

# ALCO

EDITORS PICKS:

**INTEREST RATE RISK IN THE BANKING  
BOOK (IRRBB): HISTORICAL CASE  
STUDIES IN LIGHT OF NEW  
REGULATORY REQUIREMENTS** PAGE 16

**MANAGING INTRADAY LIQUIDITY** PAGE 28

# ORACLE®

## Financial Services



### Oracle Corporation, World Headquarters

500 Oracle Parkway  
Redwood Shores, CA 94065, USA

### Worldwide Inquiries

1-800-423-0245 (US)  
+44-0-870-8-768711 (UK)

---

The views, thoughts and opinions expressed in this magazine represent those of the author(s) in their individual private capacities, and should not in any way be attributed to Oracle, BTRM Ltd or to the authors as representatives, officers, or employees of Oracle, BTRM Ltd or any employing institution or affiliation.

While every attempt is made to ensure accuracy, the author(s) or the publisher will not accept any liability for any errors or omissions herein. This magazine does not constitute investment advice and its contents should not be construed as such. Any opinion expressed does not constitute a recommendation for action to any reader. The contents should not be considered as a recommendation to deal in any financial market or instrument and the author, the publisher, any named entity, affiliated body or academic institution will not accept liability for the impact of any actions resulting from a reading of any material in this magazine. The author(s) may or may not have held a position in any instrument identified in any article.

The material in this magazine is based on information that we consider reliable, but we do not warrant that it is accurate or complete, and it should not be relied on as such. Opinions expressed are current opinions only. We are not soliciting any action based upon this material. Neither the author(s), their employers, any operating arm of their employers nor any affiliated body can be held liable or responsible for any outcomes resulting from actions arising as a result of writing these articles. Contents herein do not constitute investment advice nor should they be considered as such.

© Oracle / BTRM Ltd 2018. No part of this magazine may be copied, reproduced, distributed or stored in any form including electronically without express written permission in advance from the Publishers.

### CONNECT WITH US

-  [blogs.oracle.com/financialservices](https://blogs.oracle.com/financialservices)
-  [facebook.com/oraclefs](https://facebook.com/oraclefs)
-  [twitter.com/oraclefs](https://twitter.com/oraclefs)
-  [oracle.com/financialservices](https://oracle.com/financialservices)

### BTRM CONTACT INFO:

<https://btrm.org/>  
**Email:** [enquiries@btrm.org](mailto:enquiries@btrm.org)  
**Phone:** +44 (0) 1273 201 368  
**Twitter:** <https://twitter.com/THEBTRM>  
**LinkedIn:** <https://www.linkedin.com/groups/8124236/profile>

## EDITORIAL

Hello everyone and welcome back to *ALCO*.

It's interesting, and very welcome, to see more and more of our industry's luminaries referring to "strategic asset liability management (ALM)" or "strategic Treasury" in recent months. I note that one of the "Big 4" consulting firms, a well-known financial media publisher, and a finance conference organizer have all taken to using this expression in their publications and marketing literature. It seems this is a concept that's now come of age. But one might well say, "About time!"

This isn't a new idea. Adopting an integrated approach to balance sheet product origination has always made sense; it's just that, in the Basel III era, balance sheet optimization has to mean more than simply maximizing P&L, because the requirements of all bank stakeholders have to be taken into consideration. Ensuring that ALM disciplines are included in the product origination process will assist with optimizing the balance sheet shape and structure.

One of the benefits of a strategic ALM process is that it enables senior bank executives to have a better idea of what product and customer mix best meets the needs of both shareholders and regulators, as well as customers. Supervisory requirements for capital and liquidity are often quite prescriptive, and sometimes even quite small adjustments to the type of product offered or class of customer engaged with can have a material impact on balance sheet risk and profitability metrics.

It is interesting to follow the impact of regulatory requirements at the granular level. Consider the liquidity coverage ratio (LCR) stressed outflow factor for call deposits placed by non-bank financial customers, or those deemed financial customers because of the nature of the funding source (for example, client monies deposited by law or accounting firms). These are treated as being 100% outflow in a stress. So when undertaking liquidity stress testing, a bank is required to assume that all such funds are withdrawn in 30 days. But this begs the question, where would these funds actually go? All banks have to treat all these types of deposit as 100% outflow...so, where would the money go? These sorts of customers would not, even under non-stressed circumstances, be able to open another bank account quickly, partly because their regulatory treatment makes them unattractive to banks, so having withdrawn the money where would they take it? And given that every \$1 of deposit generates a \$1 requirement for added liquidity buffer, the funds wouldn't necessarily be welcome at any of their existing banks either (which have also just assumed that these types of funds have all left the bank when calculating their LCR).

It does make one think...the deposits can't be put under a mattress, so where are they actually going to go, when every bank has just treated them as leaving instantly? It's intriguing, isn't it?

Of course rules are rules, so one simply follows them. But adopting a strategic ALM approach to balance sheet origination will help a bank to determine the optimized value of such deposit types and customer types, and will enable it to address better how they should be deployed, assuming it is business that is still continued with.

Issue 3 of *ALCO* continues with our variety theme, but with the European Banking Authority (EBA) having just published its "Final Report" on interest-rate risk in the banking book (IRRBB), we have not one but two articles on this important topic. You'll find the case studies in one of the IRRBB articles very thought-provoking, I'm sure. Elsewhere we cover ALM generally and strategically, intra-day liquidity, and the credit value adjustment/risk weighted assets (RWA/CVA) issues associated with the fundamental review of the trading book (FRTB). It's an eclectic, but vital mix.

Enjoy the read.



**Professor Moorad Choudhry**

University of Kent Business School  
November 1, 2018



### **ALCO**

Issue 3 – November 2018

#### **Editor**

Professor Moorad Choudhry

#### **Managing Editors**

Ziauddin Ishaq  
Ziauddin.ishaq@oracle.com

Werner Coetzee  
werner@btrm.org

#### Submission Guidelines

*ALCO* welcomes article submissions from industry and academia. Please submit your manuscript by email to: [enquiries@btrm.org](mailto:enquiries@btrm.org).

Questions about the magazine and the status of articles are welcome by email.

# TABLE OF CONTENTS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PAGE |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>01 ASSET LIABILITY MANAGEMENT (ALM) RE-BOOTED: TREASURY / ALM DATA BEST PRACTICES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 05   |
| BY DAVID CASTLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |
| A welcome return from David Castle, this time looking at the next level of Treasury development and how best-practice dictates that a bank's Treasury should interact with the business lines. The challenge is as much a data analytics one as it is an organization structure, with both equally important. But this issue is at the forefront of the ALM discipline so much that some banks, as Mr. Castle writes, have appointed a Treasury Innovation Officer.                                                                                                                                                                                                                       |      |
| <b>02 INTEREST RATE RISK IN THE BANKING BOOK (IRRBB)—KEY CHALLENGES IN THE IMPLEMENTATION OF THE REVISED EUROPEAN BANKING AUTHORITY GUIDELINES AND WHY IT IS SO IMPORTANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11   |
| BY BEATA LUBINSKA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |
| The first of our two IRRBB articles is a high-level one that seeks to explain why this area presents some significant regulatory compliance challenges for banks, not least on the data crunching and risk sensitivity measurement side. Ms. Lubinska sets the reader up nicely for the next article, which is...                                                                                                                                                                                                                                                                                                                                                                         |      |
| <b>03 INTEREST RATE RISK IN THE BANKING BOOK: HISTORICAL CASE STUDIES IN LIGHT OF NEW REGULATORY REQUIREMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 16   |
| BY MICHAEL EICHHORN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |
| Mr. Eichhorn presents four case studies of banks' past experience in the interest-rate risk space, and they make for an enlightening read. We observe that sometimes the issues involved may not necessarily be the relatively straightforward one of measuring non-traded rate risk exposure, but ones concerning the governance around understanding and controlling the risk exposure, or of being able to identify in the first place that the balance sheet structure is exhibiting some difficult-to-control exposure. Definitely a must-read for everyone in the ALM space, especially with the publication of the European Banking Authority's (EBA) "Final Report" on the topic. |      |
| <b>04 MANAGING INTRADAY LIQUIDITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 28   |
| BY CHRISTIAN BUSCHMANN AND HOLGER WESTERMANN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |
| Intra-day liquidity is less of an issue for some banks, particularly for those banks that don't offer a current or "checking" account or other such instant-access deposit. For the world's clearing banks and suppliers of correspondent banking services, however, it can be a significant risk management challenge, and yet another one attracting regulator interest. This article is a comprehensive run-through of the main issues around intra-day liquidity management and an excellent primer for ALCO members (the committee) and <i>ALCO</i> readers (the magazine)!                                                                                                          |      |
| <b>05 STRATEGIC ALM AND INTEGRATED BALANCE SHEET MANAGEMENT: THE FUTURE OF BANK RISK MANAGEMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 39   |
| BY MOORAD CHOUDHRY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |
| The original concept as expounded by Professor Choudhry in his 2007 publication <i>Bank Asset-Liability Management</i> and more recently in <i>The European Finance Review</i> last year. Reproduced with permission.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |
| <b>06 BASEL REGULATION, TRADING BOOK, AND DERIVATIVES: THE NEW CAPITAL REQUIREMENTS FOR MARKET RISK AND CREDIT VALUE ADJUSTMENT/RISK WEIGHTED ASSETS (CVA/RWA)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 51   |
| BY RITA GNUTTI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |
| The fundamental review of the trading book (FRTB) is a computationally heavy quantitative calculation requirement for banks that run trading books (as distinct from banking books), and this accessible summary of the main drivers and compliance issues from Ms. Gnutti is most welcome. Ms. Gnutti also walks us through the related area of credit value adjustment (CVA) of the derivatives risk-weighted assets (RWA) charge.                                                                                                                                                                                                                                                      |      |
| <b>07 THE BACK PAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 58   |
| <b>LEADERSHIP AND TEAM BUILDING: NEEDED FROM THE "TOP" BUT THE TOP DOESN'T ALWAYS HAVE IT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |
| BY WERNER COETZEE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |

# 01



## ASSET LIABILITY MANAGEMENT (ALM) RE-BOOTED: Treasury / ALM Data Best Practices

The first quarter of each year is often a time to re-boot plans, nail down budget, and attend conferences. We have been doing all of these things and comparing notes with our clients and market practitioners about what we might all expect over this year and next.

In almost every conversation, and certainly at every conference, data and technology as a driver of an ALM re-boot has come up.

We are seeing the beginnings of a significant shift in focus towards both innovation in Treasury and refreshing the technology available to Treasury to enable a “center of excellence” with heightened engagement across businesses for data analytics and strategic business input.

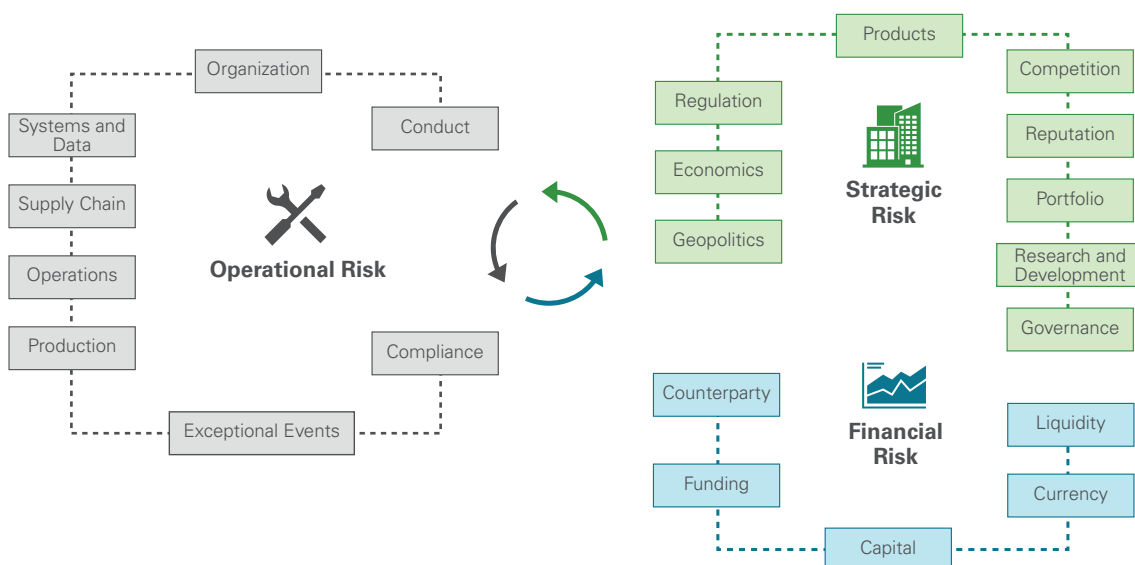


Exhibit 1. Treasury Data Analytics Themes Across the Enterprise

In previous articles, I've highlighted the need to encourage experimentation, collaboration, and innovation as it will soon be best practice. In this article, we will highlight that a lot has progressed.

## Treasury Innovation is Now a Full-time Role

Banks are increasingly appointing Treasury innovation officers as either full-time roles inside of the business or as a significant part of the job description for a senior officer in Treasury.

The responsibility of these roles varies, but we are seeing emerging best practices that we believe are important for the whole organization.

Starting with a focus on the group data plan, Treasury innovation officers are able to influence the organization of data collection, storage, and access across the enterprise. This is hugely important as establishing a data community approach will drive efficiency gains in both compliance matters and strategic business insight.

A mandate to experiment is a pre-requisite for Treasury innovation. A narrow use case that would provide a quantifiable benefit for Treasury and business partners that can be used as a test case is often found in legacy areas of “tension” —

for example, how can we improve behavioral analytics to both reduce cost drag and highlight client opportunities?

This is an important shift in Treasury/business engagement where a higher demand for data analytics and modeling resources is increasingly being recognized as a universal need across business lines and key part of the ALCO–Treasury–business–client process.

**Best Practice 1.** Appoint a Treasury innovation officer with a strong mandate to connect the organization around a data community that provides value-added output for all parties.

**Best Practice 2.** Experiment and quickly identify a business case where multiple parties benefit. Set clear and quantifiable outcome measures for both Treasury and business.

Innovation should no longer just be a separate department that tries to respond to the ideas and needs of all business lines. This approach has often (but not always) been less successful than hoped as the scale of the challenges each business faces can either consume finite innovation resources or appear too big to tackle. Direct business ownership of innovation elevates the focus and directly links it to outcomes, which benefit the whole organization.

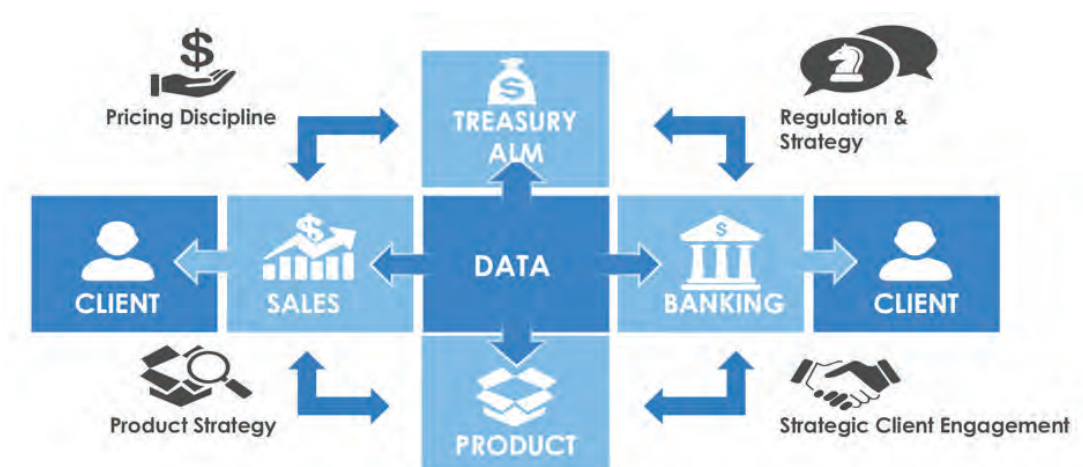


Exhibit 2. Disparate, Yet Directly Connected, Data Analytics Needs

IT departments cannot achieve agility in isolation. Organizational and communication structures between the business and technology groups need to change to support a continuous delivery cycle of best practice. This amplifies the benefits of analytical approaches across the whole enterprise.

### **Data Analytics as a Treasury/Business Engagement Tool**

Many large, complex organizations have such a rich data set that the efforts required to meet regulatory reporting requirements and business insight needs are expensive.

Our view is that, as the industry changes and we modify our technology, every part of our bank will be joined by a data community. This means that innovation, data architecture, process digitization, and how we model our world will create a super-charged culture change in the industry from “protective” to “expansive” behavior. The choice between the two cultures is a choice between being an infrastructure or customer focused company.

Data analytics are an important engagement tool in this culture change and how they are applied is now a core best practice.

Treasury innovation and data analytics approaches should both reduce cost and improve risk management for the entire organization. A full book of mandatory (regulatory) driven technology spend may appear to mean the capacity to innovate is limited—but a significant trend in the industry now is to connect these mandatory and value-add themes to gain maximum return from adopting scalable automation and computational processes, thus preventing a boxed in outcome and maintaining agility.

A connected organization can tackle these issues by adopting practices that improve outcomes for all stakeholders and, thereby, changing the conversation that is had as a result. This benefits not only internal engagement but can, and should, link directly to improved client service and value add.

At a recent workshop, participants from various Treasury-related departments shared high-level thoughts on what they thought was next for them in their data journey. These narrow examples provide some insight to where this best practice might head.

**A:** “We have all the data we need in a timely fashion for Intra-day but we want to automate this process fully so we can then spend time with our client businesses showing how this output can be insightful on specific client activities.”

**B:** “What we really would like to achieve is to show how analytics can inform our funds transfer pricing process with real, factual, outputs about balance sheet impacts. This helps us explain approaches to business lines clearly and visually, making the whole process much more effective and value-added back to the business lines.”

These examples highlight how Treasury practitioners are adapting from using data for compliance purposes (i.e., regulatory ratios, stress testing, internal risk measures) towards seeking ways to deliver additional business value.

**Best Practice 3.** Use data analytics as an engagement tool. Seek out approaches that both reduce cost and improve risk, business, and management decision-making. Elevating the conversation to “whole” business outcomes in this way brings Treasury and business closer and more aligned on balance sheet outcomes.

| CHALLENGE  | APPROACH/BENEFIT                                                                              |
|------------|-----------------------------------------------------------------------------------------------|
| Cost       | Connect process-cost savings to business benefits to increase engagement                      |
| Automation | Organize data processes so that resources may focus on value add                              |
| Visuals    | Ensure outputs engage user group, thus increasing engagement                                  |
| Complexity | Start simple, experiment, prove the value of buy-in, then move to greater complexity          |
| Resources  | Establish a center of excellence to benefit the whole business                                |
| Regulation | Use the data available to solve business opportunities, shift the perspective of the business |

Exhibit 3. Challenges and Approaches to Increase Data-led Engagement

Across Treasury, finance, risk, and business lines, there are aspects of data process and cost management that would benefit from automation. We have found that this is not specifically a cost-led exercise at any organization. Much more often we find the key driver is that with the right level of automation, resources spent on data compliance could be freed up to perform value accretive activities. We believe that this desire is fully aligned to heightened engagement across the enterprise around data analytics as an informative, forward-looking expertise.

### **Automate to Free Up Value Creative Input**

In areas connected to Treasury and critical to business outcomes, the ability to automate process, connect models, heighten behavioral analytic insights, and run forward-looking scenario analytics are increasingly those that will drive value across and organizations. Beyond this, regulatory expectations post-Interest Rate Risk in the Banking Book (IRRBB) and International Financial Reporting Standards 9 (IFRS 9), Reverse Stress Testing, and more, mean that, to some extent, complying also results in significant opportunity to apply new approaches.

Huge resources have been spent on regulatory implementation, sourcing, reconciling, compiling,

and reporting data to internal and external parties. While many efficiency gains may have been realized—through identifying data quality improvements, streamlining data reporting structures, and reducing the human resources required to perform such tasks—the industry is now at a point where really delivering value from this process is an absolute must.

