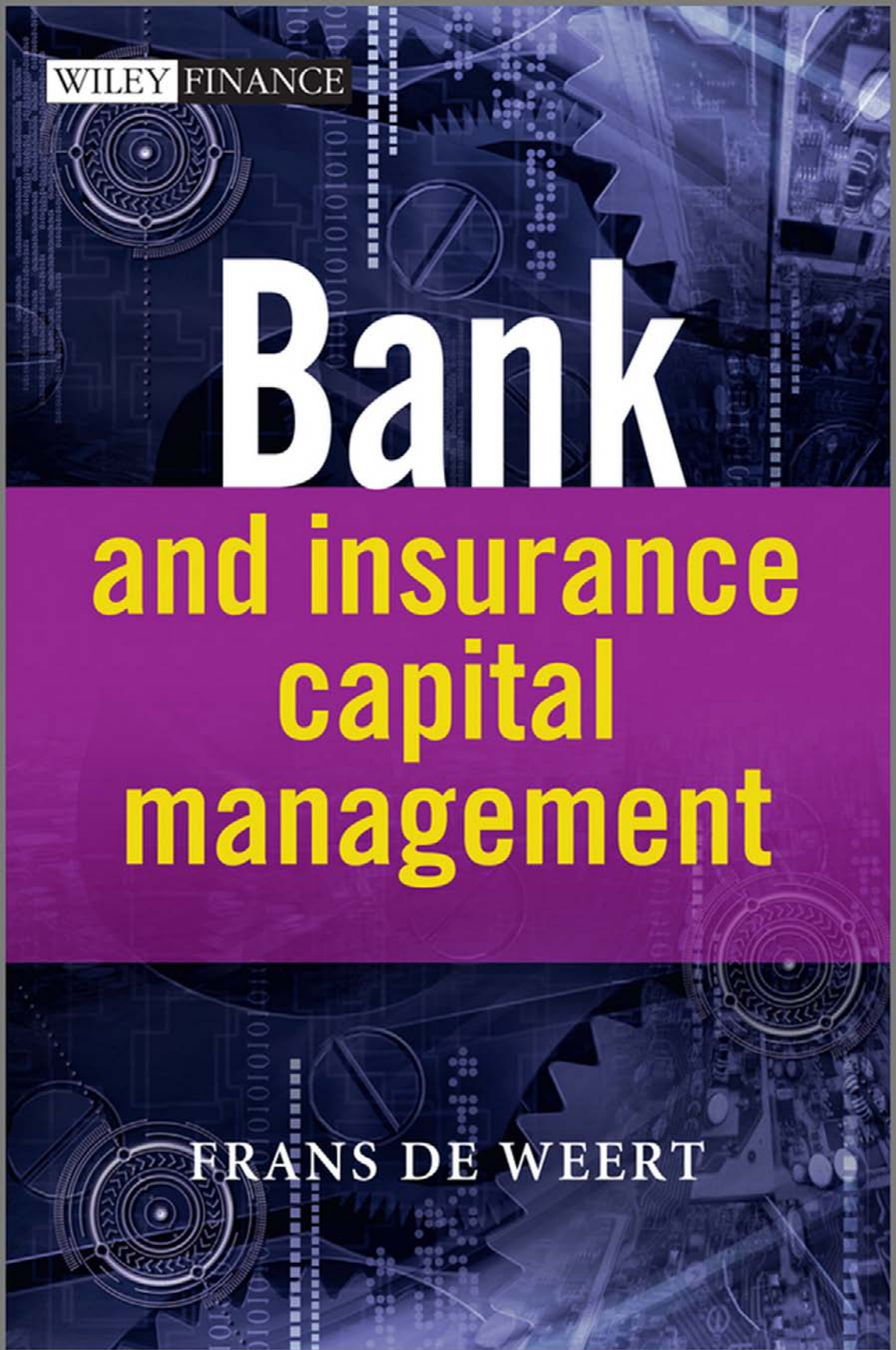
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Bank and Insurance Capital Management

Frans de Weert

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Contents

Preface

More than in any other industry, capital is an integral part of the business model of banks and insurance companies. For most industries, capital and (subordinated) debt are merely used to acquire the assets necessary to run a certain business model. In other words, the business model of most companies is not a function of its liabilities, but rather of its assets in combination with intangible assets that do not show up on the balance sheet (e.g. intellectual property, human capital, distribution network, partners). For banks and insurance companies, the non-capital part of the liability side of their balance sheets, which comprises deposits and insurance provisions respectively, are integral to their business model. These liabilities are used to acquire assets. Banks and insurance companies aim to earn a positive spread on what they pay on their liabilities and the income they receive on their assets. One of the most basic rules in finance is that one cannot earn additional yield without running risks. Therefore, a financial institution needs to have enough of a buffer to absorb losses should unexpected risks materialize. This is exactly the function of capital for a financial institution; i.e. to provide a cushion for unexpected losses related to the risks that are taken. The larger and more material the risks, the larger the required capital position. Hence, the capital position is a function of the risks and therefore an integral part of the business model of a financial institution.

Unlike non-financial companies, capital does not merely represent the claim that shareholders have on the company, capital at financial institutions is also crucial for being able to run the business. On top of that, the intense competition in the financial industry has forced banks, and to a lesser extent insurance companies, to search for optimal ways of financing. This has resulted in the fact that financial institutions

are more leveraged than other companies, which means that capital is more sensitive to risks and therefore needs to be actively managed. Even though capital is such an important element for any financial institution, there is very little literature on this subject. The book by C. Matten, *Managing Bank Capital*, stands out in the literature about the management of capital for banks.

This book aims to provide a holistic view on capital management for banks and insurance companies. A holistic approach has been chosen because it is imperative to understand all angles of capital management in order to fully comprehend the subject. Before one can start thinking about managing capital one first of all needs to be familiar with accounting and the balance sheet dynamics of financial institutions. Secondly, one has to know the boundaries within which one needs to operate. These boundaries are set by a combination of regulation, accounting, and internal risk metrics. Thirdly, one needs to understand how risk and capital management can be aligned. Lastly, it is important to understand the corporate finance aspects of capital management. Therefore, this book looks at four different perspectives on capital management for financial institutions, which are also the four parts of the book

- Part I: Accounting perspective
- Part II: Regulatory perspective
- Part III: Risk and capital management perspective
- Part IV: Corporate finance perspective.

When these four perspectives are mastered, the reader will be able to understand how capital management can fulfil its two primary objectives and create value as a result:

1. *Optimize capital structure* in order to achieve an *optimal cost of capital*;
2. *Optimize performance* so that, given a certain capital structure, a financial institution achieves an *optimal return on capital.*

For financial institutions, there is a lot more to capital management than simply optimizing the weighted average cost of capital. This is very often overlooked and misunderstood, and consequently senior managers, shareholders, and supervisors unfamiliar with the dynamics of capital management of financial institutions are often faced with unexpected and costly surprises.

The reason that this book focuses on capital management for both banks and insurance companies is because these institutions show

significant similarities and can learn from each other. In addition, banks and insurance companies are very interconnected and their business models and the products they sell continue to converge. Last, but not least, the investor base of banks and insurance companies is similar.

This book is written for capital management practitioners (e.g. capital managers, treasurers, risk managers), senior management at banks and insurance companies, shareholders, regulators, central bankers, economists, and business students. It offers the reader an overview of what capital management is really about. This is a difficult but necessary piece in order to solve the financial institution puzzle. The book is simply written and the theory is complemented with real-life examples where necessary. Even though regulation typically has little to do with actual business concepts, capital regulation has a clear business rationale. Therefore, Part II on regulation should by no means be viewed as boring, but is actually at the heart of gaining a full understanding of capital management.

Acknowledgements

This book is based on knowledge I acquired during my work in the financial industry. Therefore I would like to thank my colleagues throughout the years, especially my former colleagues at Barclays Capital (Thierry Lucas, Arturo Bignardi, and Faisal Khan) who jump-started my career in finance. Special thanks goes out to all the people involved in reviewing this work, especially Ries de Kogel, Charles Kieft, Bas Rooijmans, Maarten van Eden, and my father Jan de Weert. Finally, I would like to thank my partner Petra, who makes sure that my life is never boring and always puts a smile on my face.

1

Capital Management as a Means to Create Value

The core message of this book is that capital management is a means to create value. In order to manage capital so that value is actually being created, one needs to have an understanding of many different topics. However, when these topics are discussed in isolation, it might not always be clear how each relates to capital management, let alone understand the role each plays in the value creating function of capital management. This chapter summarizes the main objectives of capital management and how the activities to realize these objectives fit into the broader management context of financial institutions. The chapter should also help the reader to place the topics that are discussed throughout this book in a broader capital management context. Because this chapter is conclusive in nature it might be that the reader is not familiar with all the terminology and concepts that are used. If this is the case, do not be deterred as the concepts and terminology are explained in subsequent chapters.

1.1 THE PRIMARY OBJECTIVES OF CAPITAL MANAGEMENT

Capital management has two primary objectives:

1. *Optimize capital structure.* This is an objective that capital management has to fulfil almost entirely by itself and evolves around the financing of business operations.[1] The activities that capital management undertakes to achieve this objective should ultimately result in an *optimal cost of capital*.
2. *Optimize performance.* The activities that need to be employed to fulfil this objective lie partly with the individual businesses and risk management. Even though, in order to optimize performance, capital

[1] Selling deposits or underwriting insurance policies are part of business operations and are not capital management considerations when optimizing the capital structure.

management is dependent on other areas within a financial institution, it should act as the owner of this optimization process. In this role, it should oversee and manage this process. Apart from developing a corporate strategy,[2] the activities to pursue this objective are similar to the activities of the strategy, risk, and capital management cycle as described in Chapter 19. If successful, these activities should lead to an *optimal return on capital.*

Figure 1.1 displays the main activities necessary to fulfil the two primary objectives of capital management. Both objectives need to be achieved in order to create maximum value. The next two sections explain each of the two primary objectives of capital management in more detail.

1.2 OPTIMIZATION OF CAPITAL STRUCTURE

Figure 1.1 shows the four main responsibilities of capital management in order to optimize the capital structure. When performed well, this should result in an optimal cost of capital. The four main responsibilities of this optimization process are discussed throughout the book, for which capital management is almost solely responsible. To summarize, these responsibilities are:

1. *Fulfil regulatory requirements.* This is a *conditio sine qua non* and means, among other things, that a financial institution's available capital should exceed required capital. Hence, capital management should always check whether its optimal capital structure fulfils regulatory requirements. If it does not, capital management needs to continue its optimization loops until regulatory requirements are fulfilled. Because there is some leeway in how to fulfil these regulatory requirements, it does not need to be imposed as a single condition in the optimization process. However, capital management does need to "tweak" its optimization until the requirements are fulfilled.

   Some people would argue that the regulator is a stakeholder that needs to be satisfied. This book treats *fulfilling of regulatory requirements* as a separate responsibility, because of their transparency and mandatory nature. Part II explains what capital management needs to do in order to *fulfil regulatory requirements*.

[2] The CEO is responsible for developing a corporate strategy.

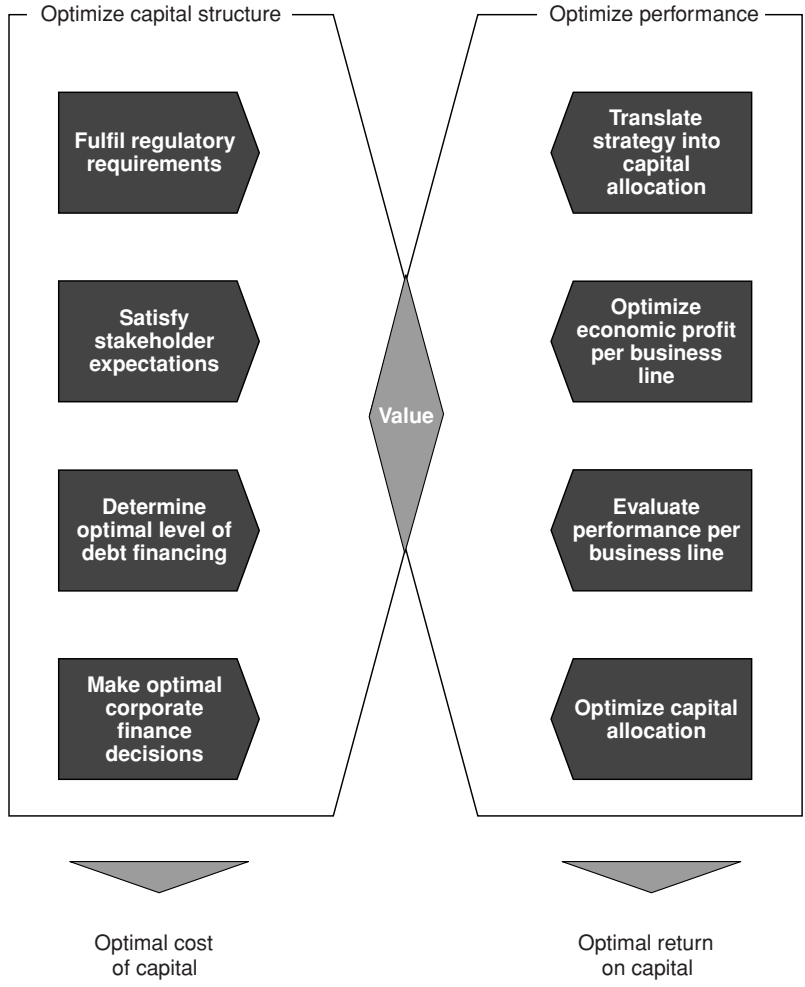

Figure 1.1 The two objectives of capital management.

2. *Satisfy stakeholder expectations.* In contrast to regulatory requirements, which are to a great extent transparent, it is hard to understand the exact expectations of different stakeholders. In general, a financial institution only gets signals if it is not satisfying certain stakeholder expectations. If this happens, it is already too late, because the financial institution needs to bear the negative consequences of the irrational behaviour of these unsatisfied stakeholders. It is crucial that a financial institution never finds itself in this situation.

Capital management is therefore responsible for conducting careful stakeholder analyses, and ensuring that the expectations of relevant stakeholders are met at all times. Or at least, if capital management chooses not to satisfy a certain stakeholder, it should be absolutely sure that the financial institution is able to withstand the potentially negative consequences. Satisfying stakeholder expectations is dubbed *the soft side of capital management* in section 17.3.

Capital management should go through optimization loops until the expectations of all relevant stakeholders are satisfied.

3. *Determine optimal level of debt financing.* This lies at the core of the cost of the capital optimization process. The main constraints for this optimization are stakeholder expectations and regulatory requirements. How to *determine the optimal level of debt financing* is discussed in section 20.3.
4. *Make optimal corporate finance decisions.* These are the more ad hoc type of decisions, such as acquisitions, but it is crucial to carefully think these decisions over as they can heavily impact the capital structure and therefore the cost of capital. How this is done in practice is explained in Chapter 20.

1.3 OPTIMIZATION OF PERFORMANCE

With respect to optimization of performance, capital management relies heavily on the individual businesses and risk management. Although optimization of (commercial) performance is primarily a responsibility of the individual businesses, capital management should drive this process in order to achieve an optimal return on capital on a consolidated basis. Nevertheless, the actual performance improvements need to be established by the businesses with the 'aid' of risk management. Capital management can influence this process by reallocating capital from businesses that perform relatively poorly to businesses that perform well. The main activities in order to achieve an optimal return on capital are discussed in Part III and can be summarized as:

1. *Translate strategy into capital allocation.* Once a corporate strategy has been formulated, available capital needs to be allocated in line with this strategy. However, this requires significant fine-tuning with the different businesses in terms of how and when this capital is actually allocated. Indeed, the allocated capital has to be in line with the size of the business. Even if the strategy is to expand a certain

business, this does not happen overnight. Hence, capital needs to be allocated over time, in line with the strategies of the individual businesses.

2. *Optimize economic profit per business line.* Once capital is allocated, the individual businesses and business risk management are responsible for getting the most out of this capital. In other words, the individual businesses need to continually improve their economic profit. Risk management challenges the individual businesses on the business they undertake and sets guidelines within which these businesses need to operate. Optimization of economic profit per business line is not a responsibility of capital management, but rather of the business and business risk management. This is discussed in Chapters 18 and 19.
3. *Evaluate performance per business line.* Performance evaluation is again a responsibility of capital management. As part of this activity, capital management evaluates how well businesses are performing and challenges them on how these individual businesses can improve their performance. Part of this performance evaluation is to compare RAROC (risk-adjusted return on capital) and economic profit growth potential. How this works exactly is discussed in Chapters 18 and 19.
4. *Optimize capital allocation.* Based on the performance evaluation, capital management should optimize its available capital allocation. This could mean that it has to reallocate capital from poorly performing businesses, or businesses with little growth expectations, to well-performing and high-growth businesses. This is also discussed in Chapters 18 and 19.

Part I
Accounting Perspective

One needs to be able to read a balance sheet in order to understand the dynamics of a financial institution. A balance sheet displays information that is valuable from a corporate finance, capital management, and risk perspective. In turn, one can only read a balance sheet if one understands the underlying business. This enables one to fully grasp what is driving the balance sheet. Hence, Chapter 2 first discusses the bank and insurance business models. Chapter 3 subsequently shows how these business models are reflected in the balance sheet and provides an in-depth overview of the balance sheet structure of a bank and insurance company, respectively. Part I then goes on to provide an overview of the differences between banking and insurance. Even though bank and insurance business models are converging, some inherent differences will always remain. Chapter 5 discusses the concept of economic capital, which is a concept that defines capital in an economic way, and is mainly used by risk and capital managers. The reason that it is discussed in Part I is because it aids readers to understand the subsequent chapters that build on the concept of economic capital (e.g. Chapter 10 on capital requirements). Chapter 6 goes into the details of balance sheet management. Lastly, Chapter 7 presents the necessary accounting concepts in order to understand the interaction between capital regulation and accounting. Although slightly technical, Chapter 7 is meant to jump-start the reader into Part II.

