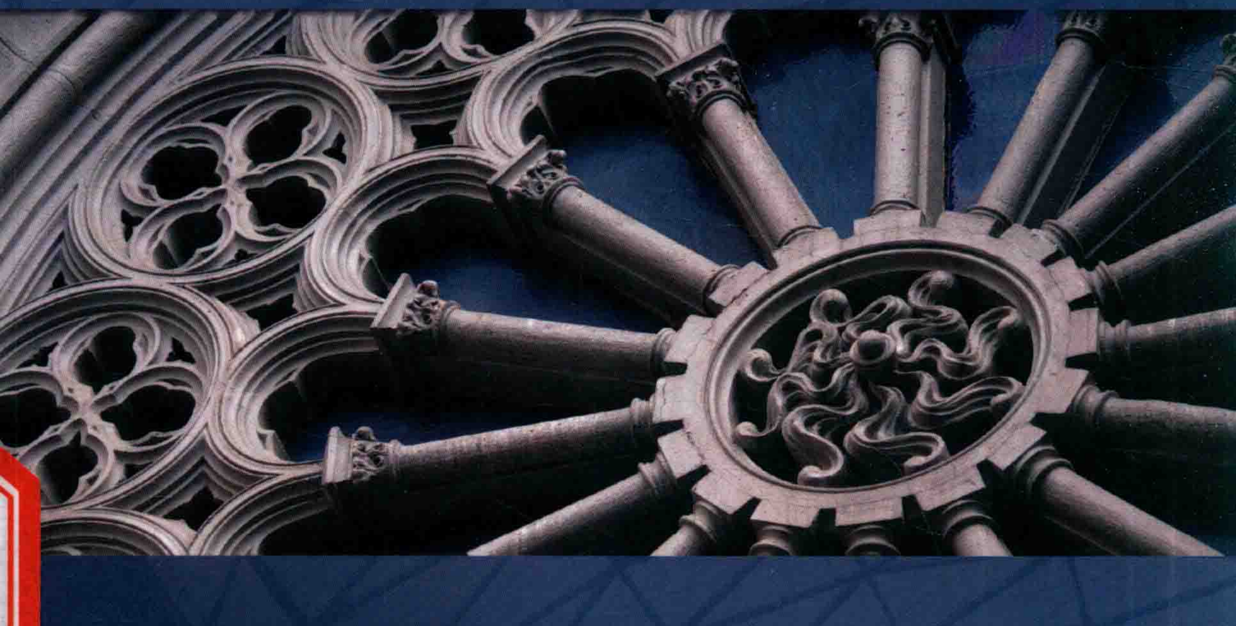
Risk Management in Banking

Fourth Edition



Joël Bessis

Wiley

RISK MANAGEMENT IN BANKING

FOURTH EDITION

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This edition first published 2015

Second edition published 2007, third edition published 2011 by John Wiley & Sons, Ltd

Registered office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

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Library of Congress Cataloging-in-Publication Data

Bessis, Joël.
[Gestion des risques et gestion actif-passif des banques. English]
Risk management in banking / Joël Bessis. — Fourth edition.
pages cm
Includes bibliographical references and index.
ISBN 978-1-118-66021-8 (paperback)
1. Bank management. 2. Risk management. 3. Asset-liability management. I. Title.

HG1615.B45713 2015
332.1068'1—dc23 2015010257

A catalogue record for this book is available from the British Library.

ISBN 978-1-118-66021-8 (paperback) ISBN 978-1-118-66018-8 (ebk)
ISBN 978-1-118-66019-5 (ebk)

Cover Design: Wiley
Building detail ©Shutterstock/K images; Background ©iStock.com/svariophoto

Set in 10/12pt TimesNewRomanMTStd by Thomson Digital, Noida, India
Printed in Great Britain by TJ International Ltd, Padstow, Cornwall, UK

"For bank managers, risk managers, and students of financial risk management in banking, this indispensable guide provides a comprehensive coverage of all related topics, from balance sheet management to market and credit models. The text groups all that they need to know to understand the techniques, the practices and the main models, to navigate by themselves in the ever-evolving and highly technical literature on risks, and towards further specialisations as needed. There is so much one can talk about, that many authors have a narrow and specialized approach, which does not help readers to appreciate the full scope of the field. On the other hand, this book stays focused on risk management while addressing all angles of the field. The book is an extremely valuable contribution to the knowledge of risk management."

