authors bear sole responsibility for the opinions expressed in the articles.

The Statement on ethics and on unfair procedures in scientific publications can be found on our website www.aifirm.it.

Processo di referaggio degli articoli proposti per la pubblicazione

Gli articoli che sono proposti alla rivista per la pubblicazione sono sottoposti in forma anonima a due successivi livelli di referaggio.

Il primo livello di referaggio (di ammissibilità) viene effettuato sull’articolo dai membri dell’Editorial Board che ne valutano la congruità ai temi trattati dalla rivista.

Il secondo livello di referaggio (di pubblicabilità) viene effettuato sull’articolo da due referee scelti all’interno dell’Editorial Board, del Consiglio Scientifico o all’esterno tra accademici, ricercatori, esperti della materia, che ne valutano il contenuto e la forma.

Regolamento redazionale

“Risk Management Magazine” è il periodico di AIFIRM (Associazione Italiana Financial Industry Risk Managers) ed interamente dedicato ai temi del risk management.

La sua struttura organizzativa prevede, oltre al direttore responsabile, un condirettore, un Editorial Board e un Consiglio Scientifico formato da accademici.

La rivista favorisce la diffusione di tutti i contenuti afferenti i temi del risk management, dagli aspetti normativi a quelli organizzativi e alle technicalities e vaglierà con interesse, per mezzo del Comitato Scientifico, i contributi che le perverranno.

Gli articoli proposti dovranno pervenire in formato Microsoft Word carattere Times New Roman 10 ed avere un numero di parole compreso tra 5.000 e 12.000; è gradita la presenza di tabelle e grafici.

La bibliografia deve essere redatta in formato APA, specificando accuratamente le fonti.

Si richiede la predisposizione di un Abstract in lingua inglese (meno di 200 parole) con indicazione delle Key words.

Le opinioni espresse negli articoli impegnano unicamente la responsabilità dei rispettivi autori.

Sul sito www.aifirm.it è pubblicata la Dichiarazione sull’etica e sulle pratiche scorrette nella pubblicazione dei lavori scientifici.

Referees Year 2021

Arianna Agosto (University of Pavia), Anna Bottasso (University of Genoa), Ottavio Caligaris (University of Genoa), Costanza Consolandi (University of Siena), Simona Cosma (University of Salento), Paola Ferretti (University of Pisa), Andrea Giacomelli (University Ca’ Foscari of Venice), Pier Giuseppe Giribone (University of Genoa), Adele Grassi (Vice President of APB), Valentina Lagasio (Sapienza University), Duccio Martelli (University of Perugia), Enrico Moretto (University of Insubria), Laura Nieri (University of Genoa), Pasqualina Porretta (Sapienza University), Annagrazia Quaranta (University of Macerata), Enzo Scannella (University of Palermo), Cristiana Schena (University of Insubria), Giuseppe Torluccio (University of Bologna)

A Gentle Introduction to Model Risk Quantification in Commercial Banking

di Tiziano Bellini (Prometeia SpA)

Abstract

Model risk is investigated from a commercial banking viewpoint. We firstly analyze model misspecification. Then, the focus shifts towards model sensitivity. Finally, interactions among various models are scrutinized. Our overarching goal is to derive a distribution of indicators for summarizing the impact of model risk on synthetic measures like bank's economic, capital, liquidity ratios, and so on. Governance impacts are also considered in terms of the definition of a comprehensive model appetite framework with corresponding tolerance bands.

Keywords: Model risk, uncertainty, extreme events

1. Introduction

The simplification and assumptions that models must necessarily employ sometimes come at the cost of accuracy and structural integrity under stress. This exposes the bank to model risk: the risk of economic or reputation loss due to errors in the development, implementation or use of models.

In what follows we introduce a framework for quantifying model risk by focusing on three main pillars. The first refers to model misspecification. The second is about model sensitivity to shifts on its natural setup. The third pillar refers to potential uncertainty explosion due to interactions in complex modelling (e.g., fully integrate balance sheet).

The paper is organized as follows. Section 2 provides a general overview of the model risk quantification framework. In Section 3 we analyze model uncertainty from an individual model (i.e., silo) perspective. Therefore, Section 4 focuses on sensitivity analysis, while Section 5 faces the issues related to complex modelling. Finally, Section 6 summarizes the key insights by providing an overview for further research.

2. The Framework

Our framework for quantifying model risk in a commercial Bank relies on the following three main pillars:

1. **Misspecification and calibration.** Alternative models can be chosen for describing a phenomenon. The question we need to address is whether the chosen one is suitable for the purpose. Challenger models pursue the goal of highlighting potential drawback of the champion.
2. **Sensitivity.** A model developed on all available data and using appropriate techniques has the potential for representing the phenomenon under analysis as it develops. Nevertheless, changes on internal conditions (e.g., portfolio composition) or external environment factors (e.g., macroeconomic situation) may reduce model's potentials. For this reason, one may inspect circumstances leading the model to fail its mission. What-if analysis based on stressed conditions together with a reverse-stress-testing setup are particularly effective in defining model risk tolerance limits and monitoring risk over time.
3. **Complex modelling.** Complex modelling frameworks characterize banking processes and management decisions. Uncertainty in each component of the framework may impacts on its dependencies as a small snowball causing an avalanche.

3. Misspecification and Calibration

One may represent model misspecification by focusing on statistics summarizing the distance among distributions. As an example, one may compare the empirical distribution against the target. In case of Kolmogorov-Smirnov test, the following applies:

$$D_n = \sup_y |F_n(y) - F_n(y)| \quad (1)$$

where \sup_y is the supremum of the set of distances between the empirical distribution function for n identical and identically distributed ordered observations Y_j . If the sample comes from $F_n(y)$, then D_n converges to 0 almost surely in the limit when n goes to infinity.

As part of the modelling process, parameters are estimated on a given sample. As an example, in linear regression, coefficient of determination is commonly used. More generally, error tracking over time becomes particularly relevant as a proxy for model uncertainty.

Remark. One may argue that both misspecifications together with calibration risks come together when tracking errors. For this reason, tracking the misspecification risk plays a key role in highlighting potential issues related to model choice. Ideally, one would expect to represent the contribution of misspecification and calibration to the whole error. The challenge can be faced by means of what-if analyses as detailed in Section 44.

Let us consider a Commercial Bank Small Medium Enterprise portfolio. We aim at representing model uncertainty due to misspecification and calibration risks. The focus is on a Probability of Default model already in use within the Bank. Monitoring data are used for the analysis.

We start by concentrating on model capability to effectively discriminate between “good” and “bad”. Two alternative approaches are followed. A champion model relies on logistic regression, while a non-optimized random forest is the challenger.

It is worth noting that monitoring should be conducted by having in mind a wider range of specifications and estimation approaches. In general the focus should be aiming for a wider assessment that aims to cover:

- Different functional model specifications or theoretical frameworks.
- Stability of the performance linked to the new data available (updating models and testing the performance).
- Consideration of different set of variables.

Figure 1 tracks Gini Index defined as follows:

$$G: \frac{1}{2\mu} \int_0^1 \int_0^1 |Q(F_1) - Q(F_2)| dF_1 dF_2, (2)$$

where μ is the mean of the distribution, and specifying that $F(y)$ is zero for all negative values.

Based on Bank’s risk appetite and tolerance, the champion model does not fall below the tolerance band throughout the entire period. In summary, we do not experience any deterioration of the model’s discriminatory power.

The use of Gini instead of granular metrics in this particular example is linked to the importance of defining key metrics summarizing a wider range of impacts on which a performance comparison is sufficiently clear. For PD models the metrics are quite consolidated, more complex the situation can be for other type of models like LGD due to the complex structure (Bellini, 2019).

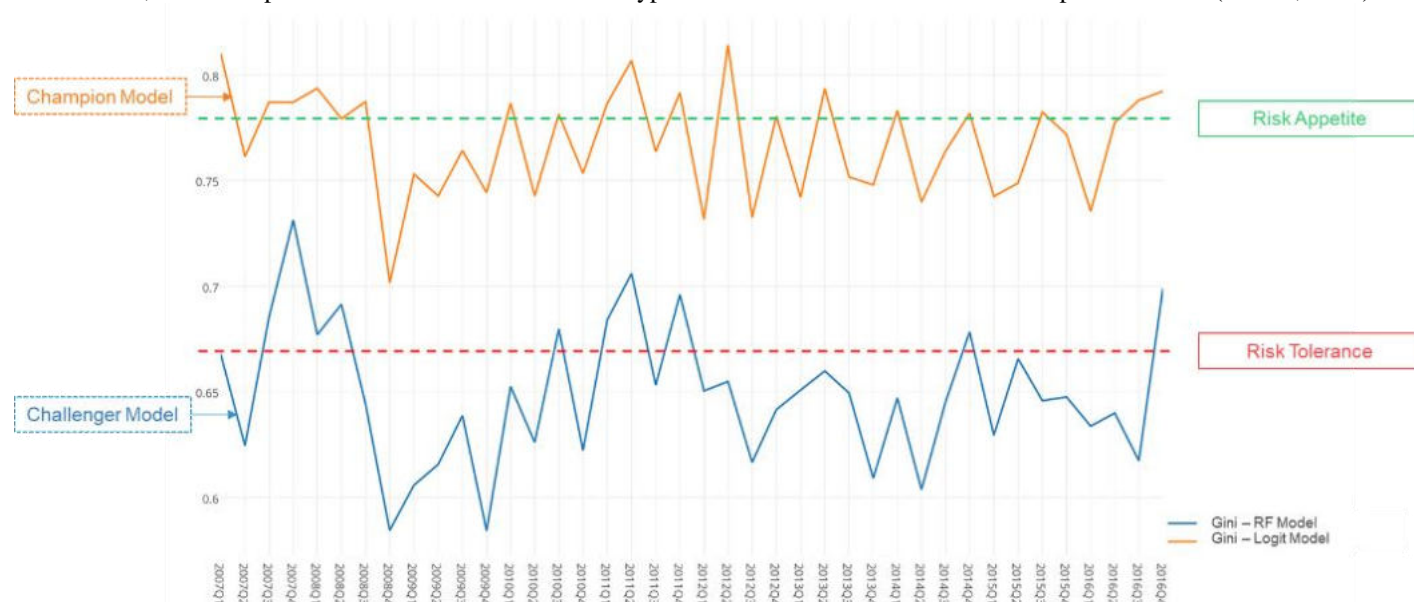


Figure 1: Gini index tracking for a PD model (misspecification analysis)

Based on the above, one would expect not to encounter issues while comparing actual Default Rates against fitted (i.e., Probability of Default). On the contrary, the left panel of Figure 2 shows the champion model based on the original calibration scheme. Errors are tracked along the historical period of observation.

We notice that in 2010-2011 a first relevant increase on its value is due to 2007-2009 financial crisis (as expected DRs increase with some lags). Another smaller jump is experienced a few years later.

Based on such setup, the average error exceeds 1.00% with a standard deviation of % As represented in the right panel, in practice, Banks do perform periodic re-calibration (in a Point in Time setup). As a consequence, we notice two re-calibration exercises leading to a substantial reduction in both average error and its standard deviation.

Figure 3 summarizes error distribution by distinguishing between the whole portfolio and its rating classes. The idea here is to represent model uncertainty by means of historical errors without including any further modelling assumption.

Similarly to what shown above, Figure 4 highlights mean error track together with lower and upper bands (i.e., 95% quantile) for the corresponding distribution.

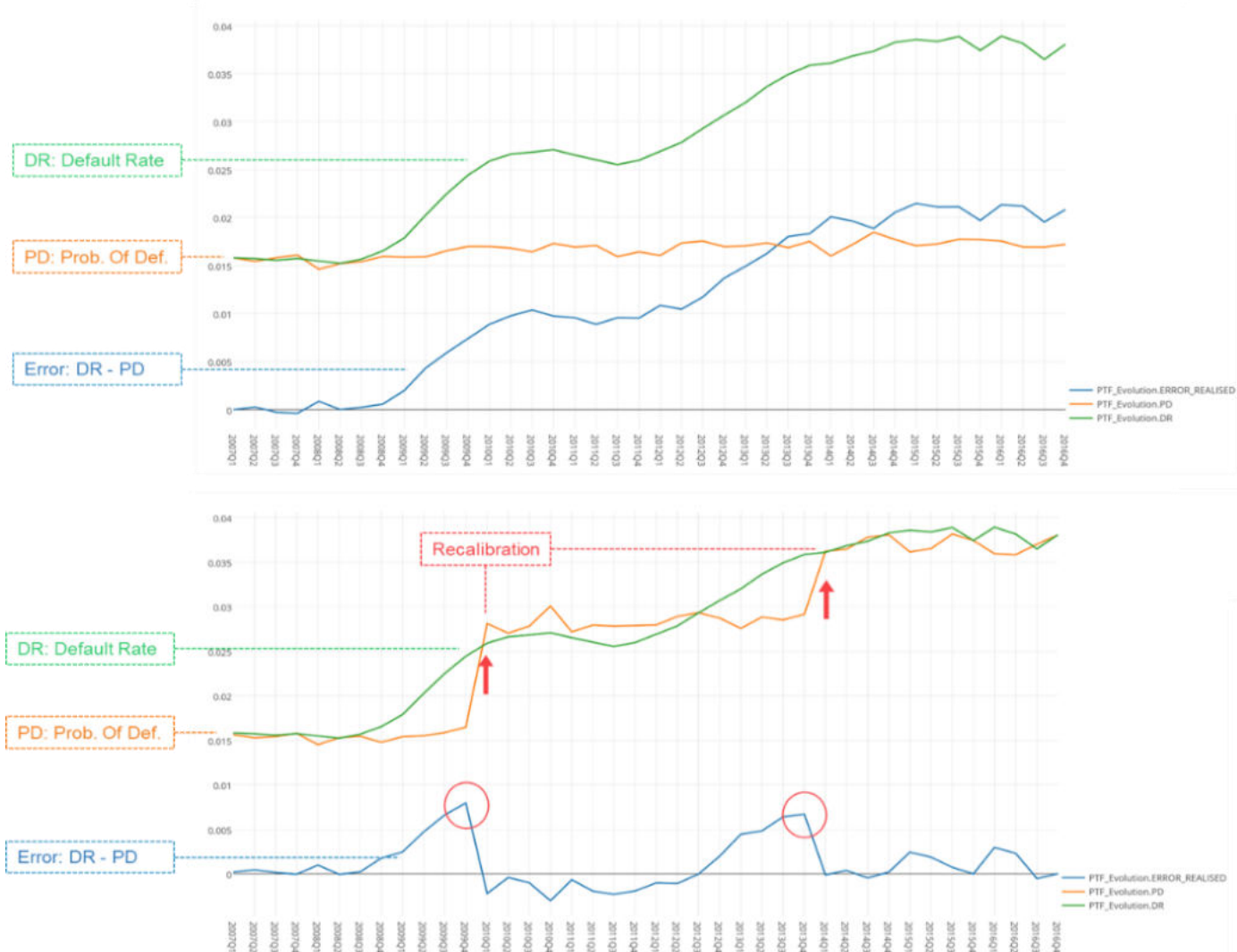


Figure 2: PD model calibration analysis – the role of model re-calibration

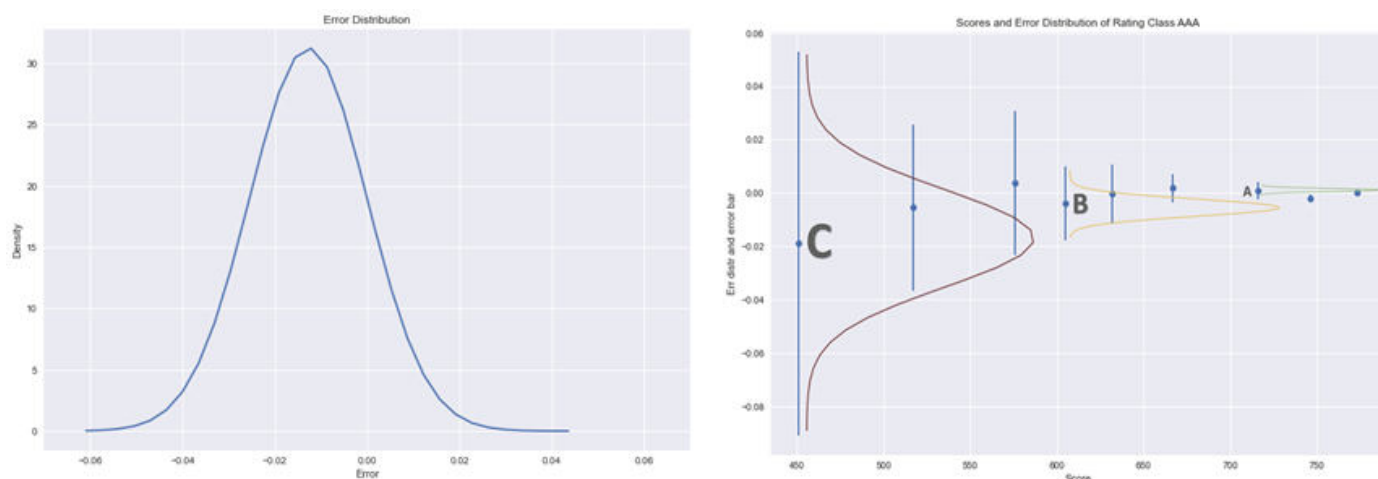


Figure 3: Model error distribution based on normal assumption – left panel refers to the whole portfolio, right panel split based on rating classes

Remark. Model uncertainty is represented by means of a confidence interval within which model error is likely to stay. It encompasses potential losses an institution may incur due to model deficiencies in representing the phenomenon under scrutiny.

One may also develop mechanics for fitting errors. On this, a few alternative approaches can be considered by highlighting the potential use of macroeconomic factors as explanatory variables. In some cases, as shown in Figure 2, errors may be linked to macroeconomic dynamics.

This may potentially be caused by not including macro factors onto the underlying model or alternatively by exogenous shocks that hardly can be incorporated in the model frame. For these reasons, in the next section we explore sensitivity analysis by applying a “stress testing” what-if analysis to our framework.

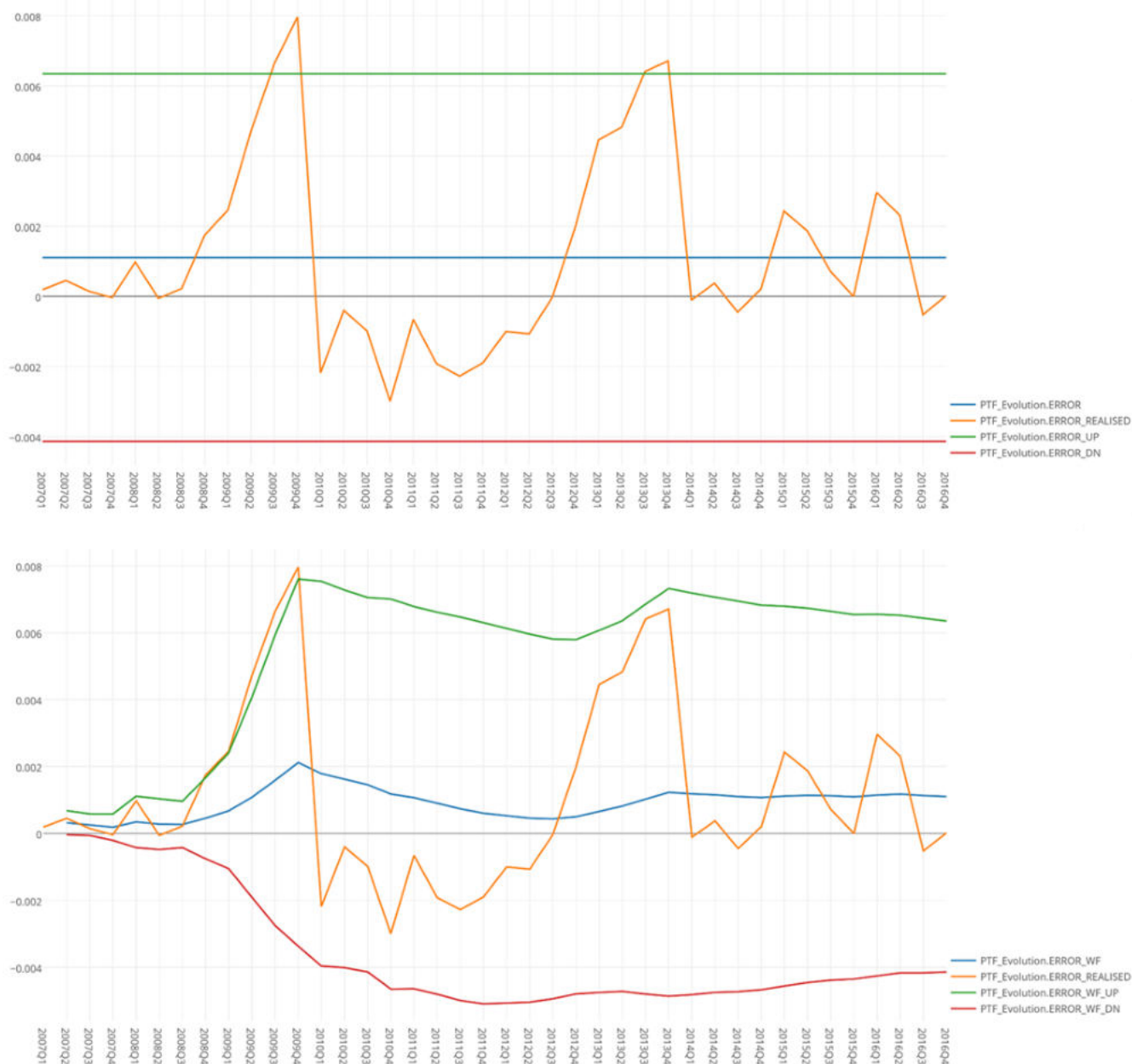


Figure 4: Uncertainty bands based on mean and standard deviation estimated on $e_{i,t}$

4. Sensitivity

One of the key questions arising while developing and implementing a model is related to its capability to perform outside the environment where it was trained. On this, Figure 5 summarizes the following idea:

- Given an initial dataset (e.g., on which the model was developed) the model projects some outcomes on a hyperplane.
- What happens if data are shifted? What happens in terms of its uncertainty?

Based on what discussed in previous sections, the key challenge for assessing uncertainty is to check model errors under various scenarios.

At a first glance, one may think of bootstrapping or nested bootstrapping when dealing with multiple models/parameters for assessing these errors based on some occurrences (Atkinson, 2004).

A major advantage of this approach is to rely on already available inputs and outcomes. On the contrary, the main disadvantage is to be limited on historical observations.

Indeed, while aiming to test for uncertainty beyond the conditions where a model was developed a crucial issue is to go beyond such a constrain.

How can we tackle such issue? We would need a method for consistently simulating both inputs as well as outputs. A few alternatives are available in statistical literature. One may rely on machine learning or artificial intelligence techniques (James, 2013).

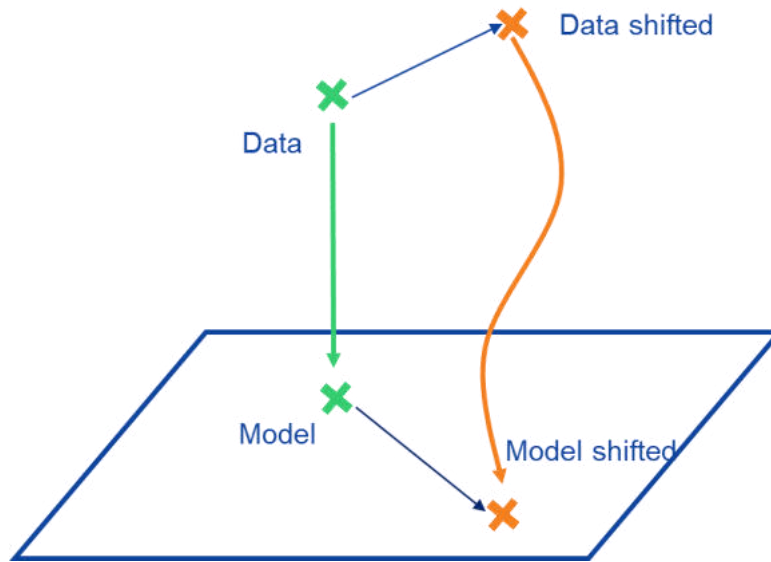


Figure 5: Idea underlying sensitivity analysis

Based on the Machine Learning generating scheme we can derive error distribution. As a consequence, we can identify extreme events causing the breaking of model risk tolerance (in case they are predefined). This procedure allows us to conduct what-if analyses. We pre-define a scenario we would like to test.

5. Complex Modelling

The wide use of models in banking implies an additional task compared to what discussed in the previous sections. How do we estimate model uncertainty when various models are involved?

Two main schemes are considered. On the one hand, we focus on nested models. We explore the case of credit Risk Weighted Asset (RWA). On the other hand, we pose our attention on fully integrated models.

5.1 Nested Models

Let us consider the following credit Advanced Internal Rating Based (AIRB) as an illustrative example for nested modelling. The formula is as follows (BIS, 2006).

$$K = LGD \cdot \left[N \left(\sqrt{\frac{1}{1-R}} \cdot G(PD) + \sqrt{\frac{R}{1-R}} \cdot G(0.999) \right) - PD \right] \cdot \frac{1+(M-2.5)b}{1-1.5b} \quad (3)$$

$$RWA = K \cdot 12.5 \cdot EAD \quad (4)$$

Where LGD is the Loss Given Default, N stands for standard normal distribution, R is a correlation parameter, G is the inverse standard normal, M is the maturity of the financial instrument.

As we notice from 6, the internally estimated risk parameters PD, LGD and EAD are involved. How can we apply model uncertainty estimated on a silos perspective and bring them together?

- In line with Section 3, one may move from silos credit risk parameter (i.e., PD, LGD, EAD) uncertainty estimates (please refer to uncertainty distributions as shown in Figure 3 and simulate them by feeding equation (4) in order to drive its distribution (Bellotti, 2009). Computations can be performed by assuming independence among risk parameters or by including correlation (e.g., historical, experience-based) (Lessmann S. a., 2015). Figure 6 highlights RWA distribution for a stylized (Small and Medium Enterprise) Bank portfolio. One may focus on the distribution quantiles (e.g., 95%) based on all credit risk parameters or investigate the contribution of each of them. As an illustrative example, Figure points out PD uncertainty as well as LGD uncertainty.
- Following the approach described in Section 4, one may perform the analysis based on a plurality of models. The key issue is related to their number and complexity. Indeed, fitting and simulating complex joint probability distribution may be a challenge.

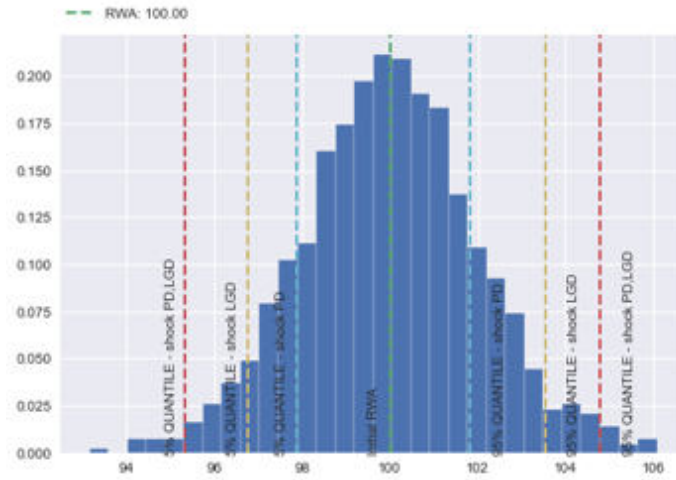


Figure 6: RWA distribution from PD and LGD silos model uncertainty

5.2 Fully Integrated Models

Interaction among different models is one of the major challenges a commercial Bank faces in terms of uncertainty impacts. A plethora of processes involve model interactions. On these, fully integrated balance sheet projection plays a key role. Figure 7 summarizes the key elements of the analysis. One needs to define a macroeconomic scenario on which projections of assets, liabilities, profit and loss, capital, RWA and liquidity are performed (Bellini, 2017). Such a process relies on a plurality of complex dependencies. Therefore, each model's uncertainty may have a significant impact on the final outcomes.

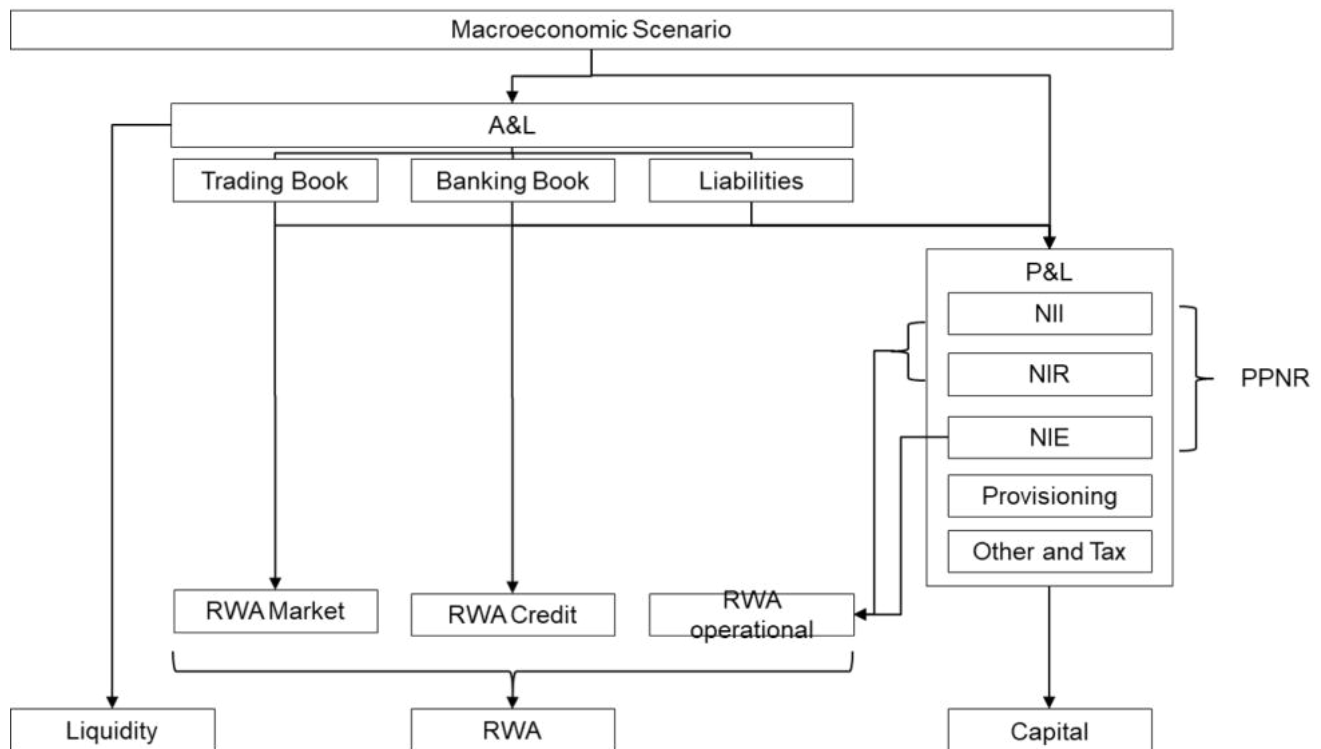


Figure 7: Fully integrated balance sheet projection

A simulation mechanism can be activated. Figure summarizes CET1 ratio for a stylized Bank defined as follows:

$$[h]CET1_{ratio} = \frac{CET1}{RWA_{total}} \quad (5)$$

where the numerator $CET1$ represents the core regulatory capital component, while RWA_{total} is the sum of Pillar 1 RWAs (i.e., credit, market, operational risks). Model uncertainty is simulated on credit risk PD and LGD models across three major business lines (i.e., retail, corporate, and global markets). A conditional forecast scheme is implemented in order to perform consistent time-series projections (Tsay, 1986). The analysis is performed based on a static balance sheet assumption for avoiding issues related to balance sheet re-composition. Figure 9 highlights two alternative working hypotheses. On the one hand (left panel) zero correlation among models' uncertainty is adopted. On the right panel, 0.5 correlation is assumed in order to highlight potential impacts on CET1

ratio uncertainty. In both cases, at inception (i.e., at the beginning of the projection exercise), we indexed the CET1 ratio to 100 in order to facilitate comparison against alternative working hypotheses.