2

Bank and Insurance Business Model

Banks and insurance companies are both in the business of attracting money from customers. In doing so they fulfil a very important social function. A bank focuses on managing customers' monies and subsequently relocating these monies (e.g. through lending) in an opportune manner to other parts of society. This process is called financial intermediation, which goes hand in hand with maturity transformation. Maturity transformation means that banks transform the maturity of money. They do this by giving customers who store money with them the option of withdrawing money on demand (short-term money), and by lending this money to customers on a long-term basis through, for example, mortgages (long-term money).

An insurance company exists by virtue of the inherent risk averseness of society and adds value by pooling these risks. In sections 2.1 and 2.2, bank and insurance business models are discussed, respectively.

2.1 BANK BUSINESS MODEL

Several types of bank companies can be distinguished. Hence, it is hard to talk about *the* business model for banks. This section introduces four different bank concepts, based on a client segmentation. Not all banks fall exactly into the segmentation set out below, as banks can focus on multiple client groups (e.g. universal bank). The four bank concepts presented below cover a wide and majority spectrum of bank clients.

- **Retail banking** focuses on attracting money (e.g. savings, current accounts) from consumers and subsequently lending the money out to (other) consumers (e.g. through mortgage lending, consumer finance, overdrafts, and credit cards) and sometimes even to small and medium-sized enterprises (SMEs) and corporates. Even within retail banking there are different value propositions and, hence, different areas of focus. For example, a savings bank attracts clients by giving

them an attractive savings rate. This lies at the core of a savings bank's value proposition. Subsequent lending of the savings to other consumers is just one of the means to be able to pay a high savings rate. However, a savings bank could well decide not to engage in lending at all and just invest the savings in such a manner that it is safe, but still earns the savings bank a decent spread (i.e. the difference between the yield on its investments and what it pays on savings).

The value proposition of a consumer finance bank is completely different to that of a savings bank. Where a savings bank focuses on managing customers' monies and paying them an attractive rate, a consumer finance bank focuses on its clients' financing needs. In other words, the business model of a consumer finance bank predominantly evolves around consumer lending. In order to do so, a consumer finance bank has to attract money from different funding sources.[1] One of these funding sources could be customer savings, but it could also be wholesale funding.[2] A retail mortgage bank is a type of consumer finance bank, as it specifically focuses on one type of consumer lending, namely mortgage lending. However, typically a mortgage bank does not only engage in retail mortgages, but also in commercial mortgages. This means that a mortgage bank has a product focus that serves different client groups.

Simply put, retail banking is nothing more than attracting deposits from consumers and subsequently lending or investing those deposits wisely. This means that a retail bank needs to have superior asset and liability management[3] (ALM) and credit assessment capabilities.

- **Private banking** serves the banking needs of high-net-worth individuals. In general, this means that private banks engage in the management of customer deposits and advisory services. Hence, private banking is really about advising, and providing high-net-worth individuals access to the products they want. Since high-net-worth individuals tend to invest a significant portion of their wealth, private banks are heavily dependent on fee income (e.g. advisory fees, transaction fees). This is a major difference between a private bank and a retail bank. A

[1] Funding sources are means for a bank to finance itself. From a balance sheet perspective, funding sources are used to finance the assets that a bank holds.

[2] Funding provided between financial services companies (e.g. banks, insurers, fund managers) takes place in the wholesale market and is typically referred to as wholesale funding.

[3] Asset and liability management is the practice of integrally managing the assets and liabilities of financial institutions. One of the main activities of asset liability management is duration matching, i.e. matching the duration of the liabilities and the assets, and liquidity management.

private bank focuses on generating fee income by offering first-class services, whereas a retail bank focuses on earning a spread on the deposited monies by investing or lending the monies wisely.

- **Commercial banking**[4] is about satisfying the banking needs of small and medium-sized enterprises. In this perspective it is similar to retail banking and private banking, only then for small to medium-sized commercial enterprises. Commercial banking asks for both retail banking *and* private banking type of capabilities. Commercial banking is about providing banking products to help commercial enterprises conduct their business and to optimize their finances. In order to do this, commercial banks need a good infrastructure to facilitate services such as international payments and cash management. Commercial banks also need to have similar ALM and credit assessment capabilities as retail banks, as well as private banking like advisory capabilities. In contrast to private banking, the advisory services of commercial banks focus much more on optimization of finances (e.g. hedging foreign exchange exposure with derivatives) than on investment advice.
- **Investment banking**[5] provides risk management and financing solutions to large corporates. Investment banks perform this task by providing large corporates with access to capital markets (e.g. bond and share issuance), mergers and acquisitions advice, syndicated lending, and by taking over or warehousing risks that a corporate does not want to run. The latter activity, in particular, distinguishes an investment bank from a retail, private, or commercial bank. Indeed, investment banks take on market risk by engaging in customer transactions that reduce the exposure of the customer's business to market volatility (e.g. an airline hedges its exposure to oil price movements with the aid of an investment bank). Taking on market risk is not part of the customer value proposition of a retail, private, or commercial bank. Another striking difference between investment banks and retail, private, and commercial banks is that investment banks typically do not focus, or focus less, on attracting money from clients. In other words, an investment bank does not view savings

[4] Commercial banking might be a confusing term as it could also stand for a bank that employs commercial activities. Hence, commercial banking could also be referred to as SME banking or corporate banking.

[5] The combination of commercial and investment banking is generally referred to as *wholesale* banking.

or deposits as a source of funding. Investment banks predominantly fund themselves in the wholesale market.

The above shows that one cannot talk about one specific bank concept or business model. However, all banks have in common that their client activity forces them to actively manage both their asset and liability sides of the balance sheet. Banks can also highly leverage[6] themselves, especially if they have significant customer deposits. Because banks have risky assets they will need sufficient capital to absorb potential losses should certain risks materialize. Furthermore, if banks have a significant amount of customer deposits, they should have superior liquidity management.

2.2 INSURANCE BUSINESS MODEL

The business model of an insurance company is closely linked to the types of products it sells. It is therefore easiest to use a product segmentation to describe the different insurance business models. Typically two types of insurance companies are distinguished.

- **Life insurance companies** sell insurance policies related to a person's life. When a customer buys such an insurance policy it can be structured such that the customer receives a benefit either as long as he is alive (e.g. pension, life annuity) or when he dies (e.g. life insurance), or a combination of both. In order to be entitled to this benefit, the customer needs to pay a premium. This can be a one-off payment, in which case it is called a single premium life insurance, or a periodic premium (typically annually).
- **Non-life insurance** is quite a broad definition, but covers all insurance policies that are not directly related to an individual's life. This means that non-life insurance companies can be health insurance companies, but also property and casualty insurance companies.

A product segmentation of the insurance industry is just one way to describe the different insurance business models. There are several other aspects that determine a business model. A very important one in the insurance industry is the distribution network. Distribution can be organized through brokers, independent agents, bank channels, tied agents, or direct selling.

[6] Total outstanding assets divided by common shareholders' equity.

Although there are many different types of insurance companies, they all have one common denominator: their reason for being is 'risk pooling'. Thus, the question arises: Why do insurance companies add value to society if their sole purpose is to pool risks? Indeed, pooling risks does not result in mitigation of risks, it only spreads the costs among a greater number of people. Then, why is there a demand for insurance products at all? The answer lies in the fact that most human beings are inherently risk averse. If one is risk averse, one can maximize his expected utility – a measure of relative satisfaction – by buying insurance. This can be illustrated by a simple example.

Consider two individuals playing in a lottery. Person A is risk averse and person B is risk seeking. The risk preferences of persons A and B can be expressed by a concave and a convex utility function, respectively. In other words, the utility of risk-averse person A increases relatively less for every additional dollar payout. This is also known as *the law of decreasing marginal utility*. Most people exhibit the same feature as person A. The utility of risk-seeking person B increases relatively more for every additional dollar payout. Alternatively put, person B's utility accelerates as a function of payout. Therefore, person B will always seek risk, because the additional utility that can be achieved outweighs the associated extra risks. Graphically, the utility functions of persons A and B are shown in Figure 2.1. Persons A and B both have a utility of 0 if the payout is 0, and a utility of 100 if the payout is 100. However, if the payout is 50, person A has a utility of 75, whereas

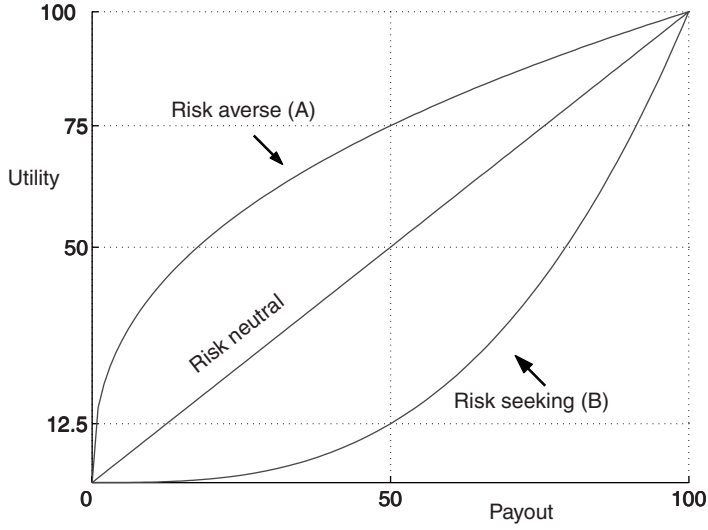

Figure 2.1 Risk preferences expressed by utility functions.

person B has only a utility of 12.5. The lottery in which A and B are participating pays 100 with a probability of 50% and 0 with a probability of 50%. The expected utility of the lottery is 50 ($= 0*50\% + 100*50\%$) for both A and B. Suppose persons A and B can purchase an insurance product that ensures a payout of 50 in exchange for the proceeds of the lottery ticket. This means that, if the payout of the lottery ticket is 0, the insurance product still pays out 50. However, if the payout of the lottery ticket is 100, the insurance product only pays 50. For A this is an attractive insurance product as it increases his expected utility from 50 to 75 (a payout of 50 generates 75 utility for person A). This confirms the statement that risk-averse people have demand for insurance products. In contrast, person B does not benefit from buying this insurance as this decreases his expected utility from 50 to 12.5.

The above example shows that insurance products are of interest to risk-averse individuals and actually 'add value'. Since society as a whole can be classified as risk averse, the insurance industry has grown to be one of the major industries of the developed world.

One of the major client differences between banks and insurance companies is that bank clients retain legal ownership of their deposited money whereas legal ownership of deposited money by insurance clients is transferred to the insurance company in the form of a premium. The insurance client can become a creditor of the insurance company at a later stage, should the conditions under the insurance contract materialize.

3

Balance Sheets of Banks and Insurance Companies

As was shown in Chapter 2, banks and insurance companies have quite different business models. What they have in common is that they both fulfil very important social functions and the business they do with customers is reflected at the liability side of their balance sheets. This contrasts with regular (non-financial) business models, which are purely asset driven. This means that customers want to do business with non-financial companies because of their abilities and (value added) outputs that are reflected at the asset side of their balance sheets.

As an example, Philips produces light bulbs which are held in stock and appear at the asset side of the balance sheet. When a customer buys a light bulb, this reduces the balance sheet item 'light bulbs in stock' and increases the item 'cash' or 'debtors'. 'Light bulbs in stock', 'cash', or 'debtors' are all items that show up at the asset side of Philips' balance sheet.

The above shows that client activity of non-financial companies takes place at the asset side of the balance sheet, whereas client activity for financial companies occurs, at least for a substantial part, at the liability side of the balance sheet. In other words, customers of non-financial companies are typically debtors (i.e. the customer owes the non-financial company money), whereas a substantial part of the customer base of a financial company has a creditor relationship (i.e. the financial company owes the customer money). This means that a customer puts significant faith in a financial company as he is willing to store money with the expectation of receiving it back at a later stage. The way this works out in the balance sheet of a bank or insurance company is discussed in sections 3.1 and 3.2 respectively.

3.1 BANK BALANCE SHEET

It has already been mentioned that, generally, the balance sheet of a bank is either liability driven or asset driven. An asset-driven balance

sheet is less common for retail banks, but more common for investment banks. When a balance sheet is liability driven, client activity at the liability side drives the structure and size of the balance sheet. For example, the balance sheet of a savings bank is liability driven. For asset-driven balance sheets the opposite holds. In other words, client activity at the asset side determines the structure and size of the balance sheet. A consumer finance bank and an investment bank have both an asset-driven balance sheet. However, almost all banks, even investment banks and consumer finance banks, have some client activity taking place at the *liability* side of the balance sheet.

There are several different bank business models with either asset-driven or liability-driven balance sheets. Nevertheless, the general balance sheet structure is similar, because banks have sought to diversify themselves at both the asset and liability sides of the balance sheet. A general bank balance sheet structure is displayed in Figure 3.1, and almost every bank has its balance sheet components displayed in this manner. Even an investment bank will typically have some deposits. Indeed, investment banks tend to sell structured products (e.g. reverse convertibles) to high-net-worth individuals. However, Figure 3.1 gives only a high-level impression of a bank balance sheet. If one looks at the balance sheet of a specific bank company one can provide a deeper level of granularity. For example, one can split up lending into corporate lending, mortgage lending, consumer lending; with respect to deposits, one can distinguish between term deposits, savings and checking accounts.

Figure 3.1 only displays the high-level structure of the balance sheet of a bank. Generally, it helps to segment the balance sheet, which will be discussed in section 16.4. At a bank, client activity either takes place at the liability side, in which case it is a type of deposit, or at the asset side, in which case it will be related to lending. There are some exceptions, however, such as derivatives. Investment banks sell or buy derivatives from their clients. This is not directly related to either lending or deposits, as derivatives can best be compared with insurance. A long derivative position is accounted for on the asset side of a balance sheet, while a short derivative position is reflected on the liability side.

It has been mentioned above that one of the functions of a bank is maturity transformation. This means that money with a short duration (e.g. savings that can be withdrawn on demand) is transformed into money with a long duration through lending (e.g. mortgages). By doing

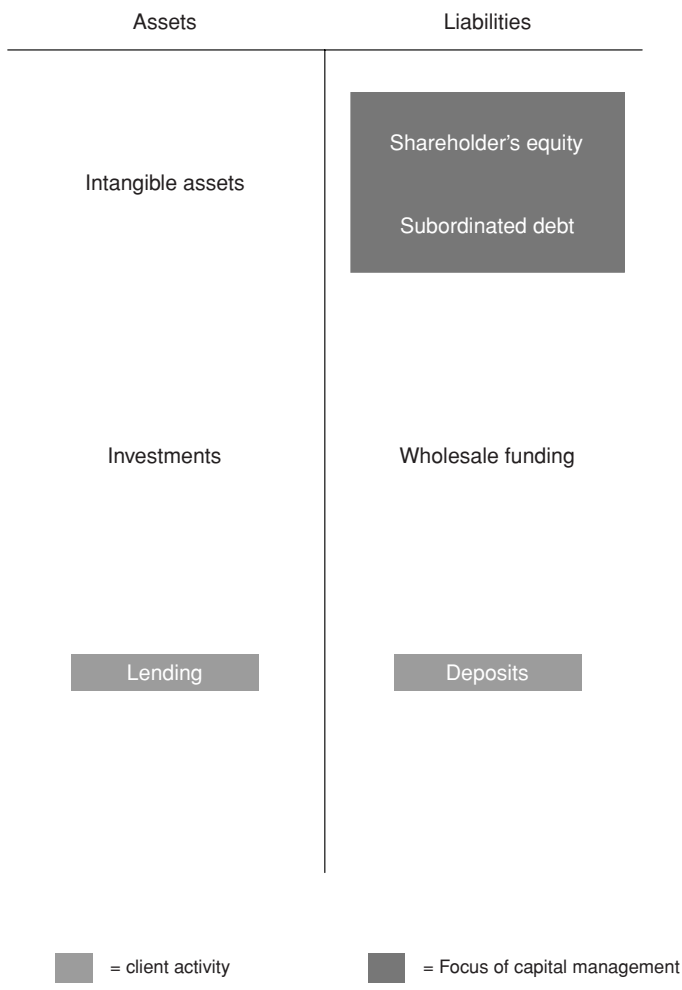

Figure 3.1 Bank balance sheet structure.

this, banks have an unfavourable liquidity position in the sense that they cannot access the money they have lent to customers (mortgages cannot be repaid on demand), but, at the same time, the money that they owe to customers (e.g. savings) can be withdrawn by the customers on demand. Banks have to manage this inherent liquidity mismatch.

Intangible assets can comprise a significant component of a bank's balance sheet and can easily be overlooked. Goodwill is one of the main examples of an intangible asset. Furthermore, although not officially

an intangible asset, the item 'deferred tax assets' is an asset whose realization depends on future profitability.[1] Since goodwill is crucial in determining the capital position of a financial institution and plays an important role in takeovers, it will be elaborated on in section 3.3. If a financial institution has deferred tax assets on its balance sheet, it is in a loss carry forward position. This means that the financial institution has suffered losses in previous years and is allowed to deduct these losses from potential future gains; in this respect, the financial institution is compensated from a tax perspective. In other words, deferred tax assets allow a company to subdue its future tax burden. It is important to emphasize that, in order to decrease its tax burden, deferred tax assets can only (partially) be released if the financial institution posts a profit.