Christian Jimenez, Regional Director, PRMIA Paris

"This comprehensive volume is ideal for finance professionals who aspire to deepen their knowledge of risk management in the banking sector. In an ever ever-changing environment of financial services, this entirely revised edition provides the keys to the sophistication and the technicalities of risk management techniques and models. With a combination of intellectual rigor and pragmatic application, the text integrates concisely a wide body of work, avoiding the narrower approaches of specialists. Overall, Joël Bessis offers a balanced, extensive yet relevant coverage of the far-reaching expertise needed to control and supervise risks in financial institutions."

Elie Heriard-Dubreuil, Senior Director, Global Supranationals, Sovereign Ratings, Standard & Poor's Rating Services

"Understanding how banking firms operate and how risk models are designed and implemented has now become central in modern finance. This book provides a concise overview of these topics and combines analytical rigor with relevance and practices inspired by the academic and professional experiences of the author. A must-read for all students and practitioners who need to have a practical knowledge of how risk management is conducted and will evolve in banking."

Christophe Perignon, Associate Professor of Finance, HEC Paris

"The author's balanced profile, combining academic background with the experience of professional life, shows up in the 'how to' approach for implementing models, techniques and processes, accessible to non-specialists, in the real world. A truly fantastic book and an enduring and worthy part of the financial markets literature."

Professor Moorad Choudhry, Department of Mathematical Sciences, Brunel University, and former Treasurer, Corporate Banking Division, Royal Bank of Scotland

"In a context where banking firms face new challenges of risk management and risk regulations, which have a direct influence of how banks develop, it is more important than ever that all professionals, bank managers and risk managers alike, have a comprehensive view of the diversity of risk management contributions, from asset-liability management to banks systems and risk models. This concise and applied coverage of risk management in banks will enable professionals to effectively to master the technicalities of the field and form educated judgments on what risk managers and risk engineers do, which impacts their own roles."

Patrick Legland, Global Head of Research and Member of Global Capital Markets Executive Committee, Société Générale

Foreword

It is a truism that while every financial crisis is different, errors made in risk management in banking are timeless. I remember well reading an article from 1994, published by the Federal Reserve Bank of Minneapolis, that highlighted mistakes made by both large and small banks in the US banking crisis of 1980–81. Every single one of the recommendations made by the authors of that paper would have been relevant and applicable to banks that crashed in 2008–09. An ineffective risk management framework, coupled with an aggressive asset origination policy, will always combine to bring badly-run banks down the next time there is an economic downturn. Sound principles of risk management are vital at all times, throughout the cycle. In essence, they are timeless.

This book is timeless. I have been familiar with it since it was first published, and have been its biggest fan ever since. It is great to see it being issued now in its 4th edition. It is one of those rare books that combines the rigor of a sound, balanced academic approach, essential if one is to operate in finance without emotion and with logic, with the accessibility and real-world relevance that is an imperative for the practitioner. It is a genuine "handbook", one can read it and apply its principles right away in just about every type of banking institution in the world, and that bank would be better off as a result.

Every single chapter in the book is worthy of study. I am very enthusiastic about the chapters on ALM gap and hedging. The author places everything in context, and ties in market risk and banking book risk, together with credit risk – a rare, combined approach that plays to my own strong belief about how risk management in banks should be governed by the Asset-Liability Committee (ALCO). Balance sheet risk needs one oversight body that operates with board authority, and as the balance sheet is impacted by ALM, market and credit risk together, it makes sense to view these from the ALCO table.

As a young man I used to play the bass guitar. Being asked to write this Foreword is a bit like being asked by Paul McCartney to play bass on his next album, it is that much of a privilege! Professor Bessis has made a fantastic and most worthwhile contribution to the financial economics literature with this book, right from its first edition, and I am lucky to have had a copy on the desk with me ever since it was first published. I do hope that this exciting and interesting new edition makes balance sheet risk in banking something that is more mainstream at the board level, and furthermore spurs readers on to their own research and investigation – if they follow the application and dedication evident in this work, they will not be going far wrong.