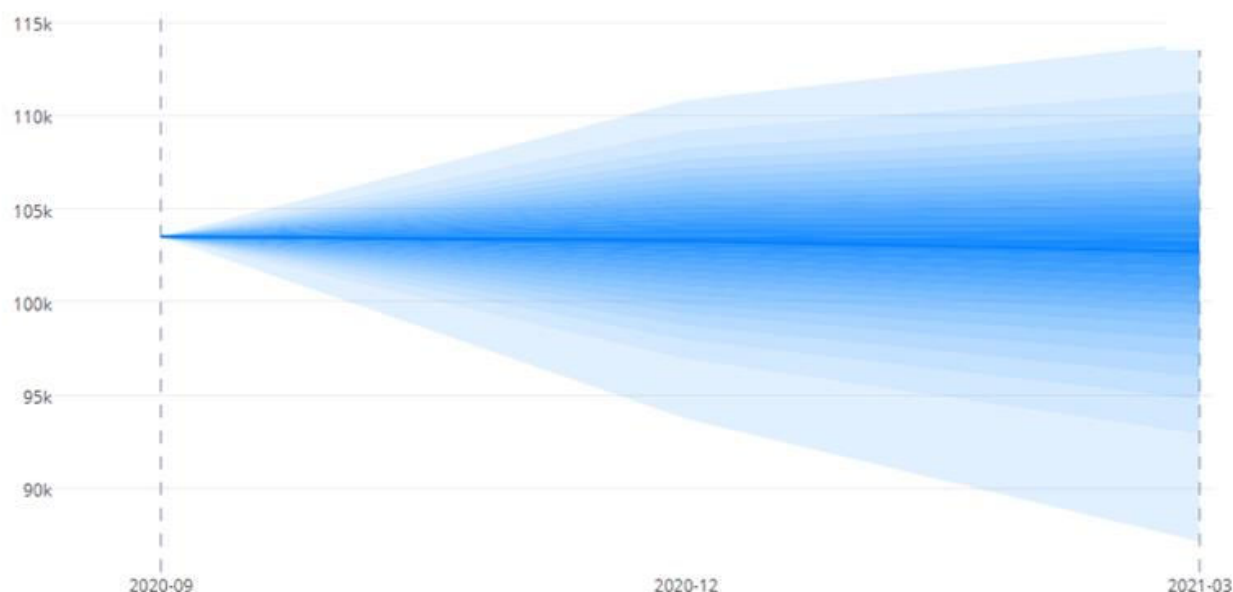


Figure 8: CET1 ratio fanchart

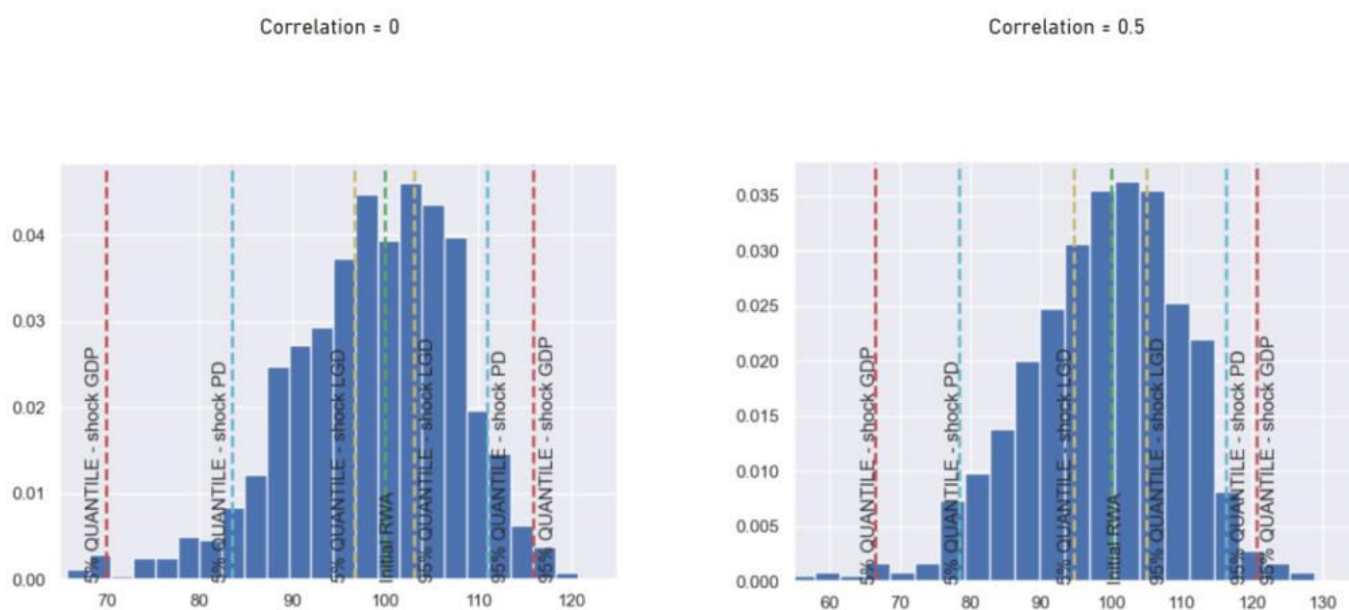


Figure 9: CET1 ratio model risk contribution

6. Concluding Remarks

A flexible framework for model risk quantification was presented by aiming to represent complex interactions characterizing commercial banking processes. Model uncertainty was represented by means of a confidence intervals on both individual (silo) models and (complex) model networks. We described how to perform effective what-if analyses for checking model's robustness against various (endogenous and exogenous) conditions. Monte Carlo simulations were used for deriving the distribution of nested models and holistic frameworks like full balance sheet projection. This pioneering research paves the way to further analyses for providing more insights on risk contributions (e.g., incremental risk), multi-model joint probability distributions, and the role of human assessment across various expert driven models.

References

- Atkinson A. C. and Riani, M. and Cerioli, A. Exploring Multivariate Data with the Forward Search [Book]. - New York : Springer - Verlag, 2004.
- Bellini T. IFRS 9 and CECL Credit Risk Modelling and Validation: A Practical Guide with Examples Worked in R and SAS [Book]. - San Diego : Academic Press, 2019.

- Bellini T. Stress Testing and Risk Integration in Banks, A Statistical Framework and Practical Software Guide in Matlab and R [Book]. - San Diego : Academic Press, 2017.
- Bellotti T. and Crook, J. Support Vector Machines For Credit Scoring And Discovery [Journal] // Expert Systems with Applications, vol 36. - 2009. - pp. 3302-3308.
- BIS Basel II International Convergence of Capital Measurement and Capital Standards: A Revised Framework, BIS, Basel [Report]. - 2006.
- James G. and Witten, D. and Hastie, T. and Tibshirani, R. An Introduction to Statistical Learning with Applications in R [Book]. - New York : Springer, 2013.
- Lessmann S. and Baesens, B. and Seow, H. V. and Thomas, L. C. Benchmarking state-of-the-art classification algorithms for credit scoring: An Update of Research [Journal] // European Journal of Operational Research, vol 247. - 2015. - pp. 124-136.
- Tsay R. S. Time series model specification in the presence of outliers [Journal] // Journal of the American Statistical Association, vol 81. - 1986. - pp. 132-141.

AML Risk Adjusted Performance Indicators: Assumptions & Methodology

di Ivano Traina, Andrea Vivoli ⁽¹⁾

Abstract

In this paper, starting from the "holistic" approach of the European Banking Authority (EBA) which reinforces the relevance of anti-money laundering in the prudential assessment of banks, a conceptual scheme is proposed for the calculation of the Economic Value Added of banking products showing how, in the face of various activities required for AML purposes (from onboarding to alert management to constant monitoring), the economic convenience of a relationship can be determined *ex ante*, at least for each product.

The results confirm that for the same creditworthiness and cost of capital, the AML variable strongly affects the economic convenience of the individual products. Considering the partially inelastic nature of AML costs, the size of the operation is equally fundamental in determining whether to initiate relationships with certain types of customers.

Nel presente approfondimento, muovendo dall'approccio "olistico" della European Banking Authority (EBA) che rafforza la rilevanza dei profili antiriciclaggio ai fini della valutazione prudenziale delle banche, è proposto uno schema concettuale per il calcolo dell'*Economic Value Added* dei prodotti bancari mostrando come, a fronte delle diverse attività richieste ai fini AML (dall'*onboarding* alla gestione degli *alert* al controllo costante), si possa determinare *ex ante* la convenienza economica di una relazione, quantomeno per singolo prodotto.

Le risultanze confermano come, a parità di merito creditizio e costo del capitale, la variabile AML incide fortemente sulla convenienza economica dei singoli prodotti. Considerata la natura parzialmente anelastica dei costi AML, la *size* dell'operazione risulta altrettanto fondamentale per stabilire se avviare o meno relazioni con determinate tipologie di cliente.

Keywords: Risk Adjusted Performance Measures, Anti-Money Laundering, Activity Based Costing, Economic Value Added, Pricing

1. ML/FT: caratteristiche e differenze rispetto ai rischi finanziari

Il rischio di riciclaggio costituisce una fattispecie del tutto peculiare dei rischi operativi che una banca si trova a fronteggiare, non tanto nell'ottica della consapevole assunzione e gestione (come nel caso di rischi finanziari e creditizi), quanto piuttosto nell'ottica della minimizzazione, con l'obiettivo a tendere di azzerare la possibilità per l'intermediario di essere coinvolto in operazioni illecite, rilevanti sotto i profili penale, patrimoniale e reputazionale.

Nel corso del tempo, l'inquadramento prudenziale del rischio di riciclaggio è stato affinato fino a trovare la sua collocazione definitiva (tuttora valida) nell'Allegato 9 dell'Accordo sul capitale di Basilea del giugno 2006 (versione consolidata del *framework* Basilea II) nell'ambito degli eventi di perdita operativa afferenti a "**Clientela, prodotti e prassi di business**" (**evento di livello I**) e, **più in dettaglio** tra le "**Prassi di business o di mercato improprie**" (**livello II**).

La manifestazione dell'evento di perdita, porta pertanto a qualificare l'evento come un rischio puro tipicamente tradotto in perdite monetarie per l'intermediario in relazione a:

- ☐ sanzioni per violazioni normative, indipendentemente dal coinvolgimento o meno in movimentazioni finanziarie illecite (profilo di compliance);
- ☐ multe per responsabilità della persona giuridica in caso di condanne penali in presenza di responsabilità dell'intermediario nelle operazioni di riciclaggio (profilo penale).

Le perdite monetarie immediate catturano peraltro parte degli effetti economici e patrimoniali, tenuto conto che i danni reputazionali possono comportare oneri aggiuntivi connessi a:

- ☐ flessione dei fondi intermediati, con effetti diretti a conto economico;
- ☐ riduzione dei corsi azionari (in caso di quotazione) con possibile incremento del costo del capitale;
- ☐ costi di marketing per favorire una "riabilitazione" dell'immagine della banca anche mediante attività di *sponsorship* di eventi a impatto sociale positivo;
- ☐ interventi di riorganizzazione aziendale per evitare il ripetersi dell'evento mediante il rafforzamento dell'organico preposto ai controlli AML/CFT e degli investimenti in strumenti avanzati di individuazione dei *pattern* sospetti anche mediante il ricorso alle potenzialità dell'Intelligenza Artificiale.

In altri termini, analogamente alle altre tipologie di rischi operativi, parliamo di un "rischio puro" che determina due stati del mondo nei quali la banca o perde o non ci guadagna tenuto conto della asimmetria negativa dei risultati economici attesi, diversamente da quanto accade con i cc.dd. rischi speculativi. Tale aspetto, che ne segna la distanza rispetto alle altre tipologie di rischio bancario, viene amplificato dal fatto che il rischio di riciclaggio è di tipo "additivo". Ogni soggetto obbligato si trova infatti a gestire un portafoglio clienti acquisito, ognuno dei quali presenta un profilo di rischio ML specifico, dal quale è possibile inferire l'esposizione

¹ **Disclaimer:** the views expressed here are those of the authors and do not represent the opinions of other entities.

complessiva della banca nel contesto del processo di autovalutazione. Diversamente dal comparto finanziario, tuttavia, la diversificazione della clientela non riduce l'esposizione al rischio: ogni nuovo cliente determina infatti un incremento «marginale» dell'esposizione al rischio.

2. Rilevanza del rischio di riciclaggio nella valutazione prudenziale delle banche

Il framework normativo e istituzionale a livello UE in tema di contrasto al riciclaggio di denaro e al finanziamento del terrorismo è oggetto di profonda revisione. Sul piano normativo, le modifiche alle Direttive AML e CRD hanno introdotto obblighi di cooperazione e di scambio di informazioni sia tra le autorità antiriciclaggio nazionali sia tra queste e le autorità prudenziali.

A dicembre 2018 il Consiglio dell'Unione europea ha adottato un Piano d'azione antiriciclaggio che ha fissato una serie di obiettivi, con risultati attesi e scadenze, per migliorare l'efficacia dell'azione di controllo dei rischi di riciclaggio e finanziamento del terrorismo.

In conformità delle modifiche alla CRD IV, l'EBA ha pubblicato il **24 luglio 2019** una Opinion diretta alle Autorità di vigilanza prudenziale che – in linea con il Piano di azione UE e delle modifiche alla CRD IV – rimarcava l'importanza dei rischi ML/TF per la vigilanza prudenziale **in tutto il mercato unico**, nei seguenti ambiti:

1. **autorizzazione di nuovi soggetti**, nella misura in cui il modello di business, i sistemi di controllo e gestione del rischio, il profilo reputazionale degli azionisti, degli amministratori, dei quadri dirigenti e dei titolari di funzioni chiave **diano luogo a rischi ML/TF**;
2. **vigilanza *ongoing***, nella valutazione delle istanze di acquisizione di partecipazioni qualificate e nella verifica del *fit & proper* dell'organo di gestione;
3. **SREP**, come parte del processo di revisione dei rischi, dei modelli di business, delle operazioni di credito, della governance e della gestione interna del rischio;
4. adozione di **provvedimenti di rigore, imposizione di sanzioni o revoca dell'autorizzazione**, garantendo in tal modo che nell'applicazione delle misure prudenziali e nell'esercizio dei poteri di vigilanza prudenziale si tenga conto delle debolezze connesse all'AML/CFT.

In linea con il piano di azione UE, aggiornato dalla Commissione Europea a maggio 2020, l'EBA ha pubblicato il 6 maggio e il 27 maggio 2021 due documenti in consultazione concernenti, rispettivamente:

1. l'istituzione di un **database centrale delle infrazioni AML**, contenente anche le misure intraprese per rimuovere le criticità da parte delle Autorità.;
2. le **procedure per lo scambio di informazioni tra Autorità prudenziali e antiriciclaggio** in conformità a quanto previsto dalla direttiva 2013/36/UE, come modificata dalla direttiva (UE) 2019/878, rimuovendo gli ostacoli a un efficace scambio di informazioni tra quelle autorità che erano legati a regole di riservatezza.

Successivamente, nel luglio 2021 la Commissione Europea ha pubblicato un pacchetto contenente quattro proposte legislative per rafforzare il *framework* normativo volto a creare un quadro molto più coerente per agevolare la conformità degli operatori soggetti alle norme AML/CFT, in particolare quelli che operano a livello transfrontaliero.

In tale contesto, sono stati presentati:

- ☐ un regolamento che istituisce la nuova autorità dell'UE in materia di AML/CFT, operativa dal 2024;
- ☐ un regolamento contenente norme direttamente applicabili, anche in relazione all'adeguata verifica della clientela e alla titolarità effettiva;
- ☐ una sesta direttiva in materia di AML/CFT (AMLD6), che sostituisce l'attuale direttiva (UE) 2015/849 (quarta direttiva antiriciclaggio, a sua volta modificata dalla quinta), contenente disposizioni da recepire nel diritto nazionale, come le norme sugli organismi di vigilanza nazionali e le Unità di informazione finanziaria negli Stati membri;
- ☐ una revisione del regolamento del 2015 sui trasferimenti di fondi ai fini del tracciamento dei trasferimenti di cripto-attività (regolamento (UE) 2015/847).

Per una sintesi delle innovazioni previste, si veda anche la newsletter dell'UIF n. 5 del dicembre 2021.

Più di recente, la Banca d'Italia con la Comunicazione n. 15 del 4 ottobre nell'ottobre 2021, ha formalmente recepito i più recenti orientamenti EBA in materia AML/CFT (EBA/GL/2021/02) in materia di adeguata verifica integrando – a decorrere dal 26 ottobre 2021 – le disposizioni contenute nel Provvedimento del 30 luglio 2019 (che recepisce i precedenti orientamenti EBA del 2017).

Il *framework* che si sta delineando porterà le banche a essere sempre più scrutinate sulla base delle modalità di gestione del rischio ML/TF, richiedendo piena consapevolezza dei profili AML/CFT in termini di incidenza sulla pianificazione strategica (*customer acceptance policy* e integrazione nel RAF), sugli assetti organizzativi, sulla redditività prospettica (cfr. *infra*) e sugli assorbimenti patrimoniali (anche a fronte di *add on* patrimoniali di secondo pilastro).

Violazioni normative, piuttosto che assetti organizzativi inefficienti aumentano il rischio di incorrere in contestazioni da parte delle Autorità di controllo, con ricadute sanzionatorie significative sotto il profilo economico e reputazionale. Sotto questo profilo, si osserva come le sanzioni AML a livello globale stiano aumentando, attestandosi a circa 10,6 miliardi di dollari nel 2020 ⁽²⁾, senza includere i potenziali effetti negativi sul piano dell'immagine e delle quotazioni di borsa per i maggiori istituti coinvolti.

² <https://www.fenergo.com/press-releases/global-financial-institution-fines-for-aml-data-privacy-and-mifid-rise-26-in-2020/>.

3. Rischiatura AML della clientela: metodologie e strumenti

A partire dal recepimento della IV Direttiva UE in materia AML (Direttiva 849/2015), le istituzioni finanziarie sono state fortemente impegnate nel rafforzamento dei presidi antiriciclaggio in ottica di prevenzione dal possibile coinvolgimento in operazioni di riciclaggio a livello nazionale e internazionale. L'approccio basato sul rischio è divenuto l'architrave del sistema dei controlli preposti all'adeguata verifica del cliente e al monitoraggio della sua operativa nel continuo.

Il quadro regolamentare europeo è stato poi integrato nel corso del 2018 con l'emanazione della V Direttiva AML (n. 843/2018) e della Direttiva n. 1678/2018 (riguardante la lotta al riciclaggio mediante il diritto penale) con le quali sono stati, tra l'altro, estesi gli obblighi antiriciclaggio a nuove figure di operatori in valute virtuali, accresciuti gli obblighi di trasparenza sugli assetti proprietari delle imprese, introdotte sanzioni penali severe nei confronti degli intermediari coinvolti in operazioni di riciclaggio, unitamente a meccanismi per rendere più coordinata l'azione di contrasto delle autorità di controllo a livello *cross-border*.

In materia, il Provvedimento della Banca d'Italia del 30 luglio 2019 declina le modalità di adempimento degli obblighi di adeguata verifica da parte delle banche, richiamando le fasi essenziali del processo. In tale contesto, la profilatura del rischio di ogni cliente costituisce un presupposto fondamentale per graduare gli adempimenti AML soppesando i diversi fattori di rischio in ragione della loro importanza relativa, con assegnazione a una delle classi di rischio predefinite dai destinatari.

La complessità e la variabilità della disciplina AML/CFT nonché l'emergere di nuovi rischi impone alle banche una revisione del paradigma classico dei controlli di compliance, evolvendo piuttosto verso modelli di tipo olistico in grado di considerare la relazione con il cliente sotto diversi punti di vista in cui i costi di organizzativi e di compliance siano corretti per i rischi associati all'operatività in concreto realizzata. Prima di illustrare la metodologia proposta per calcolare l'EVA corretto per il rischio ML del cliente, si richiamano preliminarmente i fattori rilevanti utilizzati per la profilatura della clientela in funzione dei parametri di rischio che la normativa in materia indica quali fattori rilevanti, in modo da addivenire alla classica ripartizione su quattro livelli del rischio: basso, medio-basso, medio-alto, alto.

A tale scopo, si considerino i seguenti tredici fattori di rischio che possono incidere sulla determinazione del livello di rischio:



Fonte: Private Magazine, Dicembre 2018

Il profilo di rischio complessivo del cliente è la risultante di una serie di valutazioni specifiche che dovranno tenere conto di tutte le informazioni disponibili.

L'ampiezza e la profondità delle analisi da condurre (e conseguentemente della documentazione da acquisire) dipenderà a sua volta dal livello di rischio provvisorio che verrà determinato in funzione degli elementi soggettivi (struttura del cliente, reputazione, comportamento), oggettivi (attività svolta, paese di residenza) e operativi (connessi alle transazioni che intende effettuare). Tale approccio è stato definito come iterativo a due stadi, sintetizzato come a fianco (cfr. A. Vivoli, 2018).

Nella determinazione dei livelli di rischio, ipotizziamo che i punteggi assegnati ai 13 fattori di rischio varino da 1 (rischio non significativo) a 9 (rischio elevato), tali per cui il rating AML complessivo (dato dalla sommatoria dei singoli valori) possa variare da un minimo di 13 ad un massimo 117. Ad esempio, si consideri la seguente graduazione:



La costruzione del modello riveste una estrema importanza per la valutazione dell'esposizione al rischio, favorendo la puntuale individuazione dei fattori di rischio ritenuti specifici per il singolo intermediario.

Ciò consente la quantificazione del rischio inerente e la conseguente focalizzazione sulle aree da considerare, prioritariamente sotto il profilo delle vulnerabilità e degli interventi di rafforzamento da adottare.

Sul piano metodologico, ogni volta che abbiamo un *range* di valori occorre che vengano individuati dei criteri, quanto più possibili robusti e replicabili, per l'assegnazione dello specifico punteggio in modo da giustificare *ex post* lo specifico livello di rischio.

Vediamo di seguito come si possa procedere alla costruzione delle misure di rendimento corrette per il rischio, integrando il modello classico per l'analisi dell'*Economic Value Added*, avendo presente il *breakdown* delle attività richieste per l'adeguata verifica del cliente e il suo successivo monitoraggio.

4. Costruzione di misure *risk adjusted* corrette per il rischio ML - Metriche di valutazione e simulazione risultati

La gestione del rischio all'interno della Banca avviene tipicamente in due modalità, ovvero attraverso:

- accantonamenti a conto economico di apposite somme da destinare ai cosiddetti rischi attesi (tipicamente, i rischi di credito e i rischi legali);
- il patrimonio della banca per la componente di rischio inatteso.

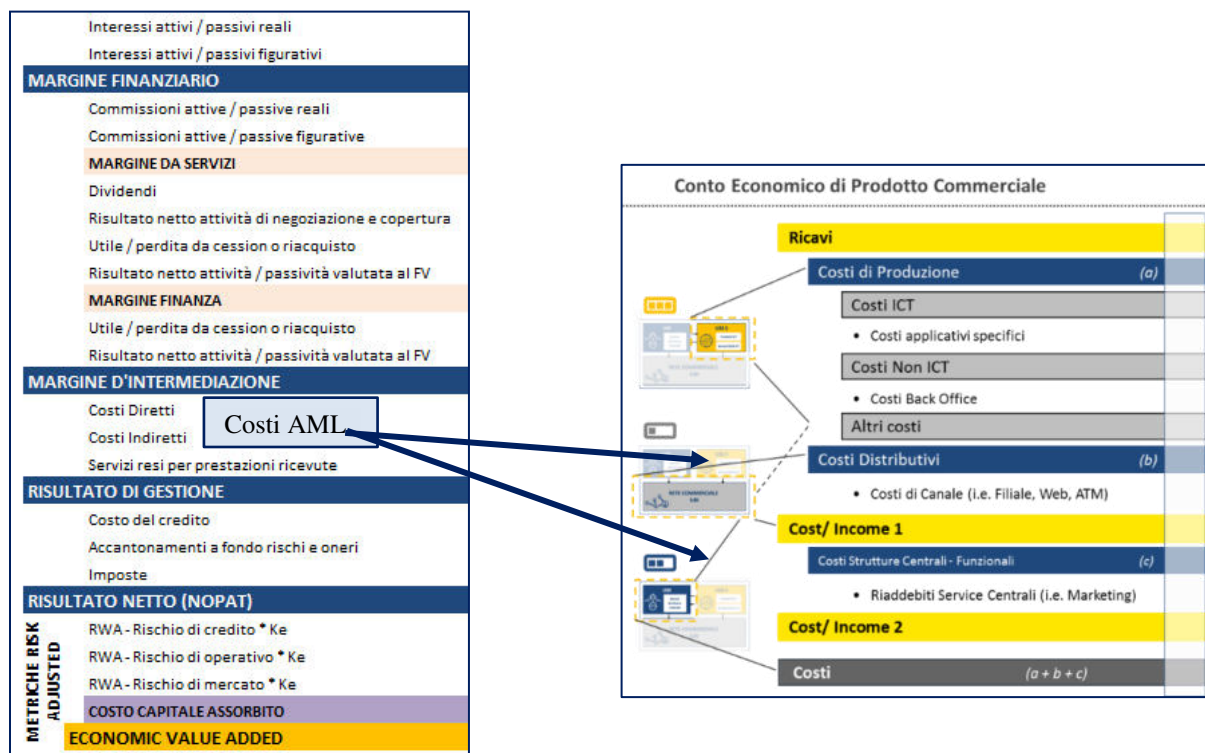
L'*Economic Value Added* (EVA), ovvero la differenza tra il *Net Operating Profit After Taxes* (NOPAT) e il costo del capitale (Ke) assorbito, è dunque impattato da entrambi i fattori sub a) e b) sopra richiamati, rispettivamente, nell'ambito del NOPAT e del Ke.

L'integrazione del rischio di riciclaggio (ML) nel calcolo implica pertanto che vengano rilevati i costi necessari alla sua gestione che attiene due ambiti: l'attività richiesta al gestore della relazione (tipicamente presso la filiale), i presidi attivati presso la struttura centrale quali la funzione Antiriciclaggio e il sistema informativo, deputato all'acquisizione dei dati necessari ai fini dell'adeguata verifica, alla connessa valutazione del profilo di rischio, al monitoraggio delle transazioni, alla conservazione della documentazione rilevante e alle segnalazioni AML.

Considerando i profili contabili ed extra-contabili connessi alla rilevazione dell'*Economic Value Added* (diversamente valorizzati a seconda del centro di profitto che si sta analizzando), potremo avere la seguente rappresentazione, che pone in relazione l'EVA (a livello di centro di profitto) con il margine netto relativo al singolo prodotto bancario.

In tale contesto, nella figura di destra abbiamo due livelli di Cost/Income in modo da calcolare indicatori di redditività ed efficienza differenziati in funzione delle componenti di costo incluse.

Per quanto attiene agli oneri connessi alla gestione e al controllo dei rischi ML/FT, la loro allocazione avviene considerando due macro-voci: i **“Costi Distributivi”**, riconducibili alle attività svolte in materia dalla filiale, e i costi afferenti alle **“Strutture Centrali-Funzionali”**, per quanto riguarda tutto ciò che è riferito alla funzione Antiriciclaggio.



4.1. L'Activity Based Costing

Tradizionalmente, i modelli di pricing dispongono di dati molto precisi e rilevati a livello di rapporto, e quindi di prodotto, per quanto riguarda i ricavi. Grande precisione hanno ormai assunto i modelli dei Tassi Interni di Trasferimento che, attraverso il modello del *Building Block Approach*, gestiscono tutte le componenti dei rischi e del costo del *funding* che la banca sostiene nel caso di un prodotto di impiego, del ricavo da investimento nel caso di un prodotto di raccolta. Così pure la componente commissionale è rilevabile sulla singola transazione/rapporto/prodotto.

Nell'ambito dei prodotti di impiego la componente rischio di credito atteso è generalmente rilevata nei modelli di *pricing* con la logica da *risk management* (ovvero finanziaria), attribuendo la perdita attesa come quota mensile di costo a conto economico, a differenza di quanto avviene contabilmente che al momento dell'erogazione accantona l'intero importo annuale. Questo, di solito, differisce da quanto avviene nei sistemi gestionali di rilevazione dei consuntivi che, ancora oggi, tendono ad agganciarsi al modello contabile.

In merito alla perdita inattesa, coperta con il patrimonio, si quantifica il capitale a rischio con modelli ormai molto precisi. Lo stesso avviene per la componente di rischio operativo. Per quanto riguarda i costi si apre un ampio mondo di supposizioni e di elevata incertezza del risultato. Infatti, tipicamente si parte dei costi consuntivati dai sistemi di controllo di gestione per unità organizzativa attraverso modelli di *cost allocation*.

Tipicamente si parte dalle filiali e si prendono in considerazione i costi di primo livello (si veda schema precedente) in modo da ricomprendere il mondo dei "costi diretti" fatti di produzione, gestione e distribuzione. Tutto questo avviene lavorando sulla classificazione dei costi per natura, tipicamente contabile.

Attraverso il calcolo di medie si arriva a quantificare una percentuale di "costi diretti" che incidono sul prodotto che viene utilizzata nel modello di *pricing*. Sebbene molte banche si fermano ancora al livello dei costi diretti, modelli più completi considerano anche l'ambito dei "costi indiretti" ovvero quelli che contengono i ribaltamenti sui centri di profitto (ovvero le filiali) dei costi delle strutture centrali della banca. In tutto questo va aggiunto che tale classificazione si fonda sulle voci per natura dei costi utilizzati dalla contabilità (spese del personale e altre spese amministrative) più o meno dettagliate, nessuna traccia è presente relativamente ai costi per l'attività di gestione di particolari ambiti, AML, compreso.

L'integrazione del modello di *pricing* per prodotto e/o servizio, richiede necessariamente una logica di costo per fase e processo, ovvero un modello basato su concetti di **Activity Based Costing**. Tale modalità, risalente ai primi anni '70, muovendo dalla necessità di elaborare informazioni utili ai fini decisionali, ha posto le basi per i concetti di *activity accounting* e *activity costing*. Il concetto di *costing* è un processo di determinazione del costo di una attività, ponendo in evidenza la classificazione dei costi in funzione del "dove", "cosa" e "perché". Il "dove" è riferibile all'elemento organizzativo dal quale scaturisce il costo, il "cosa" identifica l'oggetto del costo, il "perché" si lega alle attività che consumano risorse. Con tale logica è possibile realizzare un vero e proprio *cost management* rilevando le sacche di inefficienza e intervenire di conseguenza. Seguendo tale logica, attribuendola alla gestione del rischio di ML, si otterrebbe dunque:

DOVE= la struttura di Antiriciclaggio per le attività di sua competenza, il Gestore di Filiale per i compiti ad esso riferibili;

COSA= il prodotto/cliente associati a determinati livelli di rischio ML che comportano lo svolgimento di determinate attività (incrementali in funzione della rischiosità) che, altrimenti, non sarebbero state necessarie;

PERCHE'= la quantità di risorse di ogni tipo necessarie per svolgere le attività stesse.

Nella costruzione di una metodologia di *Activity Based Costing*, la centralità delle risorse comporta la necessità di connettere le strutture organizzative e contabili esistenti, generalmente fondate su centri di costo, con le attività come unità che coagulano risorse. Ciò riguarda in modo particolare le risorse umane che, anche se facenti riferimento da un punto di vista organizzativo e delle responsabilità ad un centro di costo, vedono le loro azioni come riconducibili a diverse attività e processi che devono essere rilevati.

L'impostazione di fondo, si traduce in quattro passaggi logici, a loro volta articolabili in *step*:

- I. individuazione dell'oggetto di costo;
- II. identificazione delle attività e dei loro costi;
- III. definizione di un parametro rappresentativo dell'intensità di utilizzo dell'attività da parte degli oggetti di costo (*resource driver*);
- IV. imputazione del costo delle attività ad oggetti di costo sulla base del fabbisogno (*cost driver*).

Vediamo come applicare al rischio di riciclaggio (ML) tale impostazione

4.2. Integrazione rischio ML nella metodologia Activity Based Costing

In conformità a quanto previsto dal Provvedimento di Banca d'Italia del 26.3.2019, le banche devono adottare presidi organizzativi antiriciclaggio minimi, dovendo:

- a) attribuire a una funzione di controllo aziendale la responsabilità di assicurare l'adeguatezza, la funzionalità e l'affidabilità dei presidi antiriciclaggio (**funzione antiriciclaggio**);
- b) formalizzare l'attribuzione della responsabilità per la segnalazione delle operazioni sospette (**responsabile della segnalazione delle operazioni sospette**);
- c) attribuire a una funzione di controllo aziendale il compito di verificare in modo continuativo il grado di adeguatezza dell'assetto organizzativo antiriciclaggio e la sua conformità rispetto alla disciplina (**funzione di revisione interna**).

La mappatura delle attività può avvenire a diversi livelli di dettaglio, al crescere dei quali migliora la qualità dell'informazione. Tuttavia, occorre prestare attenzione ad un fattore di rischio che può determinare il fallimento dell'intero progetto. Molto frequentemente vi è la tendenza a realizzare strumenti altamente sofisticati sul piano teorico e metodologico. Il rischio di questo approccio è che il costo per implementare e gestire le rilevazioni necessarie è talmente elevato da superare il beneficio. Occorre pertanto trovare pragmaticamente un equilibrio, soprattutto la prima volta che ci si approccia, tra macro aggregati di attività facilmente gestibili e il valore aggiunto della nuova informazione.

Se l'obiettivo è quello di determinare l'EVA del singolo cliente incorporando il diverso livello di rischio generato ai fini AML, occorre individuare il costo "base" delle attività che le strutture centrali dedicano all'analisi dei profili antiriciclaggio e a un livello di dettaglio maggiore, se tali attività "consumano" più tempo in funzione della tipologia di clientela.

Un primo approccio potrebbe essere quello di ribaltare sul costo della gestione per singolo cliente:

- ☐ l'intero costo del personale, dei locali, degli arredi e degli strumenti informatici adibiti alla funzione antiriciclaggio e alle segnalazioni di operazione sospette;
- ☐ la quota parte dei medesimi costi riferibili alla funzione di revisione interna stimando la quota parte dedicata ai controlli di terzo livello sui profili AML.