Regulators are increasingly speaking to the benefits of alternative modeling approaches to generate additional insights. They now wish banks to establish scenario analytics that go beyond the traditional prescribed stress testing approaches and apply deep data insights, to support improved judgement when seeking to identify specific emergent risks or opportunities across the balance sheet.

It is possible to employ systems and approaches that both reduce cost and improve risk management insights when tackling these expectations, and such approaches will add value beyond compliance.

**Best Practice 4.** Always ask how an improved process brings benefit beyond resource cost savings. Those who identify front-line business value outputs will not only be more likely to gain investment spend but also add value directly to client engagement.

## Buy vs. Build, a Changing Approach to Toolkits

A bank's core "IP" is the transmission and conversion of capital across a suite of products that meet the needs of depositors and borrowers, plus the unique expertise of a particular firm in a product, geography, or marketplace. There are processes that are uniform across the industry that can benefit from turn-key solutions to which the core IP of a particular bank may be applied.

Our clients are telling us that they no longer necessarily wish to build applications for certain business challenges in-house as they prefer to apply scarce resources to the value-driver outputs. There is also a desire to want to "always be current" by using the most advanced technologies to perform certain tasks. This means that large, multi-year platform procurements and internally built (sometimes also multi-year) projects are now less palatable than an agile provider of toolkits to which internal IP may be applied.

There is an emerging best practice of buying turn-key solutions that deliver greater than 80% of a requirement. This 80% is likely a uniform need across the industry, such as a scenario analytics or stress testing toolkit. These solutions must be able to ingest the 20% (internal IP/data) of the bank and be flexible enough to perform user-defined analytics based on the attributes of this particular firm's IP.

To reach a stage where buying services in this way is both possible and effective, it is important for Treasury and the wider organization to adopt

best practices which support the evolving structure of our industry, ensuring that the focus of each step is on the expansive benefits of adopting new ways of working.

**Best Practice 5.** Seek out routes to adopt solutions which can be quickly added and reduce cost while improving risk insights. These may likely be services which solve process and analytics challenges that are uniform for the industry.

## Summary Best Practices

The pace of change continues to accelerate, and so does the opportunity set for those who are able to adopt practices that connect an organization around new business models. While change is never easy, the benefits of a few steps—with a future vision in mind—can be both powerful and rewarding.

**Best Practice 1.** Add a full-time Treasury innovation officer

**Best Practice 2.** Experiment with a business partner

**Best Practice 3.** Data analytics as an engagement tool (internal and external)

**Best Practice 4.** Directly connect reduced cost to value output

**Best Practice 5.** Adapt buying behavior to speed value delivery

ALM re-boot is an opportunity for us to bring Treasury's expertise ever more readily to the entire organization as a close partner to the business lines. This may take many paths as things develop, but building a center of excellence in how to use and apply data for whole bank benefit is in our hands—let's grasp it.



**David Castle** is a 25-year City and Wall Street veteran with a sterling background in capital markets and treasury at Standard Chartered and Citi. David is a contributor to the BTRM's monthly column, David Castle's Treasury Notes.

# Oracle - Industry Awards & Acknowledgement

**RiskTech  
100<sup>®</sup>**

2018 Category Winner  
Balance Sheet  
Risk Management

**RiskTech  
100<sup>®</sup>**

2018 Category Winner  
Risk Data Aggregation  
& Reporting

**RiskTech  
100<sup>®</sup>**

2018 Category Winner  
Banking

**RiskTech  
100<sup>®</sup>**

2018 Category Winner  
Core Technology

Effective balance sheet risk management is essential for the success of any firm in a post-Basel regulatory environment and having first-class technology to support the process and meet regulatory requirements for capital reserves is crucial. **Oracle, the winner of the RiskTech100<sup>®</sup> Balance Sheet Risk Management** category, has a holistic offering that supports clients in everything from liquidity management to Basel reporting, making this company the one to beat.

Ambreesh Khanna, Group Vice President and General Manager of Oracle Financial Services Analytical Applications (OFSAA), says the company, which has more than 500 live customers, has applications for Capital Adequacy, Liquidity Management, Performance Management, Asset-Liability Management, Funds Transfer Pricing, IFRS 9, Balance Sheet Planning and Basel. All these applications contribute to efficient balance sheet risk management. "We have market-leading applications in all of these areas," says Khanna.

For banks, the aim is not only to fulfill reporting requirements, but also to understand the risk-adjusted return on capital—ensuring the different systems are tightly linked has obvious benefits. "We have a customer [using the Asset-Liability Management, Liquidity Management and Funds Transfer Pricing applications] in the Japan and Asia-Pacific region doing 15 million daily customer records from 40 source systems that has eliminated \$8.3m in annual interest cost," explains Khanna, who adds that the offering enables firms to focus on using capital efficiently and identifying potential impacts on liquidity levels.

"The ability to accurately plan and optimize business unit-level margin and profit with common cashflow engines shared with Oracle asset-liability management and funds transfer pricing applications was a key consideration. The added benefit of leveraging OFSAA Infrastructure is often stated by many of Oracle's clients as an important part of the purchasing decision, with a positive impact on the total-cost-of-ownership and return-on-investment criteria."

Chartis Research



# 02

## **INTEREST RATE RISK IN THE BANKING BOOK (IRRBB) – Key Challenges in the Implementation of the Revised European Banking Authority (EBA) Guidelines and Why It Is Important**

Some people understand interest rate risk in the banking book (IRRBB) as a regulatory buzzword, but it isn't just the term that regulators are focused on in the Basel Committee on Banking Supervision (BCBS) standards and recent European Banking Authority (EBA) final guidelines. IRRBB has an impact on a bank's capital base as it is a potential threat to capital, and interest movements create sensitivity to the net interest income (NII). A proper framework creates an opportunity for income generation both under near-term and longer-term horizons. This is what is meant by a steering approach or trade-off between the NII and economic value of equity (EVE) metrics. Therefore, managing IRRBB properly is vital due to it being a major source of income.

It is estimated that in the composition of the total income of a bank, NII contributes on average about 60%. Of that 60%, 85% is gained through margin differential and the remaining 15% resulting from maturity transformation. IRRBB also creates a capital demand under Pillar 2. Mismanagement can be very expensive and have implications across different areas of a bank. In the first place, both incorrect assumptions and risk underestimation can affect the profit and loss (P&L) of Treasury, which is responsible for asset liability management (ALM) profitability. Secondly, it affects P&L results of the business units through internal funds transfer pricing (FTP) rates and FTP margins. Thus, the correct IRRBB assumptions impact the product profitability assessment through the interest income split. Figure 1 shows the example of NII compression in a large international banking group. This group lost billions because it failed to hedge itself against rates going down and, consequently, it reinvested current accounts and savings accounts (CASA) and equity liabilities at lower rates. Additionally, interest rate risk was not fully transferred from the businesses to ALM, causing open positions and margin at risk.

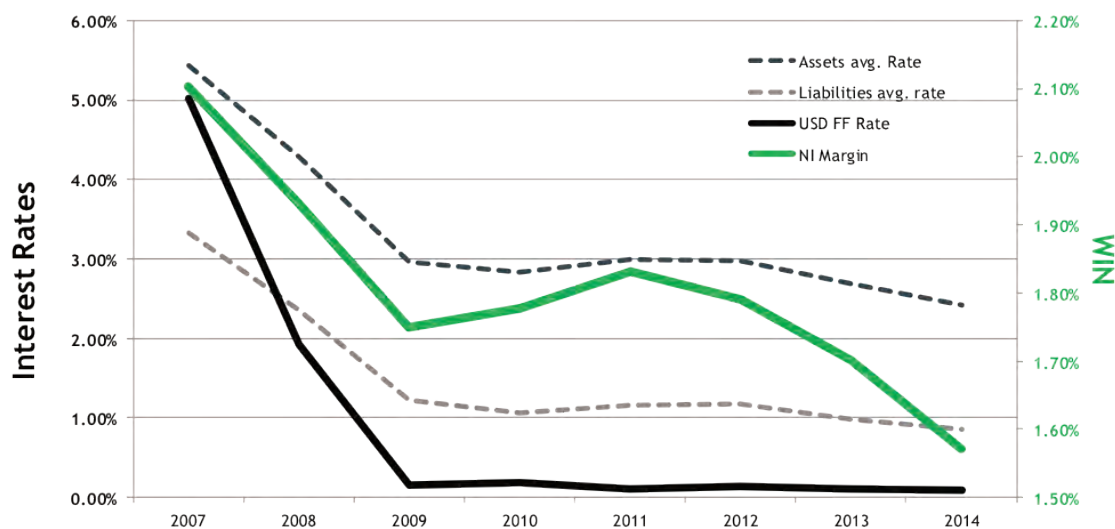


Figure 1. Example of Margin Compression Caused by Lowering Interest Rates and Inefficient FTP Process

There is increasing regulatory attention being paid to IRRBB, and it has become one of the hot topics for national and European regulators in recent years, as we show below in Figure 2.

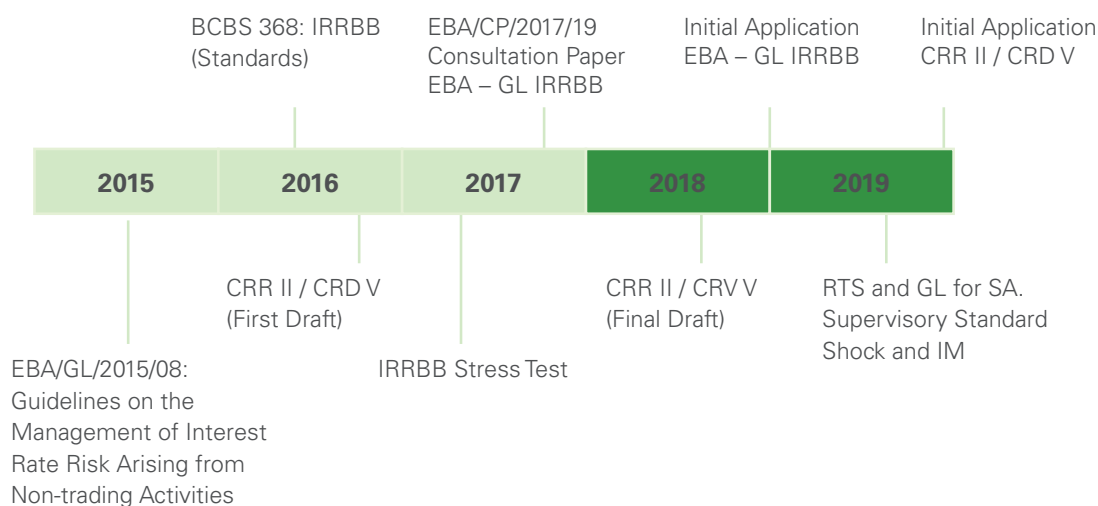


Figure 2. Regulatory IRRBB Roadmap

It can be thought that the regulatory roadmap starts in May 2015 when the EBA issued the “Guidelines on the Management of the Interest Rate Risk Arising from Non-Trading Activities.” The guidelines have been addressed to financial institutions in Europe and replaced the Committee of European Banking Supervisors guidelines as of January 2016. Subsequently, in April 2016, the BCBS published the final standards on IRRBB that replaced the 2004 principles. The new standards set out the committee’s expectations on the management of IRRBB in terms of identification, measurement, monitoring, control, and supervision. The updated IRRBB principles reflect changes in market and supervisory practices due to the current low interest rate environment and provides methods and models to be used by banks in a wider and enhanced risk management framework.

On October 31, 2017, the EBA published a consultation paper on the update of its “Guidelines on the Management of the Interest Rate Risk Arising from Non-Trading Activities.” The long-awaited update for the management of IRRBB builds on the original guidelines published in May 2015, but compared to the 2015 version, its size has increased significantly. It is also effectively the translation to the European law of the IRRBB standards published by BCBS in April 2016. The EBA is still working on a number of technical standards as part of the ongoing Capital Requirements Directive and Capital Requirements Regulation revision in which the regulator will prescribe disclosure requirements and a standardized approach for IRRBB. These technical standards will be published separately in a later stage.

The final IRRBB guidelines known as the “Final Report” were issued on July 19, 2018, and present some significant implementation challenges for banks. As a result, adequate IRRBB management needs to consider several dimensions, not only in terms of an integrated software solution, but also the revision of metrics and introduction of a model validation framework. With the new guidelines and more restricted maneuvering capabilities, banks will have to revise their IRRBB strategy and measures for its implementation.

There are several changes introduced in the final EBA guidelines. First is a major overhaul of the supervisory outlier test (SOT), which measures how the EVE responds to interest rate shocks. The SOT is an important tool for the supervisor to spot any excessive exposure of banks driven by interest rate movements. There remain existing SOT measures arising from a +/- 200 bps parallel yield curve shift in the BCBS standards. A different SOT definition was proposed, introducing a 15% trigger compared to Tier 1 capital in combination with six interest rate scenarios that also include non-parallel shocks. It is now clear that the EBA has decided to

implement both SOTs. The combination of more scenarios and an additional trigger level will restrict the maneuvering capabilities of banks. The first challenge consists in defining the IRRBB strategy and steering approach in the new regulatory landscape, which is consistent with the bank’s business model. In order to develop a comprehensive and feasible IRRBB strategy and steering approach, these key questions have to be answered:

1. To what extent shall the business model rely on generating earnings by “riding the yield curve?”
2. What level of maturity transformation stabilizes the bank’s interest income?
3. How much maturity transformation does risk capacity allow?

In parallel, there is another set of questions the bank needs to answer:

1. Which steering approach should be used in order to manage IRRBB on a regular basis?
2. Is the interest rate market efficient, and does it allow for outperformance through active management?
3. Does the bank analyze the interest rate continuously and develop its own forecast?

Finally, there are questions related to the measures in order to implement the strategy and steering approach.

Of course, IRRBB strategy, steering approach, and derivation of risk exposure measures have to be developed according to the specific business model and risk situation of the bank. Meanwhile, the derivation of strategic positioning, as shown in Figure 3, is based on the simulation of interest income and, depending on the maturity transformation level, steering is based on a strategic benchmark cash flows profile but allows for small tactical deviations. Consequently,

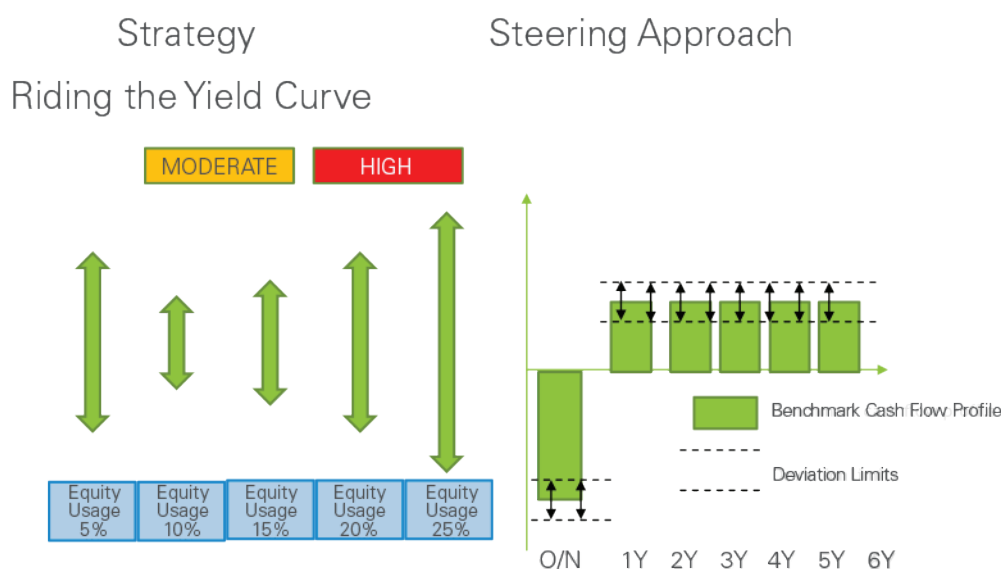


Figure 3. Definition of the IRRBB Strategy and Steering Approach

ensuring a long-term efficient strategy, while enabling additional profits due to active IRRBB management, is key. Adequate governance has to be developed and established in order to efficiently manage IRRBB, via a formal IRRBB policy approved by the bank's asset-liability committee.

The updated EBA guidelines have a section on governance that is larger compared to the previous version published in 2015. It includes new guidelines on risk management framework, risk appetite, and model governance. While the guidelines on risk management framework and risk appetite can be considered a more detailed explanation of the original guidelines, the main addition is on model risk management. This requires banks to set up a model governance process, not only for behavioral models, but for all IRRBB management methods that traditionally have not always been in scope for model governance. Various challenges have to be mastered when defining suitable governance frameworks. For example, the separation of and allocation of interest income to sales and Treasury through FTP can be highly controversial and emotional. Therefore, from the ALM system perspective, there should be the possibility to

provide clear-cut responsibilities through separation of books for each component of interest income, and a transparent calculation methodology.

The technical implementation of a NII simulation is a major challenge for larger financial institutions. This is because the results of future NII are required for different purposes across the bank and an integrated and flexible approach is needed. We have seen that NII simulation is required for EBA stress tests, European Central Bank IRRBB stress tests, and the Short-Term Exercise. Now, we also have the EBA guidelines disclosure. These different views required for NII simulation require solutions that ensure consistency between NII and EVE, and serve the various purposes of NII simulation.

Another area of concern is the guidance on capital calculation. In particular, the revised calculation of capital add-on for IRRBB requires the coverage for earnings risk and value risk so that both types of risks should be integrated in a consistent framework without duplication. Usually, if the bank's  $\Delta NII$  shows a loss under certain interest rate scenarios, we can easily expect that its  $\Delta EVE$  will show a positive number.

Given that the EVE is nothing more than the discounted value of future cash flows over the whole life of the banking book, those two metrics show the same things but under different time frames (although for the estimation of  $\Delta NII$ , the cash flows are not discounted). Consequently, the interpretation of the EBA guidelines related to the capital add-on assessment could be that impact for earnings needs to be considered only if it is showing a loss and  $\Delta EVE$  is positive. Otherwise, there is a risk that the negative impact will be double counted.

Another addition to the guidelines, which did not originate from the original document nor from the BCBS standards, is the requirement to include market value changes in earnings metrics. This change will require banks to start modeling the true International Financial Reporting Standards (IFRS) P&L and to consider the increase or reduction in total earnings and capital. This is a very important point since traditionally, earnings metrics just focus on NII and ignore interest rate sensitivity in other areas of P&L. This is a clear attempt at convergence between accounting and risk management techniques that have been always treated on a separate basis. The accounting treatment of instruments will determine how earnings metrics will be impacted.

The updated IRRBB EBA guidelines also require inclusion of non-performing exposures (NPEs) into the IRRBB equation. In particular, NPEs should be included as general interest-sensitive instruments whose modeling reflects expected cash flows and their timing. NPEs should be

included net of provisions. This point is relevant given that the gradual increase of non-performing loan stocks in Europe, particularly in Mediterranean countries, stresses the importance of a more integrated approach between credit risk and active management of IRRBB. As such, this requirement gives rise to the new trend in modern Treasury/ALM and risk management where default probabilities will be applied while hedging the volatility of NII. In this case, the financial structure of any hedging derivative would match the credit risk-adjusted cash flow profile of the asset portfolio (however only if the credit spread component is considered in hedging and it is broadly aligned with the level of expected probability of defaults). Therefore, considering the interaction between ALM and credit risk has become a methodological challenge both considering the updated EBA guidelines and IFRS 9 principles.

In summary, despite the delayed application date, a timely implementation will prove to be challenging for most banks. Hence, the implementation of the final EBA IRRBB guidelines should be a top priority for each bank. In addition, in the author's view, it is a very important step towards more efficient risk management integration.



**Beata Lubinska** is a financial engineer with 15 years' experience in the banking industry gained in Treasury, ALM, and Risk Management departments of a number of financial institutions located in Milan and London. Beata is a member of the BTRM Faculty.



# 03

## **INTEREST RATE RISK IN THE BANKING BOOK (IRRBB): Historical Case Studies in Light of New Regulatory Requirements**

A leading representative of a European Banking regulator was recently asked in an industry forum which risk he thinks would represent the next “big test” for participating senior risk managers. His answer: losses from interest rate risk in the banking book (IRRBB) as markets move out of the low and in parts negative interest rate environment.