The focus of this book is on capital. Capital comprises both shareholders' equity as well as different qualities of subordinated debt. This also holds true for an insurance company. Contrary to a non-financial company, a bank's capital position cannot be seen as a means of acquiring the necessary assets to do business. A bank's capital position serves as a buffer to absorb losses that might materialize as a result of the risks that a bank runs. How this works exactly is discussed from Part II onwards.

There is an easy link between the profit and loss (P&L) statement and the balance sheet of a company. Profits and losses are reflected on the balance sheet as retained earnings and are part of shareholders' equity. In other words, if a financial institution posts a profit of $1 billion, its shareholders' equity increases by the same amount. This is quite logical as shareholders' equity should represent the value that shareholders have a claim on. As a rule of thumb, one can say that the change in shareholders' equity is a result of profits. However, there are exceptions that can become quite material and make the management of capital more difficult. These exceptions are discussed throughout the book and are mainly related to asymmetries in IFRS accounting legislation.

3.2 INSURANCE BALANCE SHEET

The balance sheet structure of an insurance company shows similarities with that of a bank. The biggest difference is that the balance sheet of an insurance company is completely liability driven; in other words, client activity of an insurance company does not take place at the asset side of

[1] Deferred tax assets are deferred claims on tax authorities instead of intangibles.

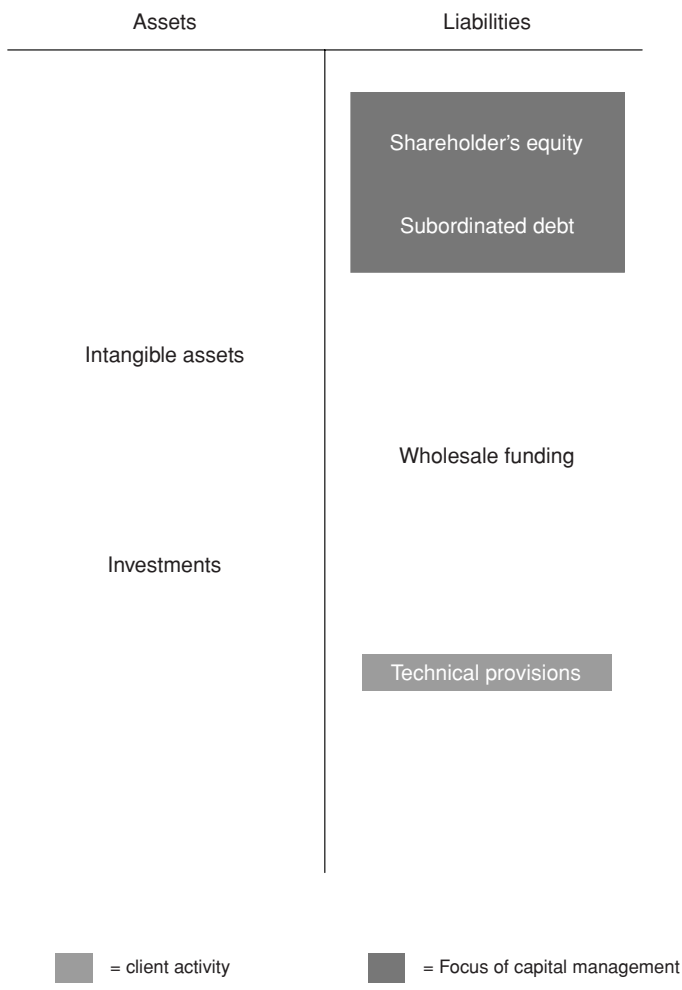

Figure 3.2 Balance sheet structure of an insurance company.

the balance sheet. The balance sheet structure of an insurance company is laid out in Figure 3.2. When comparing the balance sheet structure of an insurance company (Figure 3.2) to that of a bank (Figure 3.1), there are two striking differences.

1. Contrary to a bank, an insurance company does not lend money to customers and therefore has almost no client activity at the asset side of the balance sheet.

2. An insurance company has technical provisions as a balance sheet item, where a bank has deposits.

What deposits are for banks is what technical provisions are for insurance companies. They both show up at the liability side of the balance sheet, and they both represent the amounts that a bank, respectively insurance company, are indebted to customers. Deposits are a bit more straightforward than technical provisions, as they are nothing more than the nominal amount that a customer has deposited at a bank, and a customer is at any time entitled to this nominal amount. Technical provisions however, are a best estimate of the net present value of future claims minus the net present value of future premiums.

Intangible assets might even play a larger role in the insurance industry than in banking. The reason being that, aside from goodwill and deferred tax assets,[2] there is a significant insurance-specific balance sheet item, namely deferred acquisition costs (DACs).[3] This 'intangible asset' arises because an insurance company tends to make considerable up front costs (e.g. marketing, administration) when it sells an insurance product, especially for life insurance. Instead of charging these costs to the customer at inception of the insurance contract, an insurance company can spread these costs over the life of the product by taking them into account in the premium. Hence, accounting allows for the booking of an asset, deferred acquisition costs, so that the up-front costs do not have to be taken as a loss at once, but can be amortized over the life of the product. This works well, as long as future premiums flow in as expected. However, if premiums appear to be lower than expected, the up-front costs will not be fully recovered and the insurance company needs to make a direct charge as a result. This is called DAC unlocking. It can, for example, occur if the premium of an insurance product is a fixed percentage of an equity index that has dropped in value significantly.

3.3 GOODWILL

Goodwill is an asset that is activated if the takeover price exceeds the net asset book value of the company. The net asset book value is nothing more than the value of assets minus the value of liabilities of

[2] Deferred tax assets (DTAs) are officially not intangible assets as they represent a deferred claim.

[3] Like deferred tax assets, DACs are not officially intangible assets as they are a deferred claim on the future premiums.

the company, which should be equivalent to shareholders' equity. This increment between takeover price and net asset book value is called goodwill. Goodwill shows up as an asset on the balance sheet and is typically subject to an impairment test. An impairment test means that one tests whether it is still realistic to assume that goodwill will be earned back in the future. Indeed, before goodwill can be booked as an asset, the company has to justify this by showing it can earn back the goodwill by means of synergies, economies of scale, or any other means. If this is no longer realistic, the company has to take an impairment loss, which is equal to that part of goodwill that the company is no longer able to recoup.

Since goodwill can be a substantial portion of the balance sheet of a financial institution, it is important to understand how goodwill occurs in practice, and it is particularly relevant to understand the accounting bookings that result in goodwill. Goodwill is discussed in this section

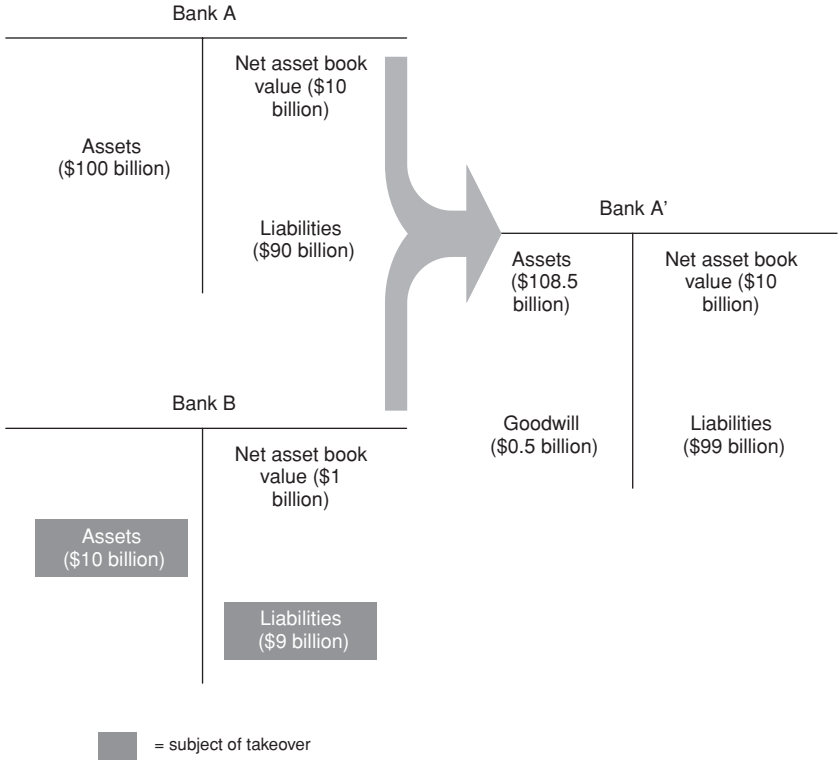

Figure 3.3 Goodwill accounting.

and is explained by means of an example as it is a determinant for the capital position and valuation of a financial institution.

Consider bank A with a total balance sheet of $100 billion and a net asset book value of $10 billion. Bank B has a total balance sheet of $10 billion and a net asset book value $1 billion. Suppose bank A acquires bank B for $1.5 billion in cash. In this case, goodwill amounts to $0.5 billion. The question is, how is goodwill accounted for on the balance sheet of the combination of banks A and B, bank A′? First of all, it is important to note that bank A acquires all the assets and liabilities of bank B. Because bank B has a net asset book value of $1 billion, the acquisition involves $10 billion worth of assets, but only $9 billion worth of liabilities. The compensation for shareholders of bank B is $1.5 billion. Hence, a $0.5 billion premium is paid over and above the $1 billion net asset book value. The balance sheets of banks A and B and of the combination, bank A′, are displayed in Figure 3.3. As one can see from the figure, the changes in the liability side, as a result of the takeover, are quite straightforward. The total amount of capital remains at $10 billion. This is quite obvious as the only way that the capital position can change is through profits or by means of an "outside" capital injection (e.g. rights issue). The liabilities increase by $9 billion, which is equal to the total amount of liabilities of bank B. The total value of the liability side of the balance sheet of bank A′ is thus equal to $109 billion. The changes to the asset side of bank A, as a result of the takeover, are a bit more complex. First of all, assets decrease by $1.5 billion as this is what bank A has to payout in cash to finance the takeover. Then, under the terms of the takeover, bank A receives ownership of the $10 billion assets of bank B. Hence, the assets of bank A′, as a result of the takeover of bank B, increase to $108.5 billion. Since the liability side and asset side of bank A′ need to match, the incremental $0.5 billion is booked as goodwill.

4

Differences between Banking and Insurance

Part I has already highlighted several differences between banking and insurance. Of all the different bank and insurance concepts, it is most relevant to compare retail banking and life insurance in order to get a picture of the differences between banking and insurance. Figure 4.1 summarizes the most important differences between a retail bank and a life insurance company. Previously, it was discussed that a bank serves customers at both the asset as well as the liability side of the balance sheet, whereas a life insurance company (mainly) only has customers at the liability side of the balance sheet. In terms of interest rate and liquidity, there is also an apparent difference. Retail banks attract deposits and subsequently lend out the monies through mortgage writing or consumer finance. The duration of the deposits is short and is an uncertain source of funding because of its liquidity. Indeed, deposits are very liquid as customers can withdraw them easily (current account, even on demand). A customer who deposits money at a retail bank is typically compensated by means of a (variable) short-term interest rate return. In other words, the liabilities of a retail bank are volatile and the interest rate cost to the retail bank is equivalent to the short-term interest rate level. The assets of a retail bank are very illiquid longer-term loans (e.g. mortgages). Indeed, the retail bank cannot demand the immediate repayment of the money it has lent, nor are the loans easily tradeable. The interest rate income of the assets depends on the long-term interest rate yield. Therefore, a retail bank benefits from a steep and upward-sloping interest rate curve; however, at the same time, it needs to be able to manage the inherent liquidity mismatch (i.e. liquid liabilities versus illiquid assets). A life insurance company does not have this unfavourable liquidity mismatch; in fact, a life insurance company has a favourable liquidity mismatch. Indeed, the liabilities of a life insurance company are not very liquid because they are not easily tradeable nor are many insurance policies surrendered, whereas the majority of assets are liquid investments (e.g. government and corporate bonds, equities). Furthermore, unlike a retail

	Retail bank	Life insurance
Customers	Appear at both the asset and liability side of the balance sheet	Appear only at the liability side of the balance sheet
Interest rate	Aims to benefit from interest rate mismatch – earnings power increases if interest rate curve steepens (i.e. short-term interest rates go down and long-term goes up)	Minimizes interest rate mismatch, but will typically lose money if (long-term) interest rates go down
Liquidity	Has to actively manage a significant liquidity mismatch (liquid liabilities versus illiquid assets)	Has a favourable liquidity position (illiquid liabilities versus liquid assets)
Distribution	Sells via its proprietary distribution network (e.g. direct, branch network)	Sells primarily through (tied) agents and brokers

Figure 4.1 Retail banking versus life insurance.

bank, a life insurance company tries to match the duration of its assets and liabilities. These are two very crucial differences between retail banking and life insurance.

5
Economic Capital

Economic capital stands for the amount of capital that a financial institution needs to hold to cover the risks it is facing. In other words, economic capital is the amount of money that is needed to secure survival in a severely adverse scenario. This means that, if the available capital of a financial institution exceeds its economic capital, the financial institution is able to weather heavy shocks.

Although economic capital is a real economic principle, it is so instrumental for the management of capital and even for regulators that we introduce the concept of economic capital very early in this book – in Part I and not in later parts. Even though regulators rely heavily on economic capital models, if there were no supervision of financial institutions at all, risk and capital managers would still use the metrics of economic capital. In fact, in trading environments, economic capital, or Value at Risk (VaR) as it is often referred to, was already mainstream before any regulation started to apply it.

It is useful to recollect why economic capital is such an important metric for financial institutions. Another question is why non-financial companies do not try to quantify economic capital. The answer is that some non-financial companies do actually try to measure the amount of money they would need to weather severe and unexpected shocks. However, it has to be said, that there is no industry that puts as much emphasis on economic capital as the financial industry. A few reasons can be given why financial institutions pay relatively more attention to economic capital.

- *Financial institutions are in the business of taking risks.* This means that financial institutions try to make money by taking risks. Hence, as part of their business, financial institutions need to manage risks and, therefore, first identify and quantify these risks. This contrasts with non-financial companies where risks arise as a result of the business they conduct. For example, oil exploration results in certain risks (e.g. explosions) but it is not on the risks that an oil explorer makes money, it is mainly on the ability to find oil wells and subsequently drill for

oil. Hence, managing risks for non-financial companies relates more to ensuring that risks do not materially affect the business, whereas, for a financial institution, managing risks *is* the business.

- *Financial institutions have significant leverage.* Because financial institutions have large sums of customer liabilities, and because of risk–reward optimization, financial institutions are significantly more leveraged than non-financial companies. Leverage can enhance returns significantly, but the downside is that the capital position is prone to more swings and risks. As a result, financial institutions are forced to identify, quantify, and closely manage all risks because failing to do so could easily result in bankruptcy. Even if the impact of a certain event causes only a small negative effect on the assets or liabilities of a financial company, leverage can help to wipe out the capital position entirely.

Now that it is clear why financial institutions need to consider economic capital in their everyday business, the question becomes: How do you quantify it and what influences economic capital? Quantification of economic capital will never be exact, just as one cannot exactly determine the probability and impact (e.g. fractures or death) of somebody being hit by a car. Even though it is not an exact science, one should nonetheless try to quantify economic capital and leverage as much information and experience as possible. However, one should always acknowledge that a quantified economic capital number is merely a ballpark figure. That is why economic capital should be complemented with other indicators, such as stress tests, to manage risks and facilitate decision making.

The principle of economic capital is to attach a probability to each possible loss (or gain). Because it is impossible to attach a probability to one specific outcome,[1] one typically tries to quantify for each number the probability that a loss in any given year will be smaller than that number. Otherwise stated, taking into account all risks (e.g. market risk, credit risk, operational risk, interest rate risk, insurance risk), one tries to determine a probability distribution that plots loss outcomes against the probability mass below that loss outcome. Once a financial institution has plotted the probability distribution, it can determine, with a certain level of confidence, its economic capital. For example, if a financial institution wants to be able to weather shocks in 99.9% (i.e. confidence

[1] A continuum of loss and gain outcomes exists, hence the probability of one specific outcome is zero.

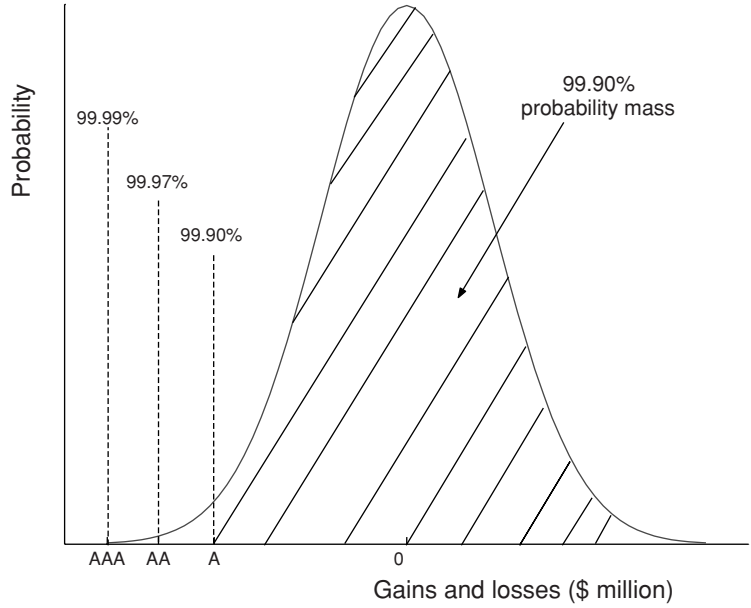

Figure 5.1 Relationship between economic capital and credit rating for a 1-year gain and loss distribution.

level) of cases, it has to capitalize itself on a level such that the probability mass below that loss level is 99.9%. Economic capital can therefore be defined as:

> *Depending on the confidence level X%, economic capital is the absolute value of the loss number Y such that in X% of cases, losses will be smaller than Y.*

To make the economic capital concept more tangible, Figure 5.1 presents the relationship between economic capital and credit rating for a 1-year time horizon. If a financial institution is aiming for a higher credit rating, it has to capitalize itself on such a level that it is able to absorb losses in a higher percentage of cases. This means that, if a financial institution is aiming for a single A rating, its capital position needs to be able to absorb losses in 99.90% of cases over a 1-year time horizon. However, if a financial institution targets a triple (AAA) rating, it needs to be able to absorb losses in 99.99% of cases over a 1-year time horizon. Hence, one can only speak of economic capital in the context of a certain confidence level, or credit rating for that matter. In other words,

economic capital depends on the level of confidence one wants to have, such that a potential loss is below that level. Consider the following example.