Professor Moorad Choudhry
Department of Mathematical Sciences
Brunel University
Former Treasurer, Corporate Banking Division,
Royal Bank of Scotland
November 2014

Preface

Risk management in banks became, and remained, a hot topic after the financial crisis. Addressing risk management in this context is challenging given that the magnitude of the crisis suggests that risk management was inefficient, that risk models were inadequate and that regulations failed to meet their goal of avoiding a major crisis. Indeed, it is ironic that the crisis started when the new Basel 2 regulations were enforced.

Risk management has made considerable progress, however, as the practices became more sophisticated and as the regulations put pressure on enhancing the resilience of banking firms. It has become a core management field in banking with a large concentration of resources dedicated to better identify, assess and control risks.

The book addresses risk management in three main core sections dedicated, respectively, to asset-liability management, market risk and credit risk. It has been largely inspired from the observation of gaps in the knowledge of the field of risk management in banks.

In business schools and other graduate programs, students are comfortable with corporate finance and capital markets, but much less so with the finance of financial firms. The financial management of banks has not much to do with the corporate finance of commercial and industrial firms. Still many would like to better understand the inside mechanisms of banks and many aim at developing themselves in banking careers. These students of finance do not need standard finance, but rather be acquainted with the specifics of the financial management of banks and the technicalities of risk management. This book is designed to address these needs.

Many professionals in banks perceive themselves as specialists of their own fields and feel that they need more background, conceptual and practical, on the expanding core area of risks. Furthermore, the usage of risk models remained in the hands of a relatively small group of "quants". Experts are embedded in banks, but being embedded does not imply that expertise is shared. The financial literature is broad, specialized and often highly technical in the field of risks. For those professionals of finance who are not model specialists, navigating through the variety of contributions is a challenge. This text is designed to provide a balanced background in risk techniques. The main risk models are introduced through a number of examples that should shed some light where more theoretical texts cannot help.

The volume of literature on market risk and credit risk has grown considerably, but less so in the field of asset-liability management, of which coverage is relatively limited, notably for non-specialists of banks. However, asset-liability management is a core function in banking. It concentrates the financial issues of banks and the attention of regulators who impose new rules on the balance sheet structure of banks. The text provides the minimum background on the area that all students or managers interested in banking should be acquainted with.

In short, this text is designed to address all that is needed to know for students and practitioners to be comfortable with the field and able to navigate further in related areas by themselves, but not more.

This edition has been streamlined compared to previous editions, with a focus entirely on financial issues, and technical developments have been reduced to the minimum for making the text self-contained. Many of my former colleagues and professionals with whom I have had the chance of working in the risk departments of banks have contributed to this text as they shared their experience. All participants in risk management seminars have also helped by raising many excellent and challenging questions, which allowed to refine the approach of the book. They all deserve many thanks for the enrichments that they inspired to this text.

Joël Bessis
Professor of Finance at HEC Paris

About the Author

Joël Bessis is Professor of Finance at HEC Paris, the leading French business school, where he conducts training in risk management throughout Europe, the US and Asia. Over the course of his career Joël has developed a dual expertise – as an academic and as a practitioner, holding permanent consulting assignments in corporations and, later, in banks. Joël worked for over 15 years in risk management departments of financial institutions – as a consultant to the risk departments of several banking institutions in Europe, including Banque Paribas and the European Bank for Development (EIB). Joël took a leave of absence from HEC Paris between 2000 and 2007 where he held positions as Director of Research at Fitch, Head of Risk Analytics and Model Validation at the Risk Department of IXIS, a Paris-based investment bank, and at the Groupe Caisse d'Epargne, a major financial institution in France. Joël graduated as an engineer from École Centrale in Paris, before earning a Master's in Business Administration from Columbia University in New York, and a PhD in Finance from the Université Paris-Dauphine. As an academic, Joël has published various papers and books in the fields of corporate finance, industrial economics and financial markets.

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1

Risks and Risk Management

For risk managers and regulators of banks, risk refers to the uncertainty of outcomes and to the negative consequences that it may have on a firm, and both aim at enhancing the resiliency of firms to adverse situations. As a result of their efforts, risks became better identified, assessed and monitored, risk practices improved and risk models became more widespread. Today, risk management has become a core central function for financial firms, banks, funds and insurance companies.

This introductory chapter presents the definitions of financial risks in banking and introduces typical organizations of the risk management function in banks, defining who should be accountable for risk controlling and processes.

