

Wiley Finance Series

INTEREST RATE RISK IN THE BANKING BOOK

A Best Practice Guide to
Management and Hedging

BEATA LUBINSKA



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Interest Rate Risk in the Banking Book

***A Best Practice Guide to Management
and Hedging***

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*“To my Father. Thank you for inspiring me, for guiding me
and for your fantastic lectures about the Universe”.*

Preface

There are so many well-written books and articles focused specifically on Interest Rate Risk in the Banking Book (IRRBB) and, more broadly, on Asset Liability Management (ALM). Therefore, the concepts related to IRRBB are already well understood by market practitioners. Recently I have found Paul Newson's (2017) book, which is fully dedicated to the topic of IRRBB, very useful and well written. I have read many books on ALM that I have found extremely useful in my career as a treasurer in a small bank.

In general, I love reading all books on ALM and treasury as I truly believe there is always something new to learn, and I am interested in seeing how the same concept is approached by other market practitioners. As an author I appreciate the amount of time and effort spent on preparing any book and I am grateful that some authors have shared their knowledge and experience. Every book reflects years and years of hard work and learning, and usually the objective of any book is to share the best of the author's knowledge and experience. This is exactly the case for this book.

Having said that, my intention here is to complement existing writing on IRRBB and ALM over the past years. My **main objective** is to share my experience and knowledge gathered over years of working in the banking industry with the focus on the importance of this risk category. It is based almost exclusively on practical **case studies** and **examples** which I have examined in my work as a treasurer, head of IRRBB and other positions. The theory lying behind the IRRBB concept is deliberately reduced to the minimum required so that the main attention is

dedicated to various case studies such as **identification of IRRBB sources** in a number of banks, **enhancement of IRRBB framework**, **IRRBB stress testing** and even an example of an **ALM report** with the focus on IRRBB, which I hope will be of value to the reader.

The second objective of the book is to share with the reader practical examples of an **integrated approach to the management of ALM risks in the treasury**, i.e. the integrated approach for building the hedging and funding strategy in one holistic exercise. This is an increasingly important task for treasurers in financial institutions, and brings quantifiable benefit in terms of reduction of the funding costs of these institutions.

As already mentioned, the theoretical part of the book is reduced to a minimum based on the rationale that there are many great books already available which explore the IRRBB metrics and other concepts in details. This book mainly consists of **walk-through practical case studies** presented for hypothetical banks and challenges in daily management of IRRBB - for example, how to fund and hedge the Banking Group's subsidiary and integrated approach for set up of the funding plan. However, the book also contains a brief summary of main concepts related to IRRBB.

Another important point which needs to be highlighted, in order to be crystal clear about the approach undertaken in articulating the book structure, is that case studies and examples are mainly based on the standardised approach proposed by the Basel Committee on Banking Supervision (BCBS) in 2016, which is already incorporated widely by national legislations across the globe. This book already envisages the compliance with the Basel approach. Therefore, the case studies and examples are built on that basis. Consequently, if the reader is looking to enhance the

IRRBB framework outside the Basel recommendations this book won't provide the solution.

The audience for the book is envisaged as treasury professionals, i.e., treasurers of medium and small sized banks who have adopted the BCBS standardised approach as an IRRBB framework. In addition, this is a perfect guide for challenger banks which are growing fast, are capital constrained and need to optimise their funding and hedging strategy. I truly believe this book will help treasury professionals in building the overall enhanced IRRBB framework based on the Basel Standards; meanwhile Risk and Audit professionals will gain the knowledge necessary to challenge the strategies undertaken by a treasurer.

Driven by the simplicity and elegance of the Basel approach this book is also well suited to practitioners who are just starting the IRRBB journey and want to equip themselves with practical tools to manage this risk.

About the Website

Thank you for purchasing this book.

You may access the following additional complementary resources provided for your use by visiting:

www.wiley.com/go/lubinska/interestraterisk.

