Palgrave Macmillan Studies in Banking and Financial Institutions

Series Editor Philip Molyneux University of Sharjah Sharjah UAE The Palgrave Macmillan Studies in Banking and Financial Institutions series is international in orientation and includes studies of banking systems in particular countries or regions as well as contemporary themes such as Islamic Banking, Financial Exclusion, Mergers and Acquisitions, Risk Management, and IT in Banking. The books focus on research and practice and include up to date and innovative studies that cover issues which impact banking systems globally.

More information about this series at http://www.palgrave.com/gp/series/14678

Paola Leone · Pasqualina Porretta Mario Vellella Editors

Measuring and Managing Operational Risk

An Integrated Approach

pəlgrəve macmillan *Editors* Paola Leone Sapienza University of Rome Rome, Italy

Pasqualina Porretta Sapienza University of Rome Rome, Italy Mario Vellella Poste Italiane, BancoPosta Rome, Italy

Palgrave Macmillan Studies in Banking and Financial Institutions ISBN 978-3-319-69409-2 ISBN 978-3-319-69410-8 (eBook) https://doi.org/10.1007/978-3-319-69410-8

Library of Congress Control Number: 2017956908

© The Editor(s) (if applicable) and The Author(s) 2018, corrected publication 2018

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Cover illustration: © nemesis2207/Fotolia.co.uk

Printed on acid-free paper

This Palgrave Macmillan imprint is published by Springer Nature The registered company is Springer International Publishing AG The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland The original version of the book was revised: Belated corrections from author have been incorporated. The erratum to the book is available at https://doi. org/10.1007/978-3-319-69410-8_6

Acknowledgements

This work is the result of progressive research work over time, on operational risk measurement and management, made by a work team composed by academicians and practitioners (operational risk manager). It is also the result of a research project (promoted by Sapienza University of Rome, Faculty of Economics) related to "Operational Risk: New models for Integration of Scenario Analysis" started in 2016.

The book has been designed and developed thanks to support, contributions and suggestions of each member of the work team. In the current literature, there is a lot of work focused on operational risk management and measurement but, in a context of collaboration and reciprocal intellectual exchanges, new research questions have been identified in order to build, progressively, this work.

An intense and fruitful collaboration among the work team members, involved in this research project, allowed to develop the theoretical and practical contents of this monograph, enabling to focus on an extremely important topic in the current regulatory framework and economic context. In fact, the project suggests an integrated approach in the fields of operational measurement and management, and analyzes advantages and disadvantages of this new regulatory approach also in the field of the Single Supervisory Mechanism Regulation (SSRM). In this perspective, and in the light of the main results of the comparative analysis, the authors attempted to define the impact of the new operational regulatory approach (SMA approach) on financial intermediaries in an integrated risk perspective; in particular, it proposes: a) comparative analysis between the new regulatory SMA model (standard measurement approach) and an advanced measurement approach; b) a risk factor sensitivity analysis of the two approaches with the purpose to finally underline the importance to give a regulatory relevance to measurement's tools directly connected to operational risk level in an integrated view.

In this perspective, the present work finally gives a great contribution to operational literature as it introduces the new regulatory perspective in the European banking supervision, and it analyses the new regulatory model (SMA model) and compares it with a specific internal model. At the same time, this work can be handy also for financial intermediaries as it provides useful operational suggestions for making operational risk management more efficient and sustainable and more integrated in the banking system.

The book and the case study that it contains have been developed not only thanks to authors and co-authors but also to the collaboration of the DIPO team (Italian Database of Operational Losses); in particular, authors and co-authors want to thank the DIPO members representatives in the Statistical Committee and Claudia Pasquini, Claudia Capobianco and Vincenzo Buggé from the DIPO secretariat that share with the team work their professional experience in the field of operational risk measurement.

Furthermore, the authors wish to express their gratitude to many colleagues and practitioners with whom they shared discussion and opinions. The authors are also grateful to the assistance and support received from Gabriele Stinco in building the BancoPosta Operational Risk Framework and to whole BancoPosta-ORM team, especially to Giovanni Machetti, Maurizio Gargano, Michele Lux, Roberto Lucia, Emanuela Ruoppolo e Flavia Camponeschi, Michele Pierri, Munzi Silvia, Boccardelli Laura, Barracchia Margherita, Daniela Valerio and Federica Capoccia. Finally, the authors and co-authors wish to express thanks to their families and ask for their forgiveness for the long time taken up in the preparation of this book. As always happen, any errors and omissions that will be encountered by readers are attributable only to authors and co-authors.