“Many banks are heavily relying on interest income with shares of net interest income (NII) over their total income of above 60%.”<sup>1</sup> As such, adverse moves in interest rates can cause earnings failures. According to a discussion paper by German Bundesbank, they can also be a key contributor to capital failures. “In particular, for a bank which engages in maturity transformation, the most likely reverse stress test scenario implies a steeper interest rate curve and an economic downturn.”<sup>2</sup>

Earlier this year, a Treasury risk officer managed what he called “the impossible”—he burned his fingers on a piece of new regulation (BCBS 368), before the latter was even introduced in his jurisdiction. What happened? In preparation for a board meeting, he summarized the new requirements. Given the audience, he focused on the governance implications for the board, just to be told his presentation was patronizing in content and tone.

The above anecdotes exemplify that IRRBB has become a “hot” topic. Against this background, the following contribution discusses four case studies and considers if the new regulatory requirements, in particular BCBS 368, are a step towards a more holistic management of IRRBB.

The contribution builds on the article in Issue 1 of this magazine in which Zia Ishaq and Elizabeth Laure comprehensively introduced the new IRRBB requirements.

<sup>1</sup> Tijmen Roebbers, The Impact of Interest Rate Risk-Taking on a Bank's Profitability, University of Twente, 2017

<sup>2</sup> Peter Grundke / Kamil Pliszka, A Macroeconomic Reverse Stress Test, Deutsche Bundesbank, Discussion Paper No 30/2015

## Case Study: Bank A

Imagine, we are close to year-end 1993. Your bank is one of the first regional U.S. banks to make extensive use of interest rate swaps to manage its structural interest rate risk.

Naturally, your bank is asset sensitive. As a consequence, its NII is expected to increase, if short-term rates were to rise as more assets than liabilities would reprice. However, your bank has entered into a large position of interest rate receiver swaps. The position is so large, that the bank has become liability sensitive, i.e., it is likely to lose (gain) NII if rates were to rise (fall).

Beside plain vanilla interest rate swaps, your bank also entered in amortizing interest rate swaps, where it again receives fixed and pays floating. In simple terms, the amortization feature mimics a mortgage portfolio with prepayments. As shown in the top right part of Exhibit 1, the amortization of the swaps is, notably, not dependent on a long-term rate but on the development of the London Inter-Bank Offered Rate (LIBOR). If LIBOR were to drop the notional value of the swap reduces (i.e., your bank would achieve a lower NII). In return for this optionality (the bank has effectively written an option), the fixed rate of these swaps is higher than the swap curve and the yield for comparable Collateralized Mortgage Obligations.

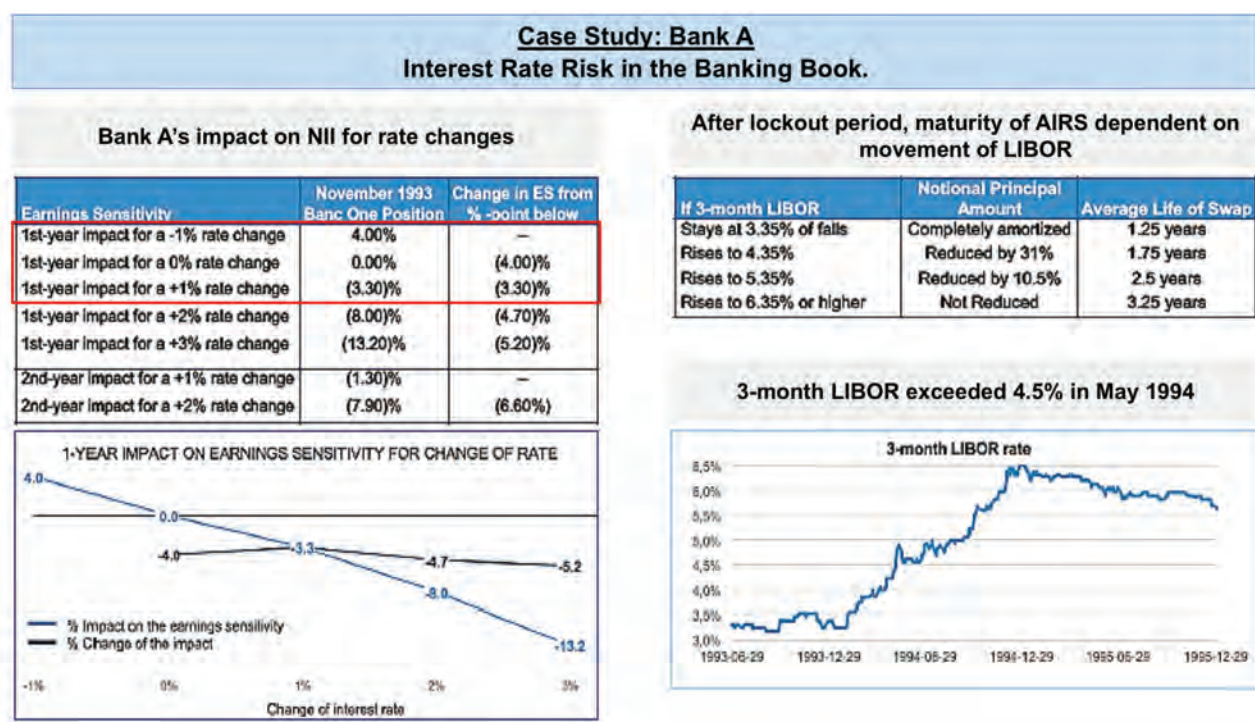


Exhibit 1. Case Summary Bank A

The top left part of Exhibit 1 summarizes the risk impact of different interest rate changes on your bank's NII over the next 12 months. As can be seen, the bank would lose significant NII if rates were to go up sharply. However, the Asset Liability Committee (ALCO) expects moderate volatility within a range of +/-1%. In this range, the receiver swaps prove income enhancing with a further pick up due to the sold optionality embedded in the amortizing swaps.

Contrary to this expectation, LIBOR rates went up sharply during 1994 as shown in the bottom right part of Exhibit 1. The bank suffered sizeable accounting losses from its interest rate swap book as it was marked to market. The bank decided to close the position to realize a significant part of these losses. Its share price dropped sharply prior to these events which executives attributed to concerns over the growing interest rate derivatives portfolio. Planned acquisitions under which your bank was paying with shares could no longer be pursued in the same way. The management came under pressure to explain itself, internally and publically.

## Considerations

This simplified summary (see, for example, Ben Esty / Peter Tufano / Jonathan S. Headley, Banc One Corporation, Harvard Business School, 2008, for detailed case study) illustrates shortcomings across the entire risk management circle:

- Risk identification and measurement: Bank A's risk appetite was mainly focused on (Delta) NII. Changes in the Economic Value of Equity (Delta EVE) were hardly considered, neither on a standalone basis or as part of the Internal Capital Adequacy Assessment Process. Likewise, an accounting view would have highlighted the potential for large losses as the swaps positions are marked to market.
- Risk control and management: Bank A had entered into two strategic bets. As noted, it changed the profile from being asset sensitive to being liability sensitive. In addition, it was betting on moderate volatility. The risk appetite and stress testing framework allowed for these bets.
- Risk reporting: The bank could have achieved a similar profile with non-derivatives. A simple comparison would have highlighted how, given their accounting treatment, derivatives helped to "dress up" key performance measures such as the return on assets. A report of the profile with and without derivatives would have illustrated how "hedges" overcompensated existing risks.
- Governance and operating model: Given the size, nature, and complexity of the hedging strategy that also included basis swaps and the novelty of the swaps at the time, it is also questionable if the bank adequately educated its senior management and the board. From an operating model perspective, Bank A lacked clearly articulated boundaries between first-line and second-line responsibilities.

In summary, Bank A should have developed a comprehensive quantitative approach including NII, EVE and accounting projections under multiple interest rates scenarios over a multi-year horizon, governed against risk controls set by an independent function—considerations that are also relevant for the case of Bank B.

## Case Study: Bank B

Imagine we are in the year 2012. You are a senior executive in another U.S. retail bank. On the left-hand side of Exhibit 2, you can see the stylized balance sheet. As can be seen, Bank B takes in deposits, mainly from retail customers and small medium enterprises. It is well capitalized, so capital is not an acute concern.

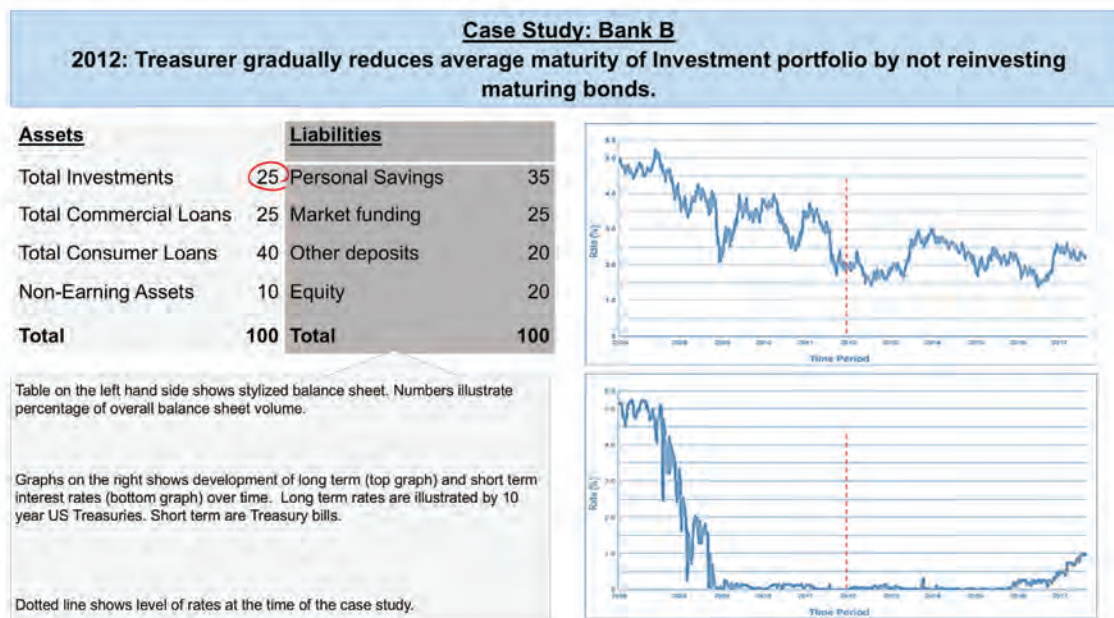


Exhibit 2. Case Summary Bank B

On the asset side, it provides consumer and other loans and runs a sizeable investment portfolio. The investment portfolio is of high quality. In fact, parts of it are ring-fenced to serve as the liquidity buffer. So, liquidity is not an acute concern either.

Your main concern is the structural interest rate risk. Specifically, the investment portfolio generates income mainly by investing in long-term bonds, e.g., 10-year US Treasuries. On the top-right of Exhibit 2, you see how the yield for the 10-year US Treasuries developed over time. In the bottom-right, you see the yield for a one-month US Treasury bill.

As noted, we are in the year 2012. Illustrated by the dotted red line, long-term rates have just come down. In response, your Treasurer has not reinvested maturing bonds with a longer duration for some months now. Instead, he has “parked” the funds short term, e.g., at the one-month yield shown in the bottom graph. He strongly believes markets will re-bound from the recent sharp drop. As it is shown as available for the sales portfolio, he is also concerned about the mark to market accounting losses should rates rise following a reinvestment now.

His local ALCO challenges him repeatedly on the resulting drop in NII. However, having been in the industry for more than 30 years and in the role for more 15 years, he manages to convince the ALCO of his view to reinvestment once rates have risen. The debate goes on for months. While it gets increasingly heated, the Treasurer manages to convince his CEO and local ALCO to wait.

Then a second frontier opens. So far, the bank has managed and governed its IRRBB using Delta NII as its main risk metrics. In an effort to harmonize the risk governance, the Global Treasury Risk department is planning to roll out Value at Risk (VaR) as the primary group-wide metric. As part of the risk appetite cascade, all group entities should have a VaR limit.

When you look at the balance sheet in Exhibit 2, you spot the dilemma for the Treasurer. On the liability side, the personal savings are largely deposits with a short-term contractual maturity (e.g., current

accounts with a contractual overnight maturity). As far as these deposits are deemed stable, the Global Treasury Risk department asks the Treasurer to apply behavioral maturity assumptions, e.g., a weighted average maturity of 2.5 years. The same applies to equity, where the group standard convention is either five years or 10 years. So, the “modeled” behavioral maturity on the liability side is significant.

At the same time, the average maturity on the asset side is reducing—first, due to convexity, e.g., in the form of prepayment rights for consumer loans, and second, because of the increasingly reduced duration of the investment portfolio.

As a result, the Treasurer is running a large structural mismatch, that in VaR terms would require a limit almost as big as that for the entire banking group. When the parent bank is asking him to reduce the mismatch, e.g., by increasing the duration of the investment portfolio, he hits back stating technical arguments questioning the suitability of VaR for the banking book and the use of what he calls “random” behavioral assumptions.

The outcome of this case was dramatic. As you can see on the right-hand side of Exhibit 2, interest rates did not significantly increase for years. The bank continued to lose more and more NII. The structural mismatch under the VaR metrics continued with implications for the parent who had to hold a higher pillar two capital add-on. Eventually, the Treasurer lost his job. One of the first things the new treasurer reportedly did was to increase the duration of the investment portfolio.

## Considerations

The key point here is not that the Treasurer was wrong with his rate expectation. As the saying goes, hindsight is a wonderful thing. The key point is that it would have been in the interest of

all stakeholders, ironically including the Treasurer, to establish an appropriate governance, operating model, measurement, and risk appetite framework around IRRBB. This should have included, for example, a stronger segregation between Treasury and Treasury risk, a stronger and more balanced governance by ALCO, and most importantly the use of Delta NII, Delta EVE, and accounting metrics for risk appetite and stress testing purposes. In fact, the EVE profile became so pronounced due to the behavioral assumptions on the liability side and the prepayment and time decay on the asset side that it almost certainly would have “forced the hand” of the Treasurer. Binding frameworks for the development, monitoring, and validation of assumptions may have prevented the prolonged, fruitless debate about the behavioral assumptions—assumptions that are also relevant in case study C.

## Case Study: Bank C

Imagine you sit in a board of directors meeting today. A Treasury risk manager presents the DV01 chart shown in Exhibit 3. He explains the chart as follows: “What you see on this slide is a portfolio of mortgages, loans, swaps, and money market transactions. The graph shows how their present value changes if market rates move up by one basis point. Maturing products are mainly fixed-term loans. Hence, the present value falls if rates rise. Non-maturing deposits are mainly sight deposits. Their contractual maturity is overnight. In reality, clients tend to leave parts of these deposits with us for longer. Based on our internal model, the behavioral maturity is up to eight years (as illustrated by light blue bars). Under these assumptions, the present value changes from loans and deposits largely offset each other. The remaining risk is hedged with interest rate swaps. The resulting overall risk profile is illustrated by the black line which shows that the bank is largely risk flat.”

After a short pause, a non-executive director challenges him, “So you are saying there is nothing we need to worry about. Right!?” The Treasury risk manager responds, “Yes, the bank is economically risk flat.”

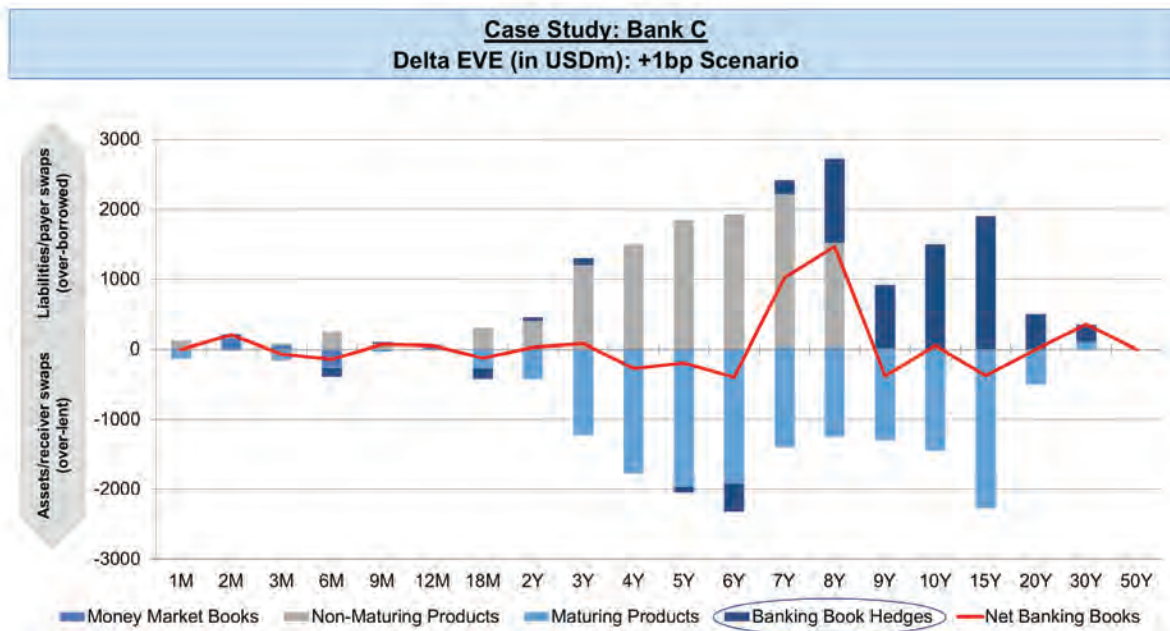


Exhibit 3. Case Summary Bank C

## Considerations

The picture provided by the Treasury risk manager seems incomplete and misleading. There is plenty to worry about. This could have been structured under three views, namely the economic view, income view, and accounting view.

Under the economic view, he should have highlighted the inherent model risk, specifically if the actual client behavior deviates from the assumptions made in Exhibit 3. In extreme circumstances, it may be so different that (as in the case of Bank A above) the management decides to close out some of the hedges at a loss. So, even if the Treasury risk manager states the bank is risk flat from an economic perspective, it runs significant model risks. To address this point, he could have referenced how the bank mitigates the model risk (e.g., validation framework, ongoing monitoring of deposit inflows, outflow tracking to “back-test” assumed split between stable and non-stable deposits).

Under the income view, he should have highlighted that the behavioral assumptions are also relevant for the NII. Assuming a normal upward sloping interest rate curve, the bank can earn a higher interest income from reinvesting the deposits funds at a longer term, in this case mainly in mortgages. Furthermore, it can contribute to the stabilization of the margins, e.g., if interest rates subsequently fall (but also lead to opportunity losses if interest rates rise later).

Under the accounting view, he should have highlighted that leading accounting regimes do not recognize the behavioral assumptions for sight deposits and instead use the contractual maturity. He should have also raised the fact that deposits and loans are accrual accounted, whereas interest rate swaps are

marked to market and that it is not possible to receive direct hedge accounting treatment. As a consequence, the accounting risk profile measured, for example, in accounting DV01 or accounting VaR metrics, is very different from the one presented in Exhibit 3. This issue may be even more pronounced if the bank placed receiver swaps against the deposits (instead of mortgages).

It would have also been sensible to talk about the potential trade-offs, e.g., between these views. For the accounting view, he may have asked for a specific amount, that expresses the bank's willingness to accept breakage costs from interest rate swaps, e.g., if the behavioral assumptions prove to be incorrect. For example, reverse stress tests could have helped to translate this "loss budget" into relevant notional and other values. At the very least, he should have made the model assumptions transparent—a point further elaborated by the final case study.

## Case Study: Bank D

Imagine you are board member of an international bank today. The Treasury risk manager presents the slides shown in Exhibit 4. He argues that the bank is almost risk flat from a Delta EVE perspective, despite several thousand of on-and-off balance sheet transactions due to a disciplined hedging strategy. One board member challenges the Treasury risk manager. He argues the change of one single set of assumptions can even change the sign of the overall result.