Suppose financial institution F has managed to establish a loss distribution of its entire operations. It appears that in 99.90% of cases the losses will be smaller than $1 billion. This means that 99.90% of profit and loss outcomes in one year fall to the right of −$1 billion. Hence, if F is targeting a single A rating, it needs to have $1 billion capital. However, F is actually targeting a double A (AA) rating. This means that its capital level needs to be able to absorb losses in 99.97% of cases over a 1-year time horizon. It appears that the loss number increases to $1.5 billion if F wants to be sure that losses are below that number in 99.97% of cases. Currently, F only has $1 billion of capital. Therefore, F needs to attract $0.5 of additional capital to qualify for an AA rating. If F wants to achieve an AA rating without attracting additional capital, it has to reduce its risks. The risks need to be reduced in such a way that, in 99.97% of cases, losses over a 1-year horizon are below $1 billion.

The loss distribution of a financial institution should take all types of risks into account. It should therefore be a joint loss distribution of all the risks to which a financial institution is exposed. This means that certain diversification assumptions need to be made with respect to the correlation between certain risks (e.g. market and credit risk). These correlation assumptions are never exact, but, experience can tell you something about these correlations. One has nevertheless to realize that economic capital tries to quantify the capital necessary to absorb losses in an adverse scenario; therefore, one should also take into account stress correlations rather than correlations experienced in quieter times. If correlations are close to 1, there is almost no diversification (i.e. one simply adds the economic capital numbers or loss distributions of the different risks). The lower the correlation becomes, the more diversification is assumed. If correlations turn negative, one even assumes that risks offset each other. Correlation is always a number that lies between −1 and 1.

Another important question with respect to economic capital is how one determines the shape of the distribution. Do you assume normally distributed returns or anything else? This is one of the hardest issues to resolve and it is exactly why economic capital is not a hard and fast number, but merely an indication. However, there are different methods for deriving the shape of the distribution, and these are discussed in

more detail in section 10.3. Nevertheless, there will always be a certain level of inaccuracy with respect to the shape of the distribution.

The last and probably most important question concerning economic capital is: What type of losses form the basis for a loss distribution? To explain this question, consider the following.

Bank Z owns $1 billion worth of corporate bonds. It can make a tremendous difference whether this bank is purely trying to quantify the credit losses or the losses related to market price movements. Indeed, the market price volatility of this corporate bond is so high that an economic capital number, based on market risk with a 99.90% confidence over a 1-year horizon, is shown to be $0.4 billion. However, if the bank calculates economic capital based on credit risk (i.e. risk that losses occur due to defaults) with a 99.90% confidence over a 1-year horizon (single A credit rating), economic capital is only $0.1 billion. This $1 billion corporate bond portfolio is booked as *available for sale*, which means that market value losses do not go through the profit and loss statement, nor do they affect available regulatory capital. Indeed, negative revaluation reserves related to interest-bearing securities are filtered out of the definition of available regulatory capital. So, if the bank wants to protect its available regulatory capital, it suffices to take the credit risk economic capital number of $0.1 billion as input for its target capitalization. However, the rating agencies do not focus on regulatory capital, but on IFRS equity. Since IFRS equity is affected by negative revaluation reserves, the rating agencies believe that the market risk economic capital of $0.4 billion is more representative for determining the capitalization associated with a single A rating. In other words, the regulator feels that a capitalization of $0.1 billion suffices to cover the risks of holding the $1 billion corporate bond portfolio, whereas rating agencies believe it should be $0.4 billion.

Exactly because different stakeholders can look at risks differently, it is important to conduct a stakeholder analysis when managing capital. Section 17.3 elaborates on this stakeholder analysis.

6 Balance Sheet Management

Before delving into the details of capital management, it is useful to understand the function of capital in the broader context of a balance sheet. This also means that one needs to become familiar with the different departments within a bank or insurance company that are responsible for managing parts of the balance sheet and can therefore implicitly impact capital management and vice versa. This chapter focuses on the practical bases of balance sheet management. Although investment of capital is an important part of balance sheet management, it is not discussed in this chapter but in Chapter 16, because it requires a more in-depth understanding of the interaction between required capital and available capital, which is discussed later in this book. This chapter is intended to give a high-level overview of how capital management and balance sheet management relate to each other.

6.1 CAPITAL VERSUS BALANCE SHEET MANAGEMENT

Capital management is responsible for managing the capital position of a bank or insurance company in relation to the risks that are being run. This means that capital management has to focus both on the actual amount of capital that a bank or insurance company holds (i.e. available capital) as well as on the risks that are being taken, which are reflected on the balance sheet and ultimately determine the amount of capital that needs to be held (i.e. required capital). This means that, in order to manage capital, one needs to manage the interaction between capital and the rest of the balance sheet. Hence, capital management and balance sheet management are interdependent and heavily intertwined. What makes capital management so difficult is that the available capital can be managed solely by the capital management department,[1] but the capital management department has much less influence over the rest of

[1] The CEO ultimately decides on the amount of available capital, but the capital management department is the predominant adviser and it will be difficult for a CEO to veto the capital management too often.

the balance sheet. The rest of the balance sheet is shaped by activities that are employed by many other departments, but is a crucial variable in managing capital well, as this is the basis for required capital. This is the main challenge of any capital manager and his success depends on his own ability to direct and convince other departments, as well as on the support he gets from the chief executive officer (CEO). In this perspective, it is good to point out that capital management, similar to risk management, has an advisory role and functions as a co-pilot to the CEO, who ultimately makes all the decisions.

6.2 FUNCTION VERSUS DEPARTMENTAL RESPONSIBILITIES

Although this book is mainly concerned with the capital management function and not so much with the departments that are directly or indirectly responsible for managing capital, it is useful to understand the typical organizational setup of a bank or insurance company. Furthermore, it is helpful to understand how responsibilities are divided and what the typical mandate of each of the departments actually entails. Figure 6.1 focuses on those departments that play an important role in managing the balance sheet, and places them in a typical organization structure of a bank or insurance company. These departments are discussed in more detail below.

1. **The CEO** is overall responsible and accountable for everything that happens in a company. In this role, the CEO takes decisions, based on information from different departments. These different departments consider different perspectives, which need to be carefully balanced by the CEO.
2. **Capital management** is generally one of the responsibilities of the chief financial officer (CFO) and is, as such, organized as a department under the CFO. The CFO department is, in turn, a staff function to the CEO. Capital management is responsible for managing available capital in relation to required capital. It is important to note that, although capital management is an advisory role, it is also responsible for executing the decisions that are taken. For example, if it is decided that a bank wants to raise equity, this is prepared and executed by the capital management department. Furthermore, it is of interest to mention that capital management is not always organized

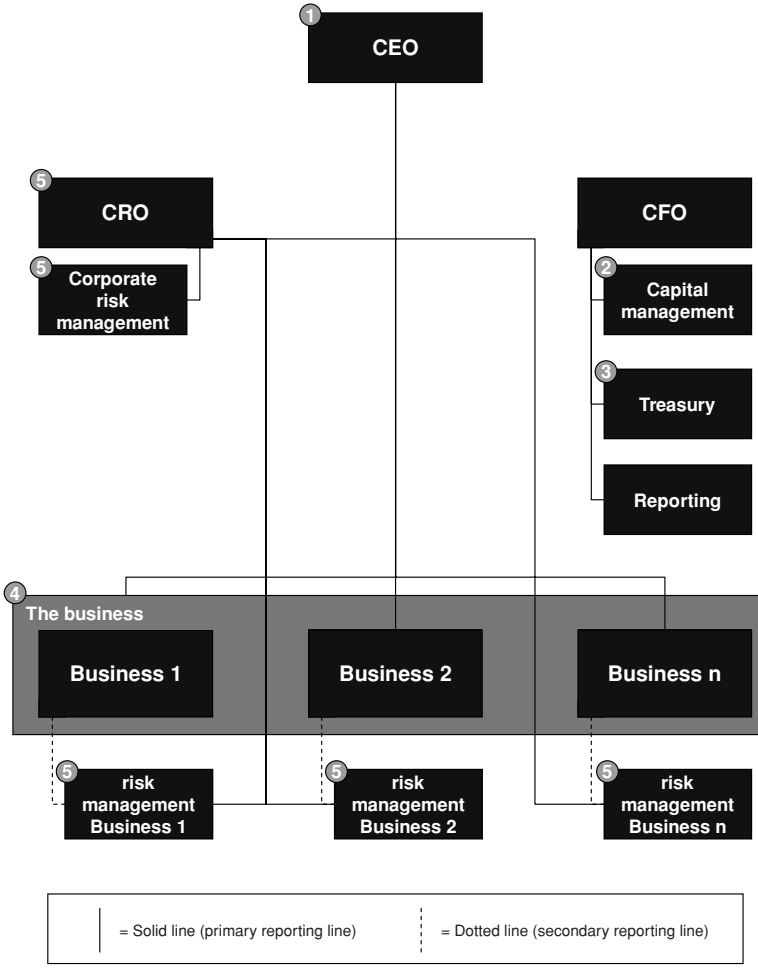

Figure 6.1 Departments involved in balance sheet management.

as a separate department, but can also form part of the treasury department, whose role is explained below.

3. **The treasury** is responsible for all the cash flows within a bank or insurance company. This means that the treasury must ensure that, if a cash payment needs to be made, the bank or insurance company has sufficient cash or can easily acquire the cash to satisfy the payment obligation. Conversely, if a cash inflow takes place, the treasury is also responsible for giving this cash a good destination. This could,

for example, mean that, if the bank or insurance company wants to hold this cash inflow in liquid securities so that it can satisfy future obligations, the treasury department buys highly liquid securities that can easily be converted into cash. In other words, treasurers need to manage the liquidity of a bank or insurance company; they also need to ensure that cash payment obligations can always be fulfilled and that cash inflow gets an appropriate destination. Because the issuance of capital (e.g. share issuance) is merely a cash inflow, capital management is sometimes seen as part of the treasury function, which is the reason that some banks or insurance companies have organized their capital management under a treasury function. Although this could be a workable model, the pitfall of this model is that it does not recognize that capital management goes far beyond liquidity management. For example, the capital position can change without any cash flows occurring (e.g. write down of assets). A change in capital position can materially affect the stability of a bank or insurance company. Hence, capital management is much more than liquidity management and, to make this transparent, it could be useful to have a capital management department that is separate from the treasury department. Apart from that, there are several different ways to organize the treasury department, the main reason being that the treasury can be seen as a profit centre or cost centre. If it is seen as a profit centre, the treasury department is expected to make a profit when managing cash inflow and outflow. This means that the treasury department has to take risks. In this case, it makes sense to organize the treasury department under the business (explained below). Alternatively, if the treasury is viewed as a cost centre, the treasury department tries to take minimal risks or only mandated risks when managing liquidity. In this case, it is more logical to place the treasury department within the responsibility of the CFO.

4. **The business** comprises all (commercial) activities that are aimed at generating earnings. This means that all business lines within a bank or insurance company, such as retail and commercial banking, form part of *the business*. The activities that are conducted in *the business* determine the structure and composition of the balance sheet and, most importantly, the associated risks. Risks need to be seen in the broadest sense possible. The liquidity risks that arise as a result of the business conducted need to be managed by the treasury department. The capital management department needs to manage

the relationship between available capital and risks taken by the business.

5. **Risk management** is a department that measures, monitors, and evaluates all risks that are being taken. This means that risk management would not only oversee the business, but also departments such as the treasury and capital management. Given a company's risk appetite, risk management generally defines the risk limits within which the company has to operate. The responsibility of risk management is to control all the risks that are being taken. However, unlike capital management, risk management does not have any executing powers as it would then run the risk of controlling and policing itself. Therefore, risk management can, similar to capital management, be seen as a co-pilot to the CEO who advises on risks management actions that should ideally be taken. Whether these actions are actually taken, ultimately depends on the CEO.

   Risk management can be organized independently as a staff function to the CEO, but is sometimes also organized under the CFO. There are pros and cons associated with both models. If risk management is organized under the CFO, this can lead to conflicts of interest, as actions can be desirable from a risk perspective, but undesirable from a finance perspective. However, if risk and finance are separate functions, this can lead to silo-thinking (i.e. risk and finance do not work together closely), which can lead to poor balance sheet management.
6. **ALCO** stands for Asset-Liability Committee and fulfils an important role in any bank or insurance company. Ideally, ALCO consists of representatives of all the above-mentioned departments and is therefore not depicted as a separate department in Figure 6.1. ALCO is generally chaired by either the CEO or the CFO. ALCO is a committee where balance sheet topics are discussed. The reason that a separate committee is charged with the task of discussing balance sheet topics is because every balance sheet decision has business, risk, and finance implications. Hence, in ALCO these business, risk, and finance perspectives – which can be in conflict – need to be aligned. For example, if a bank decides to fund itself with more long-term deposits rather than current accounts, this can be attractive from a liquidity management perspective as funding becomes more stable, but also makes the business less profitable. Hence, such a decision cannot be made in isolation, i.e. purely from a finance

perspective or purely from a business perspective; therefore, ALCO brings all these perspectives together and tries to balance them.

ALCO can only have an advisory role to the CEO or can actually have decision-making powers. Again, there are pros and cons associated with either model. If ALCO has decision-making powers, departments can try to justify underperformance by hiding against ALCO decisions. On the other hand, if ALCO does not have decision-making powers, the alignment process can become messy and intransparent, leading to suboptimal decisions.

6.3 CAPITAL HEDGING

The capital positions of banks and insurance companies with significant international operations are also exposed to currency movements. If a bank or an insurance company attracts capital in euros, but has subsidiaries in the US that need to be capitalized according to US regulations in dollars, the capital position becomes exposed to movements in the euro–dollar exchange rate. If the dollar becomes more valuable against the euro, the capital position in euros increases, whereas, if the dollar devalues against the euro, the capital position in euros deteriorates. This currency risk needs to be hedged. In other words, it cannot be the case that the consolidated solvency position of a bank or insurance company deteriorates as a result of currency movements.

Capital hedging of currency exposure can be divided into two parts:

1. *The protection of the value of an investment in the share capital of a subsidiary against currency movements.*
2. *The protection of regulatory ratios against currency movements.*

The second part is discussed in section 10.2, as it requires an in-depth understanding of regulatory ratios. The first part, the protection of the value of an investment in a subsidiary against currency movements, can in turn be hedged in two ways.

1. *Fund the investment in the same currency as the base currency of the subsidiary.* For example, this can be done by raising capital (e.g. equity and hybrids) in the same currency as the currency in which the subsidiary operates.
2. *Execute a foreign exchange hedge on the capital investment in the (foreign) subsidiary in order to translate the foreign currency exposure to the currency in which the bank or insurance company reports*

its earnings. The best way to execute this currency hedge is by shorting the foreign currency (i.e. the currency in which the subsidiary operates) and going long the domestic currency (i.e. the currency in which the bank or insurance company reports). The notional amount of this currency transaction should be equal to the amount of capital investment in the foreign subsidiary. Instead of doing an outright currency transaction, a bank or insurance company could also enter into a forward transaction. This is a transaction whereby the bank or insurance company agrees to buy its domestic currency and sell the foreign currency at an exchange rate that is determined today and at a predetermined point in the future (e.g. after one year). If the foreign currency devalues, the losses on the capital investment are offset by the forward contract, provided that the forward contract has the same notional as the amount of the capital investment in the foreign subsidiary.

6.4 EXPECTED VERSUS UNEXPECTED LOSSES

When dealing with capital, it is useful to distinguish between expected and unexpected losses. As the term suggests, expected losses are those losses that you can realistically expect (risk costs). For example, if a bank gives out 100 1-year personal loans, and experience shows that one loan will not be repaid in full, this means that, for every 1-year loan that the bank writes, it can reasonably expect a 1% loss. When pricing the loan this should be taken into account. Thus, if the bank would price a 1-year personal loan in a zero-default world with an interest rate of 5%, it has to charge 6% interest in the real world in order to make up for the expected default risk. Hence, expected losses need to be charged to the customer when pricing bank and insurance products. In contrast, unexpected losses are not (directly) priced into the products. That is where capital comes in as capital buffers for unexpected losses. So, appropriate pricing forms a buffer for expected losses and capital forms a cushion for unexpected losses. Although this is a good rule of thumb, two questions arise:

1. *For what level of unexpected losses does capital provide protection?*
2. *Are unexpected losses entirely unrelated to the pricing of products?*

To answer the first question, it is important to realize that capital cannot provide protection for *all* unexpected events, especially when these events occur all at the same time. It is virtually impossible to capitalize

on the heaviest stress as this would make financial institutions grossly inefficient. Other parts of society cannot always prepare for the worst possible scenario either. For example, a country that wants to be prepared for a flood, earthquake, and typhoon all happening at the same time, needs to be on high alert constantly and will not be productive. Another extreme comparison would be that, if a bank wants to be clear of any type of risk, it has to operate as a simple warehouse where people store money (or gold) that they can access at any time (even then there is the risk that this warehouse has too high a cost base and other operational risks). This would entail an entirely different banking system, as this would mean that banks need to have 100% of deposits readily available at any time. Ultimately this would lead to a much broader central banking trade-off question between full and fractional reserve banking that is beyond the scope of this book. However, it does show that the objective of capital at financial institutions is not to provide a cushion for *any* type of unexpected event, but for a *majority* of unexpected events. Then, what is a realistic level of confidence on which to capitalize banks and insurance companies? This ultimately depends on the risk appetite of the financial institution and its stakeholders, but banks and insurance companies are generally capitalized to withstand all impacts on capital in at least 99.5% of cases. How this is established and how reliable this is, is elaborated on in Chapters 5 and 10.

