Contents

	ano l face	Bellini'	s Biography	xiii	
		ledgme	ante	XV 	
ACK	MOW	ieagine	en es	xvii	
1.	Int	roduc	ction to Stress Testing and Risk Integration	1	
	1.1		ote to the Crisis	1	
			What Went Wrong	2 4	
			Regulatory Responses	4	
	1.2		s Testing, Risk Integration, and Reverse Stress Testing	7	
		1.2.1	Stress Testing	7	
		1.2.2	Ü	12	
	1.3		Structure at a Glance	15	
			Organization of the Book	1 <i>7</i>	
	1.4	Sumn		22	
		Reter	ences	23	
2.	Macroeconomic Scenario Analysis from a Bank				
_,		spect		25	
	Key	Abbre	viations and Symbols	26	
	2.1	Intro	duction	26	
	2.2	Autor	egression and Moving-Average Modeling	27	
		2.2.1	AR(p) Analysis	28	
		2.2.2	MA(q) Analysis	28	
		2.2.3	ARMA(p,q) Analysis	29	
		2.2.4	Box-Jenkins Time Series Analysis	31	
	2.3		r Autoregression and Vector Error-Correction Modeling	34	
			Vector Autoregression and Vector Error-Correction Analysis	34	
			Vector Autoregression and Vector Error-Correction Forecast	42	
			Impulse Response Analysis	46	
	2.4		al Vector Autoregression Modeling	47	
		2.4.1	Introduction to the Global Vector Autoregression Model	47	
		2.4.2	Global Vector Autoregression Analysis	48	
		2.4.3	Global Vector Autoregression Forecast	51	
		2.4.4	Generalized Impulse Response Analysis	52	
	2.5		Testing Scenario	53	
		2.5.1	Scenario Design	54	
		2.5.2	Conditional Forecasting	55	

viii Contents

		2.5.3 Bank Alpha's Stress Testing Scenario	57
		2.5.4 Macroeconomic Modeling and Satellite Frameworks	58
	2.6	Summary	60
		Suggestions for Further Reading	60
		Appendix. Robust Vector Error Correction Model: A Forward	
		Search Approach	61
		Exercises	69
		References	70
3.	Ass	et and Liability Management, and Value at Risk	73
	Kev	Abbreviations and Symbols	74
	•	Introduction	<i>7</i> 5
		Margin at Risk	77
	J	3.2.1 Margin at Risk Estimation	81
		3.2.2 Interest Rate Sensitivity Analysis	90
		3.2.3 Term Structure of Interest Rates	93
		3.2.4 Margin at Risk Under a Stress Testing Scenario	97
		3.2.5 Bank Alpha's Stress Testing Margin at Risk	98
	3.3	Value at Risk	99
		3.3.1 Variance-Covariance Value at Risk	103
		3.3.2 Monte Carlo Simulation Value at Risk	105
		3.3.3 Historical Simulation Value at Risk	106
		3.3.4 Stress Testing and Regulatory Value at Risk	107
		3.3.5 Bank Alpha's Market RWA	109
	3.4	•	109
		3.4.1 Bank Alpha's Liquidity Analysis	111
	3.5		114
		Suggestions for Further Reading	114
		Appendix A. Kalman Filter for Affine Term Structure Models	115
		Appendix B. Robust Kalman Filter: A Forward Search Approach to Estimate Affine Term Structure Models	447
		Exercises	117
		References	119
		References	120
4.	Po	rtfolio Credit Risk Modeling	123
	Ke	y Abbreviations and Symbols	124
	4.1		124
	4.2	Credit Portfolio Modeling	125
		4.2.1 Credit Loss Distribution	126
		4.2.2 CreditMetrics	131
		4.2.3 Credit Portfolio Modeling With Copulas	138
	4. 3	Credit Risk-Weighted Assets	142
		4.3.1 Standardized Credit Risk-Weighted Assets	142
		4.3.2 Internal Ratings-Based Credit Risk-Weighted Assets	144
		4.3.3 Bank Alpha's RWAs for Credit Risk	148