(Password: Lubinska123)

- IRRBB Model

Introduction

Interest Rate Risk in the Banking Book (IRRBB) has become a hot topic over recent years and there is a clear trend towards standardisation of the IRRBB approaches for measurement, modelling and monitoring in the banking industry. From a regulatory perspective, the journey started in April 2016 when the Basel Committee on Banking Supervision (BCBS) published the final Standards (BCBS 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, and reflect changes in supervisory practices due to the exceptionally low interest rates, whilst providing methods and models to be used by banks in a wider and enhanced risk management framework. BCBS Standards had an important impact on the global adoption of standardised metrics and emphasised a clear difference between market risk (inherent in the trading book) and IRRBB (inherent in the banking book). However, IRRBB is not only a regulatory term. It has an impact on the profitability of financial institutions and its mismanagement leads to losses. There are many cases where banks have suffered from margin compression in the aftermath of the financial crisis when interest rates started going down. These banks failed to hedge the banking book against rates going down and, consequently, Current Accounts and Saving Accounts (CASA) and equity liabilities were reinvested at lower rates. Additionally, a non-transparent and deficient internal transfer pricing framework from business to the central unit caused open positions and margin at risk. The robust balance sheet management presupposes that customer business and financial risks are

clearly separated with sound methodology. Therefore, the understanding of the interrelation between IRRBB and Funds Transfer Pricing (FTP) is an imperative in order to ensure effectiveness in the risk management process and allocation of clear responsibilities between stakeholders within the financial institution.

Without any doubt, the main driver for IRRBB evolution is a persistent low-rate environment. In some locations rates even moved into negative territory. The concept of negative rates is against a fundamental paradigm in finance that money has a time value that results from different investment opportunities. A fixed income security bought today for a specified term will return the payoff or future value that is dependent on both the compounding method and interest rate employed. Interest rates paid or charged for money depend, to a great extent, on the length of the term of investments. Therefore, the interest rate represents the price paid to use money for a period of time, which is commonly referred to as the time value of money.

In recent years, central banks in Europe have employed negative rates as an unprecedented measure to combat recession and foster recovery. The idea of being charged for lending is counter-intuitive and puts into question the concept of time value of money described above. Such a move is viewed as controversial by economists as there is a clear impact on the banking system. One of the primary concerns over negative rates is fuelling of cash hoarding behaviours as depositors are penalised instead of being compensated. Consequently, they are incentivised to hold cash. There is also a clear impact on the banks' profitability. Negative rates increase costs for banks with excess liquidity, resulting in a search for ways to offset these costs through raising account fees and charges and, in extreme cases, cutting back lending to the real economy. Indeed, the interest rates concept is extremely important

because changes in interest rates affect a bank's earnings and its risk situation in different ways. This is exactly the reason why the regulator advocates the need for appropriate and precise methods for the measurement of the interest rate risk which enable the revelation of all its significant sources and the evaluation of its impact on the operative profile of the bank.

The regulatory aspect which reflects the changes in the market landscape is an important driver for IRRBB evolution and enhanced framework. However, the author believes there is another reason for the change in approach for the management of financial risks, in particular IRRBB and liquidity risk. It is beneficial for banks to adopt holistic and proactive management of financial risks. In her book *Asset Liability Management Optimisation* (Lubinska, 2020), the author examined the interrelation between interest rate risk and liquidity risk and quantified the benefits in terms of the reduced cost of funding achieved by the optimisation exercise and the holistic management of both risk categories.

The first attempts to integrate the interest rate risk and another type of risk (credit risk) has been proposed by Drehmann et al. (2010), and Alessandri and Drehmann (2010). The work performed by Drehmann et al. constructs the general framework for measuring the riskiness of banks, which are subject to correlated interest rate and credit shocks. The results show a strong interaction between credit risk and interest rate risk, sufficient to influence net profitability and capital adequacy: in particular, the magnitude of each risk component and the speed with which profits return back to equilibrium after the hypothesised shocks depend, among other things, on the re-pricing characteristics of the positions in the banking book and the cost of funding (Baldan et al., 2012).

The literature has thoroughly debated both the liquidity risk and interest rate risk and, until the regulatory updates on stress testing, IRRBB and liquidity, there seems to be little contribution from scholars on the integrated management of these types of risk. The link between financial risks can be seen in one of the main functions of credit institution, i.e., maturity transformation. Banks finance their investments by issuing liabilities with a shorter maturity than that of their investments; the resulting imbalance between the terms for the assets and liabilities means that they take on the interest rate risk and liquidity risk (Resti and Sironi, 2007). Baldan et al. (2012) launched the hypothesis that there is a direct relationship so that reducing the exposure to the liquidity risk induces a reduction in the interest rate risk as well. Their study analysed a small Italian bank during the years 2009 and 2010 which had to modify its liquidity profile in order to comply with the Basel III requirements. As a result, it generated the simultaneous reduction in its exposure to the interest rate risk. The authors conclude that there is a need to arrive at integrated risk management in which the control of each of these risks is placed in relation to the bank's different functions and influences its strategic decisions (Baldan et al., 2012).