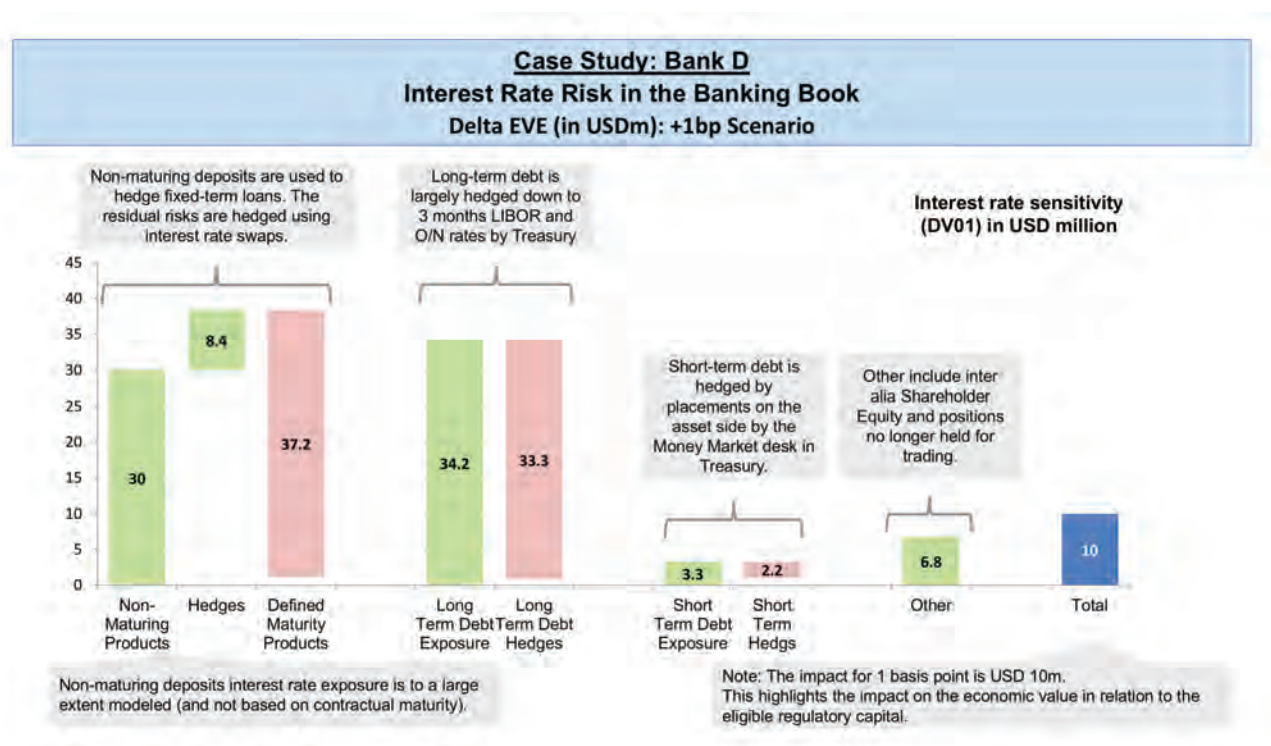


Exhibit 4. Case Summary Bank D (Part I)

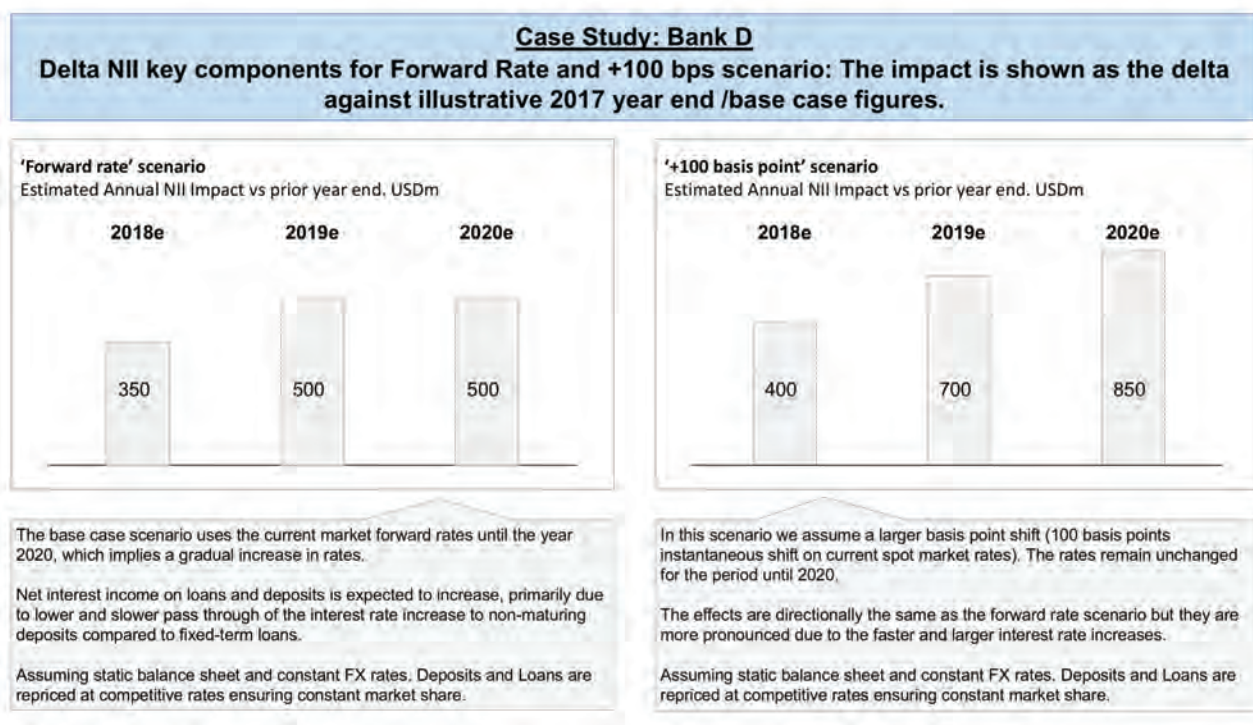


Exhibit 5. Case Summary Bank D (Part II)

The Treasury risk manager moves on to explain the impact of an increase in market rates on the bank's NII perspective. He argues the bank will benefit from rising rates. This is illustrated in Exhibit 5, which projects the NII based on today's forward curve and a shift of current interest rates by 100 basis points. This is then compared to the NII of the prior year end.

Stating he would not have a vendetta, the same non-executive director argues that the numbers could be significantly higher or lower, let's say by 20%, if he again just changed one single set of assumptions. He further states that he has been in a board meeting of a major subsidiary of the group. Despite a comparable product mix (loans, deposits) the impact of a marginal rise in rates was portrayed as having a negative impact on the subsidiary's NII.

## Considerations

The criticism of the board member seems justified. As noted in case studies B and C above, the Delta EVE numbers are highly dependent on the "right" behavioral assumptions, e.g., for non-maturing products. If they were included with their contractual maturity, e.g., overnight (as opposed to their modeled maturity) the DV01 would change dramatically. In a similar vein, the assumptions around Non-Interest-Bearing Assets and Liabilities (NIBAL) require further scrutiny. For example, the bank may have assigned maturity assumptions to its equity position which offset the risk from the reinvestment of the respective funds on the asset side. The assumption of the "natural offset" between loans and deposits may also deserve further discussion. Critics may argue that they represent different risks—non-maturing deposit volumes may reduce in rising rate scenarios due to outflows; mortgages may reduce in falling rate scenarios due to prepayments.

For the Delta NII, the Treasury Risk Manager should have explained key assumptions:

- Base case selection: Why did he use the year end as the reference point and not the financial plan?
- Balance sheet assumptions: Which assumptions did he make with regard to the size and composition of the balance sheet (e.g., constant, run-off or dynamic balance sheet with the latter including new business)? Why did he make those assumptions?
- Client rate assumptions: Which margin assumptions did he make (e.g., constant margin, assumption the bank can pass on the market interest rate increase on the asset side at a higher level and faster than on the deposit side)? Why did he make those assumptions?
- Metrics definitions: Which NII definition did he use (e.g., accounting NII vs. internal NII)?

The difference between the group and the subsidiary deserves further analysis, too. It may be explained by different assumptions, e.g., on pass through rates, between the group and the subsidiary. For example, if negative rates were not passed on to depositors but instead the loss in the liability margin was compensated by an asset margin add on, specifically on loans. If rates move closer to zero, the liability margin would still be lost while the bank may be limited in its ability to command a further asset add on. Furthermore, even if the same assumptions were used for identical depositors, the difference may be explained by different depositor groups in different jurisdictions and different currencies.

## **Are the New Regulatory Requirements a Step Towards More Holistic IRRBB Management?**

New regulatory requirements like BCBS 368 touch on critical areas, such as the use of NII, EVE, accounting metrics, the use of wider set of stress scenarios, model validation, and model monitoring requirements. At the same time, critical parts are of little help in day-to-day IRRBB management, e.g., the constant balance sheet assumption for NII, the run off balance sheet for EVE, or the NIBAL treatment prescribed for disclosure purposes.

On balance, it cannot be ruled out that banks achieve formal compliance and still don't manage their IRRBB adequately. At the same time, it may be argued that the ultimate responsibility does not reside with regulators but with individual banks, in particular, their governance bodies and senior management.

BCBS 368 rightly lifts the governance bar as the anecdote at the beginning illustrated. Despite the weaknesses identified in Bank A and Bank B, governance in a narrow sense (set up of governance bodies, limit and risk control systems, operating models, and reporting) and "mere compliance" may, however, not be the biggest challenge.

The real challenge might be to focus governance efforts on the most testing assumptions, in particular, on the behavioral modeling (e.g., non-maturing deposits, pre-payments) and financial modeling (e.g., dynamic balance sheet). This is particularly illustrated by Bank C and Bank D but equally relevant for Bank A and Bank B. Here, governance can really make a difference and ultimately decide which assumptions are acceptable (and which are not), request alternatives and comparisons, assess trade-offs,

and determine priorities, budgets, and the required level of sophistication. Also here, the battle will be decided regarding the ability of IRRBB tools to inform strategic decision-making and you may have too many “chefs in the kitchen,” e.g., from different functions and entities (global, divisional, and consultants), with different ideas and priorities so that governance may have to act as a referee. Beyond standard reviews (e.g., on limit utilization, validation status, audit results, and data quality), governance bodies and senior management should at a minimum demand more transparency, e.g., on inherent model risks and the overall consistency and cross-linkage with other performance and risk frameworks.

As an outlook, as noted at the beginning, the IRRBB management is likely to face its real “acid test” once markets leave the current low rate environment. For example, in different banks non-maturing deposit balances have grown to unprecedented levels and are likely to see migrations into other products once rates rise. Most importantly, the banking book is likely to remain a major contributor to the overall income—potentially even more so in the future.

VIEWS PROVIDED IN THE ARTICLE ARE SOLELY THOSE OF THE AUTHOR. DATA PROVIDED IN THE CASE STUDIES ARE STYLIZED AND ARE USED FOR ILLUSTRATION PURPOSES ONLY.



**Michael Eichhorn** is a professor at Hochschule Harz, University of Applied Sciences, Germany. He is a member of the BTRM faculty and a member of the European Risk Management Council.

# Enterprise Risk and Finance

Establish a single measure of risk across the organization and obtain a comprehensive view of risk and performance.

## Oracle Financial Services Enterprise Performance Management



### Funds Transfer Pricing

Monitor and reflect the detailed interest rate components, taking into account the specific cost of liquidity, basis risk, and the impact of changing behavioral profiles and their influence on business unit profitability



### Balance Sheet Planning

A planning solution for banks based on a robust cash flow engine and integrated with Oracle's leading Funds Transfer Pricing (FTP) engine. Use the same solution for budgeting, optimizing profitability, or capital planning across a wide spectrum of business stress-based scenarios



### Pricing Management

Close the loop evolving from product- and risk-based pricing to customer-centric pricing, leveraging real-time capability, to face the latest competitive challenges



### Profitability Management

Flexibly perform cost and income allocation to the most granular level through different drivers and methodologies and analyze a range of risk-adjusted performance metrics to ascertain optimal customer relationships, products, and channels that impact profitability

## Oracle Financial Services Enterprise Risk Management



### Asset and Liability Management (ALM)

Robust capability to effortlessly process large volume account-level daily cash flows to generate superior regulatory and management insights including Interest Rate Risk in the Banking Book (IRRBB). Offers a flexible reporting framework that enables group and country Asset and Liability Committees (ALCOs) to deliver on their critical and strategic ALM goals



### Market Risk and FRTB Measurement and Management

Delivers on all regulatory and management aspects of Fundamental Review of the Trading Book (FRTB) to ensure a continual appraisal of the bank's market risk profile and limit the downside risk of non-compliance by virtue of combining Oracle's powerful data management infrastructure and Numerix award winning Cross Asset Server



### Liquidity Risk Management

A dynamic steering solution that allows you to configure and execute operational funding contingency plans as well as to fulfill Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR), other operational liquidity metrics, and intra-day liquidity regulatory requirements across multiple jurisdictions



### Loan Loss Forecasting and Provisioning and IFRS 9

Provides out-of-the-box capabilities for Expected Credit Loss (ECL) calculations and natively addresses IFRS 9 standards based on a granular approach



### Credit Risk

Obtain a comprehensive view of credit risk across the organization, including counterparty credit risk on trading book



### Stress Testing

Quickly and easily assess risk appetite under extreme scenarios

## Oracle Financial Services Enterprise Capital Management



### Regulatory Capital

Enable standard and internal ratings-based Basel II and Basel III capital requirements calculation, based on flexible rules and a comprehensive metadata framework, in order to easily address any business model or multi-jurisdiction specificities and meet supervisory reviews



### Economic Capital

Provides a state-of-the-art, integrated risk and capital management solution with built-in statistical modeling features for advanced risk analytics and decision-support systems

## Oracle Financial Services Data Management



### Data Foundation

Provides a single data model for risk, finance, and treasury that reduces data sourcing effort by staging data once and reusing that data for processing among multiple applications



### Advanced Application Infrastructure

Implement analytical use cases with data management and application logic development components within a single, open standards-based analytics platform



### Data Integration Hub

Delivers an open tool to build or extend connectors, including a set of logical interfaces to Oracle Financial Services Analytical Applications (OFSAA) staging model for each OFSAA product



### Big Data

Achieve comprehensive analytical coverage and long-term success when all key facets of big data management converge onto a single, unified platform. The OFSAA suite can help financial institutions acquire transactional and unstructured information, organize and analyze data, and deliver contextual information at the point of interaction



### Model Risk Management

Provides institutions the ability to build a single and complete repository of model information across the organization and improve governance via periodic and structured assessments of risks associated with the use of each model

## Oracle Financial Services Regulatory Reporting Solutions



### Regulatory Hub

Built with an architectural theme of “build once and use across multiple regulations,” the Regulatory Hub comes with a fine-grained, comprehensive data foundation across risk, finance and regulation that lends itself to regulatory scrutiny through standard governance themes like transparency, traceability, and auditability



### Regulatory Reporting

A unique analytical platform that reinforces regulatory value chain of banks through an integrated regulatory reporting process from source to last mile reporting—with full lineage and a unique feature of productizing the regulatory update process for faster turnaround time and reduced risk

### CONNECT WITH US

 [blogs.oracle.com/financialservices](https://blogs.oracle.com/financialservices)

 [facebook.com/oraclefs](https://facebook.com/oraclefs)

 [twitter.com/oraclefs](https://twitter.com/oraclefs)

 [oracle.com/financialservices](https://oracle.com/financialservices)

### FOR MORE INFORMATION

Contact: +1.650.506.7000

<http://www.oracle.com/us/products/applications/financial-services/analytical-applications/index.html>

# 04



## MANAGING INTRADAY LIQUIDITY

### 1. Introduction

According to Jurgilas and Žikeš (2012), almost every central bank regime distinguishes between overnight liquidity and intraday liquidity in their monetary policy frameworks. This distinction can be either done explicitly, in terms of interest rates charged, or implicitly, through different eligibility criteria for collateral.

However, it is striking that only a functioning market for overnight liquidity exists. Since a developed market for intraday liquidity, in which market participants actively allocate their intraday liquidity needs, does not exist<sup>1</sup> and the theoretical and empirical literature, e.g. Bech and Garrat (2003) or Manning et al. (2009), suggests that banks have incentives to delay the settlement of non-contractual payment obligations, banks need to have a sophisticated intraday liquidity management system to be liquid

within a business day and to avoid consequences of arbitrary behavior of other institutions. Therefore, in this article, we provide an overview how commercial banks can manage their intraday liquidity.

The remainder of this article is structured as follows. In Section 2, we give an overview of the global set-up banks need to manage their intraday liquidity properly. In Section 3, we discuss the interaction of Basel III's liquidity ratios and a bank's intraday liquidity. In Section 4, we describe the determinants of intraday liquidity, and in Section 5, we look at how costly intraday liquidity can be. Section 6 provides an overview of how banks can report and steer their intraday liquidity. Finally, Section 7 concludes this chapter and derives policy recommendations.

### 2. Global Set-up for Intraday Liquidity Management

To understand the mechanics of intraday liquidity management properly, we first need to distinguish between end-of-day liquidity management and intraday liquidity. While end-of-day liquidity management can be characterized by

---

<sup>1</sup> Since a developed market for intraday liquidity does not exist, some market participants have agreed upon bilateral liquidity facilities. Within these agreements, one party has the right to draw intraday liquidity up to a pre-defined amount within a business stay. For this facility, the facility provider receives an annual fee.

allocating excess liquidity or null liquidity between the bank's Treasury hubs and respective time zones, intraday liquidity management is concerned with the management of means within a certain time zone.

As shown in Figure 1, managing a European bank's end-of-day liquidity starts at the bank's Asian Treasury hubs, Tokyo and Singapore. From this location, excess liquidity or null liquidity will be transferred to Europe, and from there, to the American Treasury hub to end the business day there. At the beginning of the new business day, this process will be re-started. In Asia, liquidity will be concentrated in Euro, US Dollar, Pound Sterling, and Swiss Franc by squaring liquidity in Asian currencies using FX swaps<sup>2</sup> and transferring the remaining liquidity balance via money market transactions to Europe.<sup>3</sup> This process of squaring local currencies and transferring liquidity in the form of major currencies is equal in each Treasury hub. In this sense, every Treasury hub can be interpreted as a single ledger.<sup>4</sup>



Figure 1. End of Day Liquidity Management

Later that day in Europe, the bank's group Treasury department clears the European currencies and transfers them at the end of the European business day via money market transactions to the Treasury hub in the Americas. Within its mandate, the Treasury in the Americas clears American currencies and squares the excess liquidity or null liquidity in the U.S. market. Since the end of the American business day is congruent with the bank's global business day, the bank is completely squared in all currencies after business hours in the United States.

Like end-of-day liquidity, intraday liquidity acts within the previously mentioned time zones. Business hours vary between these different time zones. Continuous linked settlement (CLS) payments, for example, are concentrated in the European time zone where most of the time-critical payments occur. The CLS clearing system is broadly used to mitigate settlement risk<sup>5</sup> for FX settlement transactions. To achieve this, it is necessary that all payments are executed globally at the same time, no matter the local time of day.

2 The acronym "FX" is an abbreviation for "Foreign Exchange". An FX swap is a combination of FX spot transaction and simultaneously agreed reciprocal FX forward transaction. One of the involved parties buys US Dollar against Euro in a spot transaction and sells the bought amount of US Dollar in forward transaction at once.

3 A money market transaction is a simple liquidity-providing transaction in which liquidity is allocated between units with a liquidity surplus and units with a liquidity deficit.

4 A ledger is an accounting area that summarizes all bank accounts in each Treasury hub.

5 Settlement risk, also known as the Herstatt risk, is the risk one counterparty of a bi-lateral transaction does not meet its obligation while the other counterparty already fulfilled its contractual commitment to the first counterparty.

For the Asian time zone, payments are performed at the end of the business day so that these payments and those clearing are relatively riskless since most of the core business has been settled within in the business day. See Figure 2. This risklessness stems from the fact that time-critical payments are performed at the end of the business day and most settlement transactions were already executed.