With respect to the second question, pricing is not entirely unrelated to unexpected losses. Ultimately the capital position of a bank or insurance company is based on a *plausible* quantification of unexpected losses. Every company, be it a financial or non-financial institution, has to realize a satisfactory return on capital. This return is determined by the ratio of net profit over capital position. Net profit is in turn determined by deducting operating costs and risk costs from income. Income is ultimately driven by the pricing. If the return does not exceed a certain desired threshold, a bank or insurance company has three options:

1. *Increase pricing*.
2. *Reduce operating costs*.
3. *Reduce risks in order to reduce risk costs or capital usage, through a reduction of unexpected losses, or both*.

These three options show that pricing and unexpected losses can be related when the return on capital is below a certain desired threshold, as option 1 relates to pricing and option 3 to unexpected losses.

6.5 CAPITAL VERSUS LIQUIDITY

Capital and liquidity play different roles in the functioning of banks and insurance companies. What makes the relation between capital and liquidity so difficult is that the two are linked, even though they fulfil different functions. On top of that, depending on the situation, the link can intensify. To make matters worse, the link between capital and liquidity is very different for banks than for insurance companies. For banks, liquidity is much more of a concern than capital. Banks have an unstable liquidity position in the sense that they have very liquid liabilities that can easily be withdrawn, and very illiquid assets, which means that a bank is prone to liquidity shocks. Hence, the risk of a fragile capital position for banks is not so much the capital position itself, but the fact that it can trigger a liquidity shock (e.g. large customer withdrawals). Therefore, for banks, a good capital position is mainly in support of a stable liquidity position. For insurance companies the exact opposite holds. Insurance companies have a favourable liquidity position. This is inherent to the business that insurance companies conduct. So, for insurance companies, the liquidity position can actually support the capital position; that is, insurance companies can use their favourable liquidity position to take more risks with respect to their capital position.

6.6 FUNDS TRANSFER PRICE

The funds transfer price (FTP) is a crucial mechanism that is controlled by the treasury department and/or ALCO. It basically specifies the rate of interest at which money can be lent and at which money can be borrowed internally. Ultimately, the FTP mechanism is also a way to allocate profitability between liability-driven businesses such as deposit collection, and asset-driven businesses such as lending, as illustrated by the following example.

If a certain business A sells deposits and pays customers an interest compensation of 2%, which can be stalled at the treasury at 3%, the FTP recognizes a profit of 1% to all deposits sold by business A. These deposits can subsequently be used for lending purposes by business B. The FTP that is charged to business B by the treasury for using the deposits is 3.5%. Hence, the treasury makes a profit of 0.5% on all internal lending and borrowing. If business B writes loans at 4%, the FTP implicitly recognizes a profit of 0.5% to all loans written by business B.

In the above example, the FTP is different for depositing money at the treasury (3%) and lending money from the treasury (3.5%). Basically, the treasury is charging a spread for its services. This is not always the case, as some treasury departments lend and borrow internally at (more or less) the same level of interest. However, by using different FTP levels, a bank or insurance company,[2] can ensure a minimum level of profitability. On top of that, an FTP mechanism is a powerful tool with which to manage the balance sheet and direct the different businesses within a financial institution. If a bank decreases the FTP, the lending business can lower its rate and still keep the same margin and, hence, it becomes more competitive and loan volumes can increase. In this case, deposit-taking businesses would need to lower the rate they pay to customers in order to keep the same margin. This would make the bank less competitive for depositors and would likely result in less deposit growth or even deposit outflow. Lowering the FTP can be very effective for a bank whose deposit base is growing too rapidly. A lower FTP will result in lower deposit rates and will therefore slow the growth of deposits.

6.7 CORPORATE LINE

Many financial conglomerates operate with a variety of business units. This can often blur the way that capital management is conducted and how the performance of individual business units is assessed and subsequently managed. The reason being that, at corporate level, capital is managed on a consolidated level, but the individual business units generally get capital allocated to them. On top of that, if the business unit is an actual subsidiary, there are even regulatory requirements that require the business unit to hold capital itself rather than at corporate level. This means that capital that is attracted at corporate level needs to be passed on (injected) to the business units. Hence, the business units themselves need to diligently invest capital, similar to the manner in which this is explained in section 16.1. Generally the group (i.e. corporate level) has a certain policy for the investment of capital with which the individual business units need to comply.

As mentioned, capital is attracted at corporate level which is subsequently passed on to the individual businesses. This means that at corporate level there can also be profits and losses, which are booked

[2] The FTP mechanism is more common for banks than for insurance companies.

against the so-called corporate line. Three types of costs and income determine the P&L of the corporate line:

1. *Costs associated with capital.* If, at corporate level, capital is raised, this can have a certain cost attached to it. Equity capital can have a dividend cost and hybrid capital (subordinated debt) has a certain coupon attached to it. These are costs for the corporate line.
2. *Income from the business units.* This income comprises, in turn, two components:
   (a) *Dividend upstreams from the business units.* If the business units make money and decide to pay a dividend to their shareholders (in this case the group, i.e. corporate level), this is booked as income on the corporate line. Typically, the upstream of dividends from the business units to the group are subsequently passed on the shareholders of the group.
   (b) *Internal charges from the corporate line to the business units.* Some costs that are incurred by the corporate line are charged to the business. One can think of the coupon payments that need to be made on hybrids. A much more difficult topic is the way in which equity capital is charged to the business. In principle, one would say that the corporate line should not impose a capital charge on equity capital, because equity is fully risk-bearing capital and it is at the discretion of the business unit to pay a dividend to the corporate line. However, because, from a performance management perspective, business units are assessed on the return they generate on economic capital (see Chapter 18), rather than return on available capital, the P&L of the business unit should only take into account the income that is generated on economic capital and not on available capital. Because business units invest their capital at the risk-free rate (see section 16.1), they receive risk-free income on their entire available capital that has been injected by the group. This means that, if a business unit operates with an economic capital that is much lower than the available capital, this business unit has free income equal to the risk-free rate on the difference between available capital that has been supplied by the group and its economic capital. Because, the business unit is assessed on its return on economic capital, this free income should be deducted in order to make a fair assessment. Hence, for equity capital, the corporate line charges business units the risk-free rate on the difference between available

and economic capital. This also provides[3] an incentive for business units to utilize their entire available capital, and, if they cannot do this, to reduce their amount of available capital to enable it to be used to finance growth in other parts of the group. How this works exactly is elaborated on in Chapter 18.

3. *Costs over which the business units do not have any management control and can therefore not be passed on to the business units.* These costs are incurred by the group as they concern the running of the company as whole. One can, for example, think of corporate restructuring.

[3] Or at least businesses do not get an incentive to operate with much more available capital than economic capital.

7

Accounting versus Regulation

Capital regulation depends on accounting standards. Due to the credit crisis, the international accounting standards, also referred to as International Financial Reporting Standards (IFRS), are currently under review and are therefore subject to change. The main reason that these accounting standards will be changed is because they work procyclically[1] and introduce balance sheet asymmetry. This means that liabilities have a different accounting treatment than assets. Nevertheless, one can broadly say that capital regulation uses IFRS equity as a basis and applies appropriate adjustments. Therefore, it is important to understand what drives and comprises IFRS equity. Roughly, one can say that IFRS equity has three components:

1. *Share capital.* This is the total amount of capital that was raised through share issuances. Share capital has two components, which are explained in more detail in section 9.1:
   (a) *Nominal share capital* is the nominal value of each share times the number of shares outstanding.
   (b) *Share premium account* quantifies the premium to nominal value at which shares have been issued.
2. *Retained earnings.* The aggregate of periodic (quarterly or (semi)-annually) net profit and loss additions makes up the retained earnings component of IFRS equity. Hence, it is crucial to understand what drives a profit and loss (P&L) statement for banks and insurance companies. Although it is beyond the scope of this book to discuss the profit and loss statement in detail, relevant components are discussed when necessary (e.g. loan–loss provisions[2] for banks and DAC unlocking for insurance companies). Also, profit and loss statements are heavily dependent on the accounting treatment or classification of the assets and liabilities that a financial institution holds on its

[1] This means that accounting standards tend to amplify boom periods and exacerbate periods of gloom.

[2] Loan-loss provisions are charged to the P&L and reflect the expected losses on a loan portfolio. These provisions are based on a fundamental credit analysis of the loan portfolio.

balance sheet. The different accounting categories, although subject to change, are specified in Appendix A. One can roughly say that there are two types of accounting treatments for assets and liabilities, namely:

- *Fair value through P&L* (FV). This is the most straightforward category where every change in market value is directly reflected in the P&L statement.
- *Held to maturity* (HTM). This is the exact opposite to FV as assets or liabilities in this category would never have an impact on the P&L statement, unless a fundamental value analysis of the underlying shows that the value has changed materially. In this case, an impairment is taken as a loss through the P&L to reflect the reduction in value.

3. *Revaluation reserves.* These reserves are caused by market value changes of assets that follow an accounting treatment called *available for sale* (AFS). This accounting classification is a hybrid between FV and HTM, but will likely be abolished as a result of the new accounting standards. Market value changes of AFS assets do not go straight through the P&L, but are reflected in the so-called revaluation reserve component of IFRS equity.

The above components of IFRS equity form the basis of any capital regulation. However, capital regulation adds and deducts other elements to better align the regulation with the rationale behind capital.

Part II
Regulatory Perspective

In order to manage capital at financial institutions, one needs to be fully familiar with the capital regulation. Capital regulation can be divided into two sub-regulations:

1. *Capital definitions.* This regulation specifies which items can be considered available capital. In other words, it specifies the eligible capital components.
2. *Capital requirements.* The regulation concerning capital requirements specifies the amount of capital a financial institution needs to hold.

Part II explains the capital definitions (Chapter 8) and capital requirements (Chapter 10) for banks and insurance companies in more detail. In order to link capital definitions to the real world, Chapter 9 explains the capital instruments that can be distinguished. In light of the credit crisis, Part II also discusses the potential changes to capital definitions (Chapter 11).

After the regulatory aspects have been discussed, Part II deals with diversification benefits and how they can be materialized through capital structures (Chapter 13), risk optimization (Chapter 14), and balance sheet analysis (Chapter 15).

8

Types of Available Capital

Regulators distinguish between different types of capital, depending on the quality of the specific capital component. The regulatory capital components are a bit more granular for banks than for insurance companies. However, they are converging. Especially with Solvency II[1] coming into force, the regulatory requirements and methodologies for banks and insurance companies will become similar.

In light of the credit crisis, regulation with respect to capital is subject to much debate and is therefore subject to change. This chapter explains the current capital regulation. Chapter 11 pinpoints the shortcomings in the current capital regulation and discusses where changes are to be expected.

8.1 BANK CAPITAL COMPONENTS

Figure 8.1 summarizes the different regulatory capital components with their specific features for banks.[2,3] Regulatory capital is divided into two overarching buckets: depending on its quality, capital can be qualified as either Tier 1 or Tier 2.[4] Tier 1 can be subdivided into three types of capital components, namely (in decreasing order of quality), "core capital", non-innovative, and innovative hybrid capital. Tier 2 capital can be subdivided into upper and lower Tier 2. There is a clear rationale behind the tiering of capital in terms of quality. From a business and regulatory perspective the quality of capital is determined by four tests:

1. *Permanence.* Can the bank rely on the capital component and what is the term?

[1] This project establishes a new approach to regulatory capital for insurance companies.

[2] Bank capital regulation can differ per country as it is not harmonized globally.

[3] This is a high-level overview based on European practices. Although capital regulation is not harmonized globally, different systems are generally based on similar principles, which are displayed in Figure 8.1.

[4] Currently, yet another capital bucket is distinguished, namely Tier 3 capital. Tier 3 capital comprises subordinated short-dated debt with an original maturity of over 2 years. Tier 3 capital can be used to buffer against market risks. However, Tier 3 capital is not widely used and will probably be abolished.

Type of capital		Components / features	Deductions	Limits
Tier 1	Core	• Issued and fully paid common stock • Share premium accounts • Non-redeemable and non-cumulative preference shares • Reserves (e.g. retained earnings, revaluation reserves) • Negative components of revaluation reserve 'available for sale' (AFS) of interest-bearing securities are added back (prudential filter) • Interim profits • Minority interests	• All positive revaluation reserves • Intangible assets (e.g. goodwill) • Treasury stock plus derivatives on own stocks • Adjustments own credit worthiness • Interim losses • Announced dividend payments • Cash flow hedge reserves	≥50% of Tier 1
	Non-innovative hybrid	• Perpetual • Non-cumulative • No incentive to redeem		
	Innovative hybrid	• Perpetual • Non-cumulative • Incentive to redeem	• 50% of the negative difference between impairments plus provisions and expected credit losses	≤15% of Tier 1
Tier 2	Upper	• Positive revaluation reserves, excluding those related to hedge differences and interest-bearing securities • Cumulative perpetual subordinated debt and pref shares • Positive difference between impairments plus provisions and expected credit losses (max 0.6% of credit RWA) • Tier 1 hybrids outside limit		Total Tier 2 ≤100% of Tier 1
	Lower	• Dated subordinated cumulative debt and preference shares (original maturity ≥5 years) • Claims on members (in case of cooperative banks)	• 50% of the negative difference between impairments plus provisions and expected credit losses	Lower Tier 2 ≤50% of Tier 1

Figure 8.1 Bank capital composition.

2. *Loss absorption.* To what extent can the principal of the capital component absorb losses in a going concern?
3. *Subordination.* How subordinated is the claim of the capital component and can the capital component absorb losses in a gone concern situation?
4. *Discretion over payouts.* Does the issuing institution have discretion over payouts related to the capital component?

The first test is to establish how long a financial institution can rely on the capital component. The longer the term of the capital component, the longer can the financial institution rely on it and, hence, the higher the quality. Fully paid common stock is the highest form of capital as the term is indefinite or perpetual. Dated subordinated debt is of lower quality as the financial institution can only rely on it for the term of the debt.

With respect to the second test, the more the principal (original investment) of the capital component can absorb losses in a going concern, the higher the quality and therefore the higher the tier. For example, fully paid common stock is the highest quality as all losses are fully absorbed (as soon as they occur) by the principal of this capital component. Losses are actually written off at the expense of the shareholders as it reduces their claim on the company. In contrast, the principal of subordinated debt does not absorb any losses in a going concern[5] as corporate losses cannot be written off against it. This means that, regardless of the extent of corporate losses, the issuing institution continues to have a liability towards subordinated debt holders to the whole of the principal amount.

Subordination refers to the order of priority of payment obligations. The more subordinated a capital component, the less priority it has when fulfilling payment obligations, and the higher the quality. If a capital component is very subordinated, it can effectively absorb losses in a gone concern situation. Indeed, if a bank is bankrupt and has to be liquidated, the claims of subordinated creditors have lower priority and can therefore absorb losses for less subordinated creditors. Again, fully paid common stock has the highest subordination and thus scores high on this test. However, highly subordinated debt also scores highly on this test as the only creditors that are more subordinated are common shareholders.

[5] In a gone concern, subordinated debt does have the potential to absorb losses as it is the penultimate subordinated capital component, just before shareholders, to receive anything in liquidation.

The fourth test assesses how much discretion the issuing institution has over payouts related to the capital component. For example, the issuing institution has full discretion when deciding the payout of dividends on common stock. In other words, it is entirely up to the institution whether it pays a dividend or not. When it comes to subordinated debt, the amount of discretion the issuing institution has over the payout of coupons depends on the specific contract clauses. One can distinguish between two subordinated debt categories, namely cumulative and non-cumulative. With respect to cumulative subordinated debt, if a coupon is not paid on this instrument, the payment has to be fulfilled at some time in the future; in other words, it is possible to defer a coupon payment, but it has to be paid at a later stage. On the other hand, a cancelled coupon on a non-cumulative subordinated debt instrument is forgone completely; in other words, once a coupon is cancelled on a non-cumulative subordinated debt instrument, the issuing institution is cleared from this coupon obligation. In general, skipping a coupon on subordinated debt requires that the issuing institution makes no payouts on more subordinated capital instruments, such as common stock. Although cumulative subordinated debt carries a *hard* coupon obligation, it does allow the shift of capital reductions, due to coupon payments, to the future. From a timing perspective it does therefore have advantages, as it can improve the capital position temporarily. The principal of subordinated debt might not have the potential to absorb losses in a going concern, but non-cumulative subordinated debt does have the potential to absorb some losses indefinitely, as skipped coupon payments can actually be forgone completely.

In order to get a better understanding of the individual regulatory capital components, each is discussed in more detail below.