Sofisticando il ragionamento, si potrebbe distinguere nell'ambito delle attività delle prime due funzioni, quali sono di norma maggiormente riferibili ai clienti a rischio ML medio-alto o alto. Si pensi, a titolo esemplificativo, al coinvolgimento nelle **attività di rafforzata verifica della clientela** nei casi in cui - per circostanze oggettive, ambientali e/o soggettive - appaia particolarmente elevato il rischio di riciclaggio. Laddove tale compito venga attribuito alle strutture operative, il responsabile antiriciclaggio verifica l'adeguatezza del processo di rafforzata verifica condotto dalle strutture di linea, sottoponendo ad attento controllo tale processo e i relativi esiti.

Nei confronti del gestore di filiale, che tipicamente avvia e intrattiene la relazione con il cliente, risulta essenziale perimetrare le attività dedicate alle attività AML, in conformità a quanto disposto, tra l'altro, dal Provvedimento della Banca d'Italia del 30 luglio 2019 recante disposizioni sulle modalità di esecuzione degli obblighi di adeguata verifica.

Una volta mappate le attività che vanno considerate, e che vanno fatte rientrare in un apposito "dizionario attività" per ciascuna tipologia di unità organizzativa e per tipologia di servizio/prodotto venduto e/o tipologia di cliente, occorre determinarne il prezzo di riferimento unitario. La principale metodologia utilizzata è quella dell'utilizzo del concetto "**Full Time Equivalent Fully Loaded**"⁽³⁾.

Il concetto di *Fully Loaded* si riferisce al costo pieno. Ovvero, una volta determinato l'ammontare di risorse umane effettivo per le attività in carico all'unità organizzativa (nel nostro caso l'Antiriciclaggio e la Filiale), occorre quantificarne il costo unitario. Tale

³ Essa rappresenta il carico di lavoro di un dipendente a tempo pieno per unità organizzativa. Il calcolo avviene sommando tutte le ore lavorative in un certo periodo di riferimento (tipicamente il mese) erogate dal personale, sia part-time che a tempo pieno, diviso successivamente per il numero delle ore di lavoro contrattuali di un dipendente a tempo pieno. In questo modo si determina lo sforzo necessario per svolgere le attività in carico ad una unità organizzativa prescindendo dal numero reale dei dipendenti, dalle variazioni delle ore lavorative in un dato periodo e altri fattori. L'eventuale applicazione del vincolo di non negatività potrebbe, tuttavia, smorzare l'effetto descritto sulle fasce a medio termine riducendo, di fatto, l'esposizione al rischio a seguito dell'applicazione dello scenario in questione.

più semplice metodologia è quella di prendere non solo il costo del personale (facilmente recuperabile) ma anche la quota parte dei costi di struttura direttamente riferibili all'attività del dipendente (mobili, ICT, energia elettrica, riscaldamento, affitto, etc). A questo punto basta trasformare sia il numero dei dipendenti necessario che il costo in minuti lavorati per ridurre all'unità di misura necessaria. Si riporta un esempio scolastico di calcolo.

Costo medio del personale

Il valore è stato determinato utilizzando il valor medio del costo standard del lavoro (dato riferito a Gennaio 2016) dei ruoli che potenzialmente possono aprire un conto corrente in filiale per un cliente Retail

Valori espressi in € calcolati come valore medio della retribuzione relativa a ciascun ruolo

Ruolo \ Costo Standard	Costo Annuo	Costo Giornaliero	Costo Orario
REFERENTE CLIENTI	58.691	266,78	35,57
ADDETTO CLIENTI	59.400	270	36
ADD.AREA OPERATIVA	67.881	308,55	41,14
GESTORE AFFLUENT	68.129	309,68	41,29
RESP.SERVIZI OPERATIVI	79.910	363,23	48,43
DIRETTORE FILIALE	94.529	429,68	57,29
Costo medio del personale (€/hr))			43,29

Costo Annuo Standard = media del Valore fornito da HR a livello di Banca/ Ruolo

Costo Giornaliero Standard = Costo Annuo / 220 Gg

Costo Orario Standard = Costo Giornaliero / 7,5

Costo della postazione di lavoro

Il valore è stato determinato considerando i costi riferibili alla postazione di lavoro e altri servizi generali ed amministrativi necessari per lo svolgimento della attività lavorativa. Il totale dei costi è stato diviso per il numero medio di dipendenti risultante a fine 2014 e fine 2015.

Valori espressi in €/000 riferiti a Dicembre 2015

Tipologia di costo	€/anno	€/ Gg	€/hr	# Medio dipend.	(€/hr)/ # medio dipendenti
HR No Staff Costs	77.665	353	47	14.795	3,18
Affitti	52.495	239	32		2,15
GA Common Costs	27.566	125	17		1,13
IT Common Costs	17.375	79	11		0,71
Costo medio postazione di lavoro (€/hr)					7,17

HR No Staff Costs include rimborsi spese, fringe benefits, formazione e applicativi specifici di HR;

GA Common Costs include pulizie, gestione magazzino, Spese Condominiali, Materiale Economico e Vigilanza

IT Common Costs include i costi dei servizi resi UBIS.S relativi a Help Desk, Fonia, Desktop Management e Trouble Ticketing

L'esigenza di un approfondimento sui costi di compliance AML deriva dalla loro rilevanza in termini assoluti e relativi come emerge anche dal rapporto pubblicato nel marzo 2020 da LexisNexis ⁽⁴⁾.

Le crescenti complessità derivanti dal processo di *onboarding*, l'esigenza di procedere alla corretta individuazione del titolare effettivo, unitamente a operatività connesse a prodotti innovativi comporta maggiori richieste documentali, team AML maggiori e/o dotati di risorse maggiormente qualificate comportano un incremento generalizzato dell'assorbimento orario previsto in attività di **KYC Due Diligence, Transaction monitoring, Sanctions Screening e Watchlist Analysis**.

4.3. Un esempio applicativo

Per il calcolo dell'assorbimento orario richiesto per le diverse attività AML per una ipotetica banca, si è fatto riferimento alle evidenze riportate nel report Lexis Nexis "*The True Cost of AML Compliance*", pubblicato nel settembre 2017 ⁽⁵⁾.

La metodologia proposta è articolata in due stadi. Nel primo, l'obiettivo è determinare l'assorbimento FTE nelle diverse attività AML, diversificato in funzione della diversa incidenza dei 4 livelli di rischio ML/FT assegnati alla clientela. Nel secondo, si andrà a determinare l'esatto calcolo dell'EVA per cliente con riferimento a un prodotto bancario standard (mutuo chirografario), evidenziando se e in che misura il *pricing* ipotizzato inizialmente dalla banca (determinato in funzione del solo merito creditizio del cliente) sia in grado di assicurare una effettiva marginalità positiva, anche nel caso in cui includessimo il costo connesso alla gestione e al controllo del rischio ML.

4.3.1. Il costo AML per fascia di rischio

Nel calcolo dell'assorbimento orario e del relativo costo, occorre tenere conto del salario medio del soggetto coinvolto nell'attività AML. Si ipotizzi che la banca in esame abbia la seguente ripartizione per anzianità e costo azienda del personale di riferimento. Essendo le attività di ripartite tra soggetti appartenenti a strutture centrali e periferiche e avendo già come parametro il costo medio del personale di Filiale, si ipotizzi la seguente ripartizione del team AML (per costo e *seniority*) elaborata anche sulla base delle evidenze raccolte nel 2020 da LexisNexis:

cui corrisponde un costo medio FTE per risorsa pari a € 64.392 e un costo orario standard complessivo pari a € 39,03 (ipotizzando come sopra una giornata lavorativa di 7,5 ore e 220 giorni annui).

A questo dovremmo aggiungere il costo delle spese generali e arredi di € 7,17 (cfr. paragrafo precedente).

Seniority	Amount	%
1-3 y	31.696 €	15%
3-9 y	55.538 €	49%
9+ y	92.640 €	35%

Centro operativo	Attività	Costo Medio Orario
Filiale	KYC Due diligence	50,46 €
Filiale/Centrale	Sanction Alerts	48,33 €
Filiale/Centrale	Periodic Watchlist	48,33 €
Centrale	AML Transaction Monitoring	46,20 €

⁴ Lexis Nexis 2020 (<https://risk.lexisnexis.com/insights-resources/research/true-cost-of-financial-crime-compliance-study-global-report>).

⁵ LexisNexis, *The true cost of anti-money laundering compliance*, 2017.

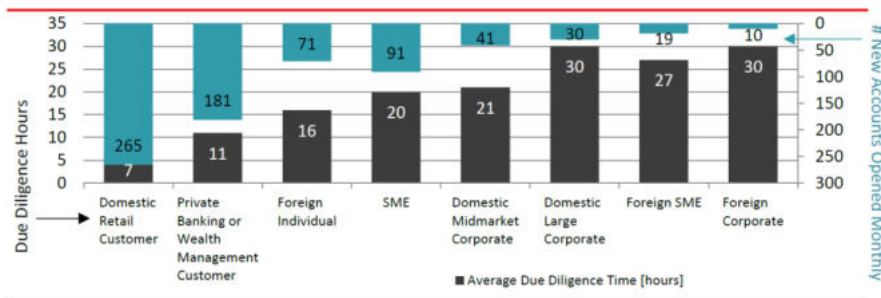
Considerando le 4 principali attività connesse alla gestione della clientela, sono determinati i costi medi orari inerenti ai diversi centri operativi coinvolti. Tali costi saranno applicati in funzione dell'assorbimento orario stimato.

Per determinare il costo orario medio connesso alla diversa rischiosità del cliente, si considerino tre principali attività di gestione del rapporto sotto il profilo AML/CFT:

- I. **Onboarding;**
- II. **Gestione alert;**
- III. **Controllo costante.**

FASE I – ONBOARDING

Con riferimento al primo aspetto (adeguata verifica iniziale), vale una regola generale ovvero che l'assorbimento orario richiesto per l'espletamento di tutti gli adempimenti AML varia in funzione della tipologia di cliente. Al riguardo, le evidenze emerse nella citata *survey* (LexisNexis, 2017) mostrano la seguente articolazione dei tempi.



Dalle citate evidenze, emerge un incremento delle attività di analisi e approfondimento documentale in ragione della complessità della struttura del cliente, della sua attività prevalente e dell'area geografica di riferimento variando dalle 7 ore in media per completare l'*onboarding* per un cliente *retail* alle 30 ore richieste per un *corporate* estero.

In relazione alle risultanze delle analisi, il tempo orario può essere suddiviso in 4 fasce di assorbimento medio in funzione del livello di rischio come indicato nella seguente tabella:

Ore assorbite per attività di onboarding		Costo annuo
Profilo di rischio basso	7	353,22 €
Profilo di rischio medio-basso	14	706,44 €
Profilo di rischio medio-alto	21	1.059,66 €
Profilo di rischio alto	28	1.412,88 €

Ne consegue che il passaggio di livello di rischio comporta un incremento del tempo medio per completare l'attività di *onboarding* di circa 7 ore, cui è commisurato un corrispondente incremento del costo complessivo.

Applicando il costo medio orario calcolato come sopra, pari a € 50,46, avremo un costo orario minimo di € 353,22 e un massimo di €

1.412,88 per singolo cliente in fase di adeguata verifica iniziale. Integrando nel sistema di controllo di gestione, a livello di cliente, l'attributo anagrafico del profilo di rischio (la tipologia di cliente è, tipicamente, già presente), è pertanto possibile in fase di apertura del rapporto stimare il costo dell'attività KYC iniziale ad essa abbinata.

FASE II – GESTIONE ALERT

Al di là delle attività di *onboarding*, la gestione del cliente comporta anche un notevole dispendio di tempo nella gestione degli *alert* generati dall'operatività sui conti, tenuto anche conto dell'elevato numero di falsi positivi potenzialmente generati dagli applicativi tradizionalmente in uso (ad esempio, GIANOS). A livello di singolo intermediario o di gruppo, sarebbe particolarmente utile, verificare con riferimento all'ultimo quinquennio:

- ☐ il **numero medio annuo di alert generati** per fascia di rischiosità della clientela;
- ☐ il **numero medio di clienti** per ogni fascia di rischiosità.

In questo modo sarebbe possibile affinare l'analisi sull'assorbimento di risorse del team AML in attività di *clearance* dei singoli *alert*.

In prima approssimazione, qualora il dato non sia immediatamente disponibile, si potrà fare riferimento alla media italiana rilevata nella richiamata *survey*, pari a 14 ore di gestione per singolo *alert*, senza distinzione per categoria in modo da definire un assorbimento medio annuo per cliente. A titolo esemplificativo, ipotizziamo di avere una banca con 1 milione di clienti, il 3% dei quali genera annualmente almeno un *alert*. Avremo pertanto 30.000 *alert* x 14 ore = 420.000 ore di gestione annua degli *alert* con un valore per cliente pari a 0,42 ore per cliente, con un assorbimento monetario di **20,30 euro per cliente**.

Ciò se facciamo ricadere sull'intera popolazione di clientela il costo. Se invece affiniamo l'analisi, potremo verificare che le operazioni di verifica e accertamento degli *alert* riguardano le operazioni più complesse da parte di clienti a maggior rischio.

Riprendiamo l'esempio precedente e supponiamo che la ripartizione della cliente per fascia di rischio sia la seguente.

					Tasso alert	3%
					Ore per alert	14
	N. clienti	1.000.000	Ore annue gestione alert		420.000	
ESEMPIO	Incidenza su base clientela	Numero clienti per fascia	Incidenza alert per fascia clientela	Ore lavorate	Costo lavorazione alert	Costo annuo per cliente
Profilo di rischio basso	65%	650.000	15%	63.000	3.044.790 €	4,68 €
Profilo di rischio medio-basso	15%	150.000	27%	113.400	5.480.622 €	36,54 €
Profilo di rischio medio-alto	12%	120.000	38%	159.600	7.713.468 €	64,28 €
Profilo di rischio alto	8%	80.000	20%	84.000	4.059.720 €	50,75 €

Ne consegue che, per ogni fascia di clientela devo tenere conto di questo ulteriore elemento di costo, associato al pertinente livello di rischio ML. Nell'ambito del controllo di gestione, la rilevazione per tipologia di *alert* consente pertanto di integrare anche tale componente di costo a livello di rapporto/cliente, variabile in funzione della specifica realtà aziendale e dell'effettiva esperienza maturata, potendo imputare il costo "atteso" di gestione *alert* nell'algoritmo di calcolo della marginalità attesa per cliente.

FASE III – CONTROLLO COSTANTE

Al di là dell'attività di adeguata verifica iniziale, dei singoli *alert* da verificare in corso d'anno, dobbiamo anche considerare l'aggiornamento del profilo di rischio che potrei avere in base alla seguente scansione temporale, rinnovando le attività svolte in sede di *onboarding*. In coerenza con il livello di rischio assegnato al cliente, la periodicità dei controlli può essere infatti graduata nel tempo come segue:

- ❖ 36 mesi per i clienti a basso rischio;
- ❖ 24 mesi per clienti a medio-basso rischio;
- ❖ 12 mesi per clienti a rischio medio-alto;
- ❖ 6 mesi per i clienti ad alto rischio.

Assumendo una durata media attesa della relazione con i clienti pari ad almeno **tre anni**, avremo che saranno più volte replicati (da 1 a 6 volte) i costi stimati per il KYC iniziale e, in particolare:

- ☐ 1 volta per i clienti a basso rischio
- ☐ 2 volte per i clienti a medio-basso rischio
- ☐ 3 volte per i clienti a medio-alto rischio
- ☐ 6 volte per quelli a rischio alto.

Stimando che la maggiore conoscenza del cliente e l'analisi della sua operatività nel corso del rapporto abbatta significativamente l'asimmetria informativa iniziale e i connessi rischi di sottovalutazione dei rischi di riciclaggio connessi alle movimentazioni effettuate: si può stimare una riduzione dell'impegno orario nel corso del triennio, assumendo che non sia possibile comunque comprimere il costo al di sotto del 30%:

TIPOLOGIA ATTIVITA'	ASSORBIMENTO ORARIO				
	INCIDENZA	Profilo rischio basso	Profilo rischio medio-basso	Profilo rischio medio-alto	Profilo rischio alto
KYC iniziale	100%	7	14	21	28
Aggiornamento 6 mesi	60%				16,8
Aggiornamento 12 mesi	50%			10,5	14
Aggiornamento 18 mesi	40%				11,2
Aggiornamento 24 mesi	30%		4,2	6,3	8,4
Aggiornamento 30 mesi	30%				8,4
Aggiornamento 36 mesi	30%	2,1		6,3	8,4

Applicando ai diversi profili il costo orario relativo alla Filiale (in quanto struttura preposta alla gestione della relazione e all'acquisizione e verifica della documentazione acquisita in sede di aggiornamento KYC), viene determinato un costo medio annuo per profilo di rischio. A conclusione delle analisi sopra condotte nell'ambito delle tre fasi di attività avremo, nell'esemplificazione fornita, la seguente struttura di costo medio annuo per singolo cliente, dovendo distinguere il caso del nuovo cliente da quello del cliente già acquisito.

Infatti, nel primo caso avrò l'imputazione al primo anno del costo di *onboarding* mentre negli anni successivi avrò le sole attività relative alla gestione *alert* e controllo costante. Utilizzando i dati dell'esempio proposto avremo:

NUOVO CLIENTE	Profilo rischio basso	Profilo rischio medio-basso	Profilo rischio medio-alto	Profilo rischio alto
FASE I - ONBOARDING	353,22 €	706,44 €	1.059,66 €	1.412,88 €
FASE II - GESTIONE ALERT	4,68 €	36,54 €	64,28 €	50,75 €
FASE III - AGGIORNAMENTO O AVC	153,06 €	306,12 €	741,76 €	1.601,26 €
COSTO MEDIO PRIMI 12 MESI	510,97 €	1.049,10 €	1.865,70 €	3.064,89 €

CLIENTE ACQUISITO	Profilo rischio basso	Profilo rischio medio-basso	Profilo rischio medio-alto	Profilo rischio alto
FASE II - GESTIONE ALERT	4,68 €	36,54 €	64,28 €	50,75 €
FASE III - AGGIORNAMENTO O AVC	153,06 €	306,12 €	741,76 €	1.601,26 €
COSTO MEDIO ANNI SUCCESSIVI	157,75 €	342,66 €	806,04 €	1.652,01 €

4.3.2. Il calcolo dell'EVA e incidenza sul pricing

Le considerazioni sopra svolte consentono adesso di valutare la marginalità effettiva di un prodotto bancario, correggendo la redditività attesa per il costo connesso alla gestione del rischio di riciclaggio che, come abbiamo visto, è significativamente diversificata in ragione dell'assorbimento di risorse umane e tecnologiche che i controlli AML richiedono.

Si ipotizzi l'erogazione di un mutuo chirografario di 100 mila, da rimborsare interamente alla scadenza di 5 anni, con incasso degli interessi annuali del 3,5%. I dati utili al calcolo dell'EVA sono riportati di seguito e tengono del costo orario che abbiamo già analizzato.

Cliente	Retail				
Tipo prodotto	Mutuo Chirografario				
Importo richiesto	100.000				
Durata anni	5				
Tasso cliente	3,50%				
Costo del funding	0,50%				
Costo del capitale proprio	10%				
Valutazione Rischio di Credito					
Rating PD	5				
PD	2,10%				
LGD	50%				
PA	1,05%				
PROFILO DI RISCHIO AML CLIENTE	BASSO	MEDIO BASSO	MEDIO ALTO	ALTO	
Commissioni di erogazione	1%	1%	1%	1%	erogato
Fattori per calcolo costi operativi di Rete					
Attività di rete	5	5	5	5	ore
Costo AML	510,97 €	1.049,10 €	1.865,70 €	3.064,89 €	euro
Costi per servizi resi	1%	1%	1%	1%	% erogato

Il costo AML è relativo al primo anno, assumendo che il cliente sia di nuova acquisizione.

Per il primo anno la marginalità netta è calcolata tenendo conto di tutti i fattori di costo e ricavo incidenti sull'erogazione, inclusi i costi per servizi resi dalle strutture centrali.

Nella tabella seguente sono riepilogati i margini per i diversi profili di rischio, ipotizzando che la PD non varia a seconda del livello di rischio AML e riducendo il costo del capitale **del costo del funding (in quanto già parte del Tasso Interno di Trasferimento)**.

Nel calcolo sono state utilizzate alcune ipotesi semplificatrici per focalizzare la logica del modello proposto e, in particolare:

- la perdita attesa si considera costante per tutta la durata del rapporto;
- nel tasso interno di trasferimento non è compreso il costo indiretto della liquidità;
- nel capitale assorbito non è compreso il rischio di sfioramento dei parametri di liquidità e ulteriori rischi e/o buffer.

Tabella 1 - EVA prodotto (anno 1)

EVA DI PRODOTTO	BASSO	MEDIO BASSO	MEDIO ALTO	ALTO
Interessi attivi	3.500,00 €	3.500,00 €	3.500,00 €	3.500,00 €
costo del funding	- 500,00 €	- 500,00 €	- 500,00 €	- 500,00 €
Margine di interesse	3.000,00 €	3.000,00 €	3.000,00 €	3.000,00 €
Costo del rischio atteso	- 1.050,00 €	- 1.050,00 €	- 1.050,00 €	- 1.050,00 €
Commissioni	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €
Margine di intermediazione	2.950,00 €	2.950,00 €	2.950,00 €	2.950,00 €
Costi operativi	- 763,27 €	- 1.301,40 €	- 2.118,00 €	- 3.317,19 €
Attività di Rete	- 252,30 €	- 252,30 €	- 252,30 €	- 252,30 €
Attività AML	- 510,97 €	- 1.049,10 €	- 1.865,70 €	- 3.064,89 €
Margine operativo	2.186,73 €	1.648,60 €	832,00 €	367,19 €
Servizi Resi strutture centrali	- 1.000,00 €	- 1.000,00 €	- 1.000,00 €	- 1.000,00 €
Capitale assorbito				
RWA density 70% (Rischio di credito e operativo)	70.000,00 €	70.000,00 €	70.000,00 €	70.000,00 €
Capitale assorbito 8%	5.600,00 €	5.600,00 €	5.600,00 €	5.600,00 €
Costo del capitale	- 532,00 €	- 532,00 €	- 532,00 €	- 532,00 €
EVA	654,73 €	116,60 €	- 700,00 €	- 1.899,19 €

Nei 4 anni, varierà l'incidenza del costo AML che diminuirà in ragione dell'*onboarding* già avvenuto e, pertanto, anche la marginalità su base annua ne beneficerà nei termini che seguono.

Tabella 2 - EVA prodotto (anni 2-5)

EVA DI PRODOTTO	BASSO	MEDIO BASSO	MEDIO ALTO	ALTO
Interessi attivi	3.500,00 €	3.500,00 €	3.500,00 €	3.500,00 €
costo del funding	- 500,00 €	- 500,00 €	- 500,00 €	- 500,00 €
Margine di interesse	3.000,00 €	3.000,00 €	3.000,00 €	3.000,00 €
Costo del rischio atteso	- 1.050,00 €	- 1.050,00 €	- 1.050,00 €	- 1.050,00 €
Commissioni	-	-	-	-
Margine di intermediazione	1.950,00 €	1.950,00 €	1.950,00 €	1.950,00 €
Costi operativi	- 410,05 €	- 594,96 €	- 1.058,34 €	- 1.904,31 €
Attività di Rete	- 252,30 €	- 252,30 €	- 252,30 €	- 252,30 €
Attività AML	- 157,75 €	- 342,66 €	- 806,04 €	- 1.652,01 €
Margine operativo	1.539,95 €	1.355,04 €	891,66 €	45,69 €
Servizi Resi strutture centrali	- 1.000,00 €	- 1.000,00 €	- 1.000,00 €	- 1.000,00 €
Capitale assorbito				
RWA density 70% (Rischio di credito e operativo)	70.000,00 €	70.000,00 €	70.000,00 €	70.000,00 €
Capitale assorbito 8%	5.600,00 €	5.600,00 €	5.600,00 €	5.600,00 €
Costo del capitale	- 532,00 €	- 532,00 €	- 532,00 €	- 532,00 €
EVA	7,95 €	- 176,96 €	- 640,34 €	- 1.486,31 €

Andando poi a cumulare l'EVA sui 5 anni di durata del prestito per addivenire ad un giudizio complessivo sulla redditività del prodotto, è possibile rilevare immediatamente come la creazione di misure di *AML risk adjusted performance* porta a conclusioni diverse rispetto a quelle cui saremmo giunti applicando la metrica tipica dei rischi creditizi e dei conseguenti assorbimenti patrimoniali.

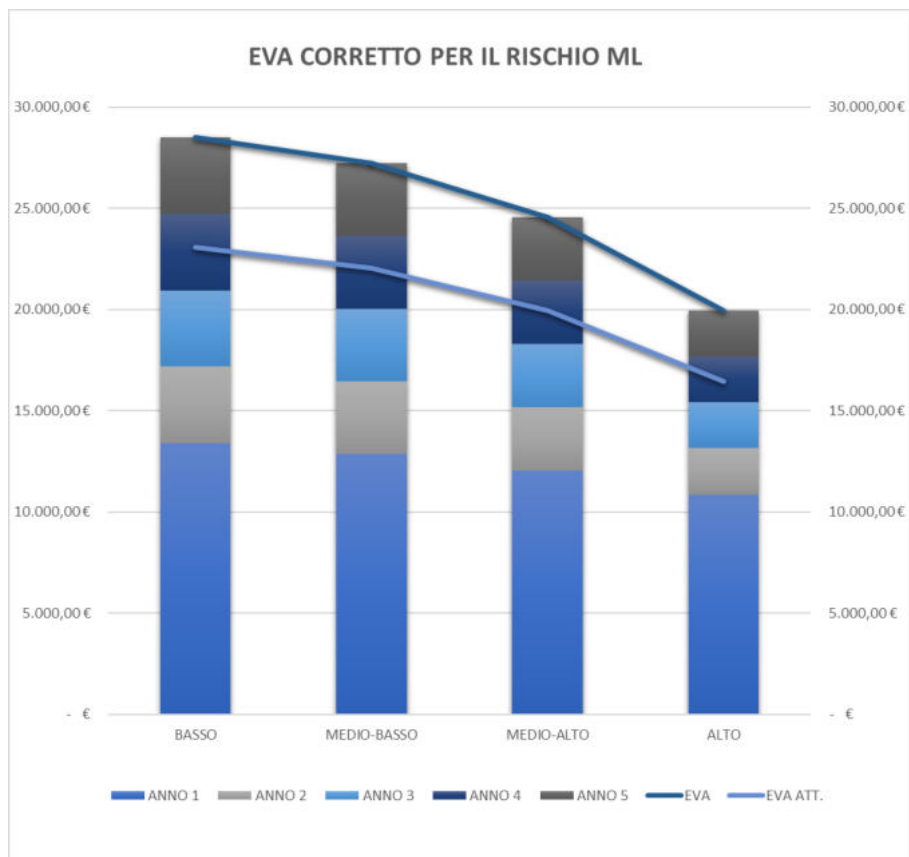
Sulla base dei dati utilizzati per l'esempio in esame (cfr. Fig. 1), emerge come l'EVA di un mutuo chirografario (di cui viene fornito anche l'importo attualizzato) risulta positivo soltanto nel caso di un cliente a basso profilo di rischio ML.

Figura 1 - Marginalità effettiva finanziamento € 100K



In base ai risultati ottenuti, risulta pertanto non conveniente - da un punto di vista strettamente economico - offrire mutui chirografari del tipo di quello sopra esemplificato a clienti che presentino un livello di rischio superiore a “basso” in quanto ciò comporterebbe distruzione di valore. Peraltro, essendo il costo AML in larga misura “anelastico” rispetto alle dimensioni del finanziamento, ne consegue che la *size* dell’operazione incide sull’EVA atteso dall’operazione. In altri termini, se il mutuo – a parità di valutazioni AML – fosse stato di 1 milione di euro, invece che di 100 mila euro, avremmo avuto un EVA positivo per tutti i profili di rischio ML (cfr. Fig. 2).

Figura 2 - Marginalità effettiva finanziamento € 1000K



5. Conclusioni

Nel presente articolo sono state utilizzate le logiche tipiche del controllo di gestione, secondo l'approccio dell'*Activity Based Costing*, per enucleare l'incidenza dei costi di compliance AML sulla marginalità reddituale dei singoli prodotti/servizi offerti, analizzando l'impatto sull'*Economic Value Added* atteso su un orizzonte multiperiodale incrociando tre dimensioni: *pricing*, volume intermediato e profilo di rischio ML del cliente.

L'elaborazione di misure RAPM corrette per il fattore AML costituisce uno strumento di supporto per la validazione delle scelte commerciali della banca, in quanto consente di graduare la *customer acceptance policy* in funzione della tipologia di prodotto, dei volumi operativi attesi e delle condizioni economiche applicate.

Le logiche AML non costituiscono, infatti, un mero vincolo di *compliance* da rispettare al fine di evitare sanzioni o danni reputazionali, ma entrano a pieno titolo nel dialogo prudenziale con le Autorità di supervisione, condizionando le scelte di pianificazione strategica e concorrendo alla fase di progettazione della gamma prodotti e del relativo *pricing*.

Quanto sopra rappresentato costituisce solo un primo spunto di riflessione, al quale saranno dedicati ulteriori approfondimenti in considerazione della rilevanza e della complessità della materia.

Bibliografia

- Banca d'Italia (2019), [*Disposizioni in materia di adeguata verifica della clientela per il contrasto del riciclaggio e del finanziamento del terrorismo*](#)
- Banca d'Italia (2021), [*Attuazione degli Orientamenti dell'Autorità bancaria europea in materia di fattori di rischio per l'adeguata verifica della clientela \(EBA/GL/2021/02\)*](#)
- Basel Committee on Banking Supervision (2006), [*International Convergence of Capital Measurement and Capital Standards. A Revised Framework Comprehensive Version*](#)
- Cattaneo, C., Traina, I. (2017), *Il cost management nelle aziende bancarie. Un modello di activity-based costing*, Franco Angeli
- European Banking Authority (2019), [*Opinion of the European Banking Authority on communications to supervised entities regarding money laundering and terrorist financing risks in prudential supervision*](#), EBA-Op-2019-08
- European Banking Authority (2021), [*Guidelines on customer due diligence and the factors credit and financial institutions should consider when assessing the money laundering and terrorist financing risk associated with individual business relationships and occasional transactions \('The ML/TF Risk Factors Guidelines'\)*](#) under Articles 17 and 18(4) of Directive (EU) 2015/849
- European Commission (2021), [*Anti-money laundering and countering the financing of terrorism legislative package*](#)
- Floreani, A. (2004), *Enterprise risk management. I rischi aziendali e il processo di risk management*, UNICATT
- LexisNexis (2017), *The true cost of anti-money laundering compliance*, Survey Report – European Edition
- LexisNexis (2020), *True cost of financial crime compliance study*, Global Report
- UIF-Banca d'Italia (2021), Newsletter 5 - 2021
- Vivoli, A. (2018), *Regole antiriciclaggio*, Private Magazine

Banks' governance and risk management frameworks: how to integrate ESG and climate risks

Giuliana Birindelli (University of Chieti-Pescara); Michelangelo Bruno (Sapienza University); Alberto Citterio (University of Insubria); Umberto Fuso (Oliwer Wyman); Guido Luciano Genero (Intesa Sanpaolo); Andrea Magurano (Oliver Wyman)¹

Article submitted to double-blind peer review, received on 11th March 2022 and accepted on 11th April 2022

Abstract

The transition towards a sustainable economy is currently one of the most pressing issues for managers, stakeholders and policy makers. For the banking sector, several regulatory initiatives have been promoted by European Supervisors and Regulators, which have recognized the pivotal role of financial sector in enhancing sustainable economic development and the risks to which financial intermediaries are exposed during this transition.

The main purpose of this article is to outline the key elements that are crucial for a proper integration of sustainability and ESG considerations into banks' strategic choices, business processes and risk management framework. In particular, an analysis of the main practices, regulatory requirements and outstanding issues will be performed in order to provide an overview of the main challenges that banks need to address in order to successfully incorporate ESG risks into their business processes and risk management frameworks. In addition, given the ongoing heterogeneity in the application of such regulatory expectations, the article provides an update on the state-of-the-art by reviewing the main international research and studies on this topic and by presenting the findings of some surveys carried out by the ECB and Aifirm (Associazione italiana financial risk managers) on a sample of European and Italian banks respectively.

1. Introduction

Environmental, Social and Governance (ESG) is currently one of the main focus areas for policy makers worldwide.

In December 2016, the European Commission formed a high-level expert group (HLEG) to develop an overarching and detailed EU sustainable finance strategy. On 31 January 2018, the HLEG released its final report². This report presented a holistic view of European sustainable finance and established two financial system imperatives. The first is to increase finance's commitment to long-term, inclusive development. The second goal is to improve financial stability by fostering the awareness about environmental, social and governance (ESG) issues while making investment decisions. The United Nations-backed Principles for Responsible Investment Directive 2016/234 incorporates ESG considerations into the EU legislative framework. The increased attention by policy makers toward this topic has also been followed by an improved appetite of financial investors for ESG funds. According to the ECB's (2020a) Financial Stability Review, the Asset Under Management (AUM) of these funds has increased by 170%, soaring from 500 billion USD in 2015 to more than 1.3 trillion USD in 2020.