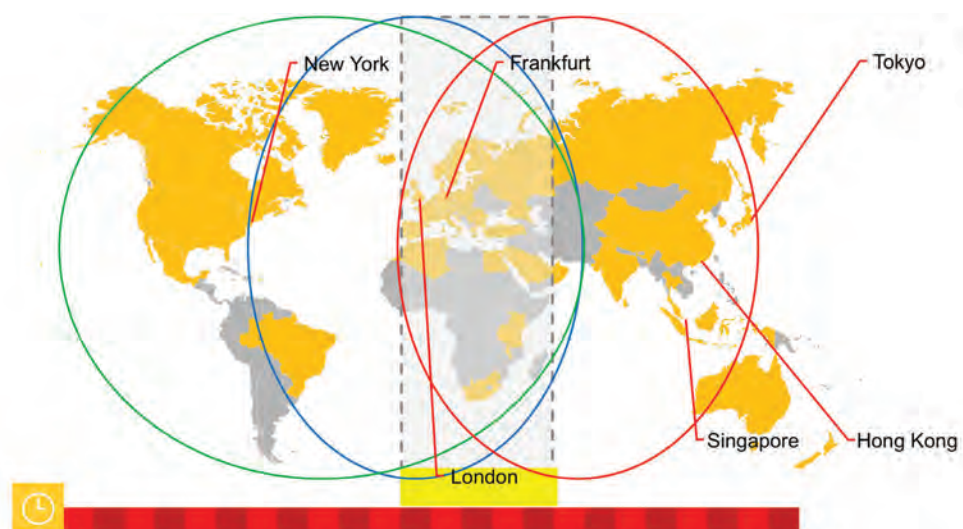


Figure 2. End-of-Day Liquidity Management

What Figure 2 implicitly reports is that the main intraday events are concentrated in the European time zone.

At the end of a global business day, the bank is squared in its liquidity position. Excess liquidity could either be allocated to other market participants or to the central bank accounts in each of the bank's Treasury hubs. Vice versa, a liquidity deficit can be neutralized by borrowing money from other market participants.

In the Asian time zone, intraday flows out of the CLS System are processed towards the end of the business day where banks have more certainty about their intraday flows and liquidity position. Therefore, these payments are less critical from a liquidity steering perspective than CLS payments in the European or American time zones.

In Europe, banks' intraday activities and time-relevant payments<sup>6</sup> are focused in the first half of a business day within the European Clearing time (7:00 a.m. – 12:00 p.m.). These activities are accompanied with the highest degree of uncertainty regarding the bank's needs of intraday liquidity.

In the American time zone, there are only minor counter flows so that time-based payments are settled through the bank's intraday credit line at the US Federal Reserve System (FED). In contrast to central bank facilities in other time zones, the FED provides, in addition to secured intraday liquidity facility, an unsecured intraday liquidity facility which has a time-dependent charge.<sup>7</sup>

<sup>6</sup> Time-relevant payments are needed to be executed at a certain point in time. If the bank fails to execute the payment when it is due, the bank needs to do penalty payments or will suffer a loss in reputation.

<sup>7</sup> An example of how this unsecured intraday facility works can be found in the appendix.

## Liquidity Ratios and Intraday Liquidity

### 3.1. Intraday Liquidity and Liquidity Regulation

In the wake of the global financial crisis, liquidity managing became one of the greatest attention-getters for practitioners, academics, and, of course, regulators. Albeit Basel III's liquidity coverage ratio (LCR) covers a time from overnight to one month and the net stable funding ratio (NSFR) up to one year, it is quite surprising that intraday liquidity and intraday liquidity risk management was not in that very spotlight.

According to Buschmann and Heidorn (2014), the LCR is a simple linear ratio that promotes a bank's short-term resilience to liquidity shocks and, by setting a limit for it, ensures that a sufficient amount of high quality liquid assets (HQLA) is maintained by a bank to offset cash outflow in a stressed environment. The NSFR is an addition to the liquidity coverage ratio and yields at the long-term funding of banks. Simply speaking, the NSFR reflects "The Golden Banking" by postulating that long-term assets should be backed by long-term liabilities to reduce roll-over risks. Therefore, the NSFR is that banking rule put in one single ratio. While both liquidity measures are created to ensure long-term resilience of bank liquidity risk profiles, they feature, apparently, no connection to banks' intraday liquidity.

While intraday liquidity was disregarded by the regulators for a long time, this changed with the publication of the policy paper of the Basel Committee of Banking Supervision (BCBS) on monitoring tools for intraday liquidity risk management in 2013. Also, regulatory bodies in the Euro area, in the United Kingdom, and in Switzerland started efforts on monitoring and reporting intraday liquidity risk. Albeit, intraday liquidity was already recognized by banks as a relevant steering variable before the financial

crisis and the publications of the BCBS policy paper identified this as a steering measure. The costs of steering intraday liquidity and the risk of steering it make intraday liquidity relevant for clearing houses and all bank-involved in clearing transactions.

In May 2015, the European Banking Authority (EBA) started a consultation process on a draft of Implementing Technical Standards (ITS) related to supervisory reporting of additional monitoring metrics for liquidity. The proposed ITS aims to develop additional metrics with a view to providing supervisors with an adequate toolkit to assess liquidity risk and facilitate their work in performing reviews of Internal Liquidity Adequacy Assessment Processes (ILAAP). These metrics are different from the liquidity coverage ratio and the net stable funding ratio. In particular, the proposed metrics are: a maturity ladder for legal maturities and one for behavioral economic maturities, concentration of funding by counterparty, prices for various sources of funding, and a metric for rollover of funding.

While the LCR and the NSFR are global liquidity regulations, there are also national ones that have to be taken into account when managing intraday liquidity. The German Liquiditätsverordnung (LiqV) requires banks to maintain certain commitments to ensure liquidity at all times. In addition, Germany's Mindestanforderungen an das Risikomanagement (MaRisk) requires banks to withstand a liquidity stress within a survival period of 30 days. According to MaRisk, banks should consider BCBS documents in their risk assessment. Local liquidity provisioning will be discontinued as soon as Basel's LCR has to be fulfilled by 100%.

### 3.2. Internal Models

To determine banks' liquidity and liquidity risk, products' legal maturities will be replenished with a going-concern market case (base case for most

banks) and a stress case. The difference of the liquidity needs of both scenarios determines the volume of the liquid asset buffer—the bank’s stress counterbalancing capacity.

Since modeled cash flow assumptions may largely differ from actual cash flows during a business day, cash outflows can be bigger than expected in a bank’s models. The difference between expected and actual cash flow is called “model risk<sup>8</sup>.” To quantify and, as consequence of this, to assess this model risk in a proper way, it is crucial for each and every banking organization to put intraday liquidity risk under intense scrutiny. The reason for this is simple: while models are, by definition, a simplification or approximation of reality, they do not fully account for clients’ turnovers within a business day. Here, the challenge is to model customer behavior properly in between because, at the end of each business day, a bank’s liquidity position is relatively stable and congruent to the model-based cash-flow assumptions. While these models grab the bank’s liquidity position at the end of the business day, intraday liquidity management tries to match intraday liquidity needs when they arise.

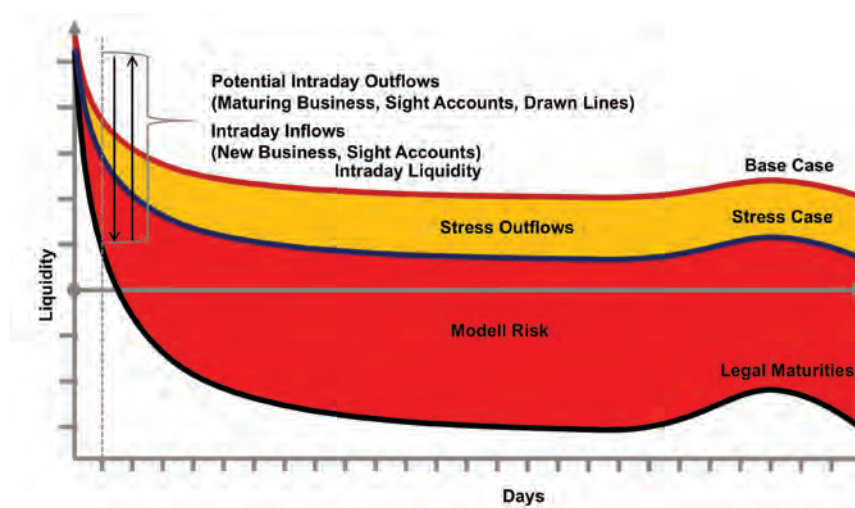


Figure 3. Liquidity Gap Analyses/Internal Liquidity Model

### 3.3. Minimum Reserve and Liquidity Management

The European Central Bank (ECB) requires banks located in the European Monetary Union (EMU) to hold deposits on accounts with their national central bank. These are called “minimum” or “required” reserves (MMR). The amount of the reserve is a fraction of the total customer deposits and issued short-term notes, held at the respective bank and is a measure to protect customer deposits. Albeit, central bank reserve requirements are still in place and are likely to remain so, this liquidity provision is de facto replacement by Basel’s liquidity ratios.

However, the held minimum reserve has a tremendous practical advantage: it serves, de facto, as an end-of-day and intraday liquidity buffer. The minimum reserve allows the bank to cover unexpected end-of-day fluctuation. Hence, held minimum reserves are smoothing the intraday liquidity steering efforts for banks and, therefore, cause stabilization of the money market in the EMU. The ability of a bank to counteract unexpected cash outflows interacts with the account balance, so-called basis capacity, of

<sup>8</sup> In addition to our definition of model risk, the common literature, e.g., Hull (2012), distinguishes between the two types of model risk: firstly, that a model reflects a wrong price at a time a product is bought or sold, and secondly, a model reflects the wrong “greeks” and, therefore, banks hedge their risk inefficiently.

the minimum reserve. The higher the account balance is, the larger the bank's capacities are to encounter any unexpected fluctuations. Lastly, since liquidity is effectively bound for a specific purpose, held minimum reserves are lowering the inflows in LCR ratio. As the deposit basis for the minimum reserve calculation is already reflected in LCR runoff factors, there is a double counting. This has minor impacts as long the reserve rates stay at 1 % of the deposit base but could cause problems when the reserve amount should be increased to ensure smoother liquidity management.

#### 4. Intraday Liquidity Drivers

The main drivers of bank intraday liquidity are commercial payments and payments from market making and trading activities. These payments can be largely divided into TARGET 2 payments and payments within the EBA clearing system<sup>9</sup>. TARGET 2 payments are subdivided into three different types of payments and consist of payments that are highly urgent and timed, such as payments for security clearing or pay in Single Euro Payments Area (SEPA) transactions. Payments with a certain priority, so-called urgent payments, such as bank-to-bank payments, e.g., money markets and foreign exchange transactions, are not cleared by CLS. Lastly, all other payments via TARGET 2 are summarized as "normal" value date payments. Payments under the EBA-clearing framework are sub-divided into four different types of payments: payments for EURO1, a net system guaranteed by a collateral pool; STEP 1 payments that have to be prefunded; SEPA clearing payments (here, the settlement result will be paid as high urgent payment); and in-house payments/bank-internal settlements with no intraday liquidity impact.

Managing these different types of commercial payments properly, a bank's Treasury department can substantially mitigate the bank's intraday liquidity risk and can mitigate other risks that emerge from other banking operations, namely operational risks and credit risk/settlement risks. As Figure 4 shows, banks need to manage the triangle of intraday liquidity risk, operational risk, and credit/settlement risk. Here, the challenge is to keep this triangle in balance since reducing one of the named risk types causes an immediate increase of one of the other risks.

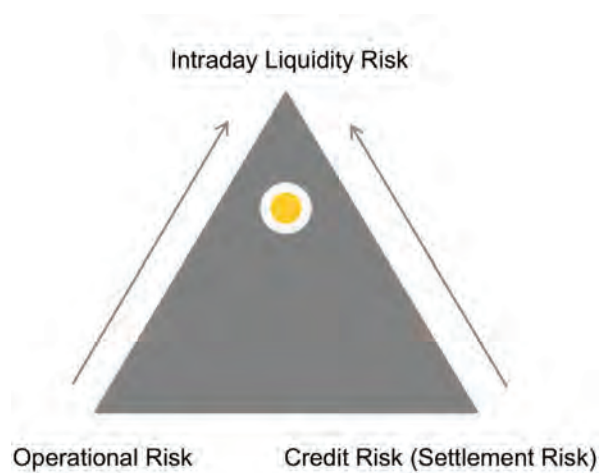


Figure 4. Intraday Liquidity and Other Risks Mitigation

<sup>9</sup> EBA CLEARING is a bank-owned provider of pan-European payment infrastructure solutions. The company was established in June 1998 by 52 major European and international banks with the mission to own and operate EURO1, the only privately owned real-time gross settlement (RTGS)-equivalent, large-value payment system on a multilateral net basis.

What Figure 4 essentially shows is that reducing operational risks by executing early payments or reducing settlement risk can only be achieved by taking willingly higher intraday liquidity risks. The same is true, vice versa. Therefore, managing intraday liquidity risk is balancing several kinds of risk at the same time.

To achieve this balance over a business day, banks schedule their payments based on their urgency. Hence, TARGET 2 payments (high urgent and urgent) will be executed at first, while the execution of other payments, such like the ones under the Federation Bancaire de l'Union Européenne (FBE) framework, are postponed to a future point in time of the same business day.

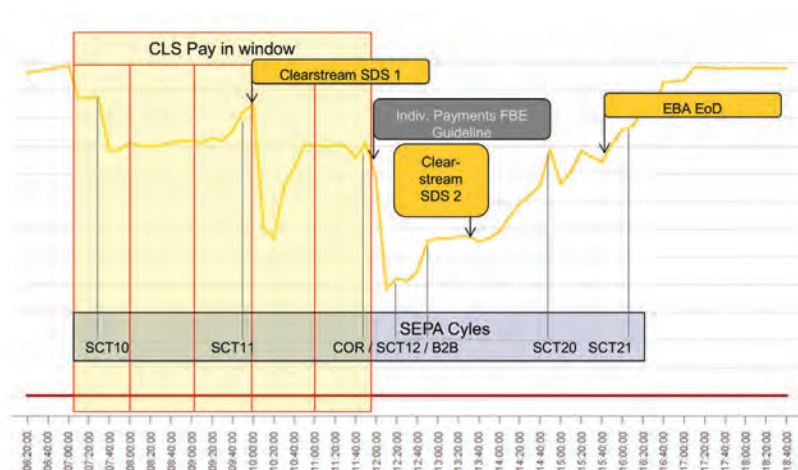


Figure 5. Intraday Liquidity Curve and Its Major Drivers

Between 8:00 a.m. and 12:00 p.m., the payment window of CLS is open. During this time, payments within the five CLS payment cycles take place. What can be clearly seen from Figure 5 is that the amount of available liquidity (yellow line) is exposed to fluctuations during the business day. Payments are executed in so-called cycles, meaning that, first, an accumulation and netting of upcoming payments takes place. In a second step, this net accumulation will be executed. After each payment cycle, the bank's available liquidity will drop considerably. These SEPA cycles are performed during the whole business day and even after closing of the CLS pay window. Nevertheless, the major SEPA activities are concentrated together with major securities settlements in the early morning hours of the European business day. Hence, the rest of the business day is driven by individual payments, being made in line with the FBE guidelines on liquidity management. The amount of intraday liquidity will be augmented to reach the necessary level at the end of the bank's business day.

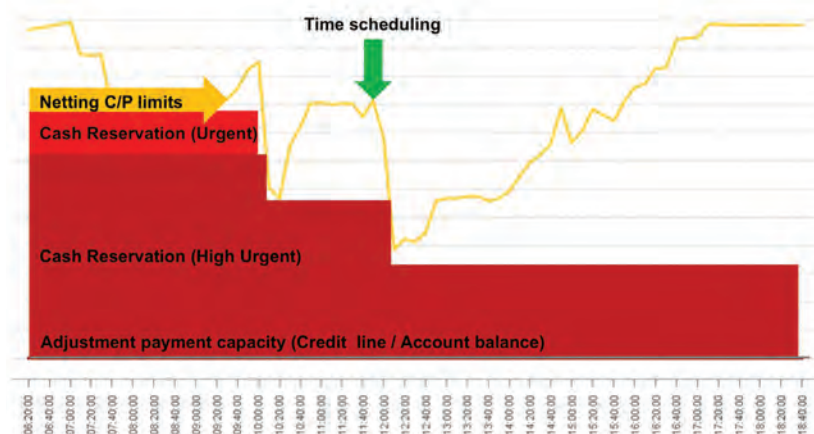


Figure 6. Intraday Liquidity Curve and Steering Measures

Eventually, banks steer their intraday liquidity by rationing payments. While Figure 5 largely illustrates the time schedule of daily payments, Figure 6 provides information from which sources the liquidity for these payments is taken. In principle, a bank's Treasury department manages these payment operations by dedicating liquidity to certain type of payments. Also, certain payments to counterparties will be postponed until the respective counterparty made its payment to the bank itself. Effectively, this procedure can be seen as a limit for cash settlement and is highlighted as "Netting C/P limits" in Figure 6. The residual of the scheduled payments are made by "dedicated cash holdings." For instance, the bank's Treasury department dedicates a certain amount of available liquidity to highly urgent payments and another one to urgent payments. This reservation of means varies from day to day and is derived from the operations of the previous business days. Lastly, other non-timely urgent payments are managed throughout the business day by using account balances and credit lines. This approach also can be accompanied by a pre-defined time schedule. Some banks are setting internal time limits until payments have to be due. To ensure unobstructed liquidity management, these deadlines are normally set around 12:00 p.m., according to the FBE guidelines.

## 5. Intraday Liquidity Costs

Managing intraday liquidity properly does not come cheap. Indeed, managing this special type of liquidity is linked to some costs. These costs depend, of course, on the bank's business model and Treasury strategy. In the first place, the bank needs to define how long the payment capacity should be maintained to protect the business model. Should it be a year or a week?

In the next step, the bank needs to define, through measurement and stress testing, its required payment capacity. With regard to assets, the bank also needs to define the asset types (e.g., cash, bonds, repurchase agreements, etc.) or class (e.g., central bank eligible, HQLA-securities<sup>10</sup> defined by Basel III), and the risk-weights (RWA) for the assets held as collateral. Lastly, intraday liquidity costs depend on the chosen funding. Hence, the funding sources and the funding profile of the collateral define the gross funding cost, while the net funding costs are derived by the difference between the income of the assets used as collateral and funding structure of this collateral.

Regarding the asset strategy for the payment portfolio, the risk-weighted assets strongly influence the decision about credit risk within the payment portfolio. In any case, charges on risk-weighted assets have to be taken into account when budgeting intraday liquidity. In this process, the implied costs of Basel's liquidity regulation (LCR, NSFR) also need to be taken in account.

To give an impression on the formation of liquidity costs, we want to provide the following, simplified, example. When it comes to central bank liquidity, the ECB directly determines the costs of liquidity provision by setting the interest rate for the liquidity and indirectly by setting haircuts for pledged securities. To back received central bank liquidity with the appropriate amount of collateral, one should be aware that the collateral value,  $CV_i$ , is equal to the asset's market value,  $MV_i$ , reduced by the asset's haircut,  $HC_i$ . Since the haircut depends on the credit risk and the liquidity of the asset, the collateral value originates by:

$$CV_i = MV_i * (1 - HC_i)$$

<sup>10</sup> Under Basel III's liquidity regulation, banks have to maintain an adequate stock of unencumbered HQLAs to guarantee their short-term resilience towards severe liquidity stresses. These HQLAs are predominantly government bonds.

The market value of the asset is simple function of the asset's notional amount  $N_i$  and its market price  $P_i$ : (2)  $MV_i = P_i * N_i$

Albeit, only the collateral value is necessary to collateralize the required central bank liquidity (CBL) because  $CV_i = CBL$ , the market value together with the haircut determines the extent of the liquidity costs. The lower the credit quality of the underlying asset, the higher the haircut is and therefore, the higher the notional amount has to be. Ceteris paribus, the lower the market price of the asset, the higher the notional amount has to be. However, what can be seen from the formulas above is that the costs of CBL arise not only from financing the haircuts but also from the credit quality of the asset. In addition to several haircut regimes employed by various central banks around the globe, the credit risk of the issuer of the asset plays a crucial role in determining the costs of the payment portfolio. Figure 7 shows the interaction between asset classes and their relative funding towards the interbank rate/EURIBOR which serves as a funding benchmark. The funding spread is function of credit quality and maturity.