Contents

1	Intro	duction to the Work and Operational Risk	1
	Paola	Leone and Pasqualina Porretta	
	1.1	Introduction	2
	1.2	Operational Risk: Transversal, Pure, Multidimensional	5
	1.3	Operational Risk: A Few Peculiarities	10
	1.4	The Work's Structure	14
	1.5	Some Conclusions	18
	Refer	ences	21
2	Oper	ational Risk Management: Regulatory Framework	
	and (Operational Impact	25
	Paola	Leone and Pasqualina Porretta	
	2.1	Operational Risk Management in the Banking	
		System: First Considerations	26
	2.2	Regulatory Approaches for Measuring Capital	
		Requirements. An Introduction	30
	2.3	Advanced Measurement Approaches (AMA)	37
	2.4	Data Collection	42
	2.5	AMA Methodologies: LDA	46

	2.6	Calculation of the Operational VaR	57
	2.7	Operational Requirements to Be Eligible for AMA	
		Methodologies	59
	2.8	In Addition to AMA Methodologies: Operational Risk	
		Management	65
	2.9	Supervision Operational Risk. From Sound Practices	
		to the New SREP	72
	2.10	Some Conclusions	86
	Refer	ences	89
3	Oper	ational Risk Measurement: A Literature Review	95
	Franc	esco Giannone	
	3.1	Introduction	96
	3.2	Loss Distribution Approach	96
	3.3	Scenario Analysis	117
	3.4	Bayesian Methods	123
	3.5	Some Conclusions	129
	Refer	ences	138
4	Integ	rated Risk Measurement Approach: A Case Study	145
	Vitan	tonio Matarazzo and Mario Vellella	
	4.1	Introduction	146
	4.2	Overview of the Measurement Framework	147
	4.3	Model Input Data	148
	4.4	Definition of Risk Classes	149
	4.5	Overview of LDA Component	150
	4.6	Overview of the Scenario Analysis Component	151
	4.7	Overview of Risk Measurements Integration	152
	4.8	Historical Loss Analysis—Quantitative Component	153
	4.9	Distribution of Aggregate Losses	171
	4.10	Results of Scenario Analysis	174
	4.11	Integration of Scenario Analysis Results with	
		Quantitative Component	175
	4.12	Conclusion	177
	Refer	ences	179

Regu	latory View	183
Paoli	a Leone, Vitantonio Matarazzo, Pasqualina Porretta	
and .	Mario Vellella	
5.1	The New Standard Approach: Is AMA	
	at a Crossroads? Some Questions to Answer	184
5.2	Case Study: A Comparative Analysis	190
5.3	Beyond the Regulatory Framework: An Operational	
	Management Tool	195
5.4	Some Conclusions	200
Refer	ences	204
ratum	to: Measuring and Managing Operational Risk	E1

Index

207

Editors and Contributors

About the Editors

Paola Leone is Full Professor of Banking and Finance at the Sapienza University of Rome. She is Chairperson of "International Finance and Risk Management (IFIR)" Post graduate Degree and Director of Master of "Banking and Financial Management" at Sapienza University of Rome, Faculty of Economics where she teaches risk management. Professor Leone is author of several books and contributes on banking and financial topics published on national and international prestigious journals. Her main research interests are banking, capital markets, risk management, mutual guarantee institutions, Bank Recovery and Resolution Directive (BRRD). She acted as consultant and trainer for various financial intermediaries, public and private entities and consulting firms; she has a great experience in banking crises management.

Pasqualina Porretta is Associate Professor in Banking and Finance at Sapienza University of Rome, Faculty of Economics where she teaches "Risk Management in bank and insurance" and "Derivatives". She is a member of the academic board of the Ph.D. in Management, Banking and Commodity Science at Sapienza. Her main research interests are risk measurement and management (credit risk, market risk, liquidity risk, counterparty risk, systemic risk), capital

regulatory framework, financial derivatives, credit guarantee institutions and microcredit. Professor Porretta is author of several books and contributes on banking and financial topics published on national and international prestigious journals. She acts as consultant and trainer for various financial intermediaries, microfinance institutions, public entities and consulting firms.

Mario Vellella is a Risk Manager with more than 10 years distinguished experience in operational risk management within Poste Italiane, BancoPosta, Rome, Italy. He is highly self-motivated team player, with the ability to take the initiative to ensure timely delivery and consistently meeting targets. His specific research interest areas are enterprise risk management, process analysis, risk mitigation, risk mapping and evaluation for firm operating in different sectors (financial or nonfinancial sectors).