Contents

1.1 UNCERTAINTY, RISK AND EXPOSURE TO RISK

Risk has been defined in various ways across time. Some definitions focus on the probability of an event, others refer to the uncertainty of outcomes, positive or negative, and others to risks as the subset of uncertainty that can be quantified.[1]

1 Knight, F. H. (1921), Risk, Uncertainty and Profit, New York.

Risk in finance is defined as the randomness of the return of investments, including both positive and negative outcomes. Under this view, a greater expected return is associated with a greater variability of outcomes.

In the financial industry, the view of risk is different. Risk is defined by the uncertainty that has adverse consequences on earnings or wealth, or the uncertainty associated with negative outcomes only. This view is that of regulators and risk managers. Regulations aim at enhancing the resiliency of financial firms and of the financial system in stressed conditions. Risk managers see their role as being accountable for identifying, assessing and controlling the likelihood and the consequences of adverse events for the firm.

Under this view, risk is seen as the potential of loss resulting from the interaction with uncertainty. The interaction arises from the exposure of financial firms to such randomness. Exposure is the extent to which a business could be affected by certain factors that may have a negative impact on earnings. For example, exposure to foreign exchange rate is the size of revenues in foreign currency; exposure to interest rates can be measured by the size of debt indexed on market rates.

The uncertainty cannot be eliminated but the exposure to uncertainty can be changed. Examples are numerous. A firm having revenues in foreign currency can borrow in the same foreign currency to minimize the earning impact of foreign exchange rate fluctuations. A firm lending floating rate can reduce the fluctuations of net interest income, the interest revenue minus interest cost, etc., by borrowing floating rate.

Exposures can be long or short. Being long is the conventional practice for investing in assets or portfolios. The holder of an asset is long and the risk is that the asset value declines. A short position can be seen as the mirror image of long positions and gains when asset values move down. In investing, a short position is the sale of a borrowed asset, such as a stock, which is later bought back for returning the assets to the lender of the security. In the event of a downside movement, the borrower of the stock buys back the stock at a lower price, hence makes a gain.

Hedging risks can be achieved by taking inverse exposures to long positions. Holding a stock is a long position, which takes a loss if the equities decline. A short position is symmetrical. When a party has both a long and a short position in the same stock, the gains and losses exactly offset. Hence, a perfectly hedged position is subject to uncertainty, but is not exposed to risk.

Hedging can be achieved with cash instruments, but is commonly done with derivatives. Derivatives are instruments, the value of which derives from other underlying assets. For example, the above firm willing to hedge its long exposure in foreign currency could enter into a contract, setting today the future exchange rate for converting foreign revenues in the home currency. This is easier than trying to borrow in the foreign currency. Because of their flexibility, derivatives are extensively used.

1.2 BROAD CLASSES OF FINANCIAL RISK

Financial risks are defined according to the sources of uncertainty. The broad classes of financial risks are credit risk, market risk, liquidity risk and interest rate risk, divided into subclasses relative to the specific events that trigger losses.

1.2.1 Credit Risk

Credit risk is the risk of losses due to borrowers' default or deterioration of credit standing. Default risk is the risk that borrowers fail to comply with their debt obligations. Default triggers a total or partial loss of the amount lent to the counterparty.

Credit risk also refers to the deterioration of the credit standing of a borrower, which does not imply default, but involves a higher likelihood of default. The book value of a loan does not change when the credit quality of the borrower declines, but its economic value is lower because the likelihood of default increases. For a traded debt, an adverse migration triggers a decline of its quoted price.

Recovery risk refers to the uncertain value of recoveries under default. Recoveries depend on the seniority of debt, on any guarantee attached to the transaction and on the workout efforts of the lender. The loss after workout efforts is the loss given default.

Counterparty credit risk exists when both parties of a transaction are potentially exposed to a loss when the other party defaults. A swap contract exchanging fixed for floating interest flows between two parties is a typical example. The party who receives more than it pays is at risk with the other party. The exposure might shift from one party to the other, and its size varies, as a result of the movements of interest rates. Counterparty credit risk exists when exposures are market driven.

1.2.2 Market Risk

Market risk is the risk of losses due to adverse market movements depressing the values of the positions held by market players. The market parameters fluctuating randomly are called "risk factors": they include all interest rates, equity indexes or foreign exchange rates.