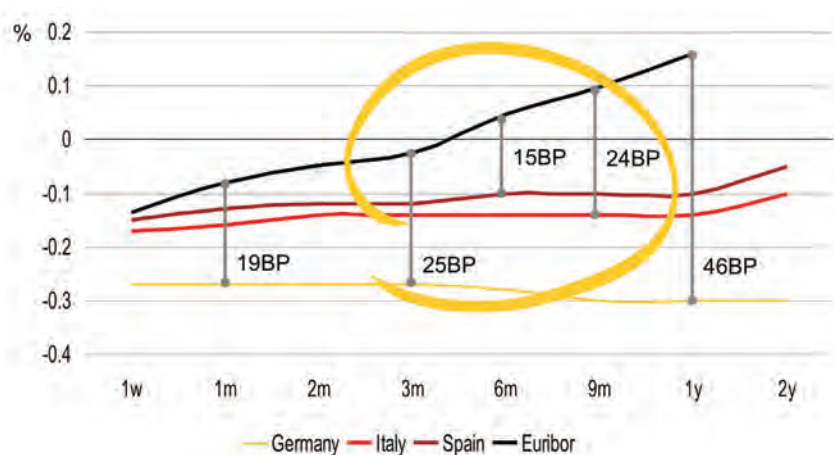


Figure 7. Asset Classes and Funding Spreads<sup>11</sup>

Since the average credit risk of the EMU banking sector is higher than the one of single-EMU sovereign states, taking the EURIBOR-curve as the benchmark for funding causes a negative carry for asset positions held in German, Italian, or Spanish government bonds. As the example above shows, holding German Bunds would create, no matter which maturity is held, the highest negative carry/or the liquidity costs for the liquid asset buffer. The same is true for other sovereign assets from the countries of the European monetary union. As a consequence, the funding spreads and the agreed funding duration are the key drivers of liquidity costs.

## 6. Reporting and Steering Intraday Liquidity

After having a discussion on how to set up proper intraday liquidity risk management globally and after discussing how to manage to intraday liquidity with its determinants as well as risk drivers and its costs, we finally look at how to steer and report intraday liquidity. Here, is it necessary to be aware of the issues that may arise from intraday liquidity risk steering and reporting.

<sup>11</sup> Source: Indicative figures based on market intelligence.

In accomplishing proper steering and reporting, banks should follow reporting guidelines set by the regulator in authority. The reporting and steering will be carried out in defined currencies.<sup>12</sup> In addition, a bank's timed payment obligations are steered and reported at the same time. Here, a bank needs to validate the possibility of timed payment obligations, like payments via CLS payment instructions. In addition, there needs to be a validation for time-sensitive settlements. This type of payment needs to be steered to avoid reputational risk through becoming a counterparty risk itself.

The ability to act describes a bank's facilities to steer its available liquidity within time zones and meeting contractual issues as a service provider. Another crucial item in intraday liquidity risk management is mitigating credit risk by recognizing unadvised cash payments. Finally, it had to be considered if secondary nostro accounts have an impact on intraday liquidity. Most of these accounts are acting equal to ancillary systems that have to be reported under BCBS 248. The steering and measurement activities should concentrate on major liquidity drivers. As long as accounts are netted with the major account in the respective currency, the liquidity transfer between these accounts should be seen as the relevant for intraday steering and monitoring. Nevertheless, it should be ensured that these accounts have a minor impact to the bank's overall intraday liquidity position.

## 7. Conclusion

In this article, we carved out the importance and functionality of banks' intraday liquidity management. We provide an overview of how banks can set up their intraday liquidity, manage globally, and steer their intraday liquidity within different time zones. We explain how Basel's liquidity measures interact with intraday liquidity

and illustrate the determinants and accompanying costs of intraday liquidity. Finally, we discuss how intraday liquidity can be reported.

Overall, this article should create awareness to an often-overlooked issue in daily liquidity (risk) management: intraday liquidity management. Hence, this article aims at three different target groups: bankers, regulators, and central bankers. First, the liquidity managers of banks can easily understand what intraday liquidity risk management is all about and how banks can set up their intraday liquidity risk management and manage its intraday liquidity. Second, since regulation gains more and more importance, regulators, especially the Basel Committee, need to understand the relevance and complexity of intraday liquidity management for banks to set up reasonable regulation. Lastly, risk can be mitigated by taking other risks, but not avoided. Due to the BCBS 248 regulation, the awareness that intraday liquidity is not the solution to mitigate other risks will rise and lead to enhanced settlement models taking intraday liquidity into account.

---

<sup>12</sup> Here, BCBS (2013) recommends that national regulators should consider currencies whose aggregate liabilities exceed the amount of 5% of a bank's total liabilities.

## References

- Abbassi, P.; Fecht, F. and Tischer, J. (2015): *The Intraday Interest Rate – What's That?* Deutsche Bundesbank Discussion Paper 24/2015.
- Basel Committee of Banking Supervision (2013): *Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools*. Basel 2013.
- Basel Committee on Banking Supervision (2014): *Basel III: The Net Stable Funding Ratio*. Basel 2014.
- Basel Committee on Banking Supervision (2008): *Principles for Sound Liquidity Risk Management and Supervision*. Basel 2008.
- Bech, M. L. and Garratt, R. (2003): "The Intraday Liquidity Management Game." *Journal of Economic Theory*, Vol. 109, No. 2, p. 198-219.
- Buschmann, C.; Heidorn, T. (2014) *The Liquidity Reserve Funding and Management Strategies*. Frankfurt School of Finance and Management. Working Paper 210, Frankfurt am Main 2014.
- European Banking Federation (2010): *European Interbank Liquidity Management Guidelines*. Brussels 2010. Federal Reserve System (2012): *Overview of the Federal Reserve's Payment System Risk Policy on Intraday Credit*. Washington, D.C. 2012.
- Hull, J. C. (2012): *Risk Management and Financial Institutions*. Hoboken 2012.
- Jurgilas, M. and Žikeš, F. (2012): *Implicit Intraday Interest Rate in the UK Unsecured Overnight Money Market*. Bank of England Working Paper No. 447. London 2012.
- Manning, M.; Nier, E.; Schanz, J. (2009): *The Economics of Large-value Payments and Settlement*. Oxford University Press. Oxford 2009.

## Appendix: Calculation FED charges

To calculate fees charged by the FED on uncollateralized daylight overdrafts, the FED maintains minute-by-minute information on account holders' daylight overdraft and collateral balances, through its automated applications. A bank's daily intraday overdraft fee is equal to the effective daily rate multiplied by the average uncollateralized intraday overdraft for the day.

The FED calculates and assesses fees on the basis of two-week reserve maintenance periods. The fee is equal to the sum of daily uncollateralized daylight overdraft charges incurred minus the fee waiver for the maintenance period.



**Christian Buschmann** is with the group treasury department of Commerzbank AG, Germany's second largest private banking group, since 2007. He holds a M. Sc. in Finance and Ph.D in Financial Economics from Frankfurt School of Finance & Management.



**Holger Westermann** is Head of Liquidity Risk Analysis and Reporting at Commerzbank.

# 05

## **STRATEGIC ASSET LIABILITY MANAGEMENT (ALM) AND INTEGRATED BALANCE SHEET MANAGEMENT:**

### **The Future of Bank Risk Management**

FIRST PUBLISHED IN THE EUROPEAN FINANCIAL REVIEW, JUL-AUG 2017, BASED ON A CHAPTER IN THE AUTHOR'S BOOK *BANK ASSET-LIABILITY MANAGEMENT* (2007). REPRODUCED WITH PERMISSION.

The traditional approach to asset-liability management (ALM) practice in banks operated as a reactive process following product origination by the customer-facing business. In the Basel III era, a more proactive approach to ALM is required in order to manage the balance sheet from an effective viability and sustainability standpoint. The article describes proactive "Strategic ALM" discipline and its implementation process.

Banks are by their nature risk-taking institutions. This is a requirement of their business, because their corporate clients may wish to tailor their funding to meet the precise needs of their business, so as to achieve some certainty in this

area, enabling them to focus on what they do best. Similarly, retail clients may wish to access banking products and services to meet their personal needs, such as purchasing a house or investing for a child's education. To meet this demand, banks offer the lending terms, maturities, rate options, currency, optionality, and contingencies demanded by their clients, and take on the range of risks that such tailoring represents. Because banks have a wide range of clients with varying borrowing and deposit requirements, exposures may to some degree offset each other, but will not match completely in terms of timing, amount, and currency. This is more evident as products become more complex and offer more alternatives.

Therefore, a key area of focus for banks is managing their capital, funding, liquidity, and interest-rate risk requirements. These all fall under the umbrella of the ALM discipline in a bank. When a bank borrows more than it needs, there can be inefficiencies in terms of capital use. This can also result in added interest rate risk, and a loss when lending on. However, failure to have sufficient funding results in the bank having to rely on central bank liquidity, poor market

perception, and loss of investors, which could ultimately lead to failure. Thus, ALM becomes the most important aspect of a bank's risk management framework.

In this article we suggest that the discipline of ALM, as practiced by banks worldwide for over 40 years, needs to be updated to meet the challenges presented by globalization and Basel III regulatory requirements. In order to maintain viability and a sustainable balance sheet, banks need to move from the traditional "reactive" ALM approach to a more proactive, integrated balance sheet management framework. This will enable them to solve the multi-dimensional optimization problem they are faced with at present.

## The Origins of ALM

Historically, interest rates were stable and liquidity was readily available to banks in developed nations. Banks focused primarily on generating assets to increase growth and profitability. However, in the 1970s, changes in regulation, inflation, and geopolitics led to greater volatility and thus increased risk from asset and liability mismatches (see Figure 1). This led to the development of ALM as a formal discipline, where both sides of the balance sheet are integrated to manage interest rate, market, and liquidity risk. In essence however, this discipline remained reactive in nature, with Treasury and risk having little or no input to the origination and deposit raising process.

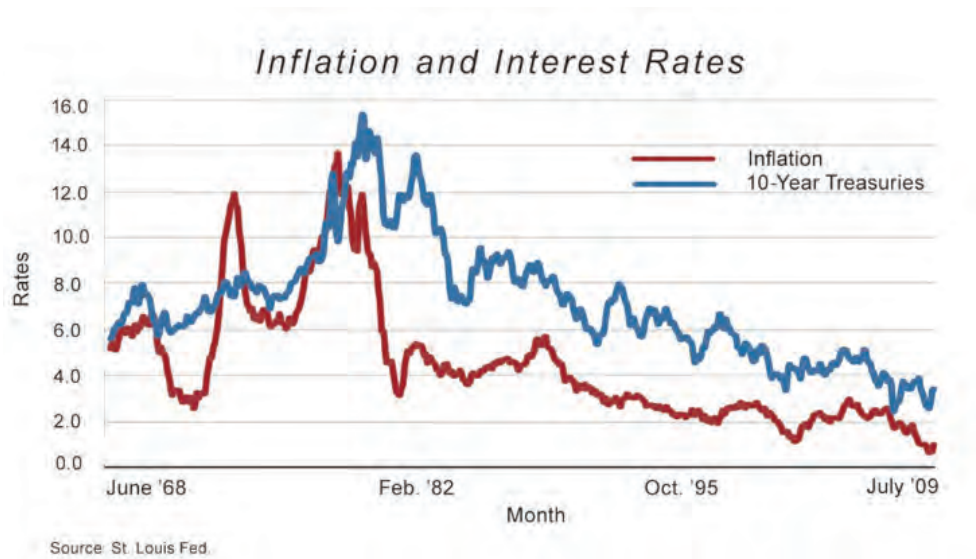


Figure 1. US Treasury Yields and US Inflation Historical Levels

Traditionally, ALM was defined by four key concepts:

- Liquidity, defined as:
  - Funding liquidity: the continuous ability to maintain funding for all assets
  - Trading liquidity: the ease with which assets can be converted into cash
- Term structure of interest rates: the shape of the yield curve at any given time depends on interest rate expectations, liquidity preference, and supply and demand from different borrowers and lenders. ALM strategy would consider how changes to the shape of the yield curve in the short and medium term will impact the bank.
- The maturity profile of the banking book: ALM would report and monitor the maturities of all asset and liabilities to measure and control risk
- Interest rate risk, essentially the risk of loss of net interest income due to adverse movements in interest rates or interest rate spreads.

In essence however, ALM, undertaken in all banks, has always been a reactive process, and despite its name has rarely, if ever, managed to integrate origination policy across both sides of the balance sheet. As a discipline, such an approach is no longer fit-for-purpose in the era of Basel III and Basel IV.

### **The Strategic ALM Concept**

Consider exactly how ALM is undertaken in virtually every bank today, irrespective of size, business model, or location. A business line in a bank, following an understood medium-term “strategy” articulated either explicitly or implicitly (but in reality aiming usually simply to meet that year-end’s budget target), goes out and originates

customer business, be this originating assets or raising liabilities. It will most likely have little interaction with any other business line, and only the formal review interaction with the risk department. This is often described as creating a “silo mentality” in the organization, and is typical of all but the very smallest banks. In some banks an individual business line may have practically zero interaction with Treasury. In this respect it will be similar to all other business lines.

Each of these business lines will proceed to undertake business, ostensibly as part of a grand strategy intertwined with other business lines, but in reality to a certain extent in isolation. The actions of all the customer-facing desks in the banks will then give rise to a balance sheet that must be “risk managed.” And the ALM part of this risk management process is then undertaken by Treasury, in conjunction with finance and risk.

There is little or no interaction between business lines and little or no influence of the Treasury function or the risk “triumvirate” of Treasury, finance, and risk in the balance sheet origination process. In other words, ALM is a reactive, after-the-fact process. The balance sheet shape and structure is arrived at, if not by accident certainly not by active design and certainly not as the result of a process that integrates assets and liabilities origination. The people charged with stewarding the balance sheet through the economic cycle and market crashes have very little to do with creating the balance sheet in the first place. Does this represent best-practice risk management discipline, with separation of duties, four lines of defense, and so on? In a word, no. There is no problem with one department originating assets and another one managing the risk on them. The issue with the traditional approach to ALM is that the balance sheet that is arrived at often lacks a coherent shape, or logic, and this makes the risk management of it more problematic.

One would not wish to have a balance sheet that was composed overwhelmingly of illiquid long dated assets funded by wholesale overnight deposits, or a liabilities strategy that concentrated on raising wholesale or corporate funding that was treated punitively by Basel III liquidity requirements. Another example observed by the author involved the funding of trade finance assets (overwhelmingly very short term) by 10-year MTNs.

In the era of Basel III, it is evident that balance sheet risk management must become more proactive. The shape and structure of the balance sheet must be arrived at because of an integrated approach to origination. What does this mean? Quite simply, the discipline of ALM must recognize that asset origination and liability raising has to be connected. For the ALM process to be fit-for-purpose for the 21st century, banks must transition and adapt from a traditional reactive ALM process to a proactive strategic ALM process.

### Addressing the Three-dimensional (3D) Balance Sheet Optimization Problem

The market environment is creating a 3D optimization challenge for banks, or at least those banks that are serious about competing and serious about being well-respected by customers and peers. This challenge requires banks to run optimized balance sheets in order to maximize effectiveness and stakeholder value. However, when we speak of “balance sheet optimization,” we do not mean what it used to mean in the pre-crash era, basically working to maximize return on capital (RoC). Today optimizing the balance sheet has to mean structuring the balance sheet to meet the competing but equivalent needs of regulators, customers, and shareholders. This is the 3D optimization challenge that we speak of.

A bank’s risk management practice is an integral part of meeting this optimization challenge. From the board level downwards, policy must be geared towards achieving this goal, and strategic ALM is a vital part of the optimizing process. However, before we consider this let us refresh the regulatory aspects first. We will not cover the myriad requirements of Basel III capital, liquidity, and leverage requirements here, which are discussed in depth in other publications. The essence of implementing the demands of Basel III as stipulated by regulators is that many banks’ business models will have to change, to ensure compliance. Figure 2 illustrates this in stylized fashion.

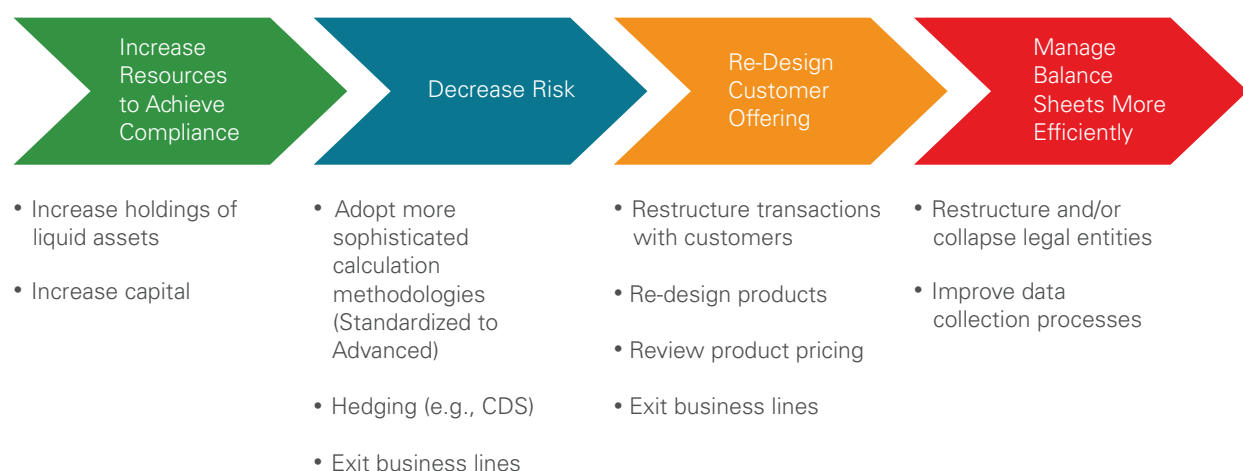


Figure 2. Mitigating the Impacts of Basel III

The inescapable conclusion since the bank crash of 2008 is that banks must manage their balance sheet more efficiently. This gives rise to the 3D optimization problem. We articulate it thus:

1. **Regulator requirements:** Banks must adhere to the capital, liquidity, and leverage ratio requirements of their regulator. With only a handful of exceptions, this means meeting the demands of the Basel III guidelines. The larger the bank, and/or the more complex its business model, the more complicated and onerous this requirement becomes. Related stipulations such as the Fundamental Review of the Trading Book (FRTB) add to the regulatory demands imposed on banks. Every bank must meet its supervisory requirements.
2. **Customer franchise requirements:** This is not necessarily anything new. In a competitive world, any bank would always wish to meet the demands of its customers. In a more constrained environment this requirement becomes more urgent of course, and this gives rise to the challenge. For instance, a “full service” bank will wish to provide all the products that its customers may demand, and sometimes these products will not be the most optimum from the viewpoint of (1) above. To illustrate one case: the deposits of large corporate customers and non-bank financial customers are considered “non-sticky” under Basel III rules and so carry a greater liquidity cost for banks. From that perspective such deposits are not optimum from a regulatory efficiency view, but the bank must accept them if it wishes to satisfy this part of its customer base.
3. **Shareholder requirements:** This aspect is of course also now new. The shareholder has always demanded a satisfactory rate of return, and so all else being equal a bank will always want to maximize its net interest income (NII) and enhance or at least preserve

its net interest margin (NIM) through changing economic conditions and interest rate environments. But of course the balance sheet mix that meets this objective will not necessarily be the one that is most efficient for (1) and/or (2) above. One example: from a NII perspective bank will maximize its funding base in non-interest bearing liabilities (NIBLs) such as current accounts (“checking” accounts) or instant access deposit accounts, whereas the demands of Basel III liquidity will often call for an amount of contractual long-term funding, which is more expensive and thus inimical to NII.

We see, therefore, that the demands of each stakeholder are, in a number of instances, contradictory. To maximize efficiency, a bank will need to work towards a balance sheet shape and structure that is optimized towards each stakeholder, and it is not a linear problem. Hence, the 3D optimization challenge arises.

This illustrates unarguably the need for a new approach to balance sheet origination and the role of the ALM function. This we call “strategic ALM”.