Contributors

Vitantonio Matarazzo is a Risk Manager with more than 5 years distinguished experience in operational risk management within Poste Italiane, BancoPosta, Rome, Italy. He is a Ph.D. Student in "Management, Banking and Commodity Sciences" at Sapienza University of Rome, Italy, and holds a Master in Energy Finance at MIP-Politecnico di Milano, and he is graduated in Physics. His specific research interest areas are nanostructured material, financial modeling for operational and reputational risk.

Francesco Giannone is Ph.D. candidate in "Management, Banking and Commodity Sciences" at Sapienza University of Rome, Italy, where he received his B.A. in "Applied Mathematics" and his master's in "Banking and Finance". His main research interests include risk measurement and management and quantitative finance. At present, he is operational risk analyst in a big insurance company.

List of Figures

w 12 38
38
60
43
ect
49
58
60
61
63
74
77
81
98
111
113
113
117

Fig. 3.6	Architecture of a simple Bayesian network	125
Fig. 4.1	Capital quantification framework	147
Fig. 4.2	Historical monthly frequency series	154
Fig. 4.3	Histogram of empirical frequency distribution [2010–2015]	155
Fig. 4.4	Historical monthly frequency series subject to modelling	156
Fig. 4.5	Autocorrelation and partial autocorrelation of the	
e	monthly Frequency Time Series	156
Fig. 4.6	An overview of the severity distribution sub-process analysis	160
Fig. 4.7	Historical monthly series of total severity containing	
-	both internal and external data	161
Fig. 4.8	Historical series of individual loss impacts distinguished	
-	by internal or external source	161
Fig. 4.9	Historical monthly series of average severity containing	
	both internal and external data	162
Fig. 4.10	Comparison of empirical distribution LDC-BP vs. DIPO	
	(log-scale)	162
Fig. 4.11	Q-Q plot of empirical distribution LDC-BP vs. DIPO	
	(log-scale)	162
Fig. 4.12	Box plot of the severity of operational losses by comparison	163
Fig. 4.13	Mean excess graph	167
Fig. 4.14	Shape parameter trend: MLE vs. PWM estimation method	168
Fig. 4.15	P-value GOF tests: KS and AD2UP. Acceptance	
	threshold 0.05 (red line)	169
Fig. 4.16	VAR-SLA (Single Loss Approximation)	169
Fig. 4.17	Q-Q plot of the GPD model for the tail, logarithmic scale	170
Fig. 4.18	Plot comparison between the empirical distributions	
	and model calculated	171
Fig. 4.19	Representation of the simulated distribution	
	of aggregate losses, ORC X	174
Fig. 5.1	Average annual frequency by event type, values	
	in thousands	191
Fig. 5.2	Operational VAR by first level event type, values	
	in millions of euros	192
Fig. 5.3	AMA vs SMA: values expressed as a percentage	
	of the Intermediation Margin	193

List of Tables

Table 1.1	Several definitions of operational risk	6
Table 1.2	Loss event types	9
Table 2.1	Business line	34
Table 2.2	Business environment and internal control factors	46
Table 2.3	The quantitative requirements provided for by the CRR	66
Table 2.4	Principles for the sound management of operational risk	70
Table 2.5	Supervisory considerations for assigning an operational	
	risk score	85
Table 3.1	Treatment of dependences between operational losses	106
Table 3.2	Alternative distributions to GPD used in literature	118
Table 4.1	Descriptive statistics of the empirical frequency	
	distribution period [2010–2015]	155
Table 4.2	Test Ljung–Box, ORC X	156
Table 4.3	Test Durbin–Watson	157
Table 4.4	Verification test of the IID hypothesis, ORC X	157
Table 4.5	Theoretical distributions used to model the historical	
	frequency series, ORC X	158
Table 4.6	Descriptive statistics of empirical severity distribution (I)	165
Table 4.7	Descriptive statistics of empirical severity distribution (II)	165
Table 4.8	Generalized Pareto Tail Fit Distribution, ORC X	170

Table 4.9	Semi-parametric model constructed for the severity	
	of ORC X	171
Table 4.10	Monte Carlo detail for VaR stabilisation and variability	
	measures, ORC X	174
Table 4.11	Scenario analysis results, ORC X	175
Table 4.12	Integration of weights calculation, ORC X	176
Table 4.13	Results of the qualitative and quantitative integration,	
	ORC X	176
Table 5.1	BI buckets in the BI component	187
Table 5.2	The SMA capital requirement	189
Table 5.3	Operational CaR: AMA approach vs SMA approach,	
	values in millions of euros	192
Table 5.4	Variation in operational loss averages for the clusters	
	relevant to the SMA calculation	193