Market risk depends on the period required to sell the assets as the magnitude of market movements tends to be wider over longer periods. The liquidation period is lower for instruments easily traded in active markets, and longer for exotic instruments that are traded on a bilateral basis (over the counter). Market risk is a price risk for traded instruments. Instruments that are not traded on organized markets are marked-to-market because their gains or losses are accounted for as variations of value whether or not materialized by a sale.

1.2.3 Liquidity Risk

Liquidity risk is broadly defined as the risk of not being able to raise cash when needed. Banking firms raise cash by borrowing or by selling financial assets in the market.

Funding liquidity refers to borrowing for raising cash. Funding liquidity risk materializes when borrowers are unable to borrow, or to do so at normal conditions. Asset liquidity refers to cash raised from the sale of assets in the market as an alternate source of funds, for example in market disruptions. Asset liquidity also refers to the risk that prices move against the buyer or seller as a result of its own trades when the market cannot absorb the transactions at the current price. Asset liquidity risk also arises when too many players do similar trades. For example, banks raising cash from liquidation of assets in the adverse conditions of the 2008 crisis faced substantial losses from the deep discounts in their trades.

Extreme lack of liquidity results in failure. Such extreme conditions are often the outcome of other risks, such as major markets or credit losses. These unexpected losses raise doubts with respect to the credit standing of the organization, making lenders refrain from further lending to the troubled institution. Massive withdrawals of funds by the public, or the closing of credit lines by other institutions, are potential outcomes of such situations. To that extent, liquidity risk is often a consequence of other risks.

1.2.4 Interest Rate Risk

The interest rate risk is the risk of declines of net interest income, or interest revenues minus interest cost, due to the movements of interest rates. Most of the loans and receivables of the balance sheet of banks, and term or saving deposits, generate revenues and costs that are interest rate driven.

Any party who lends or borrows is subject to interest rate risk. Borrowers and lenders at floating rates have interest costs or revenues indexed to short-term market rates. Fixed-rate loans and debts are also subject to interest rate risk. Fixed-rate lenders could lend at higher than their fixed rate if rates increase and fixed-rate borrowers could benefit from lower interest rates when rates decline. Both are exposed to interest rate fluctuations because of their opportunity costs arising from market movements.

1.2.5 Foreign Exchange Risk

Foreign exchange risk is the risk of incurring losses due to fluctuations of exchange rates. The variations of earnings result from the indexation of revenues and charges to exchange rates, or from the changes of the values of assets and liabilities denominated in foreign currencies (translation risk).

1.2.6 Solvency Risk

Solvency risk is the risk of being unable to absorb losses with the available capital. According to the principle of "capital adequacy" promoted by regulators, a minimum capital base is required to absorb unexpected losses potentially arising from the current risks of the firm. Solvency issues arise when the unexpected losses exceed the capital level, as it did during the 2008 financial crisis for several firms. This capital buffer sets the default probability of the bank, the probability that potential losses exceed the capital base.

1.2.7 Operational Risk

Operational risks are those of malfunctions of the information system, of reporting systems, of internal risk monitoring rules and of procedures designed to take corrective actions on a timely basis. The regulators define operational risk as "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events".[2] The focus on operational risk developed when regulators imposed that the operational risks should be assigned a capital charge.

1.3 BUSINESS LINES IN BANKING

There is a wide variety of business lines in the banking industry, with different management practices and different sources of risks. This section provides a brief overview of the diversity of activities conducted in banking.

Retail banking tends to be mass oriented and "industrial" because of the large number of transactions. Retail Financial Services (RFS) covers all lending activities to individuals, from credit card and consumer loans, to mortgages. RFS also extends to very small enterprises, such as those of physicians or home services. Lending decisions are based on a combination of automated systems and management monitoring. Statistical techniques are relevant for assessing credit risk.

Standard corporate lending transactions include overnight loans, short-term loans (less than one year), revolving facilities, term loans, committed lines of credit or large commercial and industrial loans. Such transactions are under the responsibility of credit officers and their reporting lines. For the large corporate businesses, relationship banking prevails when the relationship is stable, based on mutual knowledge. Credit analysts are industry specialists who monitor the credit standing of clients. They provide the individual credit assessments of obligors, based on expert judgment, for making lending decisions.

Investment banking is the domain of large transactions customized to the needs of large corporate and financial institutions. It also includes trading activities, under the generic name of "Corporate and Investment Banking" (CIB).