Similarly, a number of initiatives have been taken by banking regulators and supervisors worldwide with the aim of increasing the awareness of banks on this matter. All the relevant areas of the governance framework of banks have been affected by the initiatives launched by the regulators and supervisors. More specifically, both the European Banking Authority and the European Central Bank requested the Board of Directors and the Senior Management of banks to properly reflect the ESG considerations into the strategy and the internal governance processes of the credit institutions. As shown in the ECB (2021a) report, the 112 most significant credit institutions supervised by the SSM, are still not fully aligned with the supervisory expectations on this matter, nevertheless, improvements have been done during the past two years. Furthermore, as shown in a survey carried out in 2021 by the Aifirm(2021) on a sample of 31 Italian banks also the less significant institutions are taking important steps in incorporating ESG into their business processes.

The EBA (2021b) also detailed some specific expectations in relation to the control functions of the credit institutions. It is in fact expected that the risk management units will be able to properly gauge the ESG risk exposures of banks. In this respect, it is also relevant to mention that several pilot exercises on climate stress test have been launched recently by several regulators and supervisors worldwide³. This will prompt credit institutions to integrate this new source of risk into their stress testing frameworks.

Detailed disclosure requirements have also been defined to enhance the transparency and the consistency of the information reported by banks to the market.

The literature on this topic has substantially increased in the last decade, especially after the 2008-2009 financial crisis. In particular, non-financial performance and corporate social performance have progressively increased their relevance among firms and their stakeholders (e.g. Gramlich and Finster, 2013; Brooks and Oikonomou, 2018) as well as media and regulators (Al-Hadi et al., 2019; Sassen et al., 2016). The behaviour of banks managers – identified in the literature as one of the underlying causes of the global crisis (Branco and Rodrigues, 2006; Miralles-Quirós et al., 2019) - has indeed highlighted the necessity to introduce new business management tools to regain and reinforce credibility toward stakeholders (Brogi and Lagasio, 2019). Civil society has progressively expressed the need for a “moral capitalism” (Nizam et al., 2019) that prompted managers to shift from the maximization of shareholders' wealth to the maximization of stakeholders' value. This theory has been historically made explicit by Freeman (1984), which argued that a firm should consider not only the interests of its shareholders but also those of the plurality of actors involved in its activities (employees, customers, local communities, etc.). Several studies have indeed explicit the need to integrate aspects

¹ This article expresses the views of its authors, not the position or views of other institutions

² European Commission. *Financing a Sustainable Economy. Final Report by the High-Level Expert Group on Sustainable Finance*; European Commission: Brussels, Belgium, 2018; pp. 6–8.

³ The authorities that have launched pilot climate stress test exercises in the last years are: the European Central Bank (ECB), the European Banking Authority (EBA), De Nederlandsche Bank (DNB), Banque de France (BdF), Bank of England (BoE), Australian Prudential Regulation Authority (APRA), New York Federal Reserve and Bank of Canada.

related to social responsibility issues into strategic planning processes and management systems of companies in order to properly consider the expectations of all stakeholders (Post et al., 2002; Porter and Kramer, 2011).

Notwithstanding the efforts made so far still much needs to be done. On one side banks will need to collect more data on ESG risks to properly integrate them into their risk management frameworks. On the other side regulators, policy makers and supervisors will have to provide more clear guidelines to avoid inconsistencies and ensure that credit institutions could be properly assessed by the market participants. The aim of this work is to identify the key challenges faced by the credit institutions in integrating ESG risks in their governance and risk management frameworks as well as providing useful recommendations on how to address these challenges.

This article is presented as follows: paragraph 2 will discuss the role of the Board of Directors and the Senior Management in the implementation of a comprehensive strategy for incorporating ESG factors in banks' business processes; paragraph 3 will be focused on the role of the risk management function identifying the main challenges for the integration of the ESG risks in the risk management frameworks of banks; paragraph 4 will provide some examples of banks' business processes affected by the introduction of the ESG risks and, finally, paragraph 5 will present the results of some surveys carried out by different institutions/associations with the aim of reviewing banks' practices for the inclusion of ESG risks in their operational frameworks.

2. Specificities of the ESG risks and the role of the Board and the Senior Management in the definition of a comprehensive strategy for ESG factors

The United Nations Environment Programme (UNEP) and the Principles for Responsible Investment (PRI) define ESG as the following: (i) Environmental (E) issues are related to the natural environment and natural systems; (ii) Social (S) issues refer to the rights of people and communities; and (iii) Governance (G) issues are linked to the corporate governance of firms. Given the heterogeneity and complexity that characterize ESG risks (i.e. their potential effects will materialise over a medium to long time horizon and will have an impact on most of the activities performed by a bank), credit institutions must promptly implement a number of actions aimed at integrating these sources of risks in their operational processes.

Against this background, the Board⁴ of a credit institution needs to adequately plan all the necessary steps to be taken to review the management and control systems of the institution to duly integrate the ESG considerations into the corporate strategy and its operational processes.

When dealing with ESG risks, the first activity that the Board should undertake is a thorough analysis of the areas potentially affected by the introduction of the ESG considerations with the aim of identifying the necessary organisational and strategic changes to be undertaken. The Board should define a clear execution strategy by deciding whether to rely on external consultants able to offer benchmarking solutions or by setting up an internal working group. While performing this activity the Board should not only be focused on discussing and evaluating proposals, but it should also stimulate a conducive working environment. Among the other relevant Board's responsibilities are the assessment of potential organisational and regulatory interventions, the potential changes to the risk appetite framework (RAF) and the potential changes to the ICAAP and ILAAP of the institution.

With regards to the competencies, the EBA (2021b) in its report highlights the need for the Board of financial institutions to have adequate skills and experience on ESG in order to fully understand the potential impact of ESG factors and related ESG risks on the business model; in the same report is also emphasised the need to organise induction sessions aimed at providing all Directors with adequate knowledge of ESG risks to be able to make informed decisions and also to efficiently perform their role.

Moreover, with specific reference to climate risk, the ECB (2020b) defines four expectations on the duties of the Board of the banks falling under its remit. It requires the Board:

- to explicitly assign roles and responsibilities to its members and/or committees in relation to climate and environmental risks;
- to consider the knowledge, skills and experience of its members in the field of climate and environmental risks when assessing their suitability;
- to adequately consider climate and environmental risks in the overall business strategy and risk management systems;
- to conduct effective oversight of the institution's exposures to climate and environmental risks.

In defining and composing the internal Board-level structures responsible for overseeing ESG risks, the EBA guidelines on Internal governance require that the roles and responsibilities should be explicitly defined and assigned either to pre-existing structures or newly created bodies. A KPMG (2021) survey on climate risk on a sample of major global banks found that more than half of the respondents (56%) reported that they created new roles or new committees for sustainability and climate change in 2020⁵. These newly created ESG committees have responsibilities such as the oversight of the inclusion of ESG and climate risks in the various business processes, the adequate assessment of ESG aspects in commercial relations, the introduction of new ESG compliant products (e.g. insurance and asset management products).

It is worth noticing that the existing literature on the topic has found evidence of a positive correlation between the presence of specialised committees with enhanced ESG disclosure and performance by banks (Aifirm, 2021).

⁴ Article 3 of the Directive 2013/36/EU states the following: "management body' means an institution's body or bodies, which are appointed in accordance with national law, which are empowered to set the institution's strategy, objectives and overall direction, and which oversee and monitor management decision-making, and include the persons who effectively direct the business of the institution". And also: "senior management' means those natural persons who exercise executive functions within an institution and who are responsible, and accountable to the management body, for the day-to-day management of the institution".

⁵ Examples are: Global Head of Climate Change, Global Head of Sustainability or Sustainability Officer, Global Head of Climate Risk, Head of Policy and Corporate Responsibility, Board Climate Committee, Climate Risk Management Forum, Investment Committee for responsible investing.

Also the Senior Management plays a prominent role in the introduction of the ESG risks into the processes and strategies of the institution. The CEO has an important role as he/she is the head of the company while being also in charge of liaising with the Board of Directors. In the opinion of the writers, it would be desirable the appointment of a top manager (Chief Sustainability Officer) responsible for supervising the implementation of the ESG considerations into the business processes of the institution. Equally important is the assignment to an existing management committee of the tasks and powers to build and implement the various initiatives included in the ESG strategy. The EBA (2021b) specifies in its report that the banks should involve their management (and particularly the control functions) at an early stage of the ESG risks implementation process. In addition to the risk management function, the EBA also assigns a key role to the compliance function, which is tasked with verifying the compliance of internal policies with ESG regulatory requirements. Finally, in the context of a broad involvement of the management, it is necessary to clearly define the allocation of responsibilities so that they are distinct, consistent, enforceable and properly documented.

3. What is the role of Risk Management in the implementation of the ESG principles in the governance processes of the banks?

When dealing with ESG risks, the risk management team must consider new perspectives, for example, not only the impact that these risks have on the organization, but also the potential impact to which the bank is exposing its stakeholders and the environment due to its business activities.

The EBA's report (2021b) underlines the need for the institution's risk management team to be able to capture the risks associated with ESG factors when they account for them in their risk appetite, thus applying their risk management frameworks with appropriate and accurate risk metrics and limits. It is of the utmost importance that the risk management team is able to incorporate ESG risks into the risk appetite framework as this would allow the institution to embed the ESG aspects in all the relevant processes of the risk management framework and would lead it to regularly assess its counterparties' risk profiles also from this perspective.

With reference to the relevant risk limits, the risk management team might need to review or extend them to include new types of limits that are relevant from the ESG perspective (e.g. sectors excluded from eligibility based on the institution's business strategy). As an example, having regard to physical risks (in the context of the climate risk assessment), the risk management team could decide to set up new limits aimed at taking into account the potential physical impact of climatic events such as floods and droughts on land, real estate, infrastructure projects and business activities in their counterparties' production cycle. Similarly, risk management policies could envisage limits on financing projects, activities or, where they can be identified, counterparties that significantly harm environmental or social objectives, in line with the institution's business strategy. Against this background it is important to point out that the introduction of new risk limits could be mainly done with regards to the climate/environmental risk. With reference to the "social" considerations, credit institutions may decide to avoid lending money/investing to firms operating in specific sectors to avoid ethical and reputational risks whereas they may take into account the "governance" considerations (by screening the governance arrangements of its counterparties) when taking lending decisions even if not directly including it into their RAF.

Furthermore, as the influence of ESG risks can be expected to increase over time, the risk management team should be in a position to assess whether ESG risks are becoming material financial risk drivers and, where appropriate, use all the available risk monitoring and mitigating tools for the relevant exposures.

Finally, considering the latest regulatory trends and the expectations set by some Supervisory Authorities (see ECB, 2020b, but also DNB, 2020 and ACPR, 2021) the risk management team, having regards to the climate-related and environmental risks to which the institution is exposed, should evaluate the appropriateness of the internal stress testing framework with a view to incorporating primarily the climate and environmental risks (as noted above, the other considerations, notably social and governance risks, cannot easily be included as risk limits in the risk management framework of the institutions) into their baseline and adverse scenarios (see ECB 2021b).

3.1. The integration of climate risk in the risk management framework

The integration of the recommendations provided by the Task Force on Climate Related Disclosure (2017) within the Risk Appetite Framework of banks has represented the first effort to link climate change issues with banks' attitude toward risk. With regards to this objective, the Task Force in its report has indeed developed a framework with four widely adoptable recommendations on climate-related financial disclosures that "would enable stakeholders to understand better the concentrations of carbon-related assets in the financial sector and the financial system's exposures to climate-related risks". In particular, the TCFD provides a set of recommendation - applicable to organizations across sectors and jurisdictions - which refers to four thematic areas representative of the core elements of how organizations operate, i.e. governance, strategy, risk management, and metrics and targets.

With specific reference to the risk management disclosure, the TCFD defined three specific recommendations in order to support investors and stakeholders in evaluating and understanding how climate-related risks are identified, assessed and managed. The Risk Management should:

- Describe the organization's processes for identifying and assessing climate-related risks. In general, the recommendation emphasizes the relevance of transparency and clarity in the description of the underlying processes and highlights the importance to assess the relevance of climate-related risks in relation to other risks. This is particularly suitable for financial institutions, which have to evaluate the exposure to climate risk in the context of their typical financial risks (e.g., credit risk, market risk, liquidity risk, operational risk).
- Describe the organization's processes for managing climate-related risks, including the process behind the decisions to mitigate, transfer, accept or control those risks.

- Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.

Briefly put, an accurate and timely disclosure of financial implications of climate change is essential to promote a more informed understanding of climate risks and opportunities by investors and stakeholders and to ensure that appropriate controls govern the production of the required information. In addition, an accurate disclosure can result in more informed capital allocations in line with the mitigation objectives of climate-related risks.

Starting from the contribution of the TCFD, Central banks and supervisors are now working on these issues in order to introduce and regulate new risk management and monitoring practices. The EBA (2019) action plan and the ECB (2020b) guide have indeed introduced new recommendations to stimulate the internalization of policies and models for the measurement and management of climate-related risk, which must be carried out in line with strategies, policies, procedures, and, in particular, the risk appetite framework (RAF). Sustainability issues will therefore have to enter the strategic and operational agendas of banking institutions on a permanent basis. The internalization of climate-related risks in the risk appetite framework is thus fundamental for the full integration of such issues in the strategic decision process of financial institutions and for the accurate evaluation of their impact on capital adequacy.

Introduced by the FSB in 2013, the RAF is indeed a mandatory and crucial tool for the definition and the execution of the bank's business strategy. The institution's risk appetite specifies the scope and relevance of the risks to which the institution is exposed. This document, which is under the responsibility of the risk management in cooperation with the Chief Financial Officer (CFO), shows the overall approach through which risk appetite is established, communicated, and monitored. In particular, the RAF specifies the maximum level that can be assumed, the risk objectives, the tolerance thresholds as well as the operating limits for each risk category, which have to be in line with the bank's risk capacity and its business model (EBA, 2017). Banks must therefore guarantee a strict coherence between the RAF and the strategic plan, the ICAAP process, the business organization, and the structure of the internal control system.

The first step of the construction of the RAF consists in the identification of elements and metrics that allow to identify and measure the relevant material risks and to establish internal limits, which have to be consistent with the risk appetite and commensurate with financial strength, capital and strategic goals. Following the recommendation of the TCFD, the integration of climate-related risk within the RAF takes place especially in the abovementioned step, where the bank's strategy is concretely embodied in the risk framework. The proper implementation of an adequate and robust framework for the assessment of ESG factors thus requires the identification of a taxonomy of ESG risks, as well as the development of qualitative/quantitative indicators that allow measuring the impacts both in the short and in the long term. The recommendations and approaches explicated by the international and European authorities can therefore be traced back to this context (TCFD, 2017; BCE, 2020b; EBA, 2021b).

3.2. The integration of climate risk with traditional banking risks

The need to provide a standardized framework of climate-related financial disclosure was primarily concretized in the necessity to define a consistent categorization of climate-related risks into a proper taxonomy. The TCFD was the first institution to provide such taxonomy, which was later also adopted by the ECB within its guidelines (2020b). In particular, the TCFD divided climate-related risks into two major categories:

- **Physical risk:** it is linked to financial impacts deriving from climate-related events. Physical risk could be caused by extreme weather events (acute risk), such as droughts, floods, and storms, as well as gradual climate changes deriving from air, water and land pollution, water stress, deforestation, biodiversity loss, and resource scarcity (chronic risk). This could have a direct impact, for example, through damage to property or reduced productivity, or could lead to indirect subsequent events, such as the disruption of supply chains.
- **Transitional risks:** it reflects the risk connected to the transition to a lower-carbon economy, which could entail extensive policy, legal, technology, and market changes.

Starting from the abovementioned categorisation, climate related risk (and ESG risks in general) may be assessed as a stand-alone risk or as an extension of the traditional risks identified in the bank's practice, in the supervisory framework, and in the literature. More precisely, while from a theoretical point of view the climate risk might be considered as an autonomous risk, literature and authorities suggest that they cannot be unbundled from traditional risks.

On the one hand, although the topic has not yet been fully explored in the literature, there are some contributions that highlighted the potential impact of climate risks on traditional financial risks. In particular, some authors suggested that (i) climate risks could impact the market value of financial assets (Dietz et al., 2016) and that (ii) a late and abrupt implementation of climate policies could cause adverse systemic consequences for the financial system (Battiston et al., 2017; Nieto, 2019). The disclosure of climate-relevant financial information and the timing and credibility of the implementation of climate policies could therefore have a pivotal role in the reduction of the negative effects of ESG risks on the traditional financial risks.

On the other hand, the TCFD guideline and the ECB recommendations seem to confirm the necessity to integrate climate-related risks among the existing prudential categories (e.g. credit risk, operational risk, liquidity risk). The "ECB Guide on climate-related and environmental risk" provided a set of 13 recommendations about the prudent management and disclosure of aspects linked to climate-related and environmental risks. In particular, banks are expected to understand the impact of climate-related and environmental risks on the business environment in which they operate (expectation 1) and introduce them in their risk appetite framework (expectation 4) in order to integrate such risks in the definition and implementation of the business strategy (expectation 2), looking at the short, medium and long term. Banks should thus identify a business unit responsible for the management of the climate-related risks (expectation 5), which have to be evaluated and integrated as drivers of existing risk categories into their existing risk management framework (expectation 7).

In general, the definition of ESG as a horizontal financial risk theme that can influence the traditional financial risk should help to ensure that the impacts of ESG risks are correctly managed and identified. Briefly put, ESG risks could affect:

- Credit and counterparty risk: ESG factors may challenge banks throughout the credit process, from granting to monitoring. The occurring of harmful environmental events may cause financial difficulties for the counterparty, which could, in turn, generate repercussions on creditworthiness and probability of default. It should be therefore necessary to integrate the overall rating with a score as a proxy for the counterparty's environmental compliance.
- Market risks: the investments in financial instruments of companies belonging to a sector perceived as not sustainable may be more prone to be exposed to the effects of news flow or more affected by policy and regulatory actions. This could result in higher return volatility.
- Operational risk: banks are exposed to reputational and legal risks deriving from unsustainable activities carried out by the bank itself and by its counterparties. Institutions should ensure that operational risk management adequately considers physical risk impacts.
- Liquidity risk: although the banking industry is not yet considering the relationships between ESG factors and liquidity risks, ESG factors could also result in funding issues or make some assets less liquid.

Therefore, specifically for the “E” dimension, banks are expected to reflect climate-related and environmental risks by introducing a set of key performance indicators (KPIs) that should be cascaded down to individual business lines (e.g. retail banking, private banking, commercial banking, and corporate banking) and portfolios. This analysis should be conducted considering the specificities of the business model and the bank's risk profile and adapted taking due consideration of the vulnerabilities of the economic sector, operations and physical locations of the institution and its counterparties.

3.3. Indicators and methods to assess ESG risks: approaches and open challenges

The integration of ESG factors in the bank's prudential framework thus depends not only on the definition of a taxonomy but also on the identification of qualitative and quantitative indicators and methodological tools to assess their financial impacts. However, the implementation of ESG factors was hampered by the lack of data on the ESG characteristics of the counterparties and by methodological issues. In general, the evaluation of financial risks linked to climate-related issues suffers from (i) uncertainty about the timing and effects of related policies and regulatory interventions; (ii) insufficient data or low-quality data in terms of relevance, comparability, and reliability, which is especially true for SMEs, local and regional governments, and companies from developing countries; (iii) methodological constraints deriving by the traditional use of historical data to estimate current or future risks, which might be not feasible when ESG risks are introduced in risk management models; (iv) time-horizon mismatch between traditional management models and the timeframe for the occurrence of ESG risks. Most common approaches are indeed usually based on historical data that are not able to clearly assess the impact of ESG factors, which usually spread their effects in longer time windows. In addition, such risks could have quantitative or qualitative manifestation and could materialize at various levels, such as international, national, sectorial levels or specific for single entities.

In order to address such methodological issues and to help authorities to better identify ESG factors, the “EBA report on management and supervision of ESG risks for credit institutions and investment firms” provides a specific contribution to the identification and evaluation of such risks. Firstly, the identification implies the classification of assets based on their ESG characteristics that allow to identify specific quantitative and qualitative indicators. This step is preparatory for the evaluation activity, which consists of the application of methodological tools to determine the potential impact of ESG risks on banks' portfolio. In recent years, increasing efforts have been made to develop indicators for the classification of exposures to ESG risks, especially those applicable to climatic and environmental factors (e.g. regulation EU 2020/852). With this regard, the EBA highlighted the opportunity to refer to existing standards, and in particular:

- ESG taxonomies: they identify criteria for the classification of economic activities in terms of sustainability level (i.e. conducive to a low-carbon, resilient and resource-efficient economy);
- ESG standards and guidelines: they provide well-accepted measures or norms that allow comparative evaluations of sustainability results of counterparties (e.g. ISO, UN Global Compact principles);
- Investment benchmarks: they allow to compare the performance of sustainable investments over time through the definition of specific sustainable objectives (e.g. EU climate Transition Benchmarks or EU Paris-aligned Benchmarks);
- Sustainability-related frameworks: defined by national or international entities (e.g. UN, COSO) with reference to ESG factors necessary to fulfil non-financial reporting obligations (e.g. GRI e SASB).

The identification of a proper strategy capable to manage ESG risk needs a detailed analysis of the overall impact of such risks on a bank's portfolio. Although the presence of adequate indicators able to assess the financial implications of ESG factors is still very limited for several sectors and portfolios over the short, medium and long term⁶, the EBA has identified three different approaches, which have to be applied coherently with the size, complexity, risk profile and business model of the respective institution. More in detail, the EBA suggests the implementation of the following methods:

- Portfolio alignment method: this method consists of the comparison of a portfolio's sustainability performance with globally agreed (climate) targets. With respect to climate-related issues, the ultimate goal is thus to define how the institution should modify its portfolio in order to be aligned with the Paris Agreement. On the one hand, this method results to be very results-oriented. However, on the other hand, it is very linked to current industries' technologies or current potential plans to change technology and it does not take into account potential future developments.

⁶ European Banking Federation (2021), Management and supervision of Esg risks for credit institutions and investment firms: Ebf response to Eba consultation.

- Risk framework method: it focuses on the sensitivity of the portfolio and the impact that climate change has on the real risk of the exposures, without making any evaluation on how the portfolio composition is aligned or not with global sustainability targets. This approach relies on the fact that climate risk is by nature forward-looking, while the other components of risk are usually more backwards-looking. It is a method essentially driven by two different approaches: climate stress tests (analysis of future development path of transition variables, such as carbon price, GDP growth, unemployment) or climate sensitivity analysis (changes in portfolio risk by changing some of the inputs in the financial model).
- Exposure method: it consists of the direct assessment of ESG factors on individual counterparties and individual exposures. This evaluation can be used as a complement to the standard assessment of financial categories. The indicators are usually calibrated at company level, considering the characteristics at sector level of each counterpart. It is an easier methodology, which relies on backwards-looking metrics and does not take into account sensitivity analysis.

Although the latest interventions by regulators and authorities have contributed to defining a less fragmented prudential framework, some critical issues are still in place. First of all, information availability still remains an open issue, given the lack of transparency and the difficulty in obtaining relevant, reliable and comparable data. Particularly problematic is the reliability of ESG ratings, whose definition by the specialized agencies still follows different and heterogeneous logics. As reported by the European Commission (2020), the sustainability-related products and services market still suffer of lack of transparency, accuracy and reliability of sustainability-related ratings. The absence of a clear and consistent terminology, the low level of comparability and consistency among company sustainability disclosures, and the lack of engagement with and by companies on sustainability-related issues are indeed considered to be obstacles to the further development of the market. The lack of both standardized and formal auditing processes adds a subjective nature to ratings (LaBella et al., 2019) that could lead to different evaluations of the same portfolio or counterpart. As validation, Berg et al., (2019) argued that ESG ratings differ mainly due to measurement deviations and, residually, to deviations in weight and scope. The study indeed confirms the poor correlation among such ratings (0.61), in contrast to the correlation of credit ratings, which is stronger at 0.9 (Kerber and Flaherty, 2017). The risk to receive mixed signals from rating agencies on which actions are expected and evaluated by the market could in turn reduce the companies' incentives to improve their ESG performance (Berg et al., 2019). On one hand, several authorities and organizations such as the GRI, the SASB, and the TFCF are now encouraging company level transparency and they are contributing to the development of frameworks, which will help in improving standardization levels in reporting. On the other hand, in order to guarantee better quality and reliability of ESG ratings, the ESMA (2021) suggested to the European Commission to introduce similar forms of supervision and regulation to those already existing for credit ratings.

Another key element is the definition of the timeframe for the identification and assessment of ESG factors. However, this integration remains challenging, since traditional credit score systems still mainly rely on evaluations based on historical evidence, which allows assessing the creditworthiness of the counterpart solely on the basis of its past or recent economic and financial results. It is, therefore, necessary to incorporate proper prospective indicators, which have to be defined consistently with the characteristics of each counterpart and economic sector.

Finally, the full integration of ESG factors in the banks' risk framework will require the development of indicators related to social and governance dimensions, which are not yet fully assessed but they are rapidly gaining increasing attention among regulators and media.

4. Introduction of the ESG principles in the key internal processes of banks

Given that ESG issues are of increasing concern for the investor community and the regulators alike, banks are expected to embed these sources of risks in all their relevant business processes.

As noted in the European Commission study (2020), ESG risks can affect key aspects of the credit risk management process, including but not limited to: i) Lending and investment policies, often referenced in the risk appetite and connected to high-level position statements, ii) client onboarding and transaction due diligence, iii) portfolio monitoring, and iv) credit strategies and portfolio steering.

To properly integrate the ESG considerations into its lending processes, the bank needs to review the policies to ensure that the assessment of the creditworthiness of the potential borrowers properly takes into account also these aspects. Moreover, the bank should define metrics and indicators that should enable it to properly capture the exposure to climate risk deriving from its lending activities (by taking into account the exposures to the sectors and counterparties). In this respect, it would be desirable that the bank duly incorporates the EU taxonomy⁷ in its lending policies. It would also be desirable to review the internal rating system to properly reflect ESG considerations. Finally, the bank should ensure compliance with the provisions laid out in the revised EBA's guidelines (2020) and the other relevant regulatory products.

With regards to its investment activity, the bank needs to properly integrate the ESG considerations in the management of the treasury portfolio as well as in the capital market underwriting activity. In order to do that, it needs to clearly identify criteria for defining suitable investment opportunities. It also needs to set up processes that would allow its traders to closely monitor the market for new issues of ESG compliant financial instruments. Finally, it would be desirable to define thresholds for the composition of the portfolio (with ESG compliant instruments) to properly inform the management body on the improvements made towards the achievement of strategic goals (EBA, 2021b).

⁷ https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

4.1. Consideration of ESG risk in pricing new products

Pricing decisions for commercial lending have almost exclusively been made by pricing specialists in the middle and back office of the bank due to the complex nature of commercial deals, the varying profitability models, their associated credit risk data and the non-linear business processes. Nowadays, thanks to the banks' digital transformation plans, pricing and profitability analysis are readily available to all the relevant departments of the institution.

It is absolutely crucial for the bank to use the latest available financial and credit risk data. More specifically, the bank should use the most updated ESG information to structure the best price offer to its customers, based on the risk it is taking. Furthermore, as pointed out by Choi et al. (2021) credit institutions are now developing practices with regards to how to assess whether a loan with ESG-linked adjustments has cash flows that are solely payments of principal and interest (SPPI). Considering the ESG dynamism, the bank therefore needs to access real-time ESG data as these must be taken into account as part of the initial pricing negotiations with customers as well as for the classification of the financial instruments in accordance with the IFRS9 provisions. In order to do that, the bank could leverage the use of artificial intelligence (AI) / machine learning (ML) and cloud computing tools that offer structured ESG real-time data based on a wide array of sources. Thanks to the developments in this area, it should be possible to construct models that can quickly analyse large volumes of documents. Such models can also automatically identify, extract and quantify a company's ESG practices. This task has not always been readily viable due to the inconsistency in the requirements detailing how organizations are expected to disclose their ESG information, as well as the way the information is typically spread across various reports. The recent developments in the European regulatory framework (see the following paragraph) aimed at improving the disclosure of relevant information should help in providing more clarity on this aspect. Moreover, further steps need to be taken in order to improve the quality of the ESG ratings. In this respect, ESMA⁸ urged the European Commission to "address the unregulated and unsupervised nature of the market for "ESG" ratings and ESG assessment tools" in order to increase transparency. The academic literature has observed that the ESG scores assigned to the major listed companies in the euro area by three of the main providers vary significantly for the same firm, while the correlation between the more traditional credit ratings is over 90 per cent (Dimson, Marsh, Staunton, 2020).

The ability of the bank to quickly incorporate ESG considerations into its pricing processes will ensure that it will be able to offer the right product to its customers as well as set competitive pricing in the initial commercial engagement process.

4.2. Reporting/Pillar 3 Disclosure of ESG risks and the impact on supervisory authorities and stakeholders

Specific disclosure requirements have been introduced in the current European regulatory framework for industrial companies and banks alike in order to support the implementation of the so-called European Green Deal.

In January 2022, the EBA published a consultation paper on draft implementing technical standard (ITS)⁹ on Pillar 3 disclosures on environmental, social and governance risks. In line with the provisions laid down in the Capital Requirements Regulation (CRR), the draft ITS proposes comparable quantitative disclosures on climate-change related transition and physical risks, including information on exposures towards carbon related assets and assets subject to chronic and acute climate change events. They also include quantitative disclosures on institutions' mitigating actions supporting their counterparties in the transition to a carbon neutral economy and in the adaptation to climate change. In addition, they request significant institutions to disclose their GAR. The GAR identifies the institutions' assets financing activities that are environmentally sustainable according to the EU taxonomy, such as those consistent with the European Green Deal and the Paris agreement goals. Finally, the draft ITS provides qualitative information on how institutions are embedding ESG considerations in their governance, business model and strategy and risk management framework.

Furthermore, following the introduction of the sustainable finance disclosure regulation (SFDR) the European banks are expected to disclose in the information provided to investors the risks related to ESG factors to which they are exposed, and the related mitigating actions being undertaken to reduce their severity.

Under the taxonomy regulation, the EBA has also been requested to propose to the European Commission a number of key performance indicators (KPIs), together with the related methodology for the disclosure by credit institutions and by investment firms, on how and to what extent their activities qualify as environmentally sustainable. In its report released in March 2021, the EBA (2021a) underlined the importance of the green asset ratio (GAR) as a key means to understand how institutions are financing sustainable activities and meeting the Paris agreement targets.

Finally, as outlined in the previous paragraphs the management of ESG data is becoming increasingly important for banks. In particular, credit institutions will need to be able to develop a sound ESG data governance and architecture with quality controls.

ESG data comes from different sources: the clients during loan origination and on an ongoing basis, external data provider, machine learning/artificial intelligence tools. All these sources will need to be processed in a systematic manner in order to improve the quality of the reported information, reinforce credibility among stakeholders and improve reporting processes while avoiding a lack of standardisation and transparency.

When defining the new data architecture to properly include ESG data banks should leverage on the principles outlined in the BCBS' principles (2013) and on the standards issued by the Sustainability Accounting Standards Board (SASB)¹⁰ and the Task Force on Climate-Related Financial Disclosures (TCFD)¹¹.

⁸ <https://www.esma.europa.eu/press-news/esma-news/esma-calls-legislative-action-esg-ratings-and-assessment-tools>

⁹ https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Draft%20Technical%20Standards/2022/1026171/EBA%20draft%20ITS%20on%20Pillar%203%20disclosures%20on%20ESG%20risks.pdf

¹⁰ <https://www.sasb.org/>

¹¹ <https://www.fsb-tcf.org/>

5. Where do we stand?

In the recent years, an increasing number of surveys and studies have monitored the level of implementation of corporate governance

mechanisms and operational practices for the assessment of ESG factors among banks and financial institutions.

In mid-2018, Oliver Wyman and the International Association of Credit Portfolio Managers (IACPM) conducted a survey across 45 international banking institutions. The survey reveals that banks need to treat climate risk as a financial risk, not just a reputational, and integrate such considerations into their financial risk management frameworks. It is noted that only half of the institutions (57%) have planned to fully implement the TCFD recommendations. European banks seem to be more prone to adopt TCFD recommendations (77%) while American banks show a lower level of integration. Similarly, in the fourth quarter of 2019 the Institution of International Finance (IIF), in conjunction with the European Banking Federation (EBF), surveyed their members across the world (53 banks and 17 other financial institutions) and found that the adoption of TCFD is at an advanced stage in the more mature economy (60%), while only the 37% of financial institutions in emerging markets are fully or partially compliant with the recommendations. However, the survey confirms that better processes for risk management are still needed: if 45% of survey participants stated that their risk management framework includes an explicit process for the identification and assessment of climate-related issues, only 17% have fully integrated this process into their organization's overall risk management framework.