8.1.1 Core Capital

In principle, core capital is equivalent to shareholders' equity or IFRS equity with the exclusion of all positive revaluation reserves and negative revaluation reserves related to interest-bearing securities. Thus, all positive revaluation reserves are deducted from IFRS equity, and negative revaluation reserves related to interest-bearing securities are added back to IFRS equity in order to get to core capital. Basically, for regulatory purposes, core capital does not take any of the revaluation reserves into account except for the negative ones related to non-interest-bearing securities. The revaluation reserves (positive and negative) related to

interest-bearing securities are filtered out, which is referred to as the *prudential filter*, and the positive revaluation reserves related to non-interest-bearing securities are also excluded for the purpose of core capital, but are recognized in upper Tier 2. This is exactly what Figure 8.1 summarizes, but also spells out all the components of IFRS equity. For readers who are familiar with IFRS accounting, Figure 8.1 can be slightly convoluted. Nevertheless, it is useful to spell out the inclusions and deductions of core capital as it provides insight into those IFRS components that are viewed as fully loss-absorbing and perpetual by the regulator, and those that are not. Figure 8.1 therefore divides core capital into components and items that need to be deducted in order to come to a definition of core capital. Let us first look at the components in more detail and then at the items that need to be deducted in order to get to core capital.

The components of core capital comprise issued and fully paid share capital[6] (including non-redeemable and non-cumulative preference shares[7]), retained earnings, revaluation reserves of which the negative components related to interest-bearing securities are filtered out (i.e. added back), other reserves, and minority interests. Minority interests, which are included in core capital, are interests from third parties in partially owned, but fully consolidated subsidiaries. In other words, a minority interest belongs to other investors and really represents the claim other investors have on the bank. It is therefore logical that, from an accounting point of view, minority interests are presented at the liability side of the balance sheet. Indeed, it is a claim, and it is the only way to make the two sides of the balance sheet match (assets are fully consolidated and, therefore, so must liabilities). The reason that minority interests can be considered core capital is because they are fully loss absorbing and perpetual capital for the partially owned subsidiary of the bank. However, in the revised capital regulation it is expected that there will be limits on the inclusion of minority interests. This seems reasonable as, although minority interest capital is fully capable of absorbing losses in the subsidiary to which it relates, it does not offer

[6] Defined as issued and fully paid common stock plus share premiums. Share premium accounts arise because the subscription price of a share issuance is typically far in excess of the nominal value of the shares. In other words, the share premium is defined as the difference between the subscription price and the nominal value of the shares.

[7] Although non-redeemable and non-cumulative preference shares are, currently, still part of core Tier 1 capital, they are seen by some regulators as hybrids, and hence affect the regulatory limits.

the potential to absorb losses elsewhere in the bank. In other words, a minority interest only acts as fully loss-absorbing capital if losses arise in the subsidiary, but not if losses arise elsewhere in the bank.

From the components of core capital, several deductions need to be made in order to really carve out that part of core capital that is fully loss absorbing and perpetual (see Figure 8.1). This means that intangible assets such as goodwill are deducted.[8] Indeed, if intangible assets never turn into actual assets they ultimately bring down the total available capital that can absorb losses. Furthermore, all positive revaluation reserves, be it related to non-interest-bearing securities (e.g. equities) or interest-bearing securities, are also deducted. Because negative revaluation reserves related to interest-bearing securities are added back, this means that net only negative revaluation reserves related to non-interest-bearing securities (e.g. equities, commodities) are taken into account for regulatory core capital purposes. All other revaluation reserves are filtered out of core capital. The reason being that non-interest-bearing securities (e.g. equities) have a perpetual nature and therefore the difference in market value (compared to initial purchase price) best reflects the loss that has to be taken, which reduces core capital. The reason that negative revaluation reserves of interest-bearing securities are not taken into account in the definition of core capital (they are added back) is because, in this case, the market value is not necessarily a good proxy for the potential loss. Indeed, only when a default (i.e. non-payment of either coupon or principal) occurs[9] does the holder of an interest-bearing security suffer a loss.

Apart from the above deductions, there is another important deduction, namely adjustments to own creditworthiness. When a financial institution marks-to-market its liabilities, the market value changes of own-issued debt can affect the capital position positively. Indeed, when the creditworthiness of a financial institution is reduced, the market value of its own-originated debt goes down. On a balance sheet where the liabilities are fully marked-to-market, this affects the capital position positively as, on a market value basis, the financial institution owes less to the purchasers of its debt. However, this positive impact is not loss absorbing and therefore an adjustment has to be made in core capital

[8] Deferred tax assets are, in principle, not deducted in most jurisdictions, but in light of the credit crisis this might be adjusted. One could, for example, imagine that deferred tax assets can only make up a percentage of the total core Tier 1 capital, e.g. 10%.

[9] Or when the security is sold below par.

calculations.[10] Furthermore, there are adjustments for announced dividend payments, interim losses and cash flow hedge differences. One final adjustment is made with respect to investments in own shares (treasury stock). This also seems fair because, by purchasing its own shares, the financial institution shifts the loss-absorbing factor from a third party back to itself.

8.1.2 Non-innovative Hybrid Capital

Hybrid capital has both equity-like features as well as debt-like features. The perpetual nature of hybrids (i.e. it is perpetual debt that does not have a specific maturity on which the principal is repaid) can be seen as an equity feature. Otherwise, a hybrid works exactly as non-cumulative[11] subordinated debt. In other words, the financial institution continues to have a liability towards the hybrid holder for the principal amount, whereas a shareholder has swapped his right to get back his principal for a claim on the future profits of the financial institution. A hybrid represents a liability from the financial institution towards the holder, but has never to be fulfilled as it is perpetual (just like a share). Although a hybrid holder does not have a claim on the future profits, it does receive a periodic coupon payment. This coupon payment is typically tax deductible for the issuing company, which can therefore pay a more attractive coupon. However, in certain circumstances (e.g. no profit for that period, breach of regulatory ratios), the financial institution has discretion over whether it pays a coupon or not. If, because these hybrids are non-cumulative, the financial institution decides not to pay the coupon, the coupon payment obligation is actually forgone entirely. Obviously, non-innovative hybrid capital is subordinated debt, which means that, in winding up (i.e. bankruptcy), these hybrid holders rank second to last (just before shareholders) when it comes to satisfying (part) of their claim.

These non-innovative hybrids are barely loss-absorbing in a going concern.[12] Indeed, the only aspect that makes them loss-absorbing in a going concern is the potential to forgo a coupon payment. In other

[10] A financial institution can materialize this positive effect on its core capital by actually repurchasing its own debt. This is discussed in section 20.5.

[11] There are also ways to effectively structure hybrids as cumulative, through, for example, the alternative coupon satisfaction mechanism. This is discussed in Chapter 9.

[12] They can be loss absorbing in the sense that their value generally decreases if a bank suffers losses and can thus be bought back at a discount by the issuing bank. This discount at which the

words, losses cannot be written off at the expense of the principal of the hybrid, but only at the expense of the coupon amount. This is a significant difference compared to shares, where a loss directly reduces the claim of the shareholder. Hence, losses are written off at the expense of shareholders and only at the expense of hybrid holders where it concerns the coupon amount (i.e. in a going concern, the principal amount of hybrid holders is not at risk). In a gone concern (i.e. in winding up), hybrids are obviously loss absorbing as the principal they originally put in will be used to satisfy claims of creditors that are less subordinate than hybrid holders (basically all creditors except shareholders).

8.1.3 Innovative Hybrid Capital

Innovative hybrid capital is equivalent to non-innovative hybrid capital in all aspects, except that innovative hybrid capital has an incentive to redeem. In other words, the issuing financial institution has an incentive to redeem the innovative hybrid capital instrument because of, for example, a step-up in the coupon after 10 years.[13] This means that the issuing institution has a call option to redeem the hybrids and, if it chooses not to exercise this right, it is penalized as the institution will be forced to pay a higher coupon.

There is also one deduction when dealing with total Tier 1 capital. This deduction relates to 50% of the negative difference between impairments plus provisions and expected credit losses. That is, if the expected credit losses are greater than the sum of impairments and provisions, half of this difference needs to be deducted from Tier 1. The other half of this difference, if negative, should be deducted from Tier 2. Hence this is a 50–50 deduction from Tier 1 and Tier 2. This deduction is not part of the limit structure. In other words, first the limits are established (e.g. core Tier 1 need to be at least 50% of Tier 1) and then this difference, if negative, is for 50% deducted from Tier 1 capital.

8.1.4 Upper Tier 2

This capital component mainly comprises perpetual, but cumulative, debt or preference shares and positive revaluation reserves caused by

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hybrids are repurchased is recognized as a profit and increases core capital. However, a bank can only buy back hybrid instruments if it has sufficient capital.

[13] Such a step-up is only allowed after the hybrid security has been available for at least 10 years.

non-interest-bearing securities (e.g. equities, commodities). Furthermore, if the total amount of Tier 1 hybrids is greater than the amount of core capital, this 'excess' automatically becomes upper Tier 2 (even though the hybrid characteristics would qualify as Tier 1). Indeed, this is simply because one of the limits is breached. The last aspect of upper Tier 2 is the positive difference between impairments plus provisions and expected credit losses. This is quite a logical adjustment as the impairments plus provisions should really quantify the expected credit losses. However, regulation does set a limit as to this positive difference that can be considered upper Tier 2 capital, namely 0.6% of credit-related risk-weighted assets (RWAs).[14]

8.1.5 Lower Tier 2

This capital component is of the lowest quality and comprises primarily dated (at least 5 years) cumulative subordinated debt.

If the difference between impairments plus provisions and expected credit losses is negative, 50% is deducted from Tier 1 and 50% is deducted from Tier 2. Although, in Figure 8.1, this deduction was presented in the lower Tier 2 bucket, it is really a total Tier 2 deduction. It also means that this deduction is not part of the limit structure.

8.1.6 Summary

The above describes the different capital components. Figure 8.1 also specifies the associated limits for each of the capital components. The amount of core capital can be infinite, but it must be at least 50% of Tier 1 capital. This automatically means that Tier 1 hybrid capital can be at most 50% of Tier 1.[15] An additional restriction is that innovative hybrid capital (i.e. perpetual non-cumulative subordinated debt with an incentive to redeem) can only be 15% of Tier 1. Total Tier 2 can be no larger than total Tier 1. On top of that, lower Tier 2 must be less than 50% of Tier 1. The above limits imply that a significant portion of total capital needs to be core capital (at least 25%). In other words, the more

[14] Risk-weighted assets is a regulatory definition and is determined by the summation of the nominal amount of each asset class multiplied by its regulatory defined risk weight. This is elaborated on in Chapter 10.

[15] Some regulators do not allow hybrid capital to be more than 25% of Tier 1. On top of that, some regulators also include non-cumulative and non-redeemable preference shares in determining the percentage of hybrid capital, and relate it to the formal regulatory limit of 50% of Tier 1 or a (discretionary) more stringent limit of, for example, 25% of Tier 1.

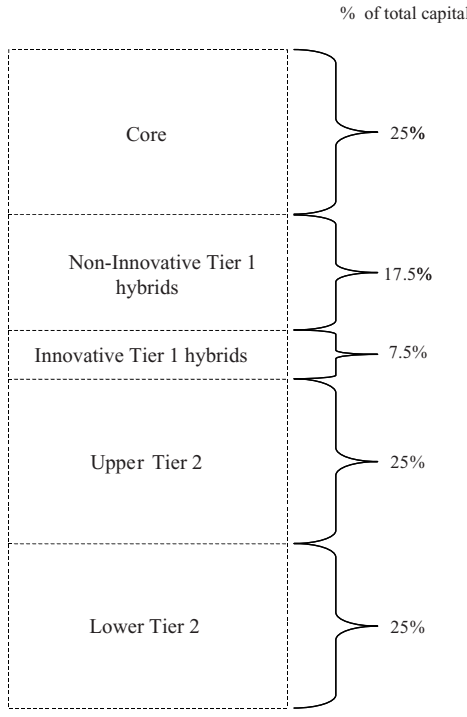

Figure 8.2 Capital breakdown for a bank that stretches each capital component to its limit.

core capital a bank holds, the more capital can qualify as hybrid Tier 1 and Tier 2 capital. Figure 8.2 shows the breakdown of the total capital position of a bank in case it stretches each capital component to its limit. Alternatively, Figure 8.2 depicts the capital composition of a bank that tries to have as much low-quality capital as possible. In practice a bank would never be exactly capitalized to the regulatory limits. Typically, banks have much more core capital than the 25% limit; in fact, very often regulators or rating agencies force banks to hold at least 75% of Tier 1 as core capital, which means that at least 37.5% of the total capital position comprises core capital. In future, core capital as a minimum percentage of total capital will very likely need to be greater. The potential changes in capital regulation are discussed in Chapter 11.

8.2 INSURANCE CAPITAL COMPONENTS

For insurance companies, the regulatory capital components are currently a bit less granular than for banks. In fact, for insurance companies

the regulator only distinguishes two components. Although there are no specific terms attached to the two components, for clarification purposes they are referred to as *core capital* and *hybrid capital*.

8.2.1 Core Capital

This capital component is similar to the definition used for banks and currently still includes non-cumulative and non-redeemable preference shares. However, there is one important difference, namely that all revaluation reserves are taken into account when determining core capital for an insurance company. This means that positive revaluation reserves (including revaluation reserves resulting from interest-bearing securities) affect the core capital of an insurance company positively, and negative revaluation reserves (including those generated by interest-bearing securities) affect the core capital of an insurance company negatively. This contrasts with bank capital regulation, where only the negative effects of non-interest-bearing securities are taken into account for core capital, and upper Tier 2 bank capital only looks at the positive revaluation reserves caused by non-interest-bearing securities. In other words, revaluation reserves caused by interest-bearing securities are not taken into account for bank capital (this is referred to as a prudential filter), whereas they are taken into account to determine the capital position of an insurance company.

8.2.2 Hybrid Capital

This category simply comprises cumulative preference shares[16] and any other subordinated debt with a maturity of at least 5 years.

8.2.3 Limits and Supplementary Capital Components

On top of the above-mentioned insurance capital components, an insurance company can ask for approval from the regulator to also take a potential overestimation of the technical provisions into account. In other words, if technical provisions are based on overly prudent mortality, morbidity, and lapse assumptions, the liability towards policy holders is smaller than what is being accounted for on the balance sheet

[16] Non-cumulative and non-redeemable preference shares are, as is the case for banks, part of core capital.

of the insurance company. If the (expected) claim from policy holders reduces, this positively affects the capital position of the insurance company. In Chapter 12 this phenomenon is elaborated on.

The capital limits for insurance companies are more straightforward than for banks. For insurance companies, core capital needs to make up at least 50% of total capital. In fact, non-core capital or hybrid capital can only be 50% of total available capital or 50% of required capital (see Chapter 10), whichever is less.

8.3 DETERMINATION OF AVAILABLE CAPITAL FOR INSURANCE COMPANIES UNDER SOLVENCY II

At the end of 2012 a new regulatory framework for insurance companies will come into force, namely Solvency II.[17] Pillar I of Solvency II defines the eligible capital components. Although the capital definitions under Solvency II have by no means been finalized, this section describes the current thinking on this subject. However, two things seem clear. The capital definitions for insurance companies will converge to the definitions used for banks (although significant differences remain) and the capital definitions will increasingly rely on market values. This section describes the general capital definitions for insurance companies, but does not discuss the regulatory filters (e.g. deduction of goodwill) that will apply (because they are still being discussed internationally). Under Solvency II, available capital or *own funds* comprise *basic own funds* and *ancillary own funds*.[18] Basic own funds consist of the following items:

(1) the excess of assets over liabilities on a market value basis (this is basically used to define common equity for regulatory purposes);
(2) subordinated liabilities.

Ancillary own funds comprise capital items, other than basic own funds, that can be called up to absorb losses. Generally, these items have not yet been paid-up, but once they are called up, they can absorb losses. One can, for example, think about *unpaid share capital that has not been called up*.

[17] This section is based on Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

[18] See articles 87, 88 and 89 of Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

Similar to bank regulation, Solvency II will tier available capital components according to their quality. In order to determine the tier of a capital component, Solvency II defines two quality characteristics and four features that shall be given due consideration in the assessment of these characteristics.[19] The characteristics are defined as:

(1) *full loss-absorption in a going concern as well as in winding up*;
(2) *in winding up, the total amount is available to absorb losses and repayment only occurs when all other creditor obligations are fulfilled (subordination).*

The four features that should be given due consideration in the assessment of the characteristics are (the more confirmative the answers, the better the quality):

1. *is the capital item undated?*
2. *does the capital item have no incentives to redeem?*
3. *is the capital item free from mandatory fixed servicing charges (e.g. fixed coupons)?*
4. *is the capital item clear of encumbrances?*

Based on the characteristics and the features, basic own funds and ancillary funds can be classified into tiers[20]:

1. **Basic own fund** items that substantially possess both characteristics and for which the feature questions can be answered confirmatively are classified as Tier 1.
2. **Basic own fund** items that substantially possess the second characteristic and for which the feature questions can be answered confirmatively are classified as Tier 2.
3. **Ancillary own fund** items that substantially possess both characteristics and for which the feature questions can be answered confirmatively are classified as Tier 2.
4. **Basic own fund** and **ancillary own fund** items that do not satisfy one of the three categories above are classified as Tier 3.