After the regulatory updates, the *silo basis* approach is being slowly replaced by more integrated management of ALM risks. This is because profitability remains a key concern for the banking sector. The low profitability and widespread dispersion for some countries, along with high operating costs, continues to dampen the profitability prospects, especially for the European banking sector. Thus, there is a need to come up with new approaches which could address shrinking profitability, a heavily regulated landscape and exposure to financial risks. This necessity has been highlighted by Choudhry (2017) in

“Strategic ALM and Integrated Balance Sheet Management: The Future of Bank Risk Management”. In this article Choudhry suggests that the discipline of ALM, as practised by banks worldwide for over 40 years, needs to be updated to meet the challenges presented by globalisation 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 optimisation problem they are faced with at present. In his book *The Moorad Choudhry Anthology: Past, Present and Future Principles of Banking and Finance* (2018), Choudhry describes a “vision of the future” with respect to a sustainable bank business model. This vision of the future contains the concepts of strategic, integrated and optimised ALM. The need for integration is now getting recognition from treasurers, risk managers and regulators. It is also starting to be considered among the ALM systems providers. They are attempting to build ALM solutions which focus on the integration between IRRBB, liquidity and FTP, supporting the view that, today, more holistic balance sheet risk management is required. Interest rate risk in banking cannot be viewed in isolation from liquidity risk, funds transfer pricing or capital management. Balance sheets have become more volatile – a result of changing term structures, optionality, better informed customers and the use of derivatives.

The objective of this book is to serve as a practical support in the daily management of IRRBB through the examples, case studies and solutions which have been developed during the author's career. It is a summary of many practical ideas related to hedging of the exposure to IRRBB subcategories, i.e., yield risk, option risk, gap risk and basis risk. The book represents the author's attempt to provide

an insight into the practical aspects of IRRBB management along with the description of the main metrics and their calculation methods. It presents the concept of immunisation and natural hedging strategy showing the benefits from the optimisation exercise and a holistic view for funding and hedging strategy adopted by the treasury. The book contains case studies which walk the reader through different aspects of building the hedging and funding strategy through the holistic and integrated approach as opposed to the silo basis approach, which is still so often adopted in this process. Therefore, one of the objectives of this book is to focus on the optimisation of hedging strategies and proactive management of IRRBB both on the short part of the interest rate curve (*directional gap* strategy) and on the medium-to-long part of the curve (*riding the yield curve* strategy). Additionally, the author walks the reader through the IRRBB stress testing, policy and instruments used in the daily management of the treasury.

[Chapter 1](#) of this book introduces the subcategories of IRRBB and provides the practical examples of identification of the risk sources in the banking book. This part highlights the main regulatory developments, sheds light on the results of the IRRBB stress test performed by the European Central Bank (ECB) in 2017 and provides examples of historical interest rate shocks which could be applied for the measurement of changes in Economic Value of Equity (EVE) or in the IRRBB stress testing framework. In this section the author answers the question why it is so important to adopt the enhanced IRRBB framework and examines the concept of *margin compression* faced by banks worldwide.

[Chapter 2](#) contains a number of practical case studies for identification of the IRRBB sources, practical approaches for hedging some products with behavioural nature such as

reversions or lifetime mortgages and how to enhance the IRRBB framework in a bank. This chapter walks the reader through the dual nature of IRRBB, the *trade off* between Net Interest Income (NII) volatility and change in EVE and the calculations methods for the main metrics. Additionally, it extends the concept of *rate transformation* and *riding the yield curve* strategy. There are case studies related to the calculation of NII sensitivity through *flows* and *stock* approach and analysis of the impact driven by the existence of automatic options in the banking book. [Chapter 2](#) summarises the main IRRBB metrics such as Earnings at Risk (EaR), Value at Risk (VaR) and static IRRBB methods.

Hedging instruments and hedging strategies are the main subject of [Chapter 3](#) which, additionally, provides the reader with the practical example of the Asset Liability Management (ALM) report with key information to be communicated to the Asset Liability Management Committee (ALCO) members. It contains an extensive analysis of the IRRBB position of an illustrative bank. In this section the natural hedging and synthetic hedging strategy are analysed in detail supported by practical examples.

The concept of *behaviouralisation* is covered in [Chapter 4](#) with the main focus on modelling of Non-Maturing Deposits (NMDs). This chapter emphasises the reason for modelling items without deterministic maturity and the impact on an IRRBB position driven by *behaviouralisation* both on the asset and liability side. It walks the reader through a simple approach for modelling of balances volatility, rate sensitivity and average life of the product. The chapter introduces also the term of structural and financial prepayments.