In the same year, the EBA (2019) conducted a survey on 38 banks aimed at collecting information from credit institutions on current practices on the definition of ESG factors and the incorporation of sustainability into business strategies. The results suggest that, although the large majority of institutions have already disclosed ESG information (81%), very few institutions (fewer than one in five) have specific risk management practices in place. In particular, despite the growing acknowledgement of climate-related risks from a prudential risk management perspective, the incorporation in the risk management framework, the development of proper risk management functions and the definition of identification and assessment tools are still at preliminary stages. The survey by the NGFS (2020) confirms that only a small percentage of banks use scenario analysis or stress tests (22%), while even fewer banks have incorporated climate risk or ESG risks in their internal model for credit evaluation. More commonly, banks tend to choose to not finance sectors with a high negative environmental impact or to limit credit exposure to more controversial sectors. Despite the low level of integration, the ECB (2020c) in a survey on 107 significant institutions (SIs) and 18 less significant institutions (LSIs) observed a clear positive trend in the level of climate-related disclosures over the past two years. In detail, the number of institutions that do not disclose any information on climate-related risks has reduced substantially, from 35% in 2019 to 14% in 2020. In addition, most institutions (58%) incorporate the information in their annual report. Finally, although the diffusion of scenario analysis and stress tests is very limited, the survey highlights that all the indicators are increasing from 2019, suggesting a growing awareness about the importance of climate-related risk for a bank's business strategy in the short, medium and long term. Another relevant initiative was the survey carried out in 2021 by Aifirm (2021) on a sample of 31 Italian banks (16 of which LSIs and the remaining 15 SIs¹²). Also this survey underlined the difficulties of the banks in integrating the ESG factors in their risk management frameworks. The tables below will present in more details some other relevant findings of the survey carried out by the Aifirm.

Table 1

	Have ESG considerations been integrated in the loan origination process?				
	No	No, but expect to integrate them by 2023	Yes, with ad-hoc procedures	Yes, into pre-existing processes	Yes, both (ad-hoc procedures and pre-existing processes)?
LSIs sample (16 banks)	25%	56%	13%		6%
SIs sample (15 banks)	7%	53%	20%	13%	7%

Source: AIFIRM (2021)

As reported in Table 1, one of the questions of the survey asked the banks to state whether they integrated the ESG risks in their loan origination process. The majority of the respondents of the LSIs sample (56%) have not integrated yet the ESG considerations (they nevertheless plan to do so by 2023) in their loan origination process; another 13% responded that they created ad-hoc procedures to incorporate the ESG considerations into the loan origination process of the bank while an additional 6% incorporated the ESG considerations by changing the pre-existing loan origination process and creating ad-hoc procedures; the remaining 25% of the respondents did not incorporate the ESG considerations nor plans to do so in the near future. Of the SIs sample, 53% of the respondents reported not having integrated yet the ESG considerations in the process (they plan to do it by 2023); another 20% responded that ad-hoc procedures have been implemented and 13% integrated the ESG considerations in the pre-existing process; an additional 7% integrated the ESG considerations by both changing the pre-existing processes and by creating ad-hoc procedures. The remaining 7% of the respondents declared that they have not yet incorporated the ESG considerations into the loan origination process and do not intend to do it in the near future.

¹² 52% of the banks in the sample have less than 30 bn of assets, 26% between 30 and 150 bn and the remaining 23% more than 150 bn of assets.

Table 2

	Have you got information on the CO2 emissions of the corporate borrowers to which you lend money/invested in?		
	Yes	No	Under development
LSIs sample (16 banks)	6%	75%	19%
SIs sample (15 banks)	7%	53%	40%
All institutions in the sample	6%	65%	29%

Source: AIFIRM (2021)

Another question (see Table 2) asked the banks to state whether they have data on the CO2 emissions of the corporate borrowers to which they lend money or invest in. Overall, 29% of the respondents in the whole sample replied that they are in the process of collecting such information. However, the percentage of the respondents that is envisaging to gather this information is somewhat higher (40% vs 19%) in the sample of SIs as compared to those of the LSIs. The percentage of respondents that already collects this information is equal to 6% (7% of the SIs and 6% of the LSIs) whereas the remaining 65% (53% of SIs and 75% of LSIs) responded that they do not have this information.

Table 3

	Do you take into account the impact of different policy scenarios (e.g. potential policies aimed at curbing the increase in temperatures by 2 degrees) when managing your credit/investment portfolio?			
	Yes, for credit portfolio	Yes, for both	No, but we aim to implement it by 2023	No
LSIs sample (16 banks)	6%		44%	50%
Sis sample (15 banks)	7%	7%	60%	27%

Source: AIFIRM (2021)

The respondents were asked if they are already considering the potential impact of a policy change (e.g. policies aimed at curbing the increase in temperatures at 2 degrees) when managing their credit or investment portfolios (see Table 3). Of the banks belonging to the SIs sample, 7% reported they already take into account this scenario while managing their credit portfolio; another 7% reported that they are currently doing it for both (credit and investment portfolios), 60% will do it by 2023 and 27% are not doing it and will not do it in the near future. For the banks belonging to the LSIs sample, 50% reported that they are not considering it and they do not intend to do so in the near future; 6% consider the impact of a policy change scenario when managing its credit portfolio and the remaining 44% will do so by 2023.

Table 4

	Do you publish an annual non financial report aimed at presenting information on sustainability?		
	Yes, as it is requested by national laws	Yes, on a voluntary basis	No
LSIs sample (16 banks)	56%	25%	19%
Sis sample (15 banks)	86%	14%	
All institutions in the sample	70%	20%	10%

Source: AIFIRM (2021)

Finally, questioned on whether they currently publish a non financial report disclosing information on sustainability, the entirety of the SIs institutions replied that they do it (in 86% of cases as it is requested by national laws and the remaining 14% on a voluntary basis). For the LSIs 56% of the respondents reported that they publish such a report to comply with the law, 25% publishes it on a voluntary basis and the remaining 19% does not publish any non-financial report featuring sustainability information. Thus, with regard to the entire sample, 70% of the respondents disclose information to comply with the national regulation, 20% disclose information on a voluntary basis and the remaining 10% do not disclose any non-financial information related to sustainability. All in all, as shown in the results of the abovementioned surveys and particularly in the ECB's report (2021a) credit institutions are taking steps to adapt their policies and procedures to properly integrate the climate and environmental risks in their risk management practices but much more still has to be done (such as for instance improving the data quality, develop suitable risk reports for the management bodies). Along these lines, the survey on the Italian banks carried out by Aifirm highlighted that the SIs sample of banks has shown more readiness for the implementation of the ESG risks in their business processes. Notwithstanding the slight delay, the sample of LSIs banks seems to be on track for introducing the ESG considerations in their most relevant internal process.

6. Conclusions

The article discussed the challenges credit institutions face in integrating the ESG risks into their governance and risk management frameworks. It also included some recommendations for banks on how to successfully address these challenges. These recommendations are drawn from best practices as well as from expert judgement. As such, they are not meant to be exhaustive and comprehensive. Additional works in this area could further enhance the recommendations for banks based on the analysis of other relevant practices.

As shown in the surveys that have been presented in the article, European banks will still need to make extra efforts to successfully integrate the ESG risks in their business processes. Indeed, it is expected that further improvements in this regard are underway and will be further developed in the course of this year and the next. Finally, to properly assist the banks in this activity, European regulators and supervisors will have to continue to define clear expectations as well as clear standards on how to assess and manage these sources of risks.

References

- ACPR, (2021). "A first assessment of financial risks stemming from climate change: the main results of the 2020 climate pilot exercise". Available at: https://acpr.banque-france.fr/sites/default/files/medias/documents/20210602_as_exercice_pilote_english.pdf (Accessed: 2022);
- Aifirm, position paper n.31, (2021). "Economia sostenibile: rischi ed opportunità per il Sistema bancario italiano". Available at: <https://www.aifirm.it/wp-content/uploads/2016/03/2021-Position-Paper-31-Economia-Sostenibile1.pdf>. (Accessed: 2022);
- Al-Hadi, A., Chatterjee, B., Yafian, A., Taylor, G., & Monzur Hasan, M. (2017). "Corporate social responsibility performance, financial distress and firm life cycle: evidence from Australia". *Accounting & Finance*, 59(2), 961–989.
- Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). "A climate stress-test of the financial system". *Nature Climate Change*, 7(4), 283–288.
- Berg, F., Koelbel, J. F., & Rigobon, R. (2019). "Aggregate confusion: the divergence of ESG ratings". MIT Working Paper.
- BCBS, (2013). "Principles for effective risk data aggregation and reporting". Available at: <https://www.bis.org/publ/bcbs239.pdf>. (Accessed: 2022);
- Branco, M. C., & Rodrigues, L. L. (2006). "Corporate social responsibility and resource-based perspectives". *Journal of business Ethics*, 69(2), 111-132.
- Brogi, M., & Lagasio, V., (2019). "Environmental, social, and governance and company profitability: Are financial intermediaries different?". *Corporate Social Responsibility and Environmental Management*, 26(3), 576-587.
- Brooks, C., & Oikonomou, I. (2018). "The effects of environmental, social and governance disclosures and performance on firm value: A review of the literature in accounting and finance". *The British Accounting Review*, 50(1), 1-15.
- Choi, U. Kennedy, L. Wiesner, R. (2021). "Post-implementation Review of IFRS 9 Classification and Measurement".
- Dietz, S., Bowen, A., Dixon, C., & Gradwell, P. (2016). "Climate value at risk" of global financial assets". *Nature Climate Change*, 6(7), 676–679.
- Dimson, E., Marsh, P., & Staunton, M., (2020). "Divergent ESG Ratings. The Journal of Portfolio Management".
- DNB, (2020). "Good Practice Integration of climate-related risk considerations into banks' risk management". Available at: <https://www.dnb.nl/voor-de-sector/open-boek-toezicht-sectoren/banken/prudentieel-toezicht/good-practice-integration-of-climate-related-risk-considerations-into-banks-risk-management/#:~:text=DNB%20expects%20that%20banks%20understand,other%20type%20of%20material%20risk>. (Accessed: 2022);
- EBA (2019). "EBA action plan on sustainable finance". Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/EBA%20Action%20plan%20on%20sustainable%20finance.pdf. (Accessed: 2022);
- EBA, (2020a). "Guidelines on loan origination and monitoring". Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Guidelines/2020/Guidelines%20on%20loan%20origination%20and%20monitoring/884283/EBA%20GL%202020%2006%20Final%20Report%20on%20GL%20on%20loan%20origination%20and%20monitoring.pdf. (Accessed: 2022);
- EBA (2020b). "Sustainable Finance: Market Practices". EBA staff paper series, 6, 1-48. Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/Sustainable%20finance%20Market%20practices.pdf. (Accessed: 2022);
- EBA, (2021a). "Advice to the Commission on KPIs and methodology for disclosure by credit institutions and investment firms under the NFRD on how and to what extent their activities qualify as environmentally sustainable according to the EU taxonomy regulation". Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/About%20Us/Missions%20and%20tasks/Call%20for%20Advice/2

[2021/CfA%20on%20KPIs%20and%20methodology%20for%20disclosures%20under%20Article%208%20of%20the%20Taxonomy%20Regulation/963619/EBA%20Opinion%20-%20Advice%20to%20EC%20on%20Disclosures%20under%20Article%208%20Taxonomy%20Regulation.pdf](https://www.efsa.europa.eu/en/consultations/consultation/2021/CfA%20on%20KPIs%20and%20methodology%20for%20disclosures%20under%20Article%208%20of%20the%20Taxonomy%20Regulation/963619/EBA%20Opinion%20-%20Advice%20to%20EC%20on%20Disclosures%20under%20Article%208%20Taxonomy%20Regulation.pdf). (Accessed: 2022);

- EBA (2021b). “EBA Report on management and supervision of ESG risks for credit institutions and investment firms”. Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1015656/EBA%20Report%20on%20ESG%20risks%20management%20and%20supervision.pdf. (Accessed: 2022);
- EBF (2021). “Management and supervision of ESG risks for credit institutions and investment firms: EBF response to EBA consultation”. Available at: https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Discussions/2021/Discussion%20Paper%20on%20management%20and%20supervision%20of%20ESG%20risks%20for%20credit%20institutions%20and%20investment%20firms/935496/2020-11-02%20ESG%20Discussion%20Paper.pdf. (Accessed: 2022);
- European Commission (2020). “Study on sustainability-related ratings, data and research”. Available at: <https://op.europa.eu/en/publication-detail/-/publication/d7d85036-509c-11eb-b59f-01aa75ed71a1/language-en/format-PDF/source-183474104>. (Accessed: 2022);
- European Commission, (2021). “Development of Tools and Mechanisms for the Integration of ESG Factors into the EU Banking Prudential Framework and into Banks' Business Strategies and Investment Policies”. Available at: https://ec.europa.eu/info/publications/210827-final-study-esg-factors-banking_en. (Accessed: 2022);
- ECB (2020a). “Financial stability review”. Available at: <https://www.ecb.europa.eu/pub/pdf/fsr/ecb.fsr202011~b7be9ae1f1.en.pdf>. (Accessed: 2022);
- ECB, (2020b). “Guide on climate-related and environmental risks. Supervisory expectations relating to risk management and disclosure”. Available at: <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguideonclimate-relatedandenvironmentalrisks~58213f6564.en.pdf>. (Accessed: 2022);
- ECB (2020c). “ECB report on institutions' climate-related and environmental disclosures”. Available at: https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.ECB_Report_on_climate_and_environmental_disclosures_202203~4ae33f2a70.en.pdf. (Accessed: 2022);
- Freeman, R.E. (1984). Strategic Management: A Stakeholder Approach. Pitman: Boston, MA, USA, 35–42.
- ECB (2021a). “The state of climate and environmental risk management in the banking sector, report on the supervisory review of banks' approaches to manage climate and environmental risks”. Available at: <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202111guideonclimate-relatedandenvironmentalrisks~4b25454055.en.pdf>. (Accessed: 2022);
- ECB (2021b). “ECB economy-wide climate stress test”. Available at: <https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op281~05a7735b1c.en.pdf>. (Accessed: 2022);
- Gramlich, D., & Finster, N. (2013). “Corporate sustainability and risk. Journal of Business economics, 83(6), 631-664.
- IIF (2020). “Global climate finance survey. A look at how financial firms are approaching climate risk analysis, measurement and disclosure”. Available at: <https://www.ebf.eu/wp-content/uploads/2020/01/Global-Climate-Finance-Survey-2020.pdf>. (Accessed: 2022);
- Kerber, R., & Flaherty, M. (2017). “Investing with green ratings? A gray area”. Reuters.
- KPMG (2021). “Climate disclosures within the Annual Financial Reports of Banks (Phase 1)”. Available at: <https://home.kpmg/be/en/home/insights/2021/04/ba-banks-climate-change-reporting.html>. (Accessed: 2022);
- LaBella, M. J., Russell, J., & Novikov, D. (2019). “The devil is in the details: the divergence in ESG data and implications for responsible investing”. Research paper QS Investor.
- Miralles-Quirós, M. M., Miralles-Quirós, J. L., & Redondo-Hernández, J. (2019). “The impact of environmental, social, and governance performance on stock prices: Evidence from the banking industry”. Corporate Social Responsibility and Environmental Management, 26(6), 1446-1456.
- Nizam, E., Ng, A., Dewandaru, G., Nagayev, R., & Nkoba, M. A. (2019). “The impact of social and environmental sustainability on financial performance: A global analysis of the banking sector”. Journal of Multinational Financial Management, 49, 35-53.
- NGFS (2020). “A status report on financial institutions' experiences from working with green, non green and brown financial assets and a potential risk differential”. Available at: https://www.ngfs.net/sites/default/files/medias/documents/ngfs_status_report.pdf. (Accessed: 2022);
- Nieto, M. J. (2019). “Banks, climate risk and financial stability”. Journal of Financial Regulation and Compliance, 27(2), 243-262.
- Oliver Wyman (2019). “Climate change. Managing a new financial risk”. Available at: https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2019/feb/Oliver_Wyman_Climate_Change_Managing_a_New_Financial_Risk1.pdf. (Accessed: 2022);
- Porter, M.E., & Kramer, M.R. (2011). “Creating shared value”. Harvard Business Review, 89, 62–77.
- Post, J., Preston, L., & Sachs, S. (2002). “Redefining the Corporation: Stakeholder Management and Organizational Wealth”. Stanford University Press: Palo Alto, CA, USA, 110–131.
- Sassen, R., Hinze, A.-K., & Hardeck, I. (2016). “Impact of ESG factors on firm risk in Europe”. Journal of Business Economics, 86(8), 867–904.
- TCFD (2017). “Recommendations of the task Force on Climate-related Financial disclosure”. Available at: <https://www.fsb-tcfd.org/recommendations/#:~:text=The%20TCFD%20recommendations%20on%20climate,included%20in%20mainstream%20financial%20filings>. (Accessed: 2022).

COVID-19: managing a pandemic risk with a Non-physical Damage Business Interruption policy

Valentina Lagasio, (Sapienza, University of Roma); Fabrizio Santoboni, (Sapienza, University of Roma); Davide Tremoglie, (Sapienza, University of Roma)

Article submitted to double-blind peer review, received on 7th February 2022 and accepted on 15th April 2022

Abstract

Pandemic risks, such as Covid-19, are difficult to insure because they are characterized by multiple risks and losses that can affect a variety of enterprises and people at the same time. Insurers are unable to generate accurate pricing due to a lack of time series and granular statistical data. To address the pandemic risk posed by the spread of Covid-19, we present a model of Catastrophe Risk with Non-Damage Business Interruption Policies (NDBI). The model entails a Monte Carlo simulation of various shutdown situations, as well as the frequency and severity of losses suffered by Italian SMEs. The research emphasizes the relevance of NDBI policies for both the firms - which can cover their losses - and insurance companies - that can achieve a profit margin thanks to the reinsurance.

I rischi pandemici, come il Covid-19, sono difficilmente assicurabili, in quanto oltre ad essere caratterizzati dalla presenza di molteplici fattori di rischio, possono condurre a rilevanti perdite e coinvolgere contemporaneamente una molteplicità di imprese ed individui. La scarsa disponibilità di serie storiche e dati statistici sugli eventi in questione impedisce di fatto agli assicuratori di formulare stime attendibili e, pertanto, di procedere a una corretta tariffazione. Obiettivo del presente contributo è quello di individuare una soluzione in chiave gestionale del rischio pandemico associato alla diffusione del Covid-19 attraverso una gestione del Catastrophe Risk con polizze Non-damage Business Interruption, utilizzando il metodo Montecarlo seguendo un approccio frequency-severity per calcolarne i valori attuariali significativi (Premio, Utile, VaR, SCR, Probabilità di rovina).

Keywords: Covid-19; Polizze assicurative; Riassicurazione; Rischio catastrofale

JEL: C15; G22

1. Introduction

A catastrophe is an event that occurs very rarely and which, in its broadest sense, exceeds the capacity of the affected people to cope with, or absorb, its effects; in the context of natural hazards, it is an extreme event that causes widespread and typically sudden damage or suffering (Mitchell-Wallace et al., 2017; Niehaus, 2002; Doherty, 1997; Jaffee & Russell, 1997; Klein & Wang, 2009)

Catastrophe risks arise from extreme and unexpected events. In the insurance sector, disasters can be divided into two broad categories: catastrophes related to human activity (Man-Made or Technical catastrophes) or generated by nature itself (Natural Disasters) (Swiss Re, 2002). The term "Natural Catastrophe" refers to an event caused by natural forces that can lead to very significant losses and involve a very large number of individuals. The extent of the losses deriving from a catastrophe is not only a function of the intensity of the natural forces that are spread out, but it also concerns factors directly dependent on human actions, such as the design of buildings or the efficiency of the control of disasters in the affected region (Swiss Re, 2019)

Windstorms, floods, hail, volcanic eruptions, earthquakes, are just a few examples of natural disasters. A natural disaster can evidently cause loss of human lives and considerable damage, the extent of which will also depend on the population density of the involved community¹ and its ability to return to a sustainable living condition relatively fast in the aftermath of the event.

Within the insurance sector, it is a shared opinion that disasters are commonly based on an event that exceeds at least one of several thresholds, expressed, for example, in terms of overall economic losses, insured losses, and loss of human lives (Swiss Re, 2015). Broadly speaking, events which appear to be so heterogeneous, such as disasters, present, on closer inspection, many similarities, so much so that at least five common characteristics can be pinpointed:

1. the occurrence of the catastrophic event must cause multiple claims in different times and places, so that the sum of the individual damages is very high;
2. all claims must be related to the same cause, which has to be of an extraordinary and exceptional nature. Therefore, neither the event that causes a single damage, even if considerable in its entity (due to the lack of the first requirement), nor the catastrophe caused by events that generate a plurality of damages which are normally covered by insurance (due to the lack of the second requirement) fall within the definition of catastrophe-risk;
3. a probability can be associated with the occurrence of the event;
4. a damage can be associated with the occurrence of the event;
5. the event is susceptible to the variability of claims over time.

¹ Damage to people, in the event of floods or volcanic eruptions, can be contained or even avoided if adequate preventive measures are taken.

A catastrophe risk, even if it has a low probability of occurrence, can seriously compromise the economic stability of an insurance company, as a result of the relevant and extensive damage it can cause. In fact, the presence of such type of risk within the insurance portfolio impacts the probability of default of the company and, consequently, the variability of the entire portfolio (Stone, 1973)

It seems therefore appropriate to pay particular attention when taking on and managing this particular type of risk, so as to avoid potential (and serious) imbalances on the overall management of the company.

From this perspective, Italy shows a high exposure to the risks of natural disasters, which, in addition to terrible loss of lives, can also cause serious damage to real estate assets. Besides, the damages associated with the occurrence of such events have always given rise to direct intervention by the State, while insurance companies have actually played only a marginal role. This situation exposes public finance to serious risks and would suggest a greater diffusion of "ad hoc" insurance policies (IVASS, 2019).

In recent months, the risks associated with natural disasters have been joined by those related to the Covid-19 pandemic, which represented - and still represent - a serious threat to public health (ECDC, 2020). However, the Covid-19 pandemic has not only had a huge impact on the health sphere, but also on an economic and financial level. In particular, in our country, both income and purchasing power have shrunk for a huge percentage of workers, with a consequent widespread failure to comply with their financial obligations (by way of example, failure to repay loans and / or payment of utilities).

Considering the above, in this work we want to propose a model for the pricing of a "Non-physical Damage Business Interruption" (NDBI) insurance policy (which in the field of non-life insurance can be placed in the "Financial loss" or "Miscellaneous Financial Loss" business) with an associated "Catastrophe excess of loss", i.e. a form of non-proportional reinsurance that protects the insurance company against an accumulation of losses due to single events. The main purpose of such form of reinsurance is to protect the financial stability of the insurer and to "level out" the alternating financial results associated with years in which catastrophic events do or do not occur (Mata, 2006).

The above-mentioned model applied with a frequency-severity standard is based on three main phases:

1. Monte Carlo simulation of the lockdown scenario (if and how many lockdowns occur in Italy in a year);
2. in the event of lockdown, simulation of the number of SMEs that will report their business interruption to the insurance company (frequency);
3. estimate of the amount to be compensated to SMEs that have interrupted the activity (severity), obtaining the distribution of the global compensation to be used for calculating the relative actuarial values.

We will particularly focus our attention on our country, since a few theoretical studies and empirical surveys have shown that the percentage of companies protected by an appropriate insurance "umbrella" appears to be rather low in Italy. The reasons behind the lack of insurance coverage undoubtedly include the low perception of risk exposure and the high cost of insurance services. Moreover, companies mostly cover the risk of fire, theft and robbery and civil liability towards third parties and employees, while little attention is paid to the risk of business interruption, especially when it comes to signing "ad hoc" insurance policies (Santoboni et al., 2012).

After all, the impact of the Covid-19 health emergency, which forced many companies to reduce or stop their activities, has been magnified precisely by the lacking coverage of the "Business Interruption Risk": in Italy only 3% of SMEs are specifically insured; in addition, small companies in the most affected sectors, such as transport and the entire tourism industry, have experienced significant decreases in their turnover in 2020 compared to 2019 (Cerved, 2020).

This work is structured as follows. In paragraph 2, the negative effects on companies and people linked to the spread of the Covid-19 pandemic are outlined, likewise highlighting the characteristics of the Italian situation. In paragraph 3, a few of the current ways of managing disaster-related risks with insurance contracts are described. Paragraph 4 focuses on the description of the proposed model and on the discussion of the achieved results. Paragraph 5 includes the concluding remarks.

2. The Covid-19 pandemic

Not only is the current pandemic caused by Covid-19 a serious event with a high social impact, which puts public health at risk on a global level, but from a macroeconomic point of view, it also represents a catastrophic event endangering the functioning of many private and public companies (Agosto et al., 2021). 2020 represented an "annus horribilis" for world economies, which were lashed by a strong global recession, which in 2020 alone recorded a decline of 3.4% compared to the previous year (with even worse levels in the Eurozone), even though 2021 is showing a favorable trend reversal (Eurostat, 2020; OECD 2021).

Due to the pandemic emergency, the world's economies have had to face a considerable increase in measures aimed at containing the pandemic, with serious implications at economic and social level: although the limitations following the imposition of lockdowns have contributed to reducing the spread of the infection, with favorable effects from a health perspective, from an economic point of view there were shocks both on the demand side and on the supply side.

On the demand side, the restrictive measures on individual mobility have a direct and immediate negative impact on domestic consumption and net exports, as well as on business investments. With regard to the shock on the supply side, the direct consequences of interrupting all activities in a specific sector and in a specific geographical area can lead to indirect "contagion" effects in other sectors and other areas as well, depending on the degree of vertical integration (i.e. interdependences) of such activities and the related level of globalization. Such a shock can only be partially mitigated by replacing "physical presence"

activities with remote work (smart working), since de facto, it excludes important sectors operating in the service sector (such as tourism, catering, entertainment) and the industrial sector, for which the bans determine the closure of plants and factories².

On the other hand, as the duration of the lockdown increases, for many companies it becomes also more likely that the interruption of their activity can turn from temporary into permanent, constituting in fact the conditions for a final closure (especially in cases of vulnerable finances or assets).

To the aspects highlighted above, we often need to add the decrease in employee productivity - due to the fear of contagion, the social distancing, the need to tend to sick family members -, the lack of labor force due to death, illness, and confinement of workers (Marsh & McLennan, 2020).

The combination of the aforementioned factors has recently prompted many insurance companies to develop insurance products that can offer coverage to employees even in the event of Covid-19 infection.

2.1 A focus on Italy

The decision to focus our analysis on the Italian context is because the Covid-19 pandemic started to spread a few weeks earlier in our country, compared to other advanced economies (i.e. Europe and US). The social distancing measures introduced in Italy were severe and initially included the closure of schools and the interruption of public events; then, starting from 9th March 2020, limitations on the free movement of people even within national borders, the closure of certain commercial activities and, lastly, from 28th March 2020, the interruption of industrial activities in several non-essential sectors. At the beginning of March 2020, therefore, the lockdown has mostly affected the service sector, in which - where possible - remote working (smart working) became largely used.

The Covid-19 pandemic has particularly affected our country both from a humanitarian point of view (Italy has been the fourth country in the world with the highest deadliness), and from an economic point of view: in the European context, Italy was among the countries that suffered the worst impact on its GDP (-17.7% in the second quarter of 2020, compared to an average EU figure of -13.9%), while the employment rate decreased by around 20% compared to 2019 (Eurostat, 2020).

Furthermore, according to Istat data referring to the first quarter of 2020, the limitation of manufacturing activities in March has involved 34% of the overall production and about 27% of the added value. In April 2020, industrial production decreased by more than 40% compared to April 2019, with an even more significant decline in certain sectors (around -85% for durable consumer goods and -53% for capital goods) and a lesser impact in other sectors (-29% for non-durable consumer goods and -14% for the energy sector). The data updated as of May 2020 indicate a partial recovery, marking an overall contraction in industrial production equal to -20% compared to the previous year (ISTAT, 2020).

3. Covid-19 pandemic risk management with a (NDBI) policy

The Covid-19 pandemic has had a major impact within trade-related workplaces, resulting in increased health risks for frontline workers supporting commercial operations, supply chain transactions and logistics. In the context of risk management techniques that can be used to tackle the Covid-19 pandemic, which tend to minimize long lasting negative impacts, the use of Business Interruption (BI) insurance policies could certainly play a fundamental role. These are policies that generally represent the extension of a property policy, effectively protecting the insured company in the event of business interruption by dealing with the relative loss of profit or with the higher costs to be incurred (Rose & Lim, 2002).

In the insurance practice, the use of NDBI insurance policies is proliferating, allowing companies that use them to benefit from the same protection and coverage as the "non-life" BI, however with one substantial difference: the interruption of the company's business - or of one of its departments or plants - originates from events that do not necessarily cause material damage, but rather from the so-called "trigger events", which are events that cause the interruption of the activity of a particular business without producing material damage.

In the past decade, due to the spread of several epidemics such as SARS, MERS, ZIKA, numerous insurance companies have started to offer NDBI insurance solutions to businesses. Since such policies produce their effects even in the absence of material damage, they are well suited for protection from business interruptions and / or profit losses deriving from risks associated with epidemic events; these policies also allow to obtain coverage for damages resulting from measures issued by the Authorities (such as electricity blackouts, strikes and cyber-attacks, etc.). It is therefore clear that (NDBI) policies can represent a valid solution for the protection of companies in the current Covid-19 pandemic.

In the analysis of catastrophe risks, such as the one related to the Covid-19 pandemic, stochastic models play a leading role and are essentially developed for risk management in insurance and reinsurance contexts. These models provide good support to management to identify all the strategies that allow for the diversification and mitigation of the risk impending on the entire portfolio (especially as regards reinsurance policies) and to determine an appropriate insurance premium (Lakdawalla & Zanjani, 2012; Finken & Laux, 2009).

² According to Cerved data (2020), the sectors with the greatest losses in their 2020 turnover were the following: Travel agencies and tour operators -51.3%; Air transport -50.8%; Hotels -47.1%; Transport management -46.7%; Restaurants/Catering -33.8%.

4. The model

Based on what we have asserted so far, the NDBI policy appears particularly suitable for guaranteeing the business continuity of micro, small and medium-sized manufacturing, commercial and service businesses; it is therefore not only a prerogative for large companies.

Besides, the observation of the Italian production context testifies to the fact that SMEs are the most vulnerable companies to the Covid-19 NDBI risk: in fact, since they do not have the same financial strength as large companies, the prolonged interruption of their business for a certain period of time could represent, to all intents and purposes, the prelude to default.

Despite the impact of the health emergency, which forced many of these companies to reduce or stop their business, in the second half of 2020 only 3% of SMEs had specific BI coverage in Italy. Considering that the Covid-19 pandemic has not stopped and that it has continued - and still continues - to display its negative effects not only from a health perspective, but above all from an economic perspective, it is clear that for SMEs the drafting of a NDBI policy has now almost become necessary to secure business continuity.

The model considers a catastrophic condition including a "lockdown" occurrence, and the study is specifically applicable to Covid-19. Because the data and historical series available were evaluated at the start of the Covid-19 pandemic, they are "limited," confirming how difficult it is to foresee and hence estimate a similar disaster risk. Indeed, many situations and variables have altered since then. The purpose of this paper is to show how the methodology used to create the model could be a good starting point for facing up to economic damage caused by the emergence of any catastrophic risks, such as Covid-19, but also pandemics, wars, and other events that, in the future, could cause the "lockdown" event and all the previously mentioned disastrous economic situations. Indeed, it is well known that if this model would have been implemented for preventing the Covid-19 pandemic, it may have resulted in less economic hardship, particularly for the public, by stipulating an NDBI policy with insurance; in fact, the state's public expenses in support of SMEs forced to close would have been lower. Although it is difficult to estimate the likelihood of an event leading to a lockdown, such as in the case of a pandemic, we are aware that there are thousands of viruses in the world that can potentially cause situations similar to Covid-19, so much so that all European Union countries are required to prepare pandemic plans that must be monitored and updated on a regular basis based on the presence of viruses. The model calculates the likelihood of a pandemic-related lockdown after it has occurred. This assessment, specifically of Covid-19, is based on scientific evidence, namely that when a virus spreads, it follows cyclical patterns, specifically in waves, as was the case with the Spanish pandemic, which lasted two years with waves of expansion and relegation. In fact, despite the vaccine, Covid-19 has recorded four waves to date, and many scholars and virologists fear a fifth. When the chance of the virus reappearance is practically definite, the lockdown variable is analyzed, and with it, the actuarial values useful for evaluating the policy are attained.

From the insurer's point of view, it is clearly undeniable that the management of a portfolio of NDBI policies requires great attention, and the adoption of a very rigorous and complex risk management process. Suffice it to think, in fact, that - unlike other catastrophic events (such as hurricanes, earthquakes, floods), usually limited to well defined areas - pandemics and particularly Covid-19, can cause a dangerous "accumulation factor" of risk for any insurance company, given its enormous and sudden capacity for spreading and the equally huge potential economic losses associated to it.

Observing the available data, during the worst months of the pandemic, it has been confirmed that the business interruption mainly concerned micro-enterprises, representing as much as 48.7%, compared to 32.7% of small enterprises, 19.2% of medium-sized enterprises and 14.5% of large enterprises, with a share equal to 69.4% of the overall entrepreneurial fabric (which also includes smaller companies, which activity was initially "suspended", then reopened (ISTAT, 2020).