[19] See article 93 of Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

[20] See article 94 of Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

The tiering of capital items under Solvency II is summarized in Figure 8.3. To get a better feel for the way in which the tiering of capital items is determined under Solvency II, let us try to determine the tier for non-redeemable and non-cumulative preference shares. Non-redeemable and non-cumulative preference shares are basic own fund items that do not possess characteristic (1), as they do not have full loss-absorbing capacity in a going concern. They do possess characteristic (2)

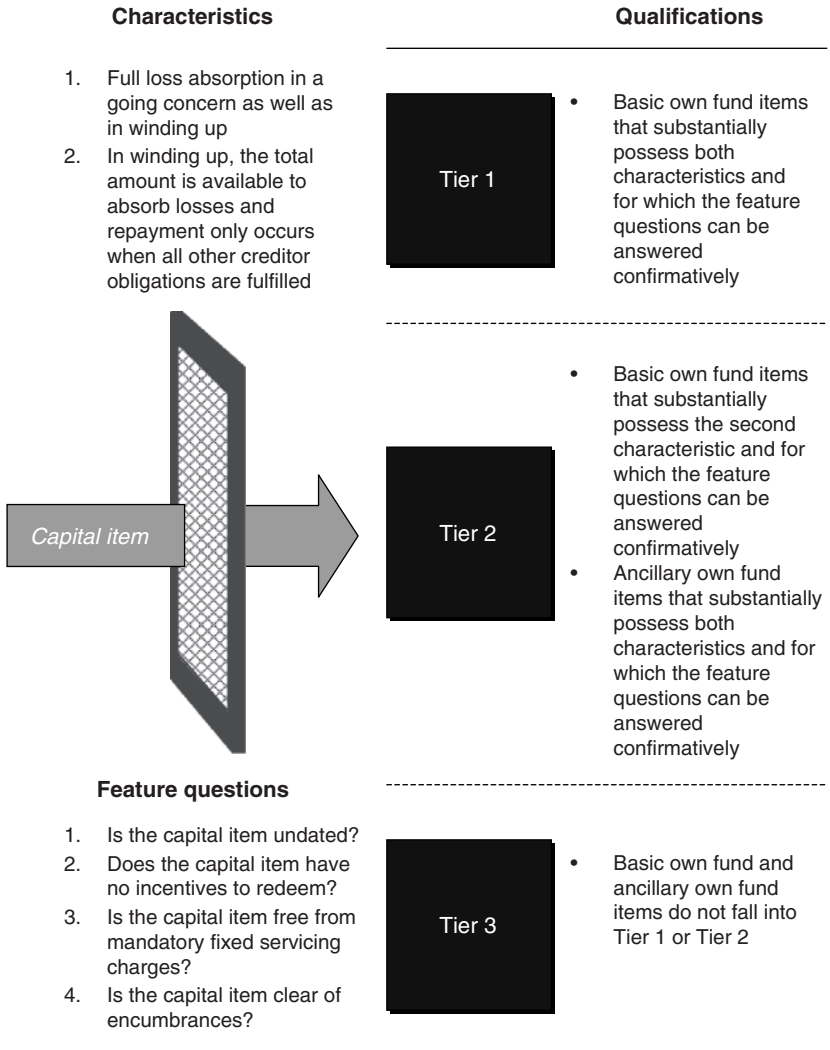

Figure 8.3 Tiering of capital items under Solvency II.

and, for non-redeemable and non-cumulative preference shares, the feature questions can be answered confirmatively. Hence, non-redeemable and non-cumulative preference shares will likely be classified as Tier 2 capital under Solvency II. Since perpetual and non-cumulative hybrids will likely also be classified as Tier 2, and since hybrids have the added advantage that the interest expense is tax deductible whereas dividends on preference shares are generally not tax deductible, issuing hybrids will be a more attractive way to attract capital under Solvency II than issuing preference shares. This is summarized in Figure 8.4. Similar to capital regulation for banks, there are specific limits associated with the eligibility of own funds. However, this is where bank and insurance capital regulations differ. Indeed, the insurance capital regulation makes the limit setting of own funds dependent on whether it is used to cover SCR or MCR.[21] SCR and MCR stand for Solvency Capital Requirement and Minimum Capital Requirement, respectively, and are discussed in section 10.5. SCR is a 'soft' target capital requirement that an insurance company should really fulfil and is calibrated on a 99.5% confidence level, whereas MCR is a hard capital requirement that should be fulfilled at all times and is calibrated on a 85% confidence level. An insurance company can use Tier 1, Tier 2 and Tier 3 capital items to cover SCR. The technical specifications of the fourth quantitative impact study specify that Tier 1 items need to make up at least one-third of the total amount of eligible own funds and Tier 3 items can be no more than one-third of eligible own funds. In the latest technical specifications of the fifth quantitative impact study, Tier 1 items need to make up at least 50% of the SCR and Tier 3 items need to be less than 15% of the SCR. When it comes to MCR, an insurance company can only use Tier 1 and Tier 2 own funds items to cover MCR. The fourth quantitative impact study specifies that Tier 1 needs to be at least half of the MCR. Hence, up to 50% of the MCR can be met with Tier 2 items. However, in the fifth quantitative impact study, Tier 2 items can only be used to satisfy up to a maximum of 20% of the MCR. Thus, in this case, a minimum of 80% needs to be satisfied with Tier 1 items. The above shows that the exact limit setting is still under debate. Figure 8.5 displays the limit setting graphically as specified by the technical specifications of the fourth quantitative impact study.

[21] See article 98 of Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

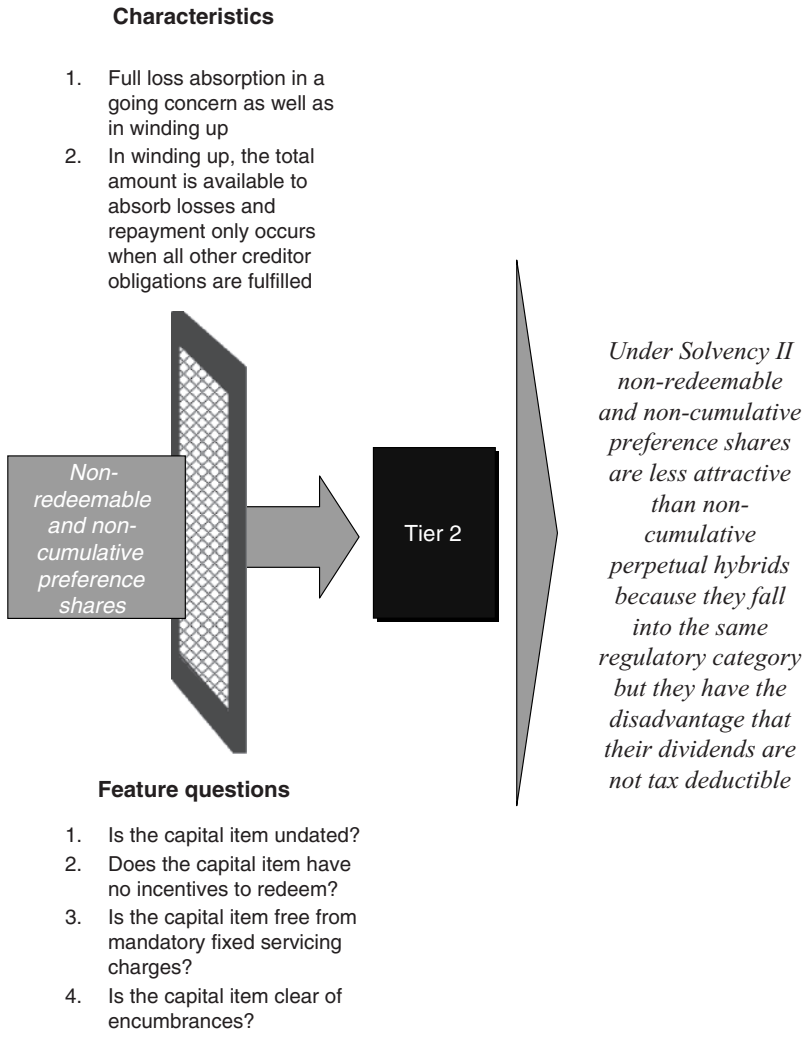

Figure 8.4 Preference share tiering under Solvency II.

8.4 CAPITAL TREATMENT OF DATED HYBRIDS

In the previous paragraphs it was shown that dated subordinated debt (i.e. debt with a certain maturity) can also be classified as capital, albeit of a lower quality (e.g. lower Tier 2 for banks). However, once the maturity of such a dated subordinated hybrid becomes less than 5 years,

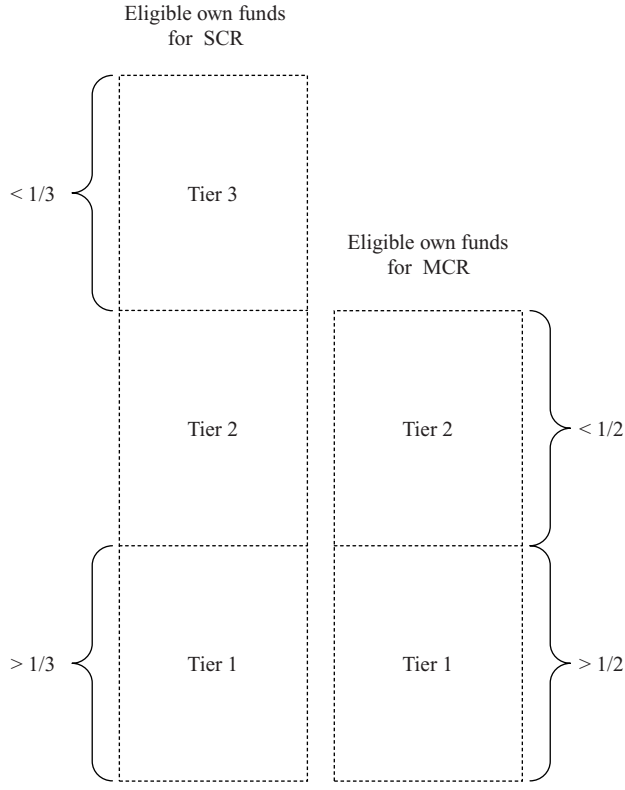

Figure 8.5 Eligible own funds items and associated limits to cover SCR and MCR.

the part that classifies as capital reduces linearly to zero. The following example can help to clarify this.

Consider a 10-year subordinated hybrid with a notional outstanding of $1 billion. For the first 5 years, the full $1 billion classifies as lower Tier 2, assuming that there is sufficient higher quality capital such that the full $1 billion can count as lower Tier 2. After 5 years, the proportion of notional outstanding that classifies as lower Tier 2 reduces linearly. This means that, after 5 years, only $0.8 billion will count as lower Tier 2. After 6 years $0.6 billion will count as lower Tier 2 and so on. Institutions are typically allowed to redeem hybrids early. However, they do need to get prior approval from the regulator. The regulator will only approve if the bank or insurance company can remain adequately capitalized after redemption.

8.5 DEDUCTION OF INTERESTS IN OTHER FINANCIAL INSTITUTIONS

Section 8.1 gave an overview of the different regulatory capital components and how each of these can be determined. This is an exhaustive overview, except in the case where bank A has an interest or holding (shares or hybrids) in another bank B. If this is a shareholding that exceeds 10% of the total issued share capital of bank B, bank A has to deduct this holding (calculated as percentage interest times net asset value[22] of bank B) from its own capital base.[23] Also, if the holding is acquired through hybrids and exceeds 10% of the total issued subordinated debt of bank B, bank A has to deduct this holding from its own capital base.[24] Regulation prescribes that the value of the holding (percentage interest times net asset value) is for 50% deducted from bank A's Tier 1 capital and for 50% deducted from bank A's Tier 2 capital. The rationale behind deducting the holding in bank B from bank A's capital position is to prevent one amount of capital being used to increase the capital position of multiple banks. This is referred to as *double gearing*. Indeed, suppose that this rule did not hold, then banks could help each other to increase their capital bases without raising any capital outside the banking sector.

Consider two banks, A and B. If A could raise $1 billion worth of equity by selling newly issued shares to B and B could subsequently finance these shares by issuing $1 billion worth of new shares to A, the capital positions of both A and B would increase while, not taking into account the cross-holdings between A and B, the total capital of A plus B remains the same. In theory, this could be played indefinitely between banks, and means that all banks would be able to increase their capital positions without raising any capital for the banking sector as a whole.

The rule of deducting holdings in other banks from the capital position is purely to prevent banks from capitalizing each other, hence making their capital positions look better than they really are. In other words, this

[22] Net asset value is defined as the difference between the assets and the liabilities of a company. This is equivalent to shareholders' equity.

[23] A holding in another bank also needs to be deducted if the net asset value is more than 10% of the bank's (investor) own total capital. In this case only the amount above 10% of the bank's own capital is required to be deducted.

[24] In fact, if, for one regulatory capital component (e.g. shares, hybrids), the threshold of 10% is reached, all holdings in other regulatory instruments of the same bank need to be deducted as well.

regulation is aimed at the banking sector as a whole and can therefore be punitive when considered in isolation. Indeed, a bank with an equity position in a non-regulated company (e.g. shares in TomTom) has to assign a risk weight between 100% and 400%, which basically entails a deduction of respectively 8% and 32% from total capital (see Chapter 10), whereas an equity participation in another bank, exceeding the 10% threshold, leads to a deduction from total capital of 100% (i.e. 50% deduction from Tier 2 and 50% deduction from Tier 1). To summarize, the regulation related to the deduction of a significant holding (greater than 10%) from capital can be punitive in isolation, but is necessary to make capital regulation work. One could say, if society wants to have effective regulation with respect to bank capital, the banking sector needs to suffer the 'imperfection' of making adjustments to the capital position when it concerns significant holdings in other banks.

Banks that have a participation in an insurance company also have to deduct this participation from their own capital position. However, in this case the participation typically needs to exceed 20% of the issued share capital of the insurance company. Otherwise, the treatment is exactly equivalent to participations in other banks (i.e. deduct 50% of the holding from Tier 2 and 50% from Tier 1). However, in the case of integrated management of the bank and insurance holding, the bank can also opt (i.e. request approval from the regulator) for another more logical treatment.

This treatment basically entails (pro rata[25]) consolidation[26] of the capital position of the insurance company and (pro rata) deduction of the insurance capital requirement. This method results in a (pro rata) addition to or deduction from the bank's capital with, respectively, capital surplus[27] or shortfall[28] of the insurance holding. This method assumes that the bank can access any surplus capital at the insurance company and will vouch to inject capital where a shortfall arises at that insurance company.

An insurance company also has to deduct a holding (threshold is typically 20%) in a bank or another insurance company. In this case, the net asset value of the holding needs to be deducted from the core capital component of the insurance company. As mentioned previously,

[25] Pro rata is in brackets because there can either be full consolidation or pro rata consolidation.

[26] Consolidation means that all potential intergroup capital injections are only accounted for once, hence preventing double counting.

[27] Amount by which the insurance capital position exceeds the regulatory requirement.

[28] Amount by which the insurance capital position is smaller than the regulatory requirement.

the rationale behind deducting participations from banks in insurance companies, and vice versa, is to prevent banks and insurance companies from recapitalizing each other, without really adding any capital to the system. As discussed above, the deduction of interests in other financial institutions is a necessary imperfection, but nonetheless an imperfection. Because of that, regulators have given some leeway with respect to this regulation in the sense that, up to a certain threshold (e.g. 10% or 20%), financial institutions do not have to fully deduct the interest. This makes sense, as it would not be good if regulation prevented financial institutions from owning stakes in each other. The reason being that, although cross-holding between financial institutions increases the impact of a systemic crisis, it also has advantages. One of the advantages is that it enables financial institutions to diversify and explore growth opportunities. Another advantage is that it reduces the chance of a systemic crisis as financial institutions implicitly support each other and have an incentive to do so because of cross-holdings. This can make the system stronger as a whole. This reduced probability of a systemic crisis does have a cost, however, as the impact of a systemic crisis, if it were to occur, is greater. Hence, the fact that regulation has set a threshold for cross-holdings above which they need to be deducted, seems to be a fair solution.

9 Capital Instruments

In Chapter 8, several capital instruments were mentioned. However, the discussion only determined whether a capital instrument was classified as core Tier 1, Tier 1, or Tier 2 capital. This chapter provides a short overview and description of different capital instruments and focuses more on the business side of capital instruments rather than the regulatory side.

9.1 COMMON SHARES

The most straightforward capital instruments are common shares. Shares are issued by a financial institution and are the most common form of risk-bearing capital. Shareholders are really the owners of a company and they therefore share in all the risks and rewards of the company. This means that shareholders actually have a 'claim' on (i.e. are the beneficiaries of) all the retained and future earnings, the share capital, and share premium accounts.[1] However, if losses arise, the 'claim' of the shareholder reduces and, if the losses are large enough, can even reduce the initial capital brought in by shareholders. In other words, in a going concern, corporate losses go directly at the expense of the shareholders' investment. These losses reduce common equity, on which the 'claim' of shareholders really lies. Common equity comprises four components:

1. *Nominal share capital.* This is the nominal value of each share times the number of shares outstanding.
2. *Share premium account.* This is defined as the summation of the differences between the subscription price (price at which shares are sold to shareholders) and the nominal value of each share. The reason that this is such a crucial component of capital is because share issuances typically occur at a significant premium to their nominal value.

[1] Share capital represents the nominal value of shares. Share premium represents the difference between the subscription price (price at which shares are sold to the initial shareholders) and the nominal value.

3. *Retained earnings.* This is the summation of all periodic earnings (after tax and dividend payments) since inception of the financial institution.
4. *Revaluation reserves.* Balance sheet items that are classified as *available for sale* (AFS) can also impact common equity. Indeed, market value changes in AFS items do not go through the P&L, but are accounted for in the revaluation reserves, which form part of common equity.