Large corporations demand a variety of services and products, for example from lending facilities and hedging instruments or issuance of securities. A number of very different activities are under the umbrella of the CIB pole. The financing of financial institutions, banks, insurance companies and brokers is organized as separate groups, distinct from those dedicated to commercial and industrial firms. Mergers and acquisitions form another business line.

All activities of specialized, or "structured", finance are also conducted by dedicated units within CIB. The scope of specialized finance includes such activities as project finance, asset financing (ships or aircrafts), commodities finance, commercial real estate and exports. The risk analysis differs radically from the assessment of a corporate borrower. In general, the primary source of repayment is the cash flows generated by the asset(s), from its operations or from the sale of the asset(s). Structuring refers to the assembling of financial products and derivatives, plus contractual clauses ("covenants") in order to make the risk manageable. Securitization is one of the fields of specialized finance: it consists of selling pools of loans, which are normally held in the balance sheet of banks, into the capital markets.

Trading involves traditional proprietary trading and trading for third parties. In proprietary trading, the bank is trading for itself, taking and unfolding positions to make gains. Trading is also client oriented. "Sales" designate trades conducted when the bank acts on behalf of their clients. The "sell side" is the bank, selling products to end-users. The "buy side" designates the clients, corporations and asset managers who buy the products, for example for hedging

2 The definition is from the Basel 2 document (2006), [21].

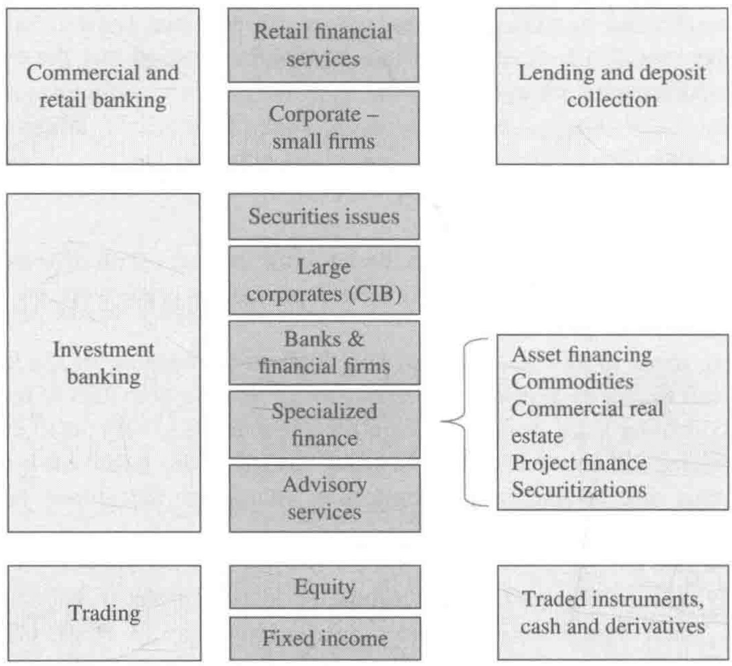

FIGURE 1.1 Business lines in banking

purposes. Traders and lending officers are not allowed to share information, as inside information on a corporate client could inspire trades based on undisclosed information. Banks are also exposed to market risk from their investment portfolio, which is not held for trading but with an objective of long-term performance.

Other activities do not generate directly traditional financial risks. For example, private banking, or asset management, is the activity of wealth management for third parties. Advisory services refer to consulting services offered by banks to corporations considering potential acquisitions, for example, which do not necessarily imply cash outlays. Risks are primarily legal and operational.

Figure 1.1 maps the banking activities grouped into main poles.

1.4 BANKING REGULATIONS AND ACCOUNTING STANDARDS

Banking activities are subject to a wide body of rules. Risks are subject to the regulations rules. Valuation of assets and liabilities and profit and loss are subject to accounting standards.

Risk regulations differ for the banking book and the trading book. The banking book refers to the transactions belonging to the core business of commercial banks, lending and deposit collection. It includes all assets and liabilities that are not actively traded by the institution, and generally held until they mature. The trading book groups capital market transactions, and is exposed to market risk. Positions held for trading are held over a short-term horizon, with the intention of benefiting from expected price movements. The trading book includes proprietary positions, and positions arising from client servicing and market making.