We used two fundamental variables ($\mu; \sigma$) to test the model because we didn't have a comprehensive data set of all the data in the financial statements of the SMEs in Italy. Where μ is a general value of the predicted monthly income of SMEs and σ is the root of their variance.

The first variable considered is the average monthly income expected net of fixed costs of SMEs (not considering variable costs as a forced closure due to the lockdown implies variable costs equal to 0 in the closing period), which according to Cerved data accessed in September 2020 is equal to € 21,239.754, which will be the average of the variable Y (compensation relating to the single damage) in the model.

The second variable considered is the average monthly income expected net of fixed costs of SMEs (not considering variable costs). The latter was calculated first by taking the square root of the variance and reporting its monthly amount, yielding a value of € 16,401,730,000; the mean square deviation was then calculated by taking the square root of the variance and reporting its monthly amount, yielding a final value of € 36,970.4, which in the model turns out to be the stain (compensation relative to the single damage).

The calculation of the variables ($\mu; \sigma$) would be more accurate if the model has been validated on an actual data set, such as assuming that the data in the financial statements of all SMEs, or those who want to insure, are available.

In the study case we are going to propose, the pricing process of an NDBI insurance product is examined, for which it is appropriate to resort to a non-proportional reinsurance treaty of the "Catastrophe Excess Of Loss" type.

In this regard, the above-mentioned Loss of Profits model is applied following not a typically "tailor made" approach, which consists of shaping the insurance policy on the basis of separate accounting data for each individual company, but rather a "standard" approach, taking the average data on the balance sheets of all SMEs that are currently covered by a BI policy in our country (3%).

A detailed description of all the variables implemented in the model is provided in Table 1.

Table 1. Variable description

Nrisc	N. of risks
Nsim	N. of simulations
Lambda	Poisson parameter for the lockdown probability
S	Total refund
PE	Fair Premium
PP	Pure Premium
C	Gross Premium
ε	Probability of failure
SCR_mi	Solvency Capital Requirement with internal model
SCR_fs	Solvency Capital Requirement with standard formula
Q	Quantile $S>0$ with 95%
Sr	Compensation payable by the reinsurer
PEr	Fair Premium of the reinsurance
PPr	Pure Premium of the reinsurance
Cr	Gross Premium of the reinsurance
Spr	Refund post reinsurance
PPpr	Pure Premium post reinsurance
Cpr	Gross Premium post reinsurance
U	Expected compensation (PP-PE)
Upr	Expected compensation post reinsurance

Specifically, the analysis that we are going to propose below has been carried out through the following steps:

- consideration of the empirical distribution of the aggregate damage, after having described and analyzed the statistical bases for defining the technical bases, through the application of a Monte Carlo standard frequency-severity simulation;
- calculation of the gross premium, once the average of the empirical distribution of the aggregate damage (fair premium) has been identified and an adequate safety loading has been added;
- calculation of the Solvency Capital Requirement (SCR) relating to the Premium sub-module of the Non-Life Underwriting Risk, adopting an Internal Model and using a Value at Risk of 99.5%;
- calculation of the reinsurance premium, using a reinsurance model for "catastrophe excess of loss", once the full catastrophe, the extent and the global compensation retained by the insurer and transferred to the reinsurer have been established.

In order to be completed, the analysis has required the use of further hypotheses, namely that:

- the NDBI policy for "lockdown" is mandatory, given the current emergency in Italy. This is to provide universal validity to the model. In fact, the most common type of NDBI coverage is a "tailored" policy, which means that each company insures its own financial loss due to business interruption. The hypothesis of mandatory nature recalls the benefit generated both on the part of the insured and on the part of the insurer by the fact that all SMEs present in Italy are insured with an NDBI policy, regardless of their desire to insure for monetary losses due to business interruption;
- the duration of such policy is annual and its coverage produces effects only in the case of the first "lockdown" event. This second hypothesis is assumed because non-life policies typically have a contractual duration of one year, and because the model algorithm estimates the probability of occurrence of one lockdown, a different calculation should be made to estimate the probability of occurrence of multiple lockdowns;
- the policy guarantees a maximum coverage of one month during the same year. This is to give generality to the model, because on average, when there was a lockdown, a company closed for about a month, and the assessments were made using the average net monthly loss of turnover; however, this does not imply that the company can close for more or less than a month, and that once the lockdown has occurred, it can renew the insurance contract;
- 3% of Italian SMEs sign the NDBI policy contract with the examined company. Indeed, at the time of this assessment only 3% of the Italian SMEs had already stipulated a type of NDBI policy; again, for generality, it was assumed that only one insurance company provided that type of policy, and that all those SMEs insured themselves into it;
- no other company, apart from those already insured, signs any NDBI insurance contract for "lockdown" with the examined insurance company during the said year. This is because when the insurance is new, and no customer enters or leaves the contract during the year in order to make the Premium and Reserve calculations simpler and more general.

We explicitly stress that the methodological approach proposed in this paper relies on the strong hypothesis that the distribution of the global compensation S is not inferred by empirical evidence, we simulated it as described in Section 4.1. So our model will be definitely validated if enough real data would be available.

4.1 Hypothesis and Monte Carlo simulation

In order to model the distribution of the global compensation S^3 that the insurance will have to pay to the policyholders in one year, 100,000 Monte Carlo simulations were performed using a frequency-severity model.

To this end, the following hypotheses have been formulated:

- the variable N , number of "lockdowns" in a year, follows a Poisson distribution with the λ parameter equal to 0.6 (therefore the probability that a lockdown will occur in a year will be equal to $P = 1 - e^{-\lambda} = 0,4511884$);
- for j ranging from 1 to 4,456 (i.e. the number of insured risks), let I_j be the probability that the j -th SME closes during the year due to the "lockdown". It has been assumed that the I_j conditioned to $N > 0$ are i.i.d. (independent and identically distributed) and follow a Bernoulli distribution with parameter 0.7⁴;
- the sum of I_j is the total number of SMEs to be compensated. For the insurer it will therefore be necessary to simulate a number of variables equal to the above-mentioned sum in order to obtain the value to be compensated in euros;
- let Y_j be the variable representing the compensation relating to the j -th SME, which is supposed to be equal to 0 if N is equal to 0. In fact, if the "lockdown" does not occur, the damage to be compensated is 0 and is distributed according to a Lognormal distribution when $N > 0$ ⁵;
- to further highlight the independence between the value of the global compensation and the total number of claims reported, it was decided to multiply the expected value of Y_j by a factor ranging from 1 to 1.3 depending on the value of the sum of the I_j , which we call M , which is distributed according to a binomial (sum of independent Bernoulli).

In the execution of the model algorithm, a number of simulations equal to 100,000 are initially performed. In each simulation:

- a. the number of lockdowns occurred in that situation is simulated. If $N = 0$, then $S_i = 0$;
- b. if, on the other hand, $N > 0$ - therefore with the above-mentioned hypotheses, the premium only covers the first lockdown – we should proceed as follows:
 1. 4,456 bernoulli I_j are simulated and added together to obtain the number M_j of the complaints relating to the i -th simulation;
 2. the factor ranging from 1 to 1.3 is calculated, and it is to be multiplied by the mean of Y_j , then a M_j number of lognormal values are simulated⁶;
 3. the value of S_i will be equal to the sum of the M_i lognormal values, which correspond to the compensation relating to the single SME that has decided to close.

The distribution generated by the simulation is shown in Figure 1, where a mass of probability concentrated in zero can be observed, when the insured event does not occur.

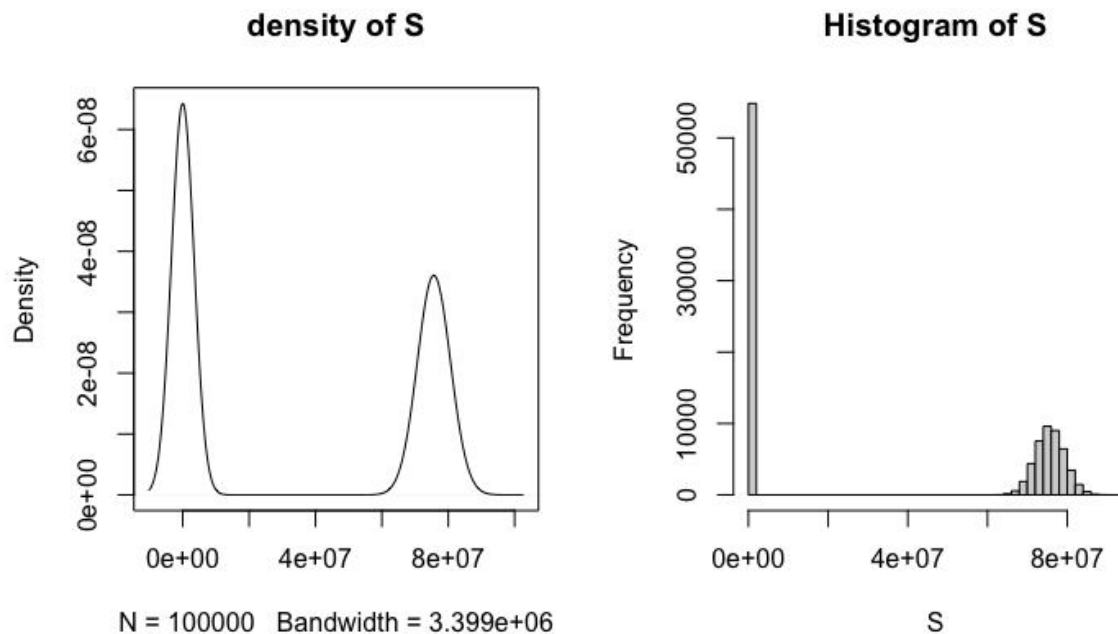
³ From this distribution, significant values such as the expected value, variance and quantiles are calculated and useful actuarial values (VaR, SCR, fair premium) are found.

⁴ Therefore, where the "lockdown" event has occurred, each of the SMEs can independently choose whether to close or not with a sufficiently high probability.

⁵ In this case, the parameters of the lognormal are such that they replicate the mean (21,239.754) and the variance (13,668,108,333) of the average monthly profit of an SME.

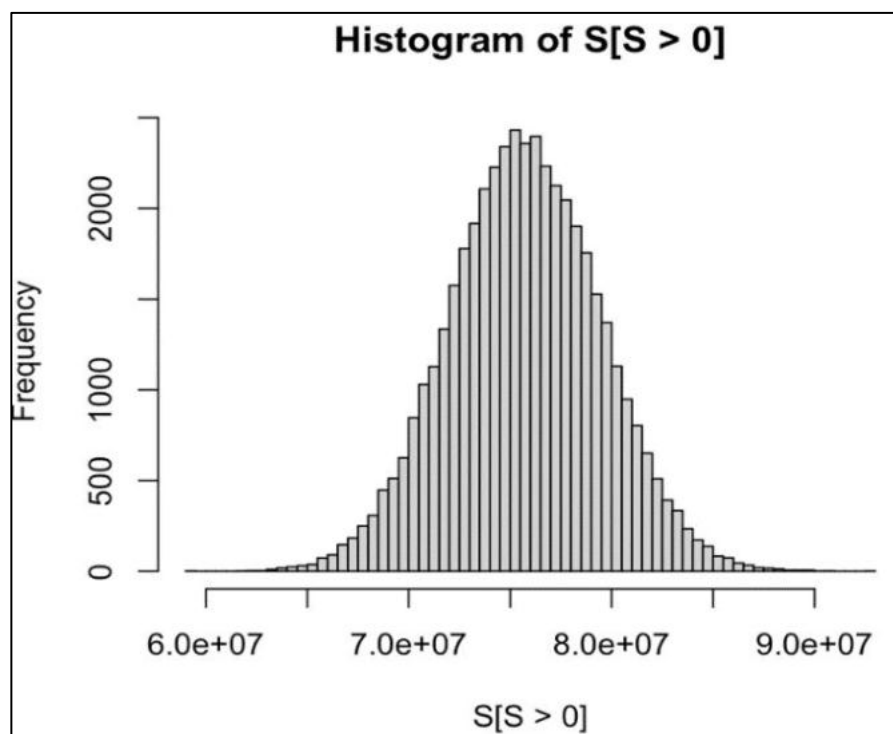
⁶ The total number of claims for each simulation was chosen to emphasize the relationship between the expected number of claims (reports) and the random variable Y (random amount of compensation to be connected with each claim). As a result, a multiplicative factor M is computed, ranging from 1 to 1.3, and it is multiplied by the theoretical average. It is calculated from the total number of complaints, that ranges from 0 to 3,257. We normalize the latter among between 0 and 1, and then recalibrate it, leading to a range from 1 to 1.3, where 1.3 corresponds to the value at the point where the most claims were filed, and 1 corresponds to the smallest number of claims. As a result, M will vary between 1 and 1.3 depending on the total number of complaints to be multiplied by the average of Y .

Figure 1. Empirical distribution of the aggregate damage S.



Conversely, a probability distribution shifted to the right (Figure 2) represents the value of the global compensation in the case that the lockdown event occurs, and it is the sum of the *lognormal*. The model has been calibrated to use the most appropriate probability distributions for defining the technical bases that are used as a reference for calculating the model's contract rate. The random variables for determining the technical grounds in a non-life actuarial valuation are not straightforward. While the technical bases to be considered in a technical assessment of a life insurance product are undoubtedly a financial technical basis (structure by maturity of interest rates or technical rate I recognized to the policyholder) and a demographic, in the case of a technical assessment of a CAT non-life insurance product, the random variables to be considered are a financial technical basis (structure by maturity of interest rates or technical rate I (damage)). To reduce the model's complexity, it was decided to calibrate the random variable Y (random amount of compensation to be associated with each claim; damage function) in this way: after generating the individual compensation values, as many as the total number of complaints depending on the number of total complaints, we find the parameters of a lognormal which replicate the average and variance of the average monthly net incomes of SMEs from ensure, therefore, Y is generated with a lognormal.

Figure 2. Empirical distribution of the aggregate damage $S > 0$



Since the insurance is actuarially fair, the “fair” premium (P) is the expected value of the damage distribution. Therefore, the estimate made for the premium will be the sample mean of the simulated S values. The Fair Premium can be expressed as:

$$\text{Fair Premium or Premium (P)} = \sum_{i=1}^{N_{\text{sim}}} S_i / N_{\text{sim}} = E(S)$$

It is therefore appropriate to use a "functional" that associates a real number (pure premium) to the probability distribution of S.

Given the specific form of the S distribution, caused by the high variability of the insured event, the principle used for calculating the pure premium deemed appropriate in this case was that of the "standard deviation", according to which the safety loading is proportional to the standard deviation of S. The Pure Premium can be written as follows:

Pure Premium (Π) = $P + \gamma\sigma(S)$; con $\gamma > 0$.

Finally, after having found the pure premium Π , an additional safety loading is performed, using the principle of "constant loading", for the calculation of the gross premium (C). The Gross Premium can be expressed as:

Gross Premium (C) = $\Pi + b$; with $b > 0$.

Specifically, we assume that the above constant loading is independent from the riskiness of the contract and that it takes into account:

1. the contract acquisition costs (such as, for example, the purchase commission which constitutes the agent's remuneration);
2. the premium collection costs (such as the collection commission paid to the agent as compensation for managing the collection of premiums);
3. the general management expenses, which include several items of general expenses incurred by the insurance company for the administration of the contract.

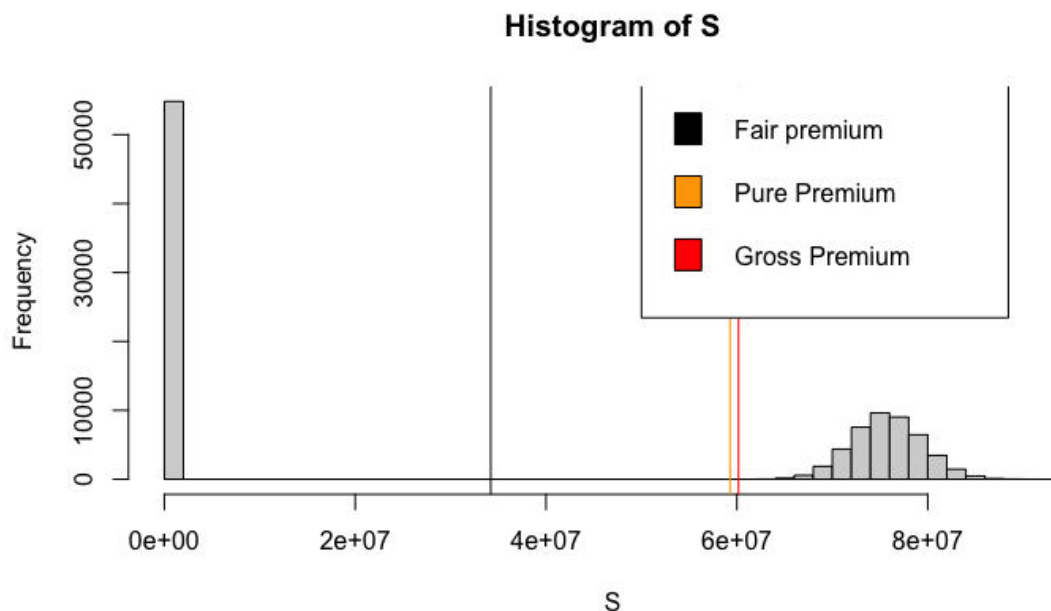
The expected value of the E(S) distribution, as shown in Figure 3, is equal to € 34,203,481; since $E(S)=P$, given the high variability, we choose $\gamma = 0.664$, the Pure Premium Π will be equal to € 59,277,367.

The gross premium, using the constant loading principle, equal to € 200 per contract, will therefore be equal to:

$C = \Pi + 200 \cdot N_{risc} = € 60,168,567.33 €$

As observable, such value is much higher than the expected value of the distribution of the aggregate damage E(S) due to the high variability present in this portfolio of policies (suffice it to think of the distribution range - minimum value and maximum value - observable in the previous figures).

Figure 3. Premium, Pure Premium and Gross Premium



The insurance company will therefore be obliged to indemnify each company that wishes to subscribe to an "NDBI" policy against the payment of a fairly reasonable annual premium equal to € 13,502.82.

As concern the hypotheses, some clarifications are needed. In detail, the λ value 0.6 of the lockdown probability is the result of a series of data retrieved from Cerved at the end of September 2020. The applied technique projected that the lockdown would occur due to an increase in the percentage of intensive care unit admissions (due to the saturation of the health department). As a result, the underlying hypothesis considers an indicator (α) that measures the percentage of ICU beds filled by Covid-19 patients and assumes a nationwide threshold of 30%. By ministerial decree, the first lockdown happens when the α indicator (% of hospital admissions in intensive care) exceeds the limit threshold. It's worth noting that during the model review period, Covid Zones (white, yellow, or red) at the regional level had not yet been established, and the vaccine was still in the testing stage. With the given data, it has been hypothesized that the curve of hospital admissions in critical care surpasses this threshold at least once a year with a

probability of roughly 45%, hence a Poisson distribution has been assigned to this $\lambda = 0.6$ that is thus associated to a probability $P=0.4511885\%$. Everything else is dependent on this value, and while this initial hypothesis is thought to be quite strong, it has no bearing on the model, which can now be readily adjusted with more realistic data and variables. Actually, 100,000 simulations are run in the model using the Monte Carlo method, and then the number of lockdowns in a year is simulated using a Poisson distribution of λ parameter. Modifying this parameter, for example, setting it to 0.3 or equal to 0.2591818, the number of scenarios in which the lockdown does not occur will increase; in fact, the chance of the lockdown occurring has dropped. In particular, the predicted worldwide compensation $E(S)$ as a whole will fall, from € 34,203,481 to € 19,673,659, lowering all major actuarial values that rely on the global compensation for mathematical construction, such as a fair premium, pure, and fare. We further explore the above issue to test the reliability of our hypotheses, and report in Table 2 a sensitivity analysis looking at the results obtained when comparing different λ values as input:

Table 2. Sensitivity analysis

Parameter	Alternative HP1	Our HP	Alternative HP2
λ	0.5	0.6	0.7
$P = 1 - e^{-\lambda}$	0.39346934	0.45118836	€0.5034147
Fair Premium or Premium (P) = E(S)	€29,841,919	€34,203,481	€38,097,018
Pure Premium (Π)	€54,458,505	€59,277,367	€63,292,426
Gross Premium (C)	€55,349,705	€60,168,567	€64,183,626
Annual Premium per company	€12,421	€13,503	€14,404

4.2 Risk of subscribing the SCR Non-Life premium

At this point, let us focus on calculating the SCR. As known, Solvency II provides that maintaining an appropriate level of solvency represents one of the fundamental objectives for the sound management of an insurance company, all the more so where the total amount of costs that will affect the contract portfolio is - precisely - uncertain and unknown at the moment of the stipulation phase. The concept of solvency must therefore be understood in a probabilistic sense and in the context of realistic hypotheses on possible scenarios, particularly on the random elements that constitute them. Therefore, it is possible to consider the concept of solvency as the ability to meet, with an established probability, the random commitments that are realistically described by a probabilistic structure (Pitacco, 2008).

The Solvency Capital Requirement is calibrated in order to ensure that all quantifiable risks to which an insurance or reinsurance undertaking is exposed are taken into account: in this sense, the term covers both existing and "new" risks that should be acquired in the following 12 months and it is calculated as an aggregate value for all business lines, according to a modular logic.

To the best of our knowledge, this is the first attempt in the literature to model the Covid pandemic as a catastrophe risk. As a result, we hypothesized the use of the standard formula due to the following reasoning.

The Solvency 2 framework specifies a number of techniques for computing the SCR, each of which increases in complexity:

- Standard formula;
- Standard formula with company-specific parameters;
- Internal model (partial) and Standard formula (only some risk modules are evaluated with an alternative approach to the Standard Formula);
- "Full" internal model (all risks are assessed by the company with its own methodology)

In the proposed scenario, the Standard formula for calculating the SCR is a series of "factor-based" formulas that companies must apply to their liabilities for various risks; in reality, a correlation matrix is used to combine the numerous risks represented in the sub-modules, which we remember to be in the SCR basic (Market, Health, Default, Life, Non-Life and Intang). The SCR for the Premium & Reserve sub-module of the Non-Life Underwriting Risk is computed in the unique situation of the examined policy; thus, independent of the distribution of the catastrophic risk, the SF is calculated as $3 * \sigma * V$. The non-life branch's XVI policy includes the NDBI policy (pecuniary losses of various kinds, in particular loss of profits). In the XVI non-life class (pecuniary losses), the value of is equal to 0.17 NpLob (100%), where V is the portfolio's premium volume.

Regarding the existing business, the capital requirement only covers unexpected losses and corresponds to the VaR of the basic capital funds of an insurance or reinsurance undertaking subject to a confidence level of 99.5% over a period of one year.

Let $FST(x) = P(ST \leq x)$ be the distribution function of the surplus in $T > 0$, which for simplicity we assume continuous and strictly increasing. Having set a probability ε (which should be considered as "small", that is, less than 0,5), the ε -quantile S, changed in its sign, is defined as the Value At Risk (VaR) of the position; we have:

$$VaR_{\varepsilon}(ST) = -x_{\varepsilon} = -FST^{-1}(\varepsilon). ST.$$

In our case, having found the VaR at 99.5% of the distribution (equal to € 85,179,047), in order to calculate the SCR using the internal model, it will be necessary to subtract the volume of premiums in the portfolio from the annual 99.5% Value at Risk.

As shown in Figure 4, the value of the SCR_IM (SCR Internal Model) that the insurance company must guarantee for the solvency of the risk in the portfolio will be equal to € 25,010,479.67.

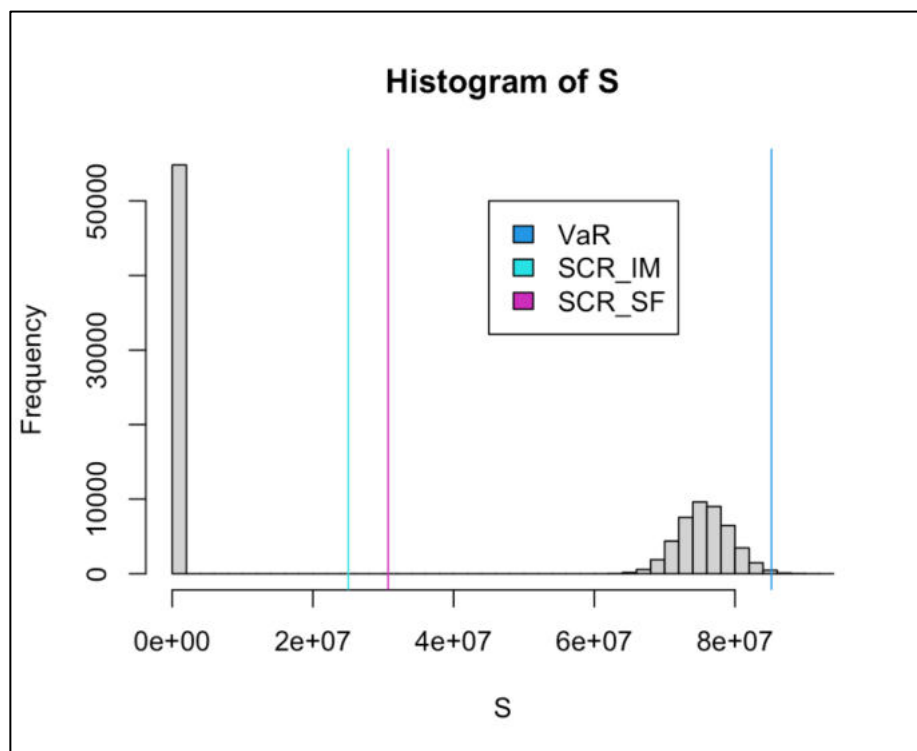
On the contrary, in the case of calculation of the premium SCR using a standard formula, the Solvency II directive provides that the SCR be equal to $3 * \sigma * V$, where:

- for the XVI non-life class (monetary losses), " σ " is equal to $0.17 * NpLob$ (100%);
- V (in our case "C") is the volume of premiums in the portfolio

The SCR_SF according to the standard formula is therefore equal to $3 * 0.17 * 60,168,567.33 \text{ €} = \text{€ } 30,685,969.34$.

Since the SCR required by applying the standard formula is greater than that obtained by adopting an internal model, the insurance company in question would clearly find it more convenient to apply this latter method for calculating the SCR.

Figure 4. Solvency capital requirement and VaR



Furthermore, in order to provide useful information on the riskiness of the portfolio, a fundamental objective for the insurer is to keep at a relatively low level (equal to a threshold deemed as acceptable, ε) the probability of the event "random burden for compensation exceeds the sum of the global increase of pure premiums ($P + r$) and of the solvency margin (W) initially available to the insurer in relation to the portfolio".

This can be expressed as:

$$\varepsilon = \Pr\{G < -W\} = \Pr\{X > W + P + r\}$$

Therefore, the probability of the event $\{X > W + P + r\}$ is aptly called the "annual probability of failure" of the insurer in relation to the portfolio and in our model $\varepsilon = 0.005$.

4.3 "Catastrophe Excess of Loss" Reinsurance

In order to reduce the annual probability of failure (ε), it is assumed that the insurance company decides to enter into a non-proportional reinsurance treaty of the "Catastrophe Excess of Loss" type.

This type of reinsurance refers to claims arising from a single catastrophic event, which affect multiple contracts in the portfolio.

With reference to a civil liability insurance portfolio, consisting of n contracts underwritten at the same time and with an annual duration, let S be the global compensation relating to claims; having set the LC priority (called full catastrophe), we will have that:

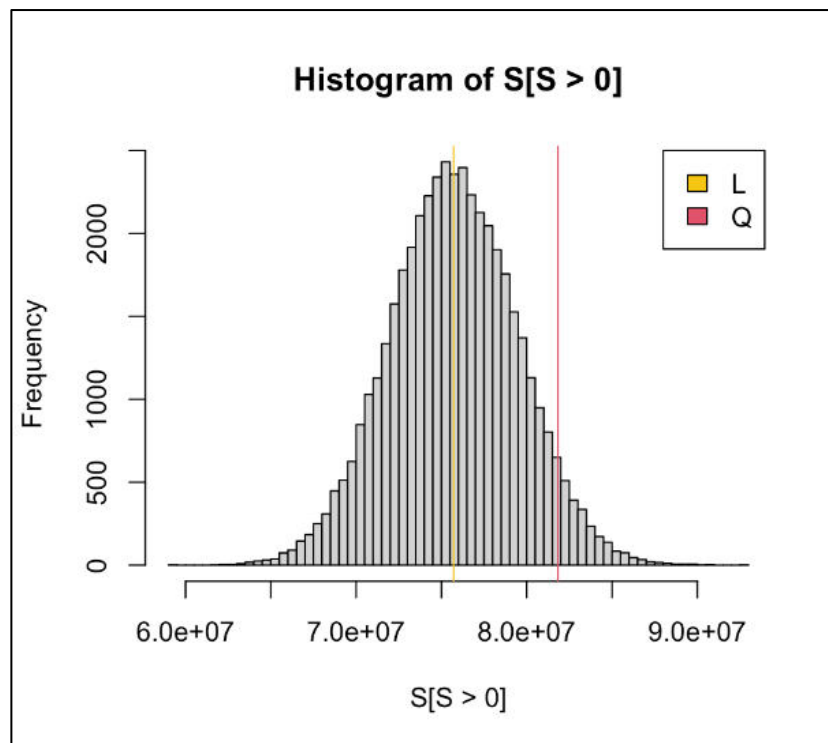
- the amount to be paid by the insurer will be equal to $SA = \min (S; LC)$;
- the amount transferred to the reinsurer, in the event that there is no upper limitation (scope), is equal to $SR = \max (S - LC; 0)$;
- in the event that there is a partial scope (which is realistic), the amount transferred to the reinsurer will be equal to $SR = \min [\max (S - LC; 0); QC]$.

Let K be the random number of catastrophes affecting the portfolio during the year and let Sh ($h = 1, 2, \dots, K$) be the global compensation corresponding to the h -th catastrophe in chronological order, once the full catastrophe, Lc , is established, then the global compensation retained by the insurer will be equal to $XA = \sum_{h=0}^K \min (Sh; Lc)$, while the global compensation assigned to the reinsurer will be equal to $XR = \sum_{h=0}^K \max (Sh - Lc; 0)$.

In our specific case, in order to proceed with the definition of the priority⁷, reference is made to the graph of the aggregate damage S given $S > 0$ (Figure 5): in this sense, we define the priority L as the average of this distribution, which turns out to be equal to € 75,714,971.

The priority in the reinsurance practice is generally partial; hence, it is customary to introduce a "scope" Q , i.e. the maximum amount within which the reinsurer undertakes to compensate the aggregate damage; in other words, the scope represents the upper limit of acceptance for the reinsurer which, in our case, is represented by the quantile of the distribution of S at 95%, for an amount of € 81,833,004.

Figure 5. Distribution of S [$S > 0$], Priority (L) and Scope (Q)



The value of the damage to be borne by the reinsurer is therefore equal to $SR = \min [\max (S - L, 0), Q]$, while the "fair" premium (Pr) that the reinsurer will request in order to assume the risk will be equal to the expected value of SR [$E (SR)$], that is: $Pr = E (SR) = € 661,525.40$.

Similarly to the method adopted previously, a safety charge is made for the pure premium by applying the principle of the standard deviation, which in this case is greater than that carried out by the insurance company. The pure reinsurance premium (Π_r), with $\gamma = 0.665$, will therefore be equal to: $\Pi_r = Pr + \gamma * s.d. (\min (\max (S - L, 0), Q)) = € 1,746,382$.

Likewise, we introduce a safety loading for expenses using the principle of "constant loading", which considers the loading as independent from the riskiness of the contract and is suitable for management expenses, including several items of overheads incurred by the reinsurer for the handling of the contract.

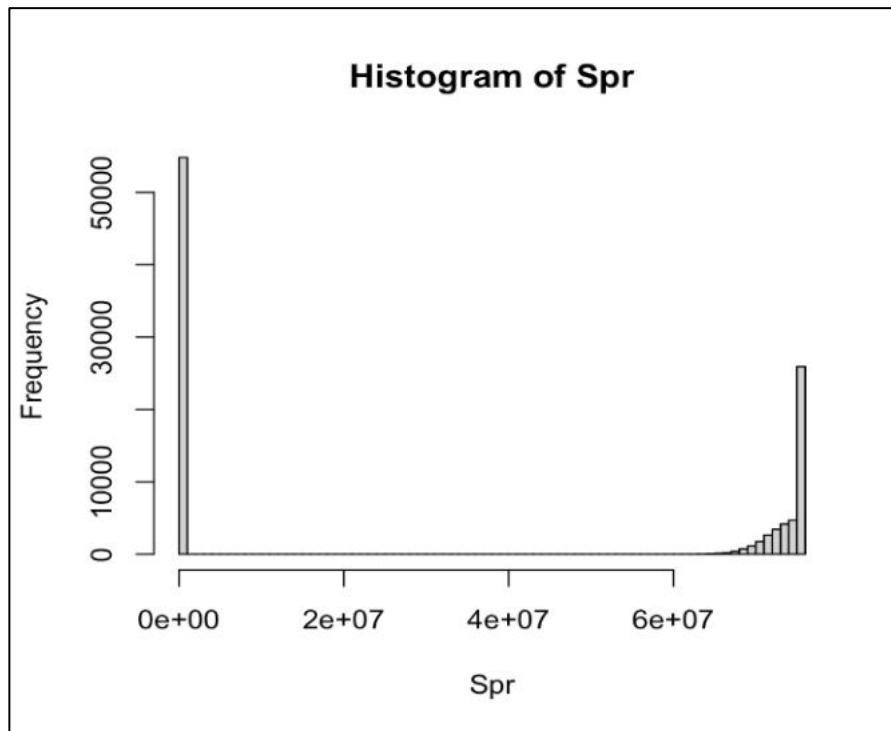
The reinsurance gross premium (Cr) is therefore equal to:

$$Cr = \Pi_r + 200 * Nrisc = € 2,637,582$$

Post-reinsurance, the compensation payable by the insurance will be: $Spr = S - Sr$; the new damage distribution S (Figure 6) will be like the previous one, but visibly truncated due to the effect of the Risk Catastrophe Excess of Loss reinsurance.