The concept of the application of optimisation methods in ALM, interrelation between liquidity risk and IRRBB is the

crucial point of [Chapter 5](#). It shows how to set up an integrated approach between funding and hedging strategy as the holistic view for the balance sheet. There is a case study related to the optimisation of hedging strategy and, in the same exercise, reduction of cost of funds.

The second part of [Chapter 5](#) is fully dedicated to the strategic tool which the treasury has at its disposal to support the optimisation exercise, i.e. the Funds Transfer Pricing (FTP) process. It shows several examples of a methodological approach to the correct transfer of both types of risks, i.e., liquidity and IRRBB from business to the central unit.

[Chapter 6](#) is divided into two parts. The first part walks the reader through the proposal of methodological approach for IRRBB stress testing and ICAAP. It shows practical examples of the implementation of the stress test and ICAAP with illustrative numbers. The second part of this chapter addresses IRRBB governance and the Risk Appetite Statement (RAS).

[Appendix 1](#) illustrates the practical example of the IRRBB policy compliant with BCBS Standards, walks the reader through the main section of the policy with the emphasis on the calculation of the value of the automatic option in a negative rates environment and an illustrative example of the treatment of NMDs for IRRBB purposes.

[Appendix 2](#) illustrates a practical example of the IRRBB model manual compliant with BCBS Standards. This section has been included to support the reader with the implementation of methodological changes required by the Standards. Appendix 2 is meant to support smaller banks where they intend to apply the standardised approach as the IRRBB measurement framework.

Chapter 1

What is IRRBB and why is it important?

The common definition of Interest Rate Risk in the Banking Book (IRRBB) describes the threat to the capital position and earnings of a bank driven by changes in the interest rates in the market. Though the definition is simple, the underlying threat to the bank's resilience is potentially serious if IRRBB is mismanaged. There are multiple ways that the interest rate curve can change its shape, i.e., it could take the form of a steepener, a flattener, a humped or an inverted curve. Changes to interest rates threaten a bank's earnings by impacting its Net Interest Income (NII) which is the main source of earnings for a bank. It is estimated that, in the composition of the total income of a bank, NII contributes, on average, about 60% ([Figure 1.1](#)).

Changes to interest rates also threaten the underlying value of bank's assets, liabilities and off-balance sheet instruments, given the adverse impact which may arise on the present value of items, in particular their future cash flows. This is known as the impact on economic value of the banking book, which is understood as the sum of the net present value of assets, the net present value of liabilities and the net present value of off-balance sheet items.

We can already see that there is a dual view under which interest rate risk in the banking book should be analysed and these two views are complementary. The short-term view relates to the impact on earnings of a bank and this is known, in the IRRBB parlance, as the *short end* curve impact. The time horizon for this kind of analysis is short, spanning from 12 months to a maximum of 36 months. Under short-term analysis we are looking at the negative impact on a bank's earnings (NII) driven by the fluctuation in the interest rate curve. One can argue that not only negative impact should be considered but the earnings variability as well. Excessive earnings sensitivity is considered bad practice in IRRBB management. We will tackle this point at a later stage.

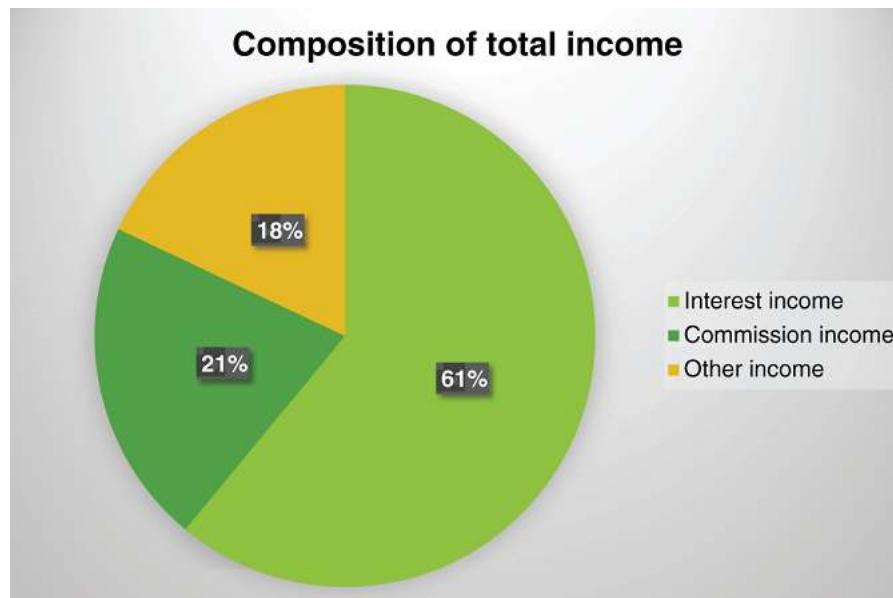


FIGURE 1.1 Composition of the total income in a bank.