	4.4	How to Link Credit Risk Parameters and	
		Macroeconomic Variables	148
		4.4.1 Default Probability and Macroeconomic Variables	149
		4.4.2 Loss Given Default and Macroeconomic Variables	151
	4.5	Portfolio Credit Risk Stress Testing	152
		4.5.1 Stress Testing Risk-Weighted Assets	152
		4.5.2 Portfolio Credit Stress Testing	154
	4.6	Summary	155
		Suggestions for Further Reading	156
		Appendix A: Default Probability Estimation Via Logit Regression	156
		Appendix B: The Forward Search for Elliptical Copulas	158
		Exercises	160
		References	161
5.	Bal	ance Sheet, and Profit and Loss Stress Testing	
		jections	163
	Key	Abbreviations and Symbols	164
	5.1	Introduction	164
	5.2	Balance Sheet Projection	165
		5.2.1 Credit Life Cycle	166
		5.2.2 Performing Portfolio Projection	169
		5.2.3 Nonperforming Portfolio Projection	172
		5.2.4 Trading Book, Other Assets, and Liabilities Projection	173
		5.2.5 Bank Alpha's Stress Testing Balance Sheet	176
	5.3	Profit and Loss Projection	179
		5.3.1 Profit and Loss Mechanics	179
		5.3.2 Bank Alpha's Stress Testing Profit and Loss	183
	5.4	Conduct and Operational Risk Stress Testing	187
		5.4.1 Projection of Conduct and Operational Losses	187
		5.4.2 Risk-Weighted Assets for Operational Risk	187
		5.4.3 Bank Alpha's Stress Testing Operational RWA	190
	5.5	Summary	191
		Suggestions for Further Reading	191
		Exercises	192
		References	193
6.	Reg	gulatory Capital, RWA, Leverage, and Liquidity	
		quirements Under Stress	195
	6.1	Introduction	196
	6.2	Regulatory Capital	198
		6.2.1 How to Compute the Regulatory Capital	199
		6.2.2 Bank Alpha's Stress Testing Regulatory Capital	203
	6.3	Risk-Weighted Assets and Capital Ratios	208
		6.3.1 Bank Alpha's Risk-Weighted Assets (From a Silo Perspective)	208
		6.3.2 Risk-Weighted Asset Aggregation	211

x Contents

		6.3.3 Bank Alpha's Stress Testing Capital Ratios	213
	6.4	Leverage and Liquidity Ratios	216
		6.4.1 Leverage Ratio	216
		6.4.2 Bank Alpha's Stress Testing Leverage	217
		6.4.3 Liquidity Coverage Ratio	219
		6.4.4 Bank Alpha's Stress Testing Liquidity Coverage Ratio	220
		6.4.5 Net Stable Funding Ratio	222
		6.4.6 Bank Alpha's Stress Testing Net Stable Funding Ratio	224
	6.5	Summary	227
		Suggestions for Further Reading	232
		Exercises	232
		References	234
7.	Ris	k Integration	235
	-	Abbreviations and Symbols	236
	7.1		236
	7.2	1 0	238
		7.2.1 Basic Integration	238
		7.2.2 Top-Level Integration	239
		7.2.3 Base-Level Integration	244
	7.3	Bottom-Up Economic Capital Integration Modeling	246
		7.3.1 Economic Capital Integration	246
		7.3.2 Integration Process	247
	7 1	7.3.3 Bank Alpha's Integrated Economic Capital	254
	7.4	Bottom-Up Liquidity Integration Modeling	256
		7.4.1 Risk Integration: Liquidity (Short-Term Perspective)	257
	7 -	7.4.2 Bank Alpha's Integrated Liquidity	261 262
	<i>7</i> .5	Summary Suggestions for Eurther Bonding	262
		Suggestions for Further Reading Exercises	263
		References	263
		References	203
8.	Re	verse Stress Testing	265
	Key	y Abbreviations and Symbols	266
	8.1	Introduction	266
	8.2	Reverse Stress Testing Objective Function	267
		8.2.1 Reverse Stress Testing: Economic Capital Versus Liquidity	
		Mismatching	267
	8.3	8 ,	269
		8.3.1 Long- and Short-Run Risk Integration	269
		8.3.2 Vulnerability Thresholds	270
	8.4	1	27 3
		8.4.1 Trading Book	273
		8.4.2 Banking Book	277
		8.4.3 Liquidity and Overall Financial Structure	270

8.5	Exploration of Ruinous Macroeconomic Scenarios	281
	8.5.1 Long- and Short-Run Ruinous Scenarios	281
	8.5.2 Conditional Mean and Hull Contours	283
	8.5.3 Bank Alpha's Ruinous Scenario Analysis	287
8.6	Summary	287
	Suggestions for Further Reading	289
	Exercises	289
	References	289
ex		291

Contents xi