⁷ Such priority represents the monetary amount such that if the aggregate damage exceeds this value, the compensation is paid by the reinsurer.

Figure 6. Distribution of S post Reinsurance



Regarding the volume of premiums that remain with the insurance company (Π_{pr}), it will be as follows:

$$\Pi_{pr} = \Pi - \Pi_r = 57,530,985.33 \text{ €} = C_{pr} = C - C_r$$

It is thus clear that the pure premium and the post-reinsurance tariff are the same, as both parties made the same loading for costs and the same technical bases were used for assessing the damage.

As regards the SCR to be set aside following reinsurance, considering the internal model⁸, we obtain SCR_{pr_IM} equal to € 19,075,186; the SCR_{pr_SF}, obtained with the standard formula $3 * 0.17 * C_{pr}$, on the other hand, is equal to € 29,340,802.52.

From the above, once again the convenience for the insurance company to adopt the internal model is confirmed.

As expected, the amount of premiums collected has decreased, although it is noteworthy that the capital to be set aside for solvency requirements has recorded a greater decrease compared to that relating to the amount of premiums collected.

In fact, analyzing the two percentage changes, we observe that post reinsurance, after a change in the expected profit $(\Pi_{pr} - \Pi) / \Pi * 100$ of (-2.94612%), the SCR_{pr_IM} has decreased by (-23.73123%).

Moreover, we can notice that the profitability index ($U_{pr} / \text{SCR}_{pr_IM}$) has increased from 1.002535 (pre-reinsurance) to 1.222924 (post-reinsurance)

The proof of the reinsurance benefit can also be appreciated by observing the decrease in the annual probability of failure (ϵ), post-reinsurance (ϵ_r): actually, in the 100.000 simulations carried out post reinsurance, the losses were never higher than the SCR_{pr_IM}. This can be described as follows:

$$\epsilon_r = \text{sum}(\Pi_{pr} - \text{Spr} < (-\text{SCR}_{pr})) / N_{\text{sim}} = 0.$$

Finally, the simulation of the frequency-severity model algorithm was repeated, with 40.000 risks in the portfolio⁹.

Lastly, observing the values of the new simulation, the technical bases (in yellow), the insurance actuarial values (in green), the post-reinsurance actuarial values (in orange) as shown in Figure 7, it is evident that they are sensitive to the size of the portfolio.

In particular, it is interesting to notice that as the size of the portfolio increases, the convenience to adopt the internal model for calculating the SCR also increases. In fact, despite the increase in the value of the SCR of the internal model, the result of the SCR_{MI} / NRA relating to each individual risk decreases, going from € 5,612.76 (in the analysis seen above with 4,456 risks) to € 5,248.40.

On the contrary, the SCR calculated with the standard formula proportionally increases with the increase in premiums¹⁰: therefore, going from 4,456 risks in the portfolio to 40,000, the value of the SCR_{FS} / NRA relating to each individual claim also increases (it has increased by approximately € 80 per risk).

⁸ In this case, we consider the VaR of the post-Reinsurance distribution, plus the expected value of the costs.

⁹ 40,000 SMEs are supposed to be insured, supposing that the insurance company in question has about 27% of Italy's SMEs in its portfolio.

¹⁰ This is a direct consequence of the standard formula $3 * \sigma * V$.

Figure 7. Technical basis and significant actuarial values on 40.000 risks

NRA	40000,00	P = E(S)	311.489.885,00 €	L	682.044.854,00 €	U/SCR	1,076233
E(N)	0,60	Sd(S)	340271361,00	Q	726.233.580,00 €	U_pr/SCR	1,28357
E(M N>0)	0,7	π	537.430.068,70 €	Pr	5.018.453,00 €		
VAR(M N>0)	0,21	C	545.430.068,70 €	πr	13.158.447,00 €		
E(Y1)	21239,75	VaR(99,5%)	755.366.089,00 €	πpr	524.271.621,70 €		
VAR(Y1)	1366810833,00	SCR_IM	209.936.020,30 €	SCRpr_IM	165.773.232,00 €		
Ds(Y1)		SCR_SF	278169335,04	SCRpr_SF	267.378.527,07 €		
Mix	9,2668	C/NRA	13.635,75 €	E(U)pr	212.781.736,70 €		
SigmaX	1,18056	SCR_IM/NRA	5.248,40 €				
		SCR_SF/NRA	6.954,23 €	Eps_pr	0		
		E(U)	225.940.183,70 €				
		Eps	0,0032				

5. Conclusion

Covid-19 has profoundly changed the world we live in, with disruptive effects at various levels, including particularly the health, social, economic and financial perspectives. The insurance sector has not been spared: insurance companies are therefore urged to adopt new and more effective tools for managing catastrophe risk, in order to ensure greater resilience while operating in a market that proves to be increasingly uncertain.

The analysis we conducted highlights the importance of the role played by NDBI policies both for the entrepreneurs, allowing them to cover the loss of profit following a business interruption, and for the insurance companies, which can achieve profits also thanks to the possibility to reinsure part of their business (with "Catastrophe Excess Of Loss" contracts).

In the near future, it seems increasingly appropriate to identify innovative pandemic risk transfer solutions contemplating lockdown scenarios and a closer cooperation between the public and the private systems. Pandemic risks, such as Covid-19, are difficult to insure, due to the fact that they are characterized by large accumulations of risks and multiple factor losses, simultaneously involving multiple types of activities in many regions. The scarcity of historical time series and statistical data prevents insurers from developing correct pricing. In fact, as pointed out in Section 4, the methodological approach proposed in this paper relies on the strong hypothesis that the distribution of the global compensation S is not inferred by empirical evidence. So our model will be definitely validated only if enough real data would be available. Nonetheless, the use of methodology proposed in this paper, may be replicated in other possible cases, bearing in mind that some hypotheses must be drawn down in order to be properly implemented. For instance, this method can be perfectly replicated using data of advanced economies (i.e. EU countries and US) to assess the potential impact of the pandemic event. Furthermore, it can be used to estimate the NDBI coverage advantages when extreme (and catastrophic) events other than the covid-19 are likely to occur, keeping the hypotheses of a mandatory policy for "lockdown" (even potentially addressed to specific industrial sectors) and that no other companies, apart from those already insured, signs any NDBI insurance contract for "lockdown" with the examined insurance company during the selected year. Lastly, the probability of lockdown occurrence may be adjusted in relation to the identified case of application.

References

- Agosto, A., Campmas, A., Giudici, P., & Renda, A. (2021). Monitoring COVID-19 contagion growth. *Statistics in medicine*, 40(18), 4150-4160.
- Angelino A., Balda F., Emiliani D., Negri F., Romano G., Sampoli L. Schivardi F., (2018), Rapporto Cerved PMI 2018 (<https://know.cerved.com/wp-content/uploads/2018/11/PMI-2018-intero.pdf>)
- Angelino A., Balda F., Emiliani D., Romano G., Sampoli L. Schivardi F., (eds), (2020), Rapporto Cerved PMI 2020 (<https://know.cerved.com/wp-content/uploads/2020/11/RAPPORTO-CERVED-PMI-2020-2.pdf>).
- CERVED, (2020), Cerved SMEs Report 2020, November (https://know.cerved.com/wp-content/uploads/2020/11/Rapporto-Cerved-PMI-2020_ENG.pdf)
- Doherty, N. A. (1997). Innovations in managing catastrophe risk. *The Journal of Risk and Insurance*, 64(4), 713-718.
- ECDC, (2020), Rapid Risk Assessment: Increased transmission of COVID-19 in the EU/EEA and the UK – thirteenth update (<https://www.ecdc.europa.eu/>)
- Eurostat, (2020), News Release Euro Indicators, in "Eurostat Report", No 133/2020, september.
- Finken, S., & Laux, C. (2009). Catastrophe bonds and reinsurance: the competitive effect of information-insensitive triggers. *Journal of Risk and Insurance*, 76(3), 579-605.

- ISTAT, (2020), Situazione e prospettiva delle imprese nell'emergenza sanitaria Covid-19, in Statistiche Report, June (<https://www.istat.it/it/files/2020/06/Imprese-durante-Covid-19.pdf>).
- Jaffee, D. M., & Russell, T. (1997). Catastrophe insurance, capital markets, and uninsurable risks. *Journal of Risk and Insurance*, 205-230.
- Klein, R. W., & Wang, S. (2009). Catastrophe risk financing in the United States and the European Union: A comparative analysis of alternative regulatory approaches. *Journal of Risk and Insurance*, 76(3), 607-637.
- Lakdawalla, D., & Zanjani, G. (2012). Catastrophe bonds, reinsurance, and the optimal collateralization of risk transfer. *Journal of Risk and Insurance*, 79(2), 449-476.
- Marsh & McLennan, (2020), Covid-19: Riflessioni e raccomandazioni pratiche per gestire le conseguenze della pandemia, *Pandemic Report*.
- Mata A. J., (2006), Catastrophe Excess of Loss, *Encyclopedia of Actuarial Science*, Volume 1, John Wiley & Sons, Ltd. Print ISBN: 9780470846766-Online ISBN: 9780470012505| DOI: 10.1002/9780470012505
- Mitchell-Wallace, K., Jones, M., Hillier, J., & Foote, M. (2017). *Natural catastrophe risk management and modelling: A practitioner's guide*. John Wiley & Sons.
- Monducci R., (2020), Audizione ISTAT per attività conoscitiva preliminare all'esame del DEF 2020 Bilancio, tesoro e programmazione, (in sito internet: <https://www.istat.it>)
- Niehaus, G. (2002). The allocation of catastrophe risk. *Journal of Banking & Finance*, 26(2-3), 585-596.
- OECD (2021), *OECD Economic Outlook, Interim Report September 2021: Keeping the Recovery on Track*, OECD Publishing, Paris (<https://doi.org/10.1787/490d4832-en>).
- Pitacco E., (2008), *Matematica e tecnica attuariale delle assicurazioni sulla durata di vita*, Lint Editoriale, Trieste, pp. 1-576.
- Rose, A., & Lim, D. (2002). Business interruption losses from natural hazards: conceptual and methodological issues in the case of the Northridge earthquake. *Global Environmental Change Part B: Environmental Hazards*, 4(1), 1-14.
- Santoboni F., Vento G.A., Porretta P., (2012), Corporate insurance and debt capacity: empirical evidence from Italy, in *Journal of Governance and Regulation*, Volume 1, Issue 4, pp. 54-75. ISSN: 2220-9352. DOI:10.22495/jgr_v1_i4_p5.
- Stone, J. M. (1973). A theory of capacity and the insurance of catastrophe risks (Part II). *Journal of Risk and Insurance*, 339-355.
- SWISS RE, (2009), Calamità naturali e catastrofi man-made nel 2008: pesanti danni in Nordamerica e Asia, *Sigma*, No 2/2009 (https://www.swissre.com/dam/jcr:94dc38fc-0810-4e9a-b5aa-d41ea6d7f7ca/sigma2_2009_it.pdf).
- SWISS RE, (2019), Natural catastrophes and made disasters in 2018: "secondary" perils on the frontline, "Sigma", No 2/2019 (https://www.swissre.com/dam/jcr:c37eb0e4-c0b9-4a9f-9954-3d0bb4339bfd/sigma2_2019_en.pdf).

Capital adequacy in banks and sustainable finance: the Green Supporting Factor¹

Mariantonietta Intonti (University of Bari Aldo Moro), Annalisa Ceo (University of Bari Aldo Moro), Giovanni Ferri (LUMSA University – Rome)

Article submitted to double-blind peer review, received on 28th February 2022 and accepted on 25th April 2022

Abstract

Starting from the analysis of the contents of the EU Action Plan on Sustainable Finance, we focus on action eight: “The EU Commission will explore the feasibility of including risks associated with climate and other environmental factors in institutions’ risk management policies, as well as the potential calibration of capital requirements of banks as part of the Capital Requirement Regulation and Directive. The aim would be to consider such factors, where this is justified from a risk perspective, to safeguard the coherence and effectiveness of the prudential framework and financial stability. Any recalibration of capital requirements, based on data and the assessment of the prudential risk of banks’ exposure, would need to rely on and be coherent with the future EU taxonomy on sustainable activities”. We focus on the characteristics of the Green Supporting Factor (GSF), a particular weighting mechanism for bank loans, useful to integrate environmental sustainability in the risk assessment and in the prudential requirements of banks. In light of the study carried out, we argue that it is possible to introduce corrective systems that favor green loans or penalize brown loans towards the ecological transition. Furthermore, to check the actual effectiveness, in particular of the GSF, and to correctly calibrate its extent following an assessment of ESG risks (significantly climate risks), we review two experimental applications carried out by financial intermediaries.

1. Introduction

Action eight of the EU Action Plan on sustainable finance, directed at integrating the sustainable transition into the prudential requirements of banks (and insurance companies), aims to prompt financial intermediaries to consider sustainability risks (relating to the environment, social and corporate governance) in their assessment of loans and in their subsequent definition of the minimum amount of regulatory capital, to impact the growth of the ESG (Environmental, Social, Governance) loan and investment market, with a particular focus on the environment. In pursuing this goal, the role of the supervisory authorities is crucial, both for defining regulatory capital requirements in the face of ESG risks, and for monitoring these rules’ enforcement. In this context, drawing also on the scant literature on the subject, the paper reflects on the opportunity to introduce a new risk weighting system (more favorable for green loans) for determining the capital requirements, in order to facilitate the arrangement and dissemination of these financing instruments, useful for reaching the goal of ecological transition on time. Starting from the analysis of the contents of the EU Action Plan on Sustainable Finance, we focus on action eight: “The EU Commission will explore the feasibility of including risks associated with climate and other environmental factors in institutions’ risk management policies, as well as the potential calibration of capital requirements of banks as part of the Capital Requirement Regulation and Directive. The aim would be to take into account such factors, where this is justified from a risk perspective, to safeguard the coherence and effectiveness of the prudential framework and financial stability. Any recalibration of capital requirements, based on data and the assessment of the prudential risk of banks’ exposure, would need to rely on and be coherent with the future EU taxonomy on sustainable activities”². Below, we focus on the characteristics of a particular weighting mechanism for bank loans, useful to integrate environmental sustainability in banks’ risk assessment and prudential requirements: the Green Supporting Factor (GSF). We appraise how the GSF has been analyzed at various levels, and how its pros and cons have been highlighted in the discussion, even as opposed to introducing, as suggested at times, a penalty factor for environmental-degrading banking assets, called Brown Penalizing Factor (BPF) or Dirty Penalizing Factor (DPF). On this basis, we try to answer the following research questions:

1. is it possible to introduce a new weighting risk mechanism for green bank loans (GSF) or brown loans (BSF) to improve the allocation of bank capital, in terms of better responsiveness to the risk associated with green loans?
2. is it useful to carry out experimental applications to verify the effectiveness in terms of cost of capital and ecological transition by means of green or brown corrective factors?

Our aim is to provide a brief critical summary of the scarce literature on the subject, and to review the limited experimental activities of the industry as a useful tool, to be supported, to evaluate the effective usability of a green weighting factor.

In the rest of the paper, Section 2 draws a literature review focused on GSF, Section 3 analyzes the origins of the GSF within the EU Action Plan on Sustainable Finance, Section 4, starting from the degree of capitalization versus risk of Italian banks³, in terms of mandatory minimum capital requirements CET1 ratio and Total Capital ratio⁴, focuses on the issue of whether the stability of the system can be influenced by the introduction of weighting factors beneficial to “green assets” (green loans), which favor the granting of such kind of loan and also a more sustainable economy.

The paper concludes with a brief review of two initial attempts for the application of weighting factors for green activities, conducted by Intesa Sanpaolo and by Natixis, on an experimental basis. Our analysis aims to highlight how practical experimentation can help verify the effective lower risk of sustainable loans and the usefulness of this instrument for the purposes of optimizing the cost of capital.

¹ Even if the paper is the result of a common effort, Mariantonietta Intonti mainly contributed to Sections 1, 2 and 5, Annalisa Ceo to Sections 3 and 4 and to collect literature, Giovanni Ferri to Section 1 and 6.

² European Commission, Action Plan to finance sustainable growth, 2018.

³ KPMG, Bilanci dei gruppi bancari italiani- Trend e prospettive, 2020.

⁴ Intonti M., “Verso Basilea 3: limiti e problematiche in tema di adeguatezza patrimoniale nelle banche” in Il ruolo del capitale tra regole bancarie e disciplina societaria, a cura di A. Dell’Atti e G. Giannelli, Egea, Milano, 2012.

2. Literature review

Scientific contributions on the GSF are rare in Italy but not at the European level⁵.

Existing surveys, both qualitative and quantitative in nature, reach mixed conclusions on how useful the green factor is. The most analyzed topics are the following: the features of the GSF and its applications; the effectiveness of the GSF in promoting green investments (compared to the SMEs' Supporting Factor – SMEs' SF – introduced by the Basel 2 Agreement, aiming to improve the weighting of loans granted to small and medium-sized enterprises, and abate the regulatory capital requirement on loans to such firms, as well as controlling the risk of credit crunch against them⁶); the peril that applying the GSF, if green investments' risk are not effectively lower, could lead to banks' undercapitalization and instability⁷.

In the context of the international quantitative literature, the contribution of Dafermos and Nikolaidi (2021) explore the potential impact of the Green Supporting Factor and the Dirty Penalizing Factor on climate-related financial risks and find that green differentiated capital requirements can reduce the pace of global warming and decrease thereby the physical financial risks. This reduction is enhanced when the GSF and the DPF are implemented simultaneously or in combination with green fiscal policies⁸.

On the other hand, Thomä and Hilke (2018), in order to quantify the effects of the GSF and of the BPF on European banks, they have estimated the impact that the two instruments, alternatively applied, can bring on bank capital requirements, comparing the results of these analyses with those relating to the SMEs' Supporting Factor verified by the EBA (2016)⁹.

The main empirical evidence deriving from this analysis shows that, by applying a GSF to risk-weighted assets, an improvement in the level of capital requirements is obtained but, in absolute terms, the total capital saving would be significantly lower than that identified by the SMEs' SF. Referring to previous research, the authors estimated that a GSF would result in a 5 to 25 basis points reduction in the cost of capital for green investments.

In the same line, the contribution of Thomä and Gibhardt (2019)¹⁰ estimates the potential impact on capital reserves of European banks and the cost and availability of capital to "green" and "brown" investments and find that a GSF would have a limited effect on capital requirements of banks compared to possible introduction of a brown penalty factor, considering the larger universe of assets on which such a penalty would be applied.

Dankert et al. (2018)¹¹, who were rather critical of the GSF, expressed their opinion on the issue by conducting a qualitative survey that does not support the thesis that green exposures are truly less risky than traditional exposures. Consequently, it would seem appropriate to be cautious in introducing such a correction factor, given that using capital requirements as a tool to incentivize green investments can have unintended consequences for financial stability, such as an underestimation of risks and a lower aggregate level of capitalization of the financial system.

Therefore, the evidence currently available reaches different conclusions, it does not yet support the assertion that green exposures are truly less risky, and it leaves many questions open about the effectiveness of the GSF as a policy tool to support and enhance green finance.

Overall, however, despite the existence of attempts by certain authors to evaluate its effectiveness, the analysis of the effects of the GSF both on capital requirements and on the expansion of the green investment market still appears to be scarce and certainly worthy of further contributions and insights.

3. Integrating sustainability into prudential requirements: the indications of the Action Plan for Financing Sustainable Growth

The climate changes that are affecting the planet, generated by the pollution of our "common home"¹² and a source of significant socio-economic impact in terms of human losses and of financial resources, together with the social and management tensions due to the Covid-19 pandemic and the Ukraine war, have required and continue to request the review of the regulatory framework in order to integrate the consideration of ESG, environmental (including physical and transitional climate risk), social and governance

⁵ Thomä J., Hilke A., The green Supporting factor. Quantify the impact on European banks and green finance", 2nd Investing Initiative, 2018; Grünewald S., Climate change as a systemic risk – are macroprudential authorities up to the task? European Banking Institute, Working Paper Series, 2020.

⁶ Sabatini G., Resolution 7-00851 Taranto, relating to the initiatives for the maintenance of the instrument of the support factor for small and medium-sized enterprises (SME Supporting factor) regarding the capital requirements of credit institutions, ABI Hearing, 2016.

⁷ Enria A., Banking Supervision, Regulation, proportionality and the sustainability of banking, Speech at the Retail Banking Conference "Creating sustainable financial structures by putting citizens first" of European Savings Bank Group, Brussels, European Central Bank, 21 November 2019; Berenguer M. et al., Integrating Climate-related Risks into Banks' Capital Requirements, I4CE Institute for Climate Economics, 2020; Meager E., What to expect from the EU's renewed sustainable finance strategy, Capital monitor, 2021.

⁸ Dafermos Y., Nikolaidi M., How can green differentiated capital requirements affect climate risks? A dynamic macrofinancial analysis, Post-Keynesian Economics Society, Working paper 2105, 2021.

⁹ EBA, Reporting on SMEs and SME supporting factor, 2016.

¹⁰ Thomä J. and Gibhardt K. (2019), "Quantifying the potential impact of a green supporting factor or brown penalty on European banks and lending", Journal of Financial Regulation and Compliance, Vol. 27 No. 3, pp. 380-394.

¹¹ Jacob Dankert, Lars van Doorn, Henk Jan Reinders and Olaf Sleijpen, "A Green Supporting Factor - The Right Policy?" SUERF "The European Money and Finance Forum" De Nederlandsche Bank N.V., 2018.

¹² Pope Francis, Enciclica Laudato si, 2015.

risks into the activity of banking risk management, also in order to induce good behavioral practices between borrowers and issuers, in light of the double materiality of the issue in the banking sector¹³.

With regard to environmental risk, the position has recently emerged that if banks, and not only banks, would take such risk into consideration in granting credit and in their investment activities, favoring companies and investments with low environmental and climate risk, this could foster increasingly better behavioral practices of borrowers and issuers (companies and states) from an environmental point of view, and consequently attenuate climate change, consequently accelerating the transition process towards a more sustainable economy.

In addition, if banks, besides considering climate risk in the preliminary assessment for granting loans, could benefit from allocating assets against green loans thanks to them actually facing a lower risk, this could further boost the transition process.

In order to raise public awareness on these issues, in September 2015, the United Nations signed the 2030 Agenda, followed by the European Union starting a process of including sustainability issues in the financial sector. This path, mainly relating to environmental issues, began with the signing, in December 2015, of the Paris Agreement¹⁴, the first step towards the diffusion of a growth and development model oriented towards environmental protection.

Subsequently, in December 2016, the European Commission established the High-Level Expert Group on Sustainable Finance (HLEG) which, in 2018, published the report "Financing a sustainable European Economy", aimed at launching, in March 2018, the Action Plan to finance sustainable growth, with the goal of increasing investments in sustainable projects and integrating environmental, social and governance criteria into risk management by financial operators.

Figure 1 - From the signing of the 2030 Agenda to the Action Plan



Source: European Commission, 2018.

The Plan identifies all the activities to be implemented with the support and involvement of financial market operators, including investors, intermediaries and managers, in order to achieve the three objectives suggested by the HLEG, namely:

1. steer capital flows towards sustainable investments;
2. limit the financial impact of environmental and social risks: an increase in world temperature exceeding the limits set by the Paris Agreement could generate destabilizing effects on the European economy and financial system, linked to events triggered by climate change. This could lead to greater exposure of banks to losses, due to the difficulties of client companies exposed to climate change and therefore also subject to climate risk;
3. ensure the transparency of market operators: greater disclosure transparency on sustainability issues could allow investors to compare the ESG performance of companies and make informed decisions on their investments.

To achieve the three objectives, the Action Plan: Financing Sustainable Growth includes ten actions (Figure 2).

¹³ Bernardini E., Faiella I., Lavecchia L., Mistretta A. e Natoli F., Banche centrali, rischi climatici e finanza sostenibile, Banca d'Italia, Questioni di Economia e Finanza, Occasional Papers, 2021.

¹⁴ European Union, Paris Agreement, ratification, 2016.

Figure 2- Objectives and actions of the Action Plan on sustainable finance

<i>Objective</i>	<i>Description</i>	<i>Planned actions</i>
1) Reorienting of capital flows towards a more sustainable economy	Since the current level of investment is not enough to support a sustainable economic system from a environmental and social perspective, huge further investments are necessary	1. Establish a unified classification system of sustainable activities
		2. Create standards and brands for sustainable financial products
		3. Promote investments in sustainable projects
		4. Integrate sustainability into financial advice
		5. Develop sustainability benchmarks
2) Integrating sustainability into risk management	In order to limit the financial impact of environmental and social risks, the financial decision process should include ESG considerations	6. Integrate sustainability into ratings and market research at best
		7. Clarify the sustainability obligations of institutional investors and asset managers
		8. Integrate sustainability in the prudential requirements of banks and insurance companies
3) Promoting transparency and encourage a long-term vision of economic and financial activities	In order to make informed decisions, a greater transparency is needed to allow investors to compare sustainability performances of investee companies. Besides, since sustainable investments require a long-term vision, short-termism should be limited	9. Strengthen sustainability communication and accounting regulation
		10. Promote sustainable corporate governance and mitigate the short-term vision in the capital markets

Source: European Commission, Action Plan for financing sustainable growth, 2018

The first objective involves five planned actions.

1. Establishing a unified classification system for sustainable activities across the EU. The shift of capital flows towards a sustainable economy can only be achieved by clearly defining the category of activities that can be defined as "sustainable". For this reason, the Action Plan has among its primary goals the creation of a unified EU classification system, also defined as the "Taxonomy Regulation"¹⁵. The taxonomy consists in a classification that helps investors to easily identify sustainable products, thus reducing the risk of "green washing"¹⁶ operations, and it will thus provide information on sustainable sectors through criteria, thresholds and parameters that will support investment choices. The taxonomy was initially focused on sustainable activities from an environmental perspective, while only recently the issue of social sustainability has been addressed.
2. Creating standards and labels for sustainable financial products, that can identify ESG financial instruments, to ensure investor protection and transparency in the sustainable finance market. The definition process has already led to the creation of an EU standard for green bonds, the bonds issued to support projects that have a positive impact on the environment, such as those relating to energy efficiency or the production of energy from renewable and clean sources etc...
3. Promoting investments in sustainable projects: in this context, the goal is to mobilize private capital towards sustainable projects, highlighting the importance of the appropriate use of financial resources as a strategic lever for achieving the ecological transition.
4. Integrating sustainability into financial advice: financial advisors are also called upon to ensure the reorientation towards sustainable investments, including sustainability in their advisory activity, identifying customer preferences in the ESG scope and suggesting a range of suitable products to meet their needs.
5. Developing benchmarks on sustainability: in addition to providing new financial instruments with sustainability characteristics, it is important to create market indices that comply with ESG criteria, which differ from traditional benchmarks and allow to specifically assess the performances of sustainable investments. For this reason, the Action Plan has provided for new ESG benchmarks to be created, based on sustainability objectives.

¹⁵ European Parliament and Council, Taxonomy Regulation 2020/852 of 18 June 2020 on the establishment of a framework that favors sustainable investments and amending regulation (EU) 2019/2088.

¹⁶ Phenomenon which consists in defining financial products, practices or company policies as "green" even if they are not, or only in part, in order to attract the market. This practice is adopted by companies that are interested in acquiring a "green" reputation, without adopting an effective modus operandi that differentiates them from traditional companies.

The second objective of the Action Plan includes three actions:

6. Integrating sustainability into ratings and market research in the best possible way: in the face of such a radical change, market research providers and rating agencies need to adopt different strategies to best assess the ESG performance of companies and their resulting ability to manage the risks associated with sustainability. In this context, ESMA¹⁷ is called upon to intervene, pushing credit rating agencies to integrate sustainability and long-term risks in the assessments made for rating issuers.
7. Clarifying the obligations of institutional investors and fund managers: in compliance with the "fiduciary obligation", the EU requires institutional investors and fund managers to act in the individual investors' best interests. At the same time, however, no obligation is explicitly stated regarding the inclusion of ESG factors and sustainability risks in the investment process. In this context, the recent disclosure regulation (Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector) was issued.
8. Integrating sustainability into the prudential requirements of banks and insurance companies: the action intends to induce supervisory authorities to consider sustainability risks in defining the risk profile and determining the capital requirements of banks and insurance companies, in order to encourage the growth of ESG financing and investments. In this respect, Directive 2019/2034 and Regulation 2019/2033 have been published, amending the CRD IV Directive and the CRR Regulation on capital requirements in banks. The Directive requests that EBA assess the inclusion of environmental, social and governance risks into the supervisory activity of the competent Authorities and to prepare a report on the introduction of technical criteria for ESG exposures as part of the review and evaluation of the supervisory requirements; in the Regulation, on the other hand, EBA is given a mandate to develop the Technical Standards for the Disclosure of ESG risks, physical risks and transition risks, by large listed banks and to assess whether a prudential treatment dedicated to ESG exposures is justified. The Commission will then consider whether it is possible to recalibrate the banks' capital requirements for sustainable investments¹⁸.

Lastly, there are the two actions relating to the third objective, namely that of promoting transparency and encouraging a long-term vision of economic and financial activities.

9. Strengthening the communication on sustainability and accounting regulation: according to Directive 2014/95/EU on "Non-Financial Information" (NFI), "large companies that are entities of public interest [...] include in the management report a non-financial statement ("DNF", Dichiarazione Non Finanziaria in Italian) containing at least information on environmental, social, personnel aspects, and on respect for human rights [...] ". Such document constitutes a first intervention carried out at European level in order to induce institutions to disclose relevant information on the main environmental, social, governance aspects and on ESG risk management, achieving a good compromise between flexibility and standardization of the information to support investors' investment choices.
10. Promoting sustainable corporate governance and mitigating short-termism in the capital markets: this action originates from the objectives that company managers set themselves, often of an exclusively economic-financial and short-term type, neglecting opportunities and risks resulting from considerations related to environmental and social sustainability, which would instead guarantee a perspective of value creation in the long term.

Regarding action 8, the aim to include risks associated with climate and other environmental factors in the risk management policies of financial intermediaries represents a highly relevant element for the purposes of the green transition. The goal, however, should be to take ESG factors into account in determining the capital requirements for sustainable loans, in cases where this is justified from expectations of concrete lower risk, so that the effectiveness and consistency of financial stability is safeguarded. It is clear, as stated in the Principles for Responsible Investment, that any recalibration of capital requirements implemented to include these elements should be based on the EU taxonomy regarding sustainable activities¹⁹.

In our country, the Bank of Italy, in following the development of the works done by the European Commission within the scope of its competences, has focused on the most appropriate ways for intermediaries to incorporate climate risks in particular in risk management policies, as well as in prudential assessments. In this regard, there is broad consensus, even among other regulators, on the concept that the risks deriving from ESG factors do not represent a random category in their own right but rather that they affect traditional risk categories (credit, market, operational).

For this reason, intermediaries will have to organize appropriate governance, organizational and internal control systems, and they will also need to develop appropriate assessments, embracing a long-term time horizon, to determine the impact of climatic and environmental risks on their portfolios and on their business strategies. The assessment partly requires the use of new methodologies, data and forecasting scenarios, that are thus suitable for evaluating losses resulting from high impact and low frequency events, linked particularly to the occurrence of extreme climate events. In particular, for physical risk, the analysis must

¹⁷ European Securities and Markets Authority: ESMA is the authority, based in Paris, responsible for the supervision of securities and their markets, at European level.

¹⁸ Consob.it, Il Piano d'Azione per la finanza sostenibile.

¹⁹ PRI, Principles for Responsible Investment, Action 8: Incorporating sustainability in prudential requirements, 2018.

allow for the calculation of the vulnerability indicators of assets with respect to climatic factors, for example taking into account the location of the investments; for transition risk, on the other hand, it will have to determine the impact of stricter rules on energy efficiency on the value of real estate as collateral for mortgages, to name just a few among the potential implications of such risk²⁰.

Furthermore, one needs to consider the role of banks and insurance companies both regarding the orientation of capital flows and regarding the defense of the stability of the economic system as a whole, and the high exposure of the banking and insurance system to risks related to climate change. Therefore, it is necessary, following the Commission's indications, to incorporate sustainability considerations into prudential requirements, to avoid that bank assets are excessively skewed towards activities with high physical or transitional risks²¹.