Source: own elaboration

The medium-to-long-term view relates to the impact on economic value of a bank and looks at a much longer horizon, i.e., it includes all risk sensitive positions in the banking book. The outcome of the economic value analysis provides the fundamental number both for the financial institution and for the regulator as it describes the extent of structural mismatching between assets and liabilities. It indicates embedded, although not crystallised, losses or gains in the economic value of a bank.

Managing IRRBB properly is vital due to it being a major source of income. 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 NII. Therefore, 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 EVE metrics. This point is analysed in detail in [Chapter 6](#).

As already shown in [Figure 1.1](#), in the composition of the total income of a bank NII contributes on average about 60%, 85% of which is considered to be gained through margin differential and the remaining 15% resulting from maturity transformation. Additionally, IRRBB creates a capital demand under Pillar 2. Mismanagement can be very expensive and can have implications across different areas of a bank. In the first place, both incorrect assumptions and risk underestimation can affect the P&L of the treasury, which is responsible for ALM profitability. Secondly, it affects P&L results of the business units through FTP rates and FTP margins and the correct IRRBB assumptions impact the product profitability assessment through the interest income split. [Figure 1.2](#) shows an example of NII compression in a banking group. This group lost billions because it failed to hedge itself against rates going down and, consequently, reinvested CASA and equity liabilities at lower rates. Interest rate risk was not fully transferred from the businesses to ALM, causing open positions and margin at risk.

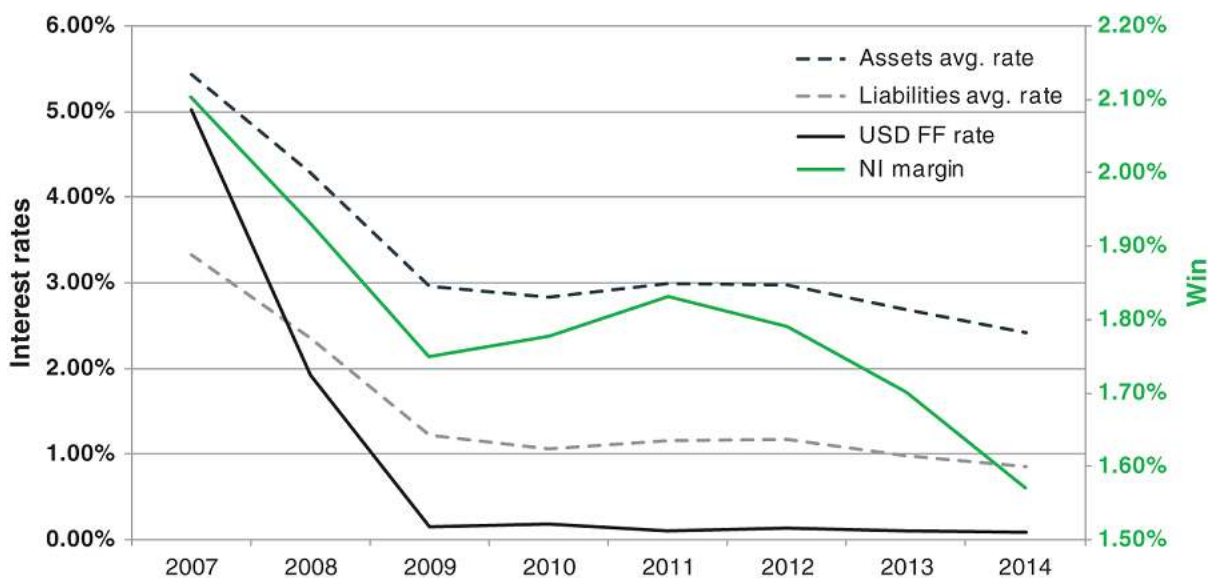


FIGURE 1.2 Example of margin compression caused by lowering interest rates and an inefficient FTP process.

Source: own elaboration

SUBCATEGORIES OF INTEREST RATE RISK

There are four main subcategories (subtypes) of IRRBB to be identified, managed and reported by a financial institution. The bank's banking book usually is exposed to all subtypes to a lesser or greater degree dependent on its business model. For example,