Losses are first absorbed by shareholders, as losses reduce common equity. Once losses can no longer be absorbed by common equity, preference shares and subordinated debt holders start to incur losses. However, it is unlikely that a financial institution enters into negative common equity territory without debt holders starting bankruptcy proceedings. Common shareholders cannot initiate bankruptcy proceedings as the financial institution does not have a fixed obligation (e.g coupon payment or dividend payment) towards shareholders. Typically, long before a financial institution enters into negative common equity territory, it will raise equity through, for example, a rights issue, which gives current shareholders priority in buying newly issued shares, hence providing additional capital to the financial institution. The next section discusses the dynamics of a rights issue.

9.2 RIGHTS ISSUE

When a financial institution or any other company wants to attract additional capital, it typically does so by means of a rights issue. The main reasons why a company wants to attract additional capital is to finance acquisitions, organic growth, debt buy-backs or to simply improve the capital position in order to better fulfil regulatory requirements. A rights issue gives each shareholder the right to buy an additional number of shares in a company at a specified price and within a specified timeframe. This additional number of shares is determined such that, if the shareholder exercises his rights, there is no stake dilution[2] as a result of the capital raising. In other words, rights are offered to existing shareholders in proportion to their current shareholding. The subscription rights are typically transferable, which means that shareholders can sell their rights on the open market. The reason that subscription rights are often transferable is because the current shareholders do not always have

[2] The issuance of extra shares results in dilution of ownership percentage, earnings per share and voting control for the current shareholders.

the cash to buy additional shares. In this case, a shareholder can sell his rights to an interested investor who does have sufficient cash at hand to buy up shares. Hence, even if the current shareholders do not have the resources to put up additional capital, a company can still raise capital through a rights issue as long as the subscription rights are transferable. The best way to explain the dynamics of a rights issue is by means of an example.

Consider a bank that has 1 billion shares outstanding and the market value of each share is equal to $12. Hence the market capitalization of this bank is $12 billion. The bank wants to finance a takeover of $5 billion. In order to do so, it issues subscription rights to the current shareholders. For every two shares a shareholder owns, one subscription right is offered with an exercise price of $10, exercisable within one month.[3] This rights issue will, when successful, exactly raise the required $5 billion to finance the acquisition. Indeed, 0.5 billion rights have been issued (for every two of the 1 billion shares, one right has been issued) at a price of $10, resulting in a total capital raising of $5 billion.

When looking at this example, one can also see that the subscription price is at a discount to the current share price ($10 instead of the current share price of $12). This discount gives shareholders an additional incentive to buy the newly issued shares. Indeed, the larger the discount, the larger the dilution in case the shareholder does not exercise his rights. This can be illustrated by reducing the subscription price to $5. In this case the company needs to give one right for every share in order to raise $5 billion capital. This means that there is 50% instead of 33% dilution. A rational shareholder does not want his stake to be diluted; if he did, he should have sold his stake in any case.

The question is: What is the theoretical ex-rights price (TERP), assuming that the rights issue is successful (i.e. the newly issued shares are taken up by the existing shareholders or transferred to other investors)? In other words, what will be the theoretical share price once the shares trade without the right to buy additional shares at a discount (ex-right). In order to establish this, suppose the closing price is $12 the day before the shares go ex-right. Assuming that all rights will be taken up, there will be 1 billion shares outstanding with a 'price' of $12 and 0.5 billion shares with a 'price' of $10. This means that the theoretical

[3] Typically shareholders get one right per share, and it requires a certain number of rights to buy one share. For simplicity, this example assumes the reverse, namely that several shares grant the shareholder one right. Mathematically this is equivalent.

ex-rights price ($1 * 12 + 0.5 * 10$ divided by 1.5) is \$11.33. This also means that the market capitalization has increased by \$5 billion (from \$12 to \$17 billion). Indeed, after the rights expire, there are 1.5 billion shares with a price of \$11.33.

Another interesting question is: What is the value of a subscription right? Again suppose that the shares are trading at \$12. The theoretical ex-rights price is therefore \$11.33. Since the rights can be exercised at \$10, the rights have a value, not taking into account any time value, of \$1.33. If a shareholder decides not to exercise his rights, he will lose exactly the same amount on the shares as he makes by selling the rights. On the shares he owns he loses \$0.67 (12 minus 11.33), but he makes \$1.33 per right of which he has half as many, and therefore makes back the \$0.67 per share. This also shows that a rights issue in itself does not result in a loss for the current shareholders, but only results in dilution if a shareholder decides not to exercise the rights.

9.3 PREFERENCE SHARES

Although preference shares are called shares, they are really a form of hybrid equity (see section 9.4). Indeed, because they have priority over common equity in terms of *dividend payments* and upon *liquidation*, preference shares are less risky than common shares and therefore they typically carry a fixed coupon and do not participate in any growth in profitability or value of the company. Hence, preference shares have similar dynamics to subordinated debt. Preference shares have an equity element as long as they are non-redeemable and the dividends are non-cumulative. If a preference share is non-redeemable it has, equivalent to common shares, a perpetual nature. If it is also non-cumulative, the issuing institution has some discretion with respect to dividend payments and any missed payments do not have to be paid in any subsequent periods. Obviously, the issuing institution can only skip a dividend on its preference shares if it also skips the dividend on its common shares. In other words, a non-redeemable and non-cumulative preference share has three equity elements:

1. It is perpetual;
2. Unlike regular debt, the holder cannot demand the issuing institution to pay a dividend and has therefore no right to start bankruptcy proceedings;
3. Dividends are not tax-deductible

But preference shares also have many debt-type features, such as:

- The coupon or dividend amount is independent of the performance of the stock or the profitability of the issuing institution.
- Upon liquidation, the claim that preference shareholders have is equal to par value, whereas common shareholders only have a residual claim. Hence, preference shares have little loss-absorbing capacity in a going concern as potential corporate losses cannot be written off against preference shares.
- Priority over common shareholders with respect to coupon payments and upon liquidation.
- Typically no voting rights.
- The value of a preference share is mainly dependent on the market interest rate and creditworthiness of the issuing institution, whereas the share price is dependent on the actual performance of the institution.

The above shows that preference shares have many debt-type features. Because the dividend payment is not tax-deductible, preference shares are not an attractive capital instrument with which to raise Tier 1 capital. Indeed, as has been shown in section 8.1, hybrid Tier 1 instruments have similar characteristics to preference shares but have the added advantage that their coupon is usually tax-deductible.

As long as preference shares are non-redeemable (i.e. perpetual) and non-cumulative, they classify as Tier 1 capital, even core Tier 1 capital.[4] Non-redeemable means that issuing institutions cannot redeem the principal of the preference shareholders. However, the issuing institution can decide to buy back the preference share on the secondary market and cancel them. A buy-back of capital typically requires approval from the relevant regulator.

9.4 HYBRID EQUITY

Hybrid equity instruments have both equity as well as debt features. Depending on the features, a hybrid equity instrument is classified as Tier 1, upper Tier 2 or lower Tier 2. To determine the 'quality' of a hybrid equity instrument, the regulator looks at the loss-absorbing capacity (principal and coupon payments) and permanence (what

[4] This will likely change in any new capital regulation. Core Tier 1 capital will probably be solely defined as common shares.

is the maturity?) of the instrument. The more loss-absorbing (e.g. non-cumulative) and more permanent (e.g. perpetual), the higher the regulatory quality classification. Over the past decade, there have been all sorts of innovations with respect to hybrid equity instruments. For example, hybrid instruments have been structured to incentivize the issuing institution, by means of a step-up in the coupon that has to be paid to the holder, to redeem after 10 years. Currently, these type of instruments can still be accepted as Tier 1 as long as they are perpetual and the option to redeem after 10 years lies only with the issuing institution. Apart from Tier 1 innovations with respect to permanence, there have also been 'innovations' with respect to the loss-absorbing capacity of Tier 1 instruments. These innovations were typically aimed at making the hybrid more attractive for investors while still satisfying the regulatory constraints. For example, in order to classify as Tier 1, a hybrid instrument needs to be non-cumulative, because the regulator does not want the issuing institution to reduce its capital position by paying out a coupon. In order to make hybrids more attractive to investors, while still satisfying the regulatory constraint of preventing a capital decrease as a result of a coupon payment, institutions have introduced the so-called alternative coupon satisfaction mechanism (ACSM). ACSM effectively turns hybrids into cumulative instruments (i.e. skipped coupons will be satisfied at a later point in time and/or in a different form) without reducing the capital position of the issuing institution. The way this works is that a skipped coupon will nonetheless be satisfied (at a later point) in newly issued stock. In other words, the coupon will be satisfied in stock rather than cash. This ACSM feature makes a hybrid more attractive as it effectively makes the hybrid cumulative at the expense of the current shareholders (they will be diluted because the coupon is satisfied in newly issued stock). A hybrid with an ACSM feature can still classify as Tier 1 because the coupon payment does not reduce the capital position of the institution as it is satisfied in newly issued stock.

All innovations with respect to hybrids have generally been aimed at making the instrument more attractive (i.e. less risky) for the investor. During the credit crisis it became apparent that, due to all the features and clauses, hybrids had in practice little loss-absorbing capacity in a going concern. Hence, it is likely that hybrids will, at least temporarily and probably for the longer term, get more equity-like features. One can, for example, think about a feature that a hybrid can be converted into common equity in a case of government support or a breach of regulatory limits.

9.5 CONVERTIBLE CAPITAL INSTRUMENTS

Convertible capital instruments are bonds (or sometimes even preference shares) that can be converted into common shares or preference-shares. As long as the bond part of a convertible instrument satisfies the relevant capital requirements, it can be treated as capital. The *option* to convert into common shares typically lies with the investor and not with the issuing financial institutions. A convertible capital instrument is nothing more than a debt-like capital instrument with a call option on the shares. This call option specifies the share price at which the investor can swap his debt-like capital instrument into actual shares. The way this works in practice is that the debt-like capital instrument is redeemed early and the investor uses the proceeds to buy shares at a prespecified price.

A convertible debt instrument has a lower coupon than regular debt instruments as compensation for the option that investors receive. Hence, from a cost perspective, convertible capital instruments might be attractive for issuing financial institutions. However, financial institutions do relinquish control over their capital management when issuing convertible capital instruments. Losing control over your own capital management can be quite a high price to pay and might not weigh up to the positive effect of a lower interest expense.

10
Regulatory Capital Requirements

In Chapter 8, the different types of capital were discussed. Chapter 8 focused predominantly on regulation with respect to available capital (i.e. the capital that banks own), but did not explain required capital. Obviously, available capital should exceed required capital. Capital manage-ment is mainly concerned with managing available capital. Required capital is, among other things, a function of the business a financial institution conducts. Managing required capital is definitely a part of capital management, but it is much slower to take effect because one effectively has to change the way business is conducted.

Although managing required capital is only a part of capital management, it is a crucial constraint to take into account in any capital management decision. On top of that, required capital should be under control and it is therefore imperative to understand the regulatory capital requirement framework. Hence, this chapter focuses on capital requirements for banks and insurance companies.

10.1 BANK CAPITAL REQUIREMENT RATIOS

The main capital requirement for banks relates to the so-called BIS ratio. The requirement is that total available capital (i.e. Tier 1 plus Tier 2) divided by risk-weighted assets has to exceed 8%. In other words, the minimum required capital equals 8% times the risk-weighted assets. To be able to calculate the minimum required capital one has to understand the concept of risk-weighted assets (RWAs). RWAs measure the riskiness of the assets that a bank owns (i.e. holds on its balance sheet). The riskier the assets the higher the RWAs and hence the higher the required capital. The way to calculate the RWAs is to multiply each asset category by its risk weight and aggregate the outcomes. Risk weights range from 0% for 'risk-free' assets, such as government bonds, to 1250% for risky assets such as CCC-rated assets (see Appendix B).[1]

[1] Credit-related assets typically have a credit rating associated with them, which gives a perception of the riskiness of this asset (i.e. what is the chance of a default?).

Next a stylized example is discussed to better understand the capital requirements related to RWAs.

Consider retail bank A that has $1 billion of equity and $18.625 billion of deposits (see Figure 10.1). The liabilities are invested in three asset categories; shares, CCC-rated corporate bonds, and government bonds. To calculate the RWAs of this retail bank one needs to know the respective risk weights of shares, CCC-rated corporate bonds, and government bonds. In this example, the risk weight of a share is 400%, that of a CCC-rated corporate bond is 1250%, and that of a government bond is 0%. This means that

Stylized retail bank balance sheet

Assets		Liabilities	
Shares	$0.625 billion	Shareholders' equity	$1 billion
CCC rated corporate bonds	$0.8 billion		
Government bonds	$18.2 billion	Deposits	$18.625 billion

Figure 10.1 Retail bank A.

the RWAs of retail bank A are equal to $(18.2 * 0) + (0.8 * 12.5) + (0.625 * 4) = \$12.5$ billion. Hence, the minimum capital requirement for retail bank A is $12.5 * 8\% = \$1$ billion. In this case, the RWAs implied capital requirement is exactly equal to the available capital of \$1 billion.

In the example above, it becomes clear that the most risky assets have a risk weight of 1250%. This could seem counterintuitive as one would expect the most risky assets to have a risk weight of 100%. However, a 1250% risk weight is needed to ensure that a bank, which holds an amount of capital that equals the value of risky assets, exactly fulfils the minimum BIS requirement of 8%. Indeed, the BIS ratio is calculated by dividing the amount of available capital by the value of risky assets multiplied by the risk weight of these risky assets. In formula form this reads as:

$$\text{BIS ratio} = \frac{\text{Available capital amount}}{\text{Value of risky assets} \times \text{Risk weight}}.$$

Although the BIS ratio is the official regulatory ratio, financial markets and the banking sector pay much more attention to the core Tier 1 ratio. This ratio is defined as core Tier 1 capital divided by the RWAs. The reason that the core Tier 1 ratio is preferred over the BIS ratio is because it provides much more information about the financial health of a bank. Indeed, core Tier 1 is the highest quality capital and is fully loss absorbing and permanent, in contrast to hybrids and Tier 2 capital. The fact that the markets focus mainly on core Tier 1 ratios became especially apparent during the credit crisis. In times of stress, investors want to know whether banks have enough of a buffer to absorb losses caused by extreme shocks. In fact, during the credit crisis the focus shifted even further, namely from core Tier 1 ratio to leverage ratio. A leverage ratio is the most basic of ratios. It is based on the narrowest capital definition and specifies tangible equity (shareholders' equity adjusted for intangible assets such as goodwill, i.e. that part of shareholders' equity that can absorb losses immediately) as a ratio to total assets. This means that, during the credit crisis, investors no longer trusted the regulatory risk weights that are used to establish RWAs and hence wanted shareholders' equity to be a sufficient proportion of total assets (i.e. a sufficiently large). This leverage ratio is discussed in more detail in section 11.9.

10.2 RATIO HEDGING AGAINST CURRENCY MOVEMENTS

Because the regulatory framework relies heavily on regulatory ratios, such as core Tier 1, Tier 1, and BIS ratios, banks do not only have to hedge their capital position against currency movements, but also against these ratios. The reason being that, if a bank has a capital investment interest in a foreign subsidiary, its regulatory ratio at consolidated level depends on both the value of the capital investment and the amount of RWAs on the balance sheet of the subsidiary as the balance sheet is fully consolidated. Hence, if the foreign currency in which the subsidiary operates appreciates, the amount of RWAs of this subsidiary increases. If the capital investment in this subsidiary is hedged against currency movements (see section 6.3), an appreciation of the foreign currency results in a worsening of the regulatory ratios as the RWAs increase while the total capital position remains unchanged. Hence, in order to ensure that the regulatory ratios are immune to currency movements, a bank not only has to hedge the capital investment in foreign subsidiaries, but also the RWAs of this subsidiary. These RWAs can be hedged by entering into a currency transaction where the bank buys the foreign currency and sells the domestic currency for a notional of the RWA of the subsidiary times the regulatory ratio of the parent. To make this more concrete, consider the following example.

A British bank has a total core capital position of £20 billion on total RWAs of £200 billion and thus a core Tier 1 ratio of 10%. Of the £20 billion core capital, £5 billion is invested in a US subsidiary, which has, at the current exchange rate of £1 = $2, a value of $10 billion. The total RWAs of this US subsidiary are $80 billion. In order to ensure that the core Tier 1 ratio is immune to currency movements, the British bank needs to hedge both the capital investment of $10 billion in the US subsidiary as well as the regulatory ratio of the parent against changes in the RWAs of the subsidiary due to currency movements. In order to do this, two currency hedges need to be executed.

1. Sell $10 billion to buy £5 billion in order to hedge the capital investment in the US subsidiary.
2. Buy $80 billion times the core Tier 1 ratio of 10% (i.e. $8 billion) by selling £4 billion in order to hedge the RWAs.

If the dollar appreciates against the pound and moves to £1 = $1, the core Tier 1 ratio moves as follows:

- Because the capital investment in the US subsidiary is fully hedged, the capital investment retains its value of £5 billion as the increase in capital investment value of £5 billion as a result of the dollar appreciation is offset by the first currency hedge.

- The RWAs of the US subsidiary become £80 billion instead of £40 billion as a result of the appreciation of the dollar. Hence, the total RWAs of the British bank become £240 billion. Because the second currency hedge results in an increase of the capital position by £4 billion to £24 billion, the core Tier 1 ratio remains 10% [(20 + 4)/240].

To summarize, a bank can hedge its regulatory ratio by hedging the capital investment in the foreign subsidiary for currency movements in combination with a hedge that offsets changes in the RWAs by buying the foreign currency and selling the domestic currency for an amount equal to the RWAs of the foreign subsidiary times the regulatory ratio of the bank.

10.3 THE THREE-PILLAR APPROACH TO BANK CAPITAL REQUIREMENTS

Although bank capital ratios such as the BIS ratio and core Tier 1 