### Principles of Strategic ALM Practice

Strategic ALM is a single, integrated approach that ties in asset origination with liabilities raising. It works to break down “silos” in the organization, so that asset type is relevant and appropriate to funding type and source, and vice versa. We define it as follows:

*A business strategy approach at the bank-wide level driven by balance sheet ALM considerations*

Strategic ALM addresses the 3D optimization problem of meeting with maximum efficiency the needs of the regulatory requirements, the NII requirements, and the customer franchise requirements and must be a high-level, strategic discipline driven from the top down. It is by nature proactive and not reactive.

Implementing a strategic ALM process will make it more likely that the bank's asset type(s) is relevant and appropriate to its funding type and source, and that its funding type and source is appropriate to its asset type. By definition then, it would also mean that a bank produces an explicit, articulated liabilities strategy that looks to optimize the funding mix and align it to asset origination. Thus, strategic ALM is a high-level, strategic discipline driven from the top down.

Proactive balance sheet management (BSM) is just that, and not the "reactive" balance sheet management philosophy of traditional banking practice. Proactive BSM means the asset-side product line is managed by a business head who is closely aligned (in strategic terms) with the liabilities-side product line head. To be effective the process needs to look in granular detail at the product types and how they are funded/deployed; only then can the bank start to think in terms of optimizing the balance sheet.

Implementing strategic ALM practice is not a trivial exercise, and can only be undertaken from the top down, with board-approved instruction (or at least approval). Elsewhere in the book we consider the bank strategy setting cycle, which is also important to the success of the strategic ALM approach. Here we consider another essential prerequisite, which is the board articulated risk appetite statement.

## **Implementing Strategic ALM**

The approach to implementing an effective strategic ALM practice has several strands. We describe each in turn.

### *Recommended Risk Appetite Statement*

The Risk Appetite Statement is an articulated, explicit statement of board appetite for and tolerance balance sheet risk, incorporating qualitative and quantitative metrics and limits. It becomes the most important document for board approval. This may appear to be a contentious statement but it is self-evident when one remembers that the balance sheet is everything. The over-riding objective of every bank executive is to ensure the long-term sustainability and viability of the bank, and unless the balance sheet shape and structure enables this viability, achieving this objective is at risk.

Figure 3 shows a template summary risk appetite statement drafted by the author when he was Treasurer at a medium-sized commercial bank. This statement received board approval. It is applicable to virtually all banking entities irrespective of their business model, although large multinational banking institutions will need to develop the list of risk metrics much further. It provides a formal guide on the desired board risk appetite framework, including a description of each of the risk appetite pillars and the key measures that will be used to confirm on a monthly basis that the bank is within risk appetite.

| Strategic Objective                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ABC Bank aims to become the Commercial Bank that is respected and trusted by all its stakeholders providing "concierge banking services for ultimate customer service quality", through: committed people; recognizing that our long term sustainability is dependent on having sufficient capital and liquidity to meet liabilities as they fall due through the cycle; the protection of our reputation; and the integrity of our relationship with our customers and wider stakeholders. |                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                                                                                                                                                                 |
| Target Credit Rating                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                                                                                                                                                                 |
| Credit rating in line with ABC Bank's closest peers and country bank average (A/A-)                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                                                                                                                                                                 |
| Risk Appetite Pillars                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                                                                                                                                                                 |
| Capital Adequacy                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Stable Earnings Growth                                                                                                                                                                                 | Liquidity & Funding                                                                                                                                                                                                           | Stakeholder Confidence                                                                                                                                                          |
| Maintain sufficient capital, quantity and quality, substantially over regulatory minimums, to cover existing projected risks in extreme but plausible scenarios                                                                                                                                                                                                                                                                                                                             | Be an agile, sustainable UK retail and corporate commercial bank that maintains its capital adequacy in terms of amount and quality, and hence is able to withstand appropriate capital related stress | Be an agile, sustainable UK retail and corporate bank that has stable and efficient access to funding and liquidity, and hence is able to withstand appropriate liquidity related stress, with relevant liquid asset holdings | Be an agile, sustainable UKK Retail and Corporate commercial bank that is respected and trusted by all its stakeholders and hence maintains stakeholder confidence at all times |
| 1. CT1 ratio<br>2. Leverage ratio<br>3. Available capital<br>4. Capital buffer minimum over regulatory requirement (ICG)                                                                                                                                                                                                                                                                                                                                                                    | 1. Earnings volatility<br>2. Return on Capital<br>3. Return on RWA<br>4. Cost to income ratio                                                                                                          | 1. Loan to deposit ratio<br>2. HQLA buffer minimum<br>3. Concentration risk<br>4. NSFR minimum<br>5. Wholesale funding limits<br>6. Internal funds pricing regime                                                             | 1. Employees<br>2. Regulators<br>3. Investors<br>4. Customers<br>5. Ratings agencies                                                                                            |

Figure 3. Example Board Risk Appetite Statement

As we see from Figure 3, for each of the measures identified an overall bank-wide "macro-tolerance" is set, which is then broken down into tolerances for individual business lines (e.g. Retail, Corporate). The range of quantitative limits is user-defined; for example, in the section on liquidity limits:

- A vanilla institution with no cross-border business may content itself with setting limits for the primary liquidity metrics such as loan-deposit ratio and liquidity ratios, as well the regulatory metrics such as LCR and NSFR.
- A bank transacting across currencies will wish to also incorporate FX exposure tolerance.
- A bank employing a significant amount of secured funding will wish to add asset encumbrance limits.

The board risk appetite statement is the single most important policy document in any bank and should be treated accordingly. It requires regular review and approval, generally on an annual basis, or whenever changes have been made to the business model and/or customer franchise. It also should be updated in anticipation or in the event of market stress.

Armed with the board risk appetite statement, which must be a genuine "working" document and not a list of platitudes, with specific quantitative limits, the implementation of a strategic ALM process becomes feasible. As well as the board risk statement, the other ingredient that is required to make strategic ALM a reality is an ALCO with real teeth. One cannot emphasize enough the paramount importance of a bank's ALCO.

## Elements of Strategic ALM: Paramountcy of ALCO

Consider the executive committees, below board level, that are responsible for the strategic direction as well as the ongoing viability and sustainability of the bank. Which of them has responsibility for oversight of balance sheet risk? Perhaps it is one or more of the following:

- Executive committee (or “management committee”): This is the primary committee responsible for running the bank, chaired by the CEO.
- Risk management committee: Chaired by the Chief Risk Officer (CRO), responsible for “managing” all the risk exposures the bank may face, from market and credit risk to technology risk, conduct risk, regulatory risk, employee fraud risk, etc.
- Credit risk committee: Chaired by the head of credit or the credit risk officer, this committee is responsible for managing credit policy including credit risk appetite, limit setting and credit approvals. As credit risk is the single biggest driver of regulatory capital requirement in banks (in some vanilla institutions representing 75%-80% of total requirement) it can be seen that the credit risk committee is also a balance sheet risk committee.
- ALCO: While all of these committees have an element of responsibility for the bank’s balance sheet, it is the ALCO that is responsible for this and nothing else. It alone has the bandwidth to discharge this responsibility effectively and to help ensure that the balance sheet shape and structure is long-term viable. Thus executive committee that is most closely concerned with balance sheet risk on a strategic and integrated basis (both sides of the balance sheet and all aspects of risk) is ALCO. Given this, what is the most effective way to ensure above-satisfactory and effective governance from board perspective? We suggest that it is to ensure the paramountcy of ALCO, as illustrated in the organization chart given at Figure 4.

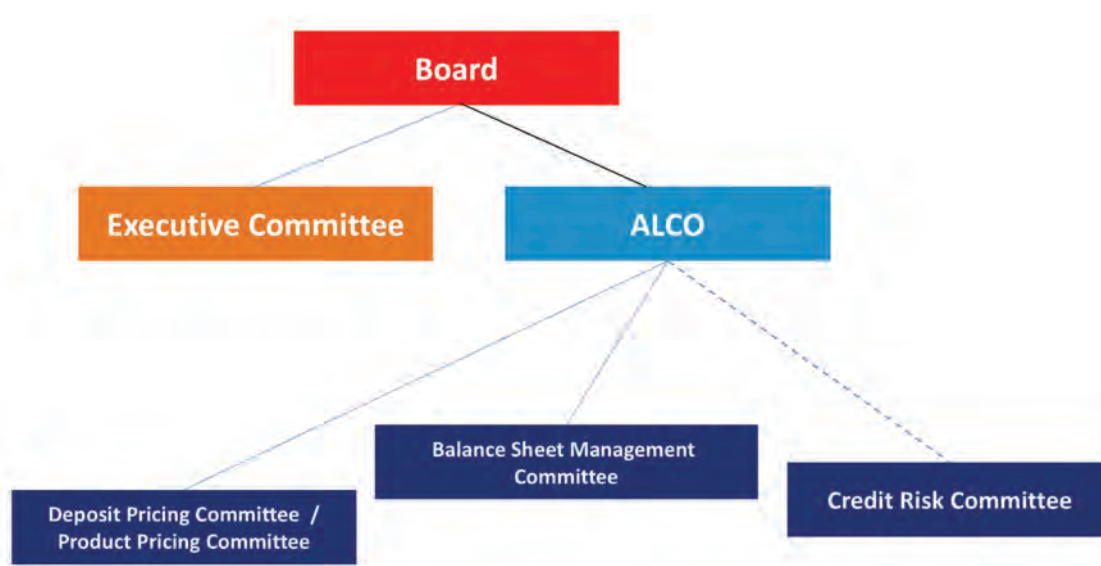


Figure 4. Recommended Bank Executive Committee Organization Structure

The key highlight of the structure shown at Figure 4 is that ALCO ranks *pari passu* with the executive committee (ExCo) and that it also has an oversight role over the credit committee. The former ensures that balance sheet strength and robustness is always given equal priority with shareholder return, and the latter ensures that ALCO really does exercise control over the assets and liabilities on the balance sheet, as suggested in its name. For instance, it would be ALCO, and not ExCo or the risk committee, that would design, drive, and monitor the bank's early warning indicator (EWI) metrics, as it would be the committee with the required expertise and understanding of the balance sheet.

With this structure in place, implementing strategic ALM practice can become a reality.

### *Elements of Strategic ALM: Integrated Balance Sheet Origination*

At its heart the objective of the strategic ALM process is to remove the "silo mentality" in place at banks in order to ensure a more strategically coherent origination process. This will help the bank to arrive at a balance sheet shape and structure more by design than by well-intentioned accident.

In the first instance, a bank's liquidity and funding policy should not be concerned solely with its liabilities. The type of assets being funded is as important a consideration as the type of liabilities in place to fund those assets. For a bank's funding structure to be assessed on an aggregate balance sheet approach, it must measure the quality and adequacy of the funding structure (liabilities) alongside the capital and asset side of the balance sheet. This gives a more holistic picture of the robustness and resilience of the funding model, in normal conditions and under stress. The robustness of funding is as much a function of the liquidity, maturity, and product type of the asset base as it is of the type and composition of the liabilities.

Typical considerations would include:

- Share of liquid assets versus illiquid assets
- How much illiquid assets are funded by unstable and/or short-term liabilities
- Breakdown of liabilities
- Retail deposits: stable and less stable
- Wholesale funding: secured, senior unsecured
- Capital: subordinated/hybrid, equity

As part of an active liabilities strategy, on the liability side ALCO should consider:

- Debt buy-backs, especially of expensive instruments issued under more stressful conditions at higher coupon
- Developing a wide investor base
- Private placement program
- Fit-for-purpose allocation of liquidity costs to business lines, the funds transfer pricing (FTP) process

- Design and use of adequate stress testing policy and scenarios
- Adequate risk management of intraday liquidity risk
- Strong public disclosure to promote market discipline

On the asset side, strategic action could include:

- Increasing liquid assets as share of the balance sheet (although liquidity and ROE concerns must be balanced)
- De-linking the bank–sovereign risk exposure connection
  - The LCR doesn't have to be all sovereign debt
- Avoiding lower loan origination standards as the cycle moves into bull market phase
- Addressing asset quality problems.
  - Ring-fence NPLs and impaired loans? (A sort of “non-core” part of the balance sheet that indicates you are addressing the problem and looking at disposal)
- Review the bank's operating model. Retail-wholesale mix? Franchise viability? Comparative advantage?
- Limit asset encumbrance as this contradicts pressure for secured funding

In essence, as far as possible a bank's balance sheet should aim to maximize those assets and liabilities that hit the “sweet spot” shown in the Venn diagram at Figure 5, where the requirements of all three stakeholders are served. Of course, a “full service” commercial bank will still need to offer loan and deposit products that meet customer needs but may be less optimum from a regulator or shareholder requirement perspective. This is the nature of banking and must be accepted. Nevertheless, for efficiency and optimization reasons, the process of strategic ALM is still needed so as to ensure maximization of the origination of assets and liabilities that cover off all three stakeholder needs, and minimization of the origination of product types that meet the needs of just one or two stakeholders.

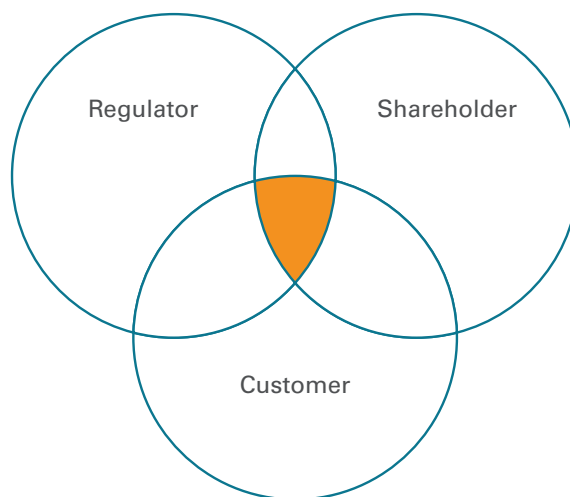


Figure 5. Product Mix Optimization

We emphasize strongly one of the bullet points above, namely

*Strong public disclosure to promote market discipline.*

A bank that discusses the structure and strength of its balance sheet is assisting the industry as a whole, as regulators point to it (off the record, it is unlikely that a bank supervisor would make this point formally) as a benchmark and as its peers look to it when comparisons are made by analysts.

We present at Figure 6 a summary high-level asset-liability policy guide, to be followed as part of the strategic ALM process

| ALCO OVERSIGHT OF BALANCE SHEET                                                      |                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASSETS                                                                               | LIABILITIES                                                                                                                                                                                |
| Strong asset quality, based on resilience of (i) borrowers and (ii) collateral value | Diversity of funding by (i) investors (ii) instruments (iii) geography (iv) currency where appropriate                                                                                     |
| Adequate share of genuinely liquid assets (liquid in times of stress)                | Stability of retail and wholesale investor base, based on (i) their investment constraints and preference (ii) their resilience (iii) their behavior                                       |
| Reduced / limited leverage                                                           | Maintaining mismatches by (i) maturity and (ii) currency between assets and liabilities to what is manageable through the cycle. Understand the potential risk exposure in times of stress |
| Minimize asset encumbrance                                                           | Adequate level of capital buffer                                                                                                                                                           |
| "Simple" assets and appropriate disclosure / documentation                           | Minimize use of complex funding instruments                                                                                                                                                |

Figure 6. Summary of Asset Liability Policy Guide

## Conclusions

Bank assets and liabilities are inextricably linked. Banks cannot manage risk and return without considering both sides of the balance sheet at the same time and continuously throughout the business origination process. All areas of the bank must come together to understand interest rate and liquidity risks in setting and pursuing high-level strategy.

Traditionally, "ALM" meant managing liquidity risk and interest-rate risk. But this isn't full "ALM" if what one wishes to manage is all the assets and all the liabilities from one integrated, coherent aggregate viewpoint. The balance sheet is everything—the most important risk exposure in the bank. Managing ALM risk on the balance sheet therefore is managing everything that generates balance sheet risk. Proactive ALM or what we call "Strategic ALM" is self-evidently best-practice in the Basel III environment, where one can't expect to originate assets and raise liabilities in isolation from each other and still "optimize" the balance sheet.

We have addressed a number of factors with respect to implementing strategic ALM, from a high-level standpoint. The correct approach to ALM discipline demands a keen appreciation and understanding of other related factors, including:

- Product type and behavior
- Behavioral tenor characteristics of assets and liabilities (something required to some depth now anyway with implementation of Basel III)
- Relevant reference interest rate benchmarks
- The London Inter-Bank Offered Rate (LIBOR) index swap spread, the LIBOR term premium and determinants of the swap spread

Also important are other related aspects such as peer benchmarking and understanding net interest margin (NIM) behavior. ALM is an all-encompassing discipline and one that should be understood by all senior bankers, particularly the executive committee.

In the Basel III era, in order to meet the 3D optimization challenge faced by banks, one must seek to achieve maximum balance sheet efficiency, and that calls for the risk “triumvirate” of Treasurer, CFO, and CRO, operating through ALCO, to have a bigger influence in origination and customer pricing. This is now the future of risk management practice in banks. Without this approach, it will be difficult to optimize the asset-liability mix that addresses the “3D” problem of regulatory compliance, NIM enhancement and customer franchise satisfaction.



**Professor Moorad Choudhry** lectures on the MSc Finance program at University of Kent Business School. He was previously Treasurer, Corporate Banking Division at The Royal Bank of Scotland, and is author of *The Principles of Banking*.



# 06500

## **BASEL REGULATION, TRADING BOOK, AND DERIVATIVES THE NEW CAPITAL REQUIREMENTS FOR MARKET RISK AND CREDIT VALUE ADJUSTMENT RISK- WEIGHTED ASSET (CVA RWA)**

A number of the world's largest banking entities are working to be compliant with Basel regulations, which are due to take effect in 2022 (as stated in "Finalizing Basel III Reforms") and will introduce changes to many processes in the bank that have to do with the regulatory requirements relating to risk exposures. This article focuses on two of the topics of Basel Reform:

- The Fundamental Review of the Trading Book (FRTB): about computing, monitoring, and reporting market risk capital charge for financial assets in the trading book
- New framework for computing Credit Valuation Adjustment (CVA) capital charge: the "market risk" charge applied to over-the-counter (OTC) derivatives (in addition to the counterparty credit risk charge, to take into account risk of losses

arising from weakening of the creditworthiness of the counterparty)

The above-mentioned regulations will require a huge effort for banks in becoming and remaining compliant. There are some elements of the FRTB framework that will enter the CVA Risk-Weighted Asset (RWA) framework, and it is useful to treat the two topics together in order to provide a high-level view of the changes and potential impacts on business.

### **Section 1: FRTB—Market Risk and Regulatory Capital**

The set of new rules applies to market risk in the trading book (i.e., financial instruments on interest rates, equities, and credit spreads), as well as foreign currencies and commodities (both trading and banking book). Financial instruments, foreign exchange, and commodities can be included in the trading book if there is no legal impediment against selling or fully hedging them. Banks must hold regulatory capital to protect the bank against losses that can arise from market and portfolio movements that can be computed using a standardized approach or a supervisory approved internal model approach.

The current regulatory landscape is the so called “Basel 2.5” framework, which started in 2011 as the first regulatory remediation after the financial crisis and introduced new requirements for market risk mainly focused on internal models. Two new capital figures were added to the traditional value at risk (VaR)—the stressed VaR (SVaR) to address procyclicality for all risk factors, and the incremental risk charge (IRC) to capture migration and default risk for credit related instruments. FRTB rules will replace existing Basel 2.5 with the purpose of strengthening the regulatory framework.

The revised framework is based on the following key enhancements:

**A revised boundary between trading book and banking book:** More prescriptive rules are established in order to avoid regulatory arbitrage while still being aligned with a bank’s risk management practices; they include a regulatory defined “presumptive list” of assets that are supposed to be in the trading or banking book and a limited possibility to move assets across boundary, with the need of supervisory approval and without recognition of capital relief.

**A revised standardized approach (SA):** FRTB introduces a completely new SA that will serve as a fallback, as well as a floor to the internal model. The standardized capital charge will be the sum of three components:

- The sensitivity-based approach (SBA), based on risk sensitivities with regulatory prescribed risk weights calibrated to a period of financial stress and correlations calibrated with the purpose of reducing hedging benefits. For each risk factor, the capital charge will be the sum of delta, vega, and curvature calculated as the highest of three “correlation scenarios.” No diversification across risk factors is allowed.