4. Minimum bank capital requirements, the GSF and the BPF: some critical considerations

The degree of capitalization versus risk of Italian banks²², in terms of mandatory minimum capital requirements CET1 ratio and Total Capital ratio, determined by the ratio between the regulatory capital and the assets weighted for credit risk (RWA, Risk Weighted Assets), market risk and operational risks²³, is certainly considerable. This circumstance raises the question of whether the stability of the system can be influenced by the introduction of weighting factors beneficial to “green assets” (green loans), which favor the granting of such kind of loan and with it also a more sustainable economy.

In order for the capital requirements to be correctly calibrated in relation to sustainable loans, a weighting system for RWAs needs to be identified which specifically concerns this class of loans and which is able to capture the actual risk associated with them, linked to the ESG factors. Currently, the development of green loans is influenced by the so-called Green Finance Gap²⁴, according to which sustainable investments are considered as not convenient from a risk perspective. Moreover, by not considering the impact of climate-related risks and ESG risks in general on credit risk, the current capital requirements tend to make banks less inclined to grant green loans. Therefore, climate-related financial risks must be defined and measured more broadly and completely, to prevent a wrong approach from compromising the achievement of climate objectives, which also involves the growth of green financing.

In this regard and as already underlined, following the preparation of the Action Plan for sustainable growth, the possibility was suggested of introducing a green supporting factor, the GSF, or a specific green weighting coefficient, to be included in the weighting methodologies for quantifying risks and defining regulatory capital, particularly for banks.

This is a useful factor in overcoming the Green Finance Gap, in support of which both the European Commission, the high-level expert group on Sustainable Finance (HLEG, 2018) and the Association of European Banks have expressed their opinion²⁵.

The underlying rationale of such instrument is that it has the potential to bring banks' investment decisions into line with green finance objectives, as established by the EU, thus introducing a framework of incentives to finance and invest for sustainable growth in Europe²⁶.

The GSF operates in the sense that it requires bank intermediaries to have a smaller capital buffer to hold against green loans, to which reduced risk weighting coefficients are associated, based on a different concept on their degree of uncertainty. The proposed mechanism has the purpose of influencing banks' ability to generate credit, implying an adjustment of the capital requirement, and modifying the ratio between regulatory capital and risk-weighted assets²⁷. Through the action of this mechanism, a weighting system for credit risk assets is therefore introduced which can favor, through lower weights, loans oriented towards an environmental, social and governance goal.

In order to determine the green weighting coefficient, two different weighting methods were provided for by the Basel Agreements, as follows:

- the standard method appropriately adjusted in order to take into account not only the economic-financial rating of the borrowers but also a sustainability rating calculated by specialized advisors;
- the internal rating method (IRB), equally modified to take into account the ESG factors in assessing the rating calculated internally by the bank for the borrowers.

The green corrective weighting factor, the GSF, introduced as the denominator of the capital ratio, reduces the sum of the RWAs, which has a few relevant consequences.

²⁰ Signorini L.F., *Rischi climatici e regolamentazione prudenziale*, Convegno Sviluppo sostenibile, finanza e rischio climatico, 2019.

²¹ AIFIRM, Italian Association of Financial Industry Risk Managers, 2020, position paper n ° 20.

²² KPMG, *Bilanci dei gruppi bancari italiani- Trend e prospettive*, 2020.

²³ Intonti M., “Verso Basilea 3: limiti e problematiche in tema di adeguatezza patrimoniale nelle banche” in *Il ruolo del capitale tra regole bancarie e disciplina societaria*, a cura di A. Dell’Atti e G. Giannelli, Egea, Milano, 2012.

²⁴ One of the most commonly cited obstacles for the transition to a zero-carbon economy is related to the amount of investments aimed at this goal. Achieving climate policy goals, in line with the Paris Agreement, requires countries to rapidly decarbonise their manufacturing sectors. This involves high levels of investment in low-carbon energy infrastructure, which are currently not yet undertaken at the required scale and speed. Hafner S. et al., “Closing the green finance gap - A systems perspective”, 2019.

²⁵ D’Orazio P., Popoyan L., *Fostering Green Investments and Tackling Climate-Related Financial Risks: Which Role for Macroprudential Policies?* RUHR Economic Papers, 2018.

²⁶ Dankert J. et al., *A Green Supporting Factor — The Right Policy?* SUERF The European Money and Finance Forum, 2018, n° 43.

²⁷ D’Orazio P., Popoyan L., *Fostering Green Investments and Tackling Climate-Related Financial Risks: Which Role for Macroprudential Policies?* RUHR Economic Papers, 2018.

First of all, it allows to improve the overall capital ratio: by keeping the existing amount of regulatory capital fixed, the decrease in the assets weighted in the denominator of the capital ratio, thanks to the use of the GSF, can lead to an increase in such ratio, resulting in an improvement in the bank's capital adequacy profile. Secondly, if the bank does not need to improve the ratio, it can initiate a process of reducing or resetting the regulatory capital, reducing its cost and improving performance²⁸.

The benefit of using the GSF, to improve the capital requirements for investments designated as green, is closely linked to the actual lower riskiness of green investments compared to others, or at least compared to carbon-intensive investments (so-called brown investments). Furthermore, the usefulness of such factor could result even higher if it were possible to prove that the risk of continuing to provide loans that do not favor the ecological transition is greater than the overall risk deriving from the application of an incentive on the capital to be allocated against the granting of green loans.

In view of the above considerations, as previously highlighted, the literature on the matter highlights that it is appropriate to assess whether green exposures are truly less risky, considering that a mechanism to reduce risk-weighting could lead to financial instability²⁹. Indeed, the idea of introducing a green supporting factor sets two public interest objectives side by side, a greener finance and safer banks, and it is necessary to thoroughly evaluate that these objectives do not conflict but proceed towards greater environmental sustainability in finance without compromising the banks' stability and solvency.

A further tool to promote the transition towards a greener economy, partly similar to the GSF, is related to the introduction of a Brown Penalizing Factor, which, unlike the GSF, would constitute a disincentive to the granting of loans that are harmful to the environment, or "brown loans". This idea has garnered praise from a few banks specialized in sustainable finance, such as Triodos, although, like the GSF, it still rouses mixed opinions³⁰. This factor is the exact opposite of the GSF and would apply higher risk weights to investments that do not support the transition. Whereas the GSF would lower the capital requirement for green credit, even without properly proving that green assets really are less risky (although the tool is yet to be defined), the BPF would require banks to hold more prudential capital for carbon-intensive activities and it would function as an additional weighting factor.

Still regarding the concrete application of this tool, however, it should be pointed out that a critical point is due to the fact that the EU taxonomy on sustainable economic activities offers a definition for green activity but does not provide an equivalent definition for brown activity. It is obviously quite complex to divide the entire bank loan portfolio into two categories (green and brown), since so many different activities fall in the middle, qualifying as not strictly environmentally sustainable, but at the same time not particularly harmful either³¹. In a nutshell, assuming that both factors were introduced, the scenario that could be envisaged would be the following: while the GSF would lower the capital requirement for green credit, even lacking appropriate proof of a lower risk associated with green activities³², the BPF would require banks to hold more prudential capital for carbon-intensive assets, but without these being clearly defined.

It is therefore believed that only with adequate practical testing by financial intermediaries, which concerns the riskiness of green and brown loans, the extent of the corrective factors, the effect on the cost of capital, and the effects systemic, can be reached a conclusion on which tool to adopt, whether green or brown or a combination of both, and on what are the long-term effects of their use. Based on this consideration, two cases of experimentation in the field are analyzed below, useful to focus on the position of some players in the industry and the possibilities of application on a larger scale, possibly shared, of these tools.

5. The experimental application of the GSF

Following the considerations that emerged at European level, a few international banks have started to reflect on the potential adoption of the GSF mechanism, in the process of granting ESG loans, particularly for green loans. The finding of cases of practical experimentation of GSF, as well as of BPF, is rather complex, considering that it is a technical topic, on which intermediaries do not always provide details in documents containing indications on risk management and capital adequacy, such as financial statements, sustainability reports or document on Pillar 3. It is believed, in this regard, that an activity of coordination of the experimental activities could be useful, especially if carried out with the support of the Supervisory Authority, which could induce bank intermediaries to initiate in-depth activities, collect and validate the results and carry out any sharing and application activities on a larger scale.

Among intermediaries that have started to reflect on the GSF mechanism we can find, in Italy, Banca Intesa, where the granting of ESG mortgages, mostly green, is being tested. Such mortgages could be considered less risky than traditional ones, to the extent that it could validate a lower weighting coefficient when determining the bank's capital requirements.

The sustainable loans launched by Intesa consist of mortgages and personal loans, which reward those who buy highly energy-efficient properties (energy class equal or greater than B) and those who implement upgrades aimed at increasing their energy class. Such customers obtain favorable rate conditions, considering that only 30% of Italian properties belong to a medium-high energy class, while the remainder require renovation, this could contribute to the achievement of sustainable development goals, if implemented on a large scale. Furthermore, Intesa Sanpaolo has introduced a solution to finance and incentivize sustainable growth projects for SMEs, namely ESG-Linked S-Loans.

²⁸ Ferri G., Intonti M., "Crescita sostenibile: l'Europa ha un Piano", Rivista MyAdvice, luglio-agosto 2018.

²⁹ Dankert J. et al., A Green Supporting Factor — The Right Policy? SUERF The European Money and Finance Forum, 2018, n° 43.

³⁰ Ford G., Un fattore di sostegno verde indebolirebbe le banche e farebbe poco per l'ambiente, Finance Watch, 2018.

³¹ Manninen O., Tiililä N., Could the Green Supporting Factor help mitigate climate change? Bank of Finland Bulletin, 2020.

³² Sustanaibonds – Green Social Sustainability, Green supporting factor could weaken banks, says Moody's, 2017.

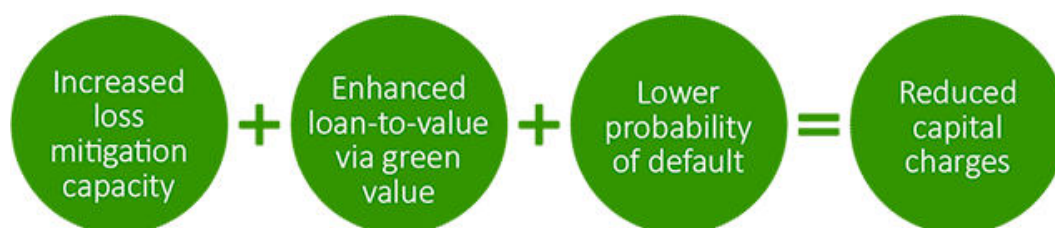
Upon the achievement of specific indicators subject to annual monitoring, certified by the company in the financial statement, companies that achieve the objectives, can obtain forms of "reward" in terms of facilitated conditions, in particular rate reductions. The loan is activated through the signing of a covenant, based on the choice of two KPIs belonging to different ESG areas (e.g., energy supply with Guarantees of Origin or Introduction of an energy supply policy that integrates environmental considerations). If the covenant is respected, based on what is declared in financial statements regarding the performance achieved on the KPIs, to the firm is granted the rate benefit.

The Intesa banking group, in line with their attention to the green world, has joined the so-called Energy Efficient Mortgages Action Plan (EeMAP), a European project which, together with the Energy Efficiency Data Portal & Protocol (EeDaPP³³), is among the actions promoted within the "Energy Efficient Mortgage" (EEM³⁴) initiative, which aims to create a standard energy-efficient mortgage, in order to encourage the renovation of buildings and to encourage highly efficient properties³⁵.

The EeMAP³⁶ initiative, in particular, aims to create a standard European loan for energy efficiency, to incentivize borrowers to both purchase and upgrade their buildings in line with sustainability objectives. The incentives related to the granting of green mortgages may relate to reduced interest rates and / or larger amounts granted, which reflect the reduced credit risk of such loans and enhance their potential contribution to the ecological transition³⁷.

From a capital adequacy point of view, for financial intermediaries that provide this type of loan, the reduction in the "capital charge" is connected to three significant elements: the increase in the ability to mitigate losses, the improvement of the Loan to value (LTV) ratio, defined as the ratio between the amount of the loan granted and the value of the collateral asset, thanks to the green value connected to higher energy efficiency, and the lowest probability of default linked to the creditworthiness of the counterparty, which improves the rating and makes it possible to lower the risk weight (see Figure 5).

Figure 5 - Business case of a mortgage investment for energy efficiency



Source: EeMAP, Energy Efficient Mortgages Action Plan, 2019.

As envisaged by the EeDaPP initiative, this effect might well be recognized in the future decisions about the regulatory framework. Those decisions could take the form of a realignment of capital requirements based on the lower risk associated with this type of exposure. In turn, this would represent an incentive for banks and investors in general to play an active role in the energy efficiency financing agenda, with a consequent impact on the interest rate as well³⁸.

Another entity that has launched an even more incisive testing on the subject of GSF in the financial sector is Natixis Corporate & Investment Banking (CIB). It is a French multinational that deals with financial services specialized in asset and wealth management, corporate and investment banking³⁹. Natixis CIB provides a green and sustainable hub that aims to develop Green and Sustainable Finance activities both in Europe and in America and Asia. The main mission of this network is to design and lead product innovation to generate and develop sustainable revenues; in this area of activity, the company has also provided for the introduction of an ad hoc weighting factor for all the green loans it has granted⁴⁰.

During the Climate Finance Day⁴¹, Natixis CIB launched its Green Weighting Factor (GWF), a proprietary mechanism that regulates the allocation of capital based on the degree of sustainability of each loan and allows for a transition process towards a

³³ The EeDaPP initiative aims to complement and build on the previous EeMAP initiative, addressing the current lack of large-scale standard energy-efficient asset data sets, in order to help develop a true market for energy efficient financing, improving transparency, profitability and thus enabling a comprehensive risk analysis. See EeDaPP, The initiative.

³⁴ The Energy Efficient Mortgages initiative is a pan-European financing mechanism created by private banks, which aims to stimulate and finance investments in energy-efficient buildings, renovations aimed at saving energy to ensure a greener future. Energy Efficient Mortgages Action Plan & Energy Efficiency Data Protocol and Portal, 2019.

³⁵ Intesa San Paolo Group, Environment, and climate change, "Green Economy", 2019.

³⁶ The initiative is led by a consortium led by the European Mortgage Federation-European Covered Bond Council (EMF-ECBC).

³⁷ EeMAP, Creating an energy efficient mortgage for Europe, 2018.

³⁸ EeMAP, Energy Efficient Mortgages Action Plan, 2018; Alliance HQE, The EeMAP project - Towards green mortgages in Europe, 2020.

³⁹ Natixis, Beyond banking, Green Weighting Factor, 2019.

⁴⁰ Natixis, Beyond banking, Green & Sustainable Hub, 2019.

⁴¹ On 11 December 2017, the Third Annual Climate Finance Day was held in Paris to boost international mobilization to finance the fight against climate change. This event has the main objective of gathering high-level representatives from the financial sector, regulators and supervisors and central banks, to highlight the most innovative initiatives aimed at accelerating the financing of the energy transition and the adaptation to global warming. Climate Finance Day was first held in May 2015, at UNESCO's Paris headquarters, marking the launch of the financial sector's campaign to tackle climate issues. This movement, which has grown considerably since the adoption of the Paris Agreement, today sees a large

greener economy by acting on the company's balance sheet. However, the transition of banks' balance sheets depends on the transition of their customers, particularly those coming from predominantly brown sectors⁴², for this reason customers' awareness should be raised towards the activation of green projects that can be financed with resources specifically intended for this purpose, coming from depositors who use their savings responsibly.

The GWF works in the wake of the GSF suggested at European level, applying a positive adjustment on the risk weights of RWAs that have a favorable impact on the climate and applying a negative adjustment on RWAs that, on the contrary, have an unfavorable impact⁴³.

The objective of Natixis CIB is to integrate climate risk into the overall assessment of lending transactions, simultaneously hindering the negative impact on climate thus seeking to align with the objectives of the 2015 Paris Agreement. Such risk assessment, which is particularly innovative and complex, allows to improve and render the overall banking risk measurement activity more precise, while at the same time improving asset allocation.

The application of the GWF by Natixis provides that each loan is assigned an environmental rating through a seven-level color scale, ranging from dark brown to dark green, through a specific analysis activity that assesses the sustainability impact of the loans⁴⁴. As for the evaluation of investment projects, Natixis has developed a benchmark called green/brown ratio, which measures the involvement of a company in green rather than brown activities, based on the indications provided by the TEG. Figure 6 lists a few examples of what can be considered green or brown⁴⁵.

Figure 6 - Green and brown activities

Green activities quoted in the report	Brown activities quoted in the report
Energy Efficiency Renewable Electricity T&D and storage	Fossil fuels extraction and conversion Fossil electricity Hydrogen

Source: Natixis, Beyond banking, EU Climate benchmarks Reality and consistency check, 2019.

Below, four pilot sectors were selected to test the green weight factor: automotive, real estate, electric and mining. Natixis has defined a few criteria to classify each individual lending operation in each of these four sectors based on its environmental and climate impact, designing a fully operational system that can nowadays be tested on 31% of the portfolio of such lending operations within the bank.

This methodology will gradually refer to the EU taxonomy, i.e. the classification system for environmentally sustainable economic activities, as developed over time by the TEG⁴⁶.

Once the climate impact of the project has been assessed, the GWF:

- provides that all loans with a green rating receive a discount of up to 50% on their risk weights.
- and provides, on the contrary, that all loans indexed with a negative rating in terms of their climate impact, have an increase in the risk weight up to 24%⁴⁷.

In the first case, within the possible revisions to the regulatory framework envisaged above, the granting of green loans might allow a reduction in the weighting of assets, with a consequent reduction in the denominator of the capital ratio and an increase in the ratio itself. This could imply greater capital solidity for the bank.

In the case of granting loans for polluting activities, the risk weighting required of the bank by the revised regulatory framework might be higher. In this case, the denominator of the capital ratio would be greater, and the entire solvency ratio would suffer a reduction, due to the increase in risk-weighted assets (RWA).

Furthermore, by adjusting the expected return on each loan according to its impact on environment and climate, Natixis encourages and favors green financing solutions (for an equivalent level of credit risk).

number of banks, insurance companies and investors adopting strategies to decarbonise their portfolios, invest in renewable energy and develop new green financing solutions. Climate Finance Day, 2017.

⁴² Natixis, Beyond banking, Brown industries - the transition tightrope.

⁴³ Gagiuc A., Natixis introduce il fattore di ponderazione verde, Commercial property executive, 2019.

⁴⁴ Gagiuc A., Natixis introduce il fattore di ponderazione verde, Commercial property executive, 2019.

⁴⁵ Natixis, Beyond banking, EU Climate benchmarks Reality and consistency check, 2019.

⁴⁶ Natixis, Beyond banking-Natixis innovates on climate action by introducing the first green weighting factor for its financing deals to comply with Paris Agreements goals, 2018.

⁴⁷ Natixis, Universal Registration Document and Financial Report, Sez. 6, Green growth: financing the energy transition and combating climate change, 2019.

The GWF methodology will be able to incorporate the criteria included in the EU classification system, the so-called taxonomy, as the European Commission's Technical Expert Group progresses in completing it⁴⁸. Although the GWF initiative was initially announced at the Climate Finance Day in Paris on 11 December 2017, the methodological development took 18 months to be completed and involved an independent review, implemented by KPMG in 2020⁴⁹.

Natixis' tool is replicable and could be adopted by other banks engaged in the transition of their portfolios. To this end, the French bank will progressively share the details of its approach with other banks, including banks which signed the Principles for Responsible Banking, established as part of the United Nations environmental program⁵⁰.

6. Conclusions

This paper tackled the introduction of a green supporting factor (GSF), a way suggested by the EU Action Plan on Sustainable Finance to incentivize the expansion of green loans – and through that promote the sustainable transition – by reducing banks' minimum capital requirements on such loans. In particular, we addressed two specific research questions. First, we surveyed the literature on whether it is possible to introduce a GSF – or, on the opposite, a brown penalizing factor (BPF) – to improve the allocation of bank capital, making it more responsive to loan risks. Second, by examining real examples, we evaluated the usefulness of experimental applications to verify the effectiveness in terms of cost of capital and ecological transition by means of a GSF.

Our survey of the literature on the subject and of assessments by industry and opinion makers, highlighted that the introduction of a GSF, applied to the weightings of assets subjected to risk, contributes in different ways to improving the capital profile of financial intermediaries. Such contribution hinges on the size of the GSF and it must be explained and accompanied by a correct quantification of the ESG risks of those assets, to avoid stability risks and negative effects on "prudent management". In response to the first research question, we can therefore argue, in light of the study carried out, that it is possible to introduce corrective systems that favor green loans or penalize brown loans to support the ecological transition. Furthermore, in response to the second research question, to check the actual effectiveness of the GSF and to correctly calibrate its extent following an assessment of ESG risks (significantly climate risks), we highlighted how the experimental applications carried out by two financial intermediaries prove particularly useful. Such banks are fully aware of the risks, but also of the benefits that could originate from the application of the GSF, both in relation to the capital burden and in view of the development of the green finance sector. Moreover, these banks are willing to invest time and resources to assess the effectiveness of the introduction of an innovative and challenging mechanism, both at the single bank level and for the entire financial system.

These trials, conducted internally but monitored by the supervisory authority, should therefore be encouraged and followed in order to prevent any distorting effects and to evaluate their future application on a larger scale. A recent and particularly significant initiative on the GSF, which sustains the experiments implemented by single banks and works towards a systemic application, was taken by the European Banking Federation (EBF), which has proposed a support factor for sustainable finance (SFSF, Sustainable Finance Supporting Factor) as an interim measure, pending the development of new methodologies for incorporating ESG factors into the supervisory framework. The goal of the EBF refers to the possibility, suggested by the EBA, of introducing the SFSF for activities that are classified as sustainable by the EU taxonomy and which also display a lower risk associated with their sustainability profile⁵¹. ABI, the Italian Banking Association, also contributed to define the SFSF proposal presented during the Cop25 in Madrid in 2019, along with other forms of non-prudential incentives. The proposal stems from a series of EBF considerations including the possibility of introducing activities that are well positioned with respect to the taxonomy objectives through a correct adaptation of RWAs. In fact, the proposed SFSF can only be applied to Eligible exposures, i.e. to single exposures having two characteristics at the same time they must be connected to:

1. the classes of economic activities/projects mentioned in the EU taxonomy for which a reduction in the credit risk profile has been assessed as highly probable precisely by virtue of their sustainability. They are Eligible economic activities (sometimes also defined Eligible asset classes) identifiable at institutional level with forward-looking methods⁵² or with partly innovative approaches.
2. economic activities that individually comply with the criteria and other provisions of the taxonomy.

In the second characteristic, the future can be read: at the moment, the taxonomy only considers the two environmental objectives relating to mitigation and adaptation to climate change, but the mechanism of the SFSF may extend to consider the other environmental objectives, as well as the social objectives that are particularly relevant nowadays, given the problems linked to inequalities, poverty and unemployment related to the Covid-19 pandemic and the Ukraine war. The next challenge for Europe seems to identify, with the same methodology already applied to sustainable assets from an environmental perspective, assets that are sustainable from a social point of view, in order to pursue the objective of reorienting financial resources in a correct and conscious manner even towards activities that pursue objectives of common good, human dignity and respect for rights. And such future should not be delayed.

⁴⁸ Natixis, Universal Registration Document and Financial Report, Sez. 6, Green growth: financing the energy transition and combating climate change, 2019.

⁴⁹ Gagiuc A., Natixis introduce il fattore di ponderazione verde, Commercial property executive, 2019.

⁵⁰ Di Lernia H., Natixis, i finanziamenti si giudicano in base all'impatto sul clima, Bluerating, 2019.

⁵¹ European Banking Federation, Sustainable Finance Supporting Factor; Schieppati M., La sostenibilità? Deve essere davvero sostenibile, Bancaforte, 2021.

⁵² "While the traditional retrospective approach does not capture risk, it appears that the forward-looking technique captures the long-term nature of environmental risks, but it emerges that these are not available on a large scale, so it could be difficult to incorporate them into the prudential framework given the different time horizon ..." AIFIRM, Italian Association of Financial Industry Risk Managers, 2020, position paper n° 20.

Bibliography

- ABI, La sostenibilità sempre più un fattore di competitività -ABI BusinESsG 2019.
- ABI, Le banche italiane impegnate per uno sviluppo sostenibile- ABI Esg Benchmark 2015.
- AIFIRM, Associazione Italiana Financial Industry Risk Managers, 2020, position paper n° 20.
- Alliance HQE, Il progetto EeMAP- Verso i mutui verdi in Europa, 2020.
- Banca d'Italia, The Bank of Italy values sustainability in its financial investments, 2019.
- Berenguer M. et al., Integrating Climate-related Risks into Banks' Capital Requirements, I4CE Institute for Climate Economics, 2020.
- Bernardini E., Faiella I., Lavecchia L., Mistretta A. e Natoli F., Banche centrali, rischi climatici e finanza sostenibile, Banca d'Italia, Questioni di Economia e Finanza, Occasional Papers, 2021.
- Climate Finance Day, 2017.
- D'Orazio P., Popoyan L., Fostering Green Investments and Tackling Climate-Related Financial Risks: Which Role for Macroprudential Policies? RUHR Economic Papers, 2018.
- Dafermos Y., Nikolaidi M., How can green differentiated capital requirements affect climate risks? A dynamic macrofinancial analysis, Post-Keynesian Economics Society, Working paper 2105, 2021.
- Dankert J., Van Doorn L., Reinders H.J. and Sleijpen O., "A Green Supporting Factor - The Right Policy?" SUERF "The European Money and Finance Forum" De Nederlandsche Bank N.V., 2018.
- Di Lernia H., Natixis, I finanziamenti si giudicano in base all'impatto sul clima, BlueRating, 2019.
- EBA, Reporting on SMEs and SME supporting factor, 2016.
- EeDaPP, The initiative.
- EeMAP, Creating an energy efficient mortgage for Europe, 2018.
- EeMAP, Energy Efficient Mortgages Action Plan, 2018.
- Energy Efficient Mortgages Action Plan & Energy Efficiency Data Protocol and Portal, 2019.
- Enria A., Banking Supervision, Regulation, proportionality and the sustainability of banking, Speech at the Retail Banking Conference "Creating sustainable financial structures by putting citizens first" of European Savings Bank Group, Brussels, European Central Bank, 21 November 2019.
- European Banking Federation, Towards a green finance framework, www.ebf.eu.
- European Commission, Action Plan to finance sustainable growth, 2018. Consob.it, Il Piano d'Azione per la finanza sostenibile.
- European Parliament and Council, Taxonomy Regulation 2020/852 of 18 June 2020 on the establishment of a framework that favors sustainable investments and amending regulation (EU) 2019/2088.
- European Parliament and Council, Regulation (EU) 2019/2088 of 27 November 2019 on sustainability-related disclosures in the financial services sector.
- Ferri G., Intonti M., "Crescita sostenibile: l'Europa ha un Piano", Rivista MyAdvice, luglio-agosto 2018.
- Ford G., Un fattore di sostegno verde indebolirebbe le banche e farebbe poco per l'ambiente, Finance Watch, 2018.
- Gagiuc A., Natixis introduce il fattore di ponderazione verde, Commercial property executive, 2019.
- Grünewald S., Climate change as a systemic risk – Are macroprudential authorities up to the task? European Banking Institute, Working Paper Series, 2020.
- Gruppo Intesa San Paolo, Environment and climate change, "Green Economy", 2019.
- Hafner S. et al., "Closing the green finance gap – A systems perspective", 2019.
- Intonti M., "Verso Basilea 3: limiti e problematiche in tema di adeguatezza patrimoniale nelle banche" in Il ruolo del capitale tra regole bancarie e disciplina societaria, a cura di A. Dell'Atti e G. Giannelli, Egea, Milano, 2012.
- KPMG, Bilanci dei gruppi bancari italiani- Trend e prospettive, 2020.
- Manninen O., Tiilikä N., Could the Green Supporting Factor help mitigate climate change? Bank of Finland Bulletin, 2020.
- Meager E., What to expect from the EU's renewed sustainable finance strategy, Capital monitor, 2021.
- Natixis, Beyond banking, Brown industries - the transition tightrope, 2019.
- Natixis, Beyond banking, EU Climate benchmarks Reality and consistency check, 2019.
- Natixis, Beyond banking, Green & Sustainable Hub, 2019.
- Natixis, Beyond banking, Green Weighting Factor, 2019.
- Natixis, Beyond banking, Natixis innovates on climate action by introducing the first green weighting factor for its financing deals to comply with Paris Agreements goals, 2018.
- Natixis, Universal Registration Document and Financial Report, Sez. 6, Green growth: financing the energy transition and combating climate change, 2019.
- Pope Francis, Encyclical Letter Laudato Si, 2015.

- PRI, Principles for Responsible Investment, Action 8: Incorporating sustainability in prudential requirements, 2018.
- Sabatini G., Resolution 7-00851 Taranto, relating to the initiatives for the maintenance of the instrument of the support factor for small and medium-sized enterprises (SME Supporting factor) regarding the capital requirements of credit institutions, ABI Hearing, 2016.
- Schieppati M., La sostenibilità? Deve essere davvero sostenibile, Bancaforte, 2021.
- Signorini L.F., Rischi climatici e regolamentazione prudenziale, Convegno Sviluppo sostenibile, finanza e rischio climatico, 2019.
- Sustanaibonds – Green Social Sustainability, Green supporting factor could weaken banks, says Moody's, 2017.
- Thomä J. and Gibhardt K. (2019), "Quantifying the potential impact of a green supporting factor or brown penalty on European banks and lending", Journal of Financial Regulation and Compliance, Vol. 27 No. 3, pp. 380-394.
- Thomä J., Hilke A., The green Supporting factor. Quantify the impact on European banks and green finance", 2nd Investing Initiative, 2018.
- Unione Europea, Accordo di Parigi, ratifica, 2016.
- Viviani A., SME Supporting Factor- una spinta per i prestiti alle PMI, Studio Eidos, 2016.

Risk Management Magazine

Volume 17, Issue 1, January – April 2022

Direttore Responsabile (Editor in Chief)

Maurizio Vallino

Condirettore (Managing Editor)

Corrado Meglio

Editorial Board

Giampaolo Gabbi - Chief Editor Business Economics Area (SDA Bocconi); Paolo Giudici - Chief Editor Statistical Economics Area (Università di Pavia); Daniel Ahelegbey (Università di Pavia); Raffaella Calabrese (University of Edimburgh); Robert Eccles (Oxford University); Franco Fiordelisi (University of Essex); Pier Giuseppe Giribone (Università di Genova); Gulia Iori (London City University); Richard M. Levich (New York University); Michèle F. Sutter Rüdissler (University of San Gallen); Peter Schwendner (ZHAW Zurich University of Applied Sciences); Alessandra Tanda (Università di Pavia).

Scientific Committee

Arianna Agosto (Università di Pavia); Ruggero Bertelli (Università di Siena); Paola Bongini (Università Milano Bicocca); Anna Bottasso (Università di Genova); Marina Brogi (Università La Sapienza di Roma); Ottavio Caligaris (Università di Genova); Rosita Coccozza (Università Federico II di Napoli); Costanza Consolandi (Università di Siena); Simona Cosma (Università del Salento); Paola Ferretti (Università di Pisa); Andrea Giacomelli (Università di Venezia); Adele Grassi (Vice Presidente APB); Valentina Lagasio (Università La Sapienza di Roma); Duccio Martelli (Università di Perugia); Enrico Moretto (Università Insubria, Italy); Laura Nieri (Università di Genova); Adamaria Perrotta (UCD – University College Dublin, Ireland); Pasqualina Porretta (Università La Sapienza di Roma); Anna Grazia Quaranta (Università di Macerata); Enzo Scannella (Università di Palermo); Cristiana Schena (Università dell'Insubria); Giuseppe Torluccio (Università di Bologna).

Cartoonist: Silvano Gaggero

Ownership, Newsroom and Secretariat:

Associazione Italiana Financial Industry Risk Managers (AIFIRM), Via Sile 18, 20139 Milano

Registration number at Court of Milan n. 629 dated 10th September 2004

ISSN Print 2612-3665 – **ISSN Online** 2724-2153

DOI 10.47473/2016rrm

E-mail: risk.management.magazine@aifirm.it; Tel. +39 389 6946315

Printing

Algraphy S.n.c. - Passo Ponte Carrega 62-62r 16141 Genova

Authors bear sole responsibility for the opinions expressed in their articles.

MAILED TO AIFIRM SUBSCRIBERS WHO ARE RESIDENT IN ITALY AND DULY REGISTERED





#1 PER LE SOLUZIONI DI BALANCE SHEET RISK MANAGEMENT

Prometeia conferma il riconoscimento per le migliori soluzioni di Balance Sheet Risk Management e Capital Optimization nell'edizione 2022 di RiskTech100® di Chartis Research, il più prestigioso e completo sondaggio tra i tech vendor internazionali in ambito Risk Management e Regulatory Compliance.

Prometeia è entrata stabilmente nei primi 25 provider di tecnologia per il rischio a livello globale. Successi che confermano l'apprezzamento della nostra innovazione, anche e soprattutto in questo contesto di grande incertezza.

www.prometeia.com