- The default charge, newly introduced (which is not in the current framework for SA) to account for default risk of credit and equity related instruments. It will be the sum of jump to default components calculated with prescribed aggregation and risk weights depending on bucket (in terms of type of issuer) and rating grade.
- The residual risk add-on (RRAO), a notional-based measure that aims to capture the residual risk (1% for exotics and 0.1% for other instruments bearing residual risk not captured in the SBA).

The new SA, more punitive compared to the internal model, will have to be computed by banks that have approval to use the internal model, and reporting at desk level is required at least monthly. For banks with small trading portfolios, the committee is proposing a simplified SA, providing some materiality thresholds.

#### **A revised internal model approach (IMA):**

Changes to internal models are focused on the need to capture tail risk, to take into account market illiquidity, and to cover potential losses from jump to default without double counting the capital charge. A more challenging modeling assessment will be required for assets to be included in the IMA. In more detail, the capital charge will be the sum of following three components:

- **Expected Shortfall (ES)**, calibrated to a period of stress for the bank’s portfolio, will replace VaR and SVaR of the Basel 2.5 framework. Market illiquidity will be accounted for in ES model through the introduction of different liquidity horizons at risk factor level (and for different instruments belonging to same risk factor), from a minimum of 10 days to a maximum of 120 days. Expected

shortfall, moreover, will be the sum of ES diversified and ES for each risk factor; and a supervisory defined multiplier to constrain diversification will be applied

- **Non-Modelable Risk Factors (NMRF)**, those risk factors for which there is not a sufficient number of observable executed prices or committed quotes (24 in one year with at maximum one-month gap between two consecutive observations), will have to be considered as “non-modelable.” They will not be allowed to be included in the ES model, but a “stress” will have to be computed and added to ES capital charge, without any diversification
- **Default Risk Charge (DRC)** will replace current Incremental Risk Charge (IRC). It will take into account default risk only (no migration to avoid double counting with ES), and it will apply to credit and equity-related instruments. Some more prescriptive requirements, such as a floor of 3bp for the default probability of all issuers (including investment grade sovereign), and some other methodological constraints will be in place

#### **Model validation process at desk level:**

Quantitative and qualitative requirements will have to be fulfilled during the first application for the internal model and monitored continuously in order for the bank to be allowed to keep the internal model. Supervisors may remove model permission for individual trading desks failing the model validation test, which will consist of back-testing and profit and loss (PL) attribution analysis. Back testing will be similar to the current Basel 2.5 framework but applied not only firmwide but also at desk level. PL attribution will compare the PL produced by the front office (so called “hypothetical PL”) with the PL produced by the Risk Management Model (so called Risk

Theoretical PL). Banks will have to maintain the two PLs very close to each other. Desks failing back-testing and the PLA test (which have to be both passed for each desk in scope of the internal model) will have to be capitalized through the more punitive SA charge.

Market risk capital charge will be the sum of IMA charge (for desks passing the model validation test) and SA charge for desk that don’t pass the model validation test and desks that are declared by the bank as out of the scope of IMA. When the bank applies for the IMA, desks in scope of the internal model have to be submitted to supervisors.

The Basel Committee published the first draft of FRTB in 2012, and since then, the rules have undergone a series of amendments, taking into account results of consultations, the Quantitative Impact Study produced by industry members, and a lot of technical work produced by industry working groups (International Swaps and Derivatives Association, Association of Financial Markets in Europe, Institute of International Finance). Given the complexity of the new framework, the need for banks to complete challenging implementations and the need for supervisors to assess final impact to avoid unintended effects on the capital ratios (for which first analysis from industry—back in April 2016—highlighted a material increase in capital requirements), the entry into force has been postponed from the initial plan. Moreover, a phase-in is expected after the start of regulatory reporting (i.e., at least a three-year phase-in, when the capital charge will be initially charged taking into account a percentage of the FRTB outcome, and then move to the full requirement at the end of the phase in period).

The Basel Committee issued a consultation in March 2018 (BCBS d426—Revisions to Minimum Capital Requirements for Market Risk) to support the completion of the framework that will have to

become law for each jurisdiction. Furthermore, technical standards for the adoption of the framework will have to be published by the European Banking Authority (EBA) before the entering into force.

Enhancements proposed in the March consultation are mainly regarding the calibration of the SBA approach, the NMRF, and the PL attribution test. Regarding small banks, the proposal for the “simplified” SA is a re-calibration of the current SA.

NMRF and PL attribution tests are still the main challenges. Banks at the international level have estimated that NMRF may account for 30% of the whole capital charge. As banks make progress in the NMRF assessment, the 30% increase could even be underestimated. Some improvements introduced with the last consultation paper are welcome, but further calibration is needed in order not to jeopardize incentives for internal models.

Concerning NMRF, some of the improvements introduced, are relative to:

- Allowance of data pooling schemes that could be employed to help banks satisfy the risk factors eligibility test (RFET)
- Permission to use bucketing as part of RFET, which could help achieve a higher degree of modelability than using a very granular approach
- Recognition to use institutions’ committed quotes

A PL attribution test could potentially cause a cliff effect in capital charge if a desk exited the internal model, with the consequence of making capital planning difficult and the potential loss of incentive for the internal model. Review of the quantitative ratios applied to the PL attribution test have been introduced during the last consultation. “Variance ratio” and “mean ratio”

will be replaced by a quantitative test of similarity and correlation between front-office and risk PL distributions; there is, however, still the need to calibrate the thresholds that have been established. Moreover, the problem of test failing for the well-hedged portfolio still exists.

The FRTB framework poses a challenge to banks’ implementation, both in terms of IT developments and process review. Internal models require a lot of re-run to compute the expected shortfall. The DRC charge requires index decomposition and including equities in the scope of application implies the need to decompose equity indexes. A lot of effort is required to analyze and explain the new regulatory figures, which behave differently from current figures.

In terms of impact of these new rules on trading activity, it is clear that the risk function will have to increase effort in the daily monitoring of the regulatory figures, especially in the case of internal model banks. The effort will also depend on the choice in terms of risk architecture (a risk engine separate from the front-office engine will be more challenging to be kept aligned for the purpose of the PL attribution test). The effort in explaining the new figures to business people will increase, given their different behavior compared to the current regulatory and managerial metrics.

## **Section 2: The New CVA Risk Framework**

CVA RWA was introduced with the initial phase of Basel III reforms (BCBS d189); it introduces a new capital charge for potential mark to market loss of derivatives that could be caused by a creditworthiness deterioration of a counterparty. During the crisis, roughly two-thirds of counterparty credit risk (CCR) losses were due to CVA losses and only about one-third were due to actual defaults. This charge (CVA-RWA) is computed in addition to the CCR charge, which takes into account default of the counterparty.

Two approaches are established by the regulation for the CVA capital charge computation:

- **Advanced CVA**, also known as CVA VaR, used by banks with approved internal models for both CCR and market risk for specific risk for debts
- **Standardized CVA**, used by all banks that don't have internal model approval for specific risk for debt instruments. In such a case, the committee provides a single formula to compute the portfolio CVA capital charge

Some exemptions from CVA in the European Union (EU) are related to corporations not subject to mandatory clearing under European Markets Infrastructure Regulation (corporate under threshold), sovereign issuers, and qualified central counterparties (QCCPs). The EBA has recommended that EU exemptions be reconsidered and possibly removed upon completion of a review of the CVA risk charge in Basel, and periodically monitors the impact of the removal of these exemptions.

This charge and its eligible hedges are currently computed only for the credit risk part of the exposures; they are excluded from the market risk capital charge. CVA hedges of exposure component (interest rates, foreign exchange) are not allowed to mitigate a CVA charge and enter the market risk capital requirement.

The Basel Committee proposed revisions to the CVA RWA framework in July 2015 (BCBS d325) and March 2016 (BCBS d362).

The recent regulatory document about CVA RWA (BCBS d424 December 2017) introduces changes in the scope of application and the hierarchy of methodologies for the CVA capital charge:

- In terms of **scope of application**, some exemptions from a CVA charge are removed. The "covered transactions" include all derivatives except those transacted directly with a qualified central counterparty, as well as Securities Financing Transactions that are fair valued for accounting purposes
- Regarding **hierarchy of methodologies**, the use of the FRTB-IMA/CVA which was among the approaches described in BCBS d325 of July 2015 is no longer allowed, and the two acceptable methodologies are:
  - **FRTB SA/CVA**, largely based on SA FRTB
  - **Basic Approach** for small banks. The capital requirement in the basic framework is determined by a regulatory-defined formula

If the total notional amount of non-cleared derivatives is below 100 billion EUR, the bank can choose to set the CVA charge equal to 100% of its CCR capital requirement.

In terms of impact on the capital charge, it is clear that apart from the change in methodology compared to current approaches, there is significant impact from the removal of exemptions with the widening scope of application of the CVA capital charge.

### The Challenge of FRTB SA CVA

The SA CVA approach is more risk sensitive and complex to implement. Similar to the SBA in the FRTB, the capital requirement is given by the sum of the contributions from different risk classes. The overall CVA capital requirement is calculated as the sum of the capital requirements for delta and vega risks for the entire CVA book and relevant hedges (including Forex and interest rates).

Differently from FRTB-SBA, no curvature is needed. The SA CVA can be applied only after supervisory approval (which is not required for market risk SBA)

The minimum criteria defined by the Basel Committee for the SA CVA eligibility are following:

- The ability for the bank to model exposure and calculate monthly (and on demand) CVA and CVA sensitivities to the relevant market risk factors
- The presence in the bank of a CVA desk responsible for CVA risk management and hedging

The revised CVA charge poses some challenges in methodology, process, and implementation.

In terms of methodology, the profile of exposure on which to perform CVA sensitivities has to be aligned to the accounting CVA in terms of risk factors simulation (adopting a “risk neutral approach” instead of a “real-world approach”), with some regulatory constraints. For example, the need to compute “unilateral CVA,” assuming the bank itself is default free and the need to use a “regulatory MPOR” for margined netting sets (instead of the contractual MPOR). Although a kind of alignment with accounting practice is required in terms of scenarios to be used for computing the exposure profile. The above differences reduce the possibility to leverage on previous implementations and require banks to afford new implementation costs to be compliant.

Current Basel regulation (Advanced vs. Standardized CVA) does not imply any sensitivity framework, and from this perspective, the SA-CVA is completely innovative.

Sensitivity computation is considered to be the most challenging part of the implementation. SA-CVA sensitivities measure the change in CVA

figures due to changes in both market and credit risk factors, and they require the ability to reiterate CVA simulation using risk-neutral methodology several times after the shocks application.

Methodological/technological enhancements are necessary inside the risk engine:

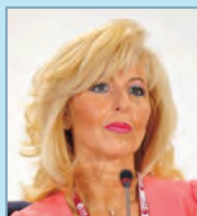
- Given the BCBS requirements, the number of sensitivities to be computed for each risk class and related granularities, banks need more advanced techniques compared to the finite difference approach (or bump and run approach) that is widely used in market risk analyses. Indeed, a few thousands CVA sensitivities are expected to be computed for typical portfolios, which implies a huge and unsustainable increase in central processing unit time for the bump and run approach
- Advanced techniques, such as Adjoint Algorithmic Differentiation, can offer powerful solutions in optimizing calculations, but require developments in terms of pricing function refactoring and technological upgrades

## Final Comments

The forthcoming FRTB and CVA RWA regulations are structural changes to the methodology, technology, and processes that support capital charge calculation and monitoring. Achieving and maintaining approval for the more advanced approaches is a huge challenge that has to be evaluated in terms of effort required versus regulatory incentives.

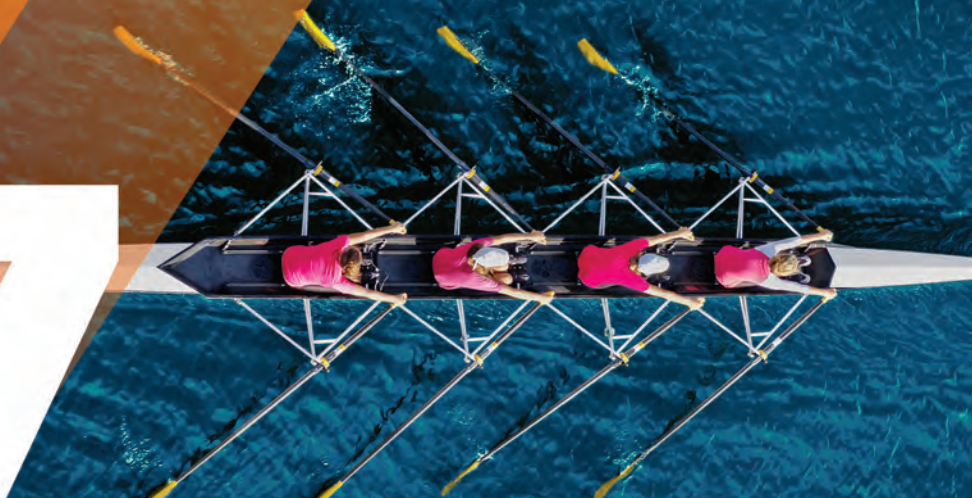
The new standardized approaches have become more risk sensitive and more important (FRTB reporting of standardized capital figures is also required for internal model banks), but they also entail implementation and process complexity compared to the current regulatory framework.

It is clear that some areas of synergy can be exploited between the two frameworks. Banks are required to make very challenging and complex implementations, which come at a high cost, but should be worthwhile in the presence of regulatory incentives. It is, therefore, very important to follow the ongoing calibration of the rules and take part in the monitoring exercises with data that can support regulatory-informed decisions.



**Rita Rosaria Gnutti** is the Head of Market and Counterparty Risk Internal Models in the Risk Management department of Intesa Sanpaolo. Gnutti is a member of the BTRM Faculty.

# 07



## THE BACK PAGE

### LEADERSHIP AND TEAM BUILDING: Needed From the “Top” But the Top Doesn’t Always Have It

Whoever walked into an office and saw a positive, lively, and upbeat team alongside a morose uninspiring boss? Or into a brooding, lifeless office where the boss was a bundle of energy and motivation?

Culture comes from the top. Unfortunately, those fortunate enough to achieve positions of seniority and team leadership don’t always possess the requisite people management skills. Here is an illuminating excerpt from a recent book by a US Air Force Vietnam War Veteran:

*At [Royal Thai Air Force Base] Korat, I saw the most dramatic example of leadership significance. By my second day at Korat, I knew the 469th TFS [Tactical Fighter Squadron] was better than the 34th TFS. It was obvious from watching the aircrews from the two squadrons. The 469th aircrews were enthusiastic, energetic and positive. The 34th aircrews were just doing a job—no spirit or élan, no enthusiasm. We had a lot of good people; we just weren’t a real positive organization.*

*...in a very short time, both squadrons replaced their commanders and operations officers. Overnight, we flip-flopped. The 34th found a swagger and the 469th was just putting in their time..*

— Rick Heiser, quoted in Bell, D., *The Tiger FACs: A Dance with the Devil*, Outskirts Press, Inc. 2014.

For me, this is a surprising observation. Surprising because, while I would expect to see it and have done many times in civilian life, I’d assumed that, to achieve command positions where there is more at stake (namely life itself), one had to demonstrate genuine leadership credentials. Perhaps to expect that consistently in any large organization is to be naïve.

A friend of mine told me about a bank at which he worked. The first day he walked into the main office, which held the credit, finance, compliance, risk and human resources teams all on one floor, he was astounded at how dead it appeared. No enthusiasm of any kind. The managers sat behind closed doors in offices as drab as the environment.

It was depressing for him to spend even an hour there, let alone days or weeks. But that was what the staff did, just “putting in their time.” Of course, it was easy for him to see why this was the case. The senior management had the same dull and uninspired approach to the job as he’d observed on the floor below and protected themselves upstairs in their executive suites. The staff simply took their cue from the executives and turned up to work just to receive a paycheck. It was dire and a great lesson on how rot sets in from the top and just permeates inexorably downwards until the people at the top are replaced.

Leadership and team building comes from the top, but don’t expect a person’s job title to imply they possess anything like the credentials needed to lead. Time spent serving bureaucrats will never inspire anyone.



**Werner Coetzee** is the Course Director at The Certificate of Bank Treasury Risk Management (BTRM), having previously commissioned business and finance content for the world’s largest publishing houses. He now manages this world-renowned certificate program.

# PRAISE FOR THE MOORAD CHOUDHRY ANTHOLOGY

*"Any professional involved with banking can use this thorough reference text covering a bank's intermediary role, the nature of its balance sheet, how yield curves work, regulatory capital, and the fundamentals of bank strategy, conduct, credit, liquidity, and asset-liability management. Moorad Choudhry writes in a way that is technical and detailed while still readable and understandable. While bringing in current concepts such as derivatives, securitization and stress testing, he emphasizes throughout the book that the basic conservative principles of bank management, strategic planning and corporate governance remain the same. An excellent work."*

—Henry A. Davis, Editor, Journal of Structured Finance, and Journal of Investment Compliance, Washington DC

*"The Moorad Choudhry Anthology is Google for financial professionals! This mega resource is a first aid kit for boiling minds of bankers and a guide-dog for those who want to get started in the world of financial markets and institutions. Prof. Choudhry masterfully deep dives into details of risk measurement and management of financial instruments as well as discourses on global topics like principles and perspectives of banking business and finance overall. This highly awaited book will definitely find a place on the desks of every practitioner and academician."*

—Polina Bardaeva, PhD, FRM, Director Group ALM, Treasury, Sberbank, Moscow

## TABLE OF CONTENTS

### PART 1 PRINCIPLES OF BANKING, FINANCE AND FINANCIAL PRODUCTS

- Ch1 A Primer on Banking, Finance and Financial Instruments
- Ch2 Derivative Instruments and Hedging
- Ch3 The Yield Curve
- Ch4 Eurobonds, Securitisation and Structured Finance

### PART 2 BANK REGULATORY CAPITAL AND RISK MANAGEMENT

- Ch5 Banks and Risk Management
- Ch6 Banks and Credit Risk
- Ch7 Understanding and Managing Operational Risk
- Ch8 Regulatory Capital and the Capital Adequacy Assessment Process
- Ch9 Financial Statements, Ratio Analysis and Credit Analysis

### PART 3 BANK TREASURY AND STRATEGIC ASSET-LIABILITY MANAGEMENT

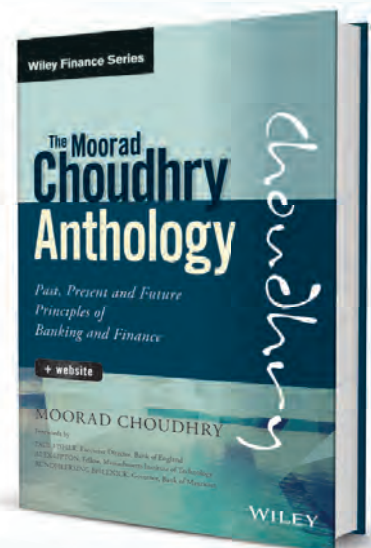
- Ch10 The Bank Treasury Operating Model and ALCO Governance Process Best-Practice
- Ch11 Bank Asset-Liability Management (ALM) and "Strategic ALM"
- Ch12 Liquidity and Funding: Policy, Management, and Risk Management
- Ch13 Market Risk and Non-Traded Market Risk (Interest-Rate Risk in the Banking Book)
- Ch14 The Future of Bank Treasury and Balance Sheet Risk Management
- Ch15 Regulatory Reporting and Principles of Policy Documentation

### PART 4 THE FUTURE OF BANKING: STRATEGY, GOVERNANCE AND CULTURE

- Ch16 Strategy Setting: Principles for Sustained Bank Viability
- Ch17 Present and Future Principles of Governance and Culture
- Ch18 Present and Future Principles of Banking: Business Model and Customer Service

### PART 5 CASE STUDIES: ANALYSIS, COHERENT ADVICE AND PROBLEM SOLVING

- Ch19 Case Studies: Analysis, Coherent Advice and Problem Solving
- Ch20 Guide to the Website



Buy *Anthology* from [Amazon.com](https://www.amazon.com) or order your copy from [www.wiley.com](https://www.wiley.com) and input code ANT20 at checkout to get your **20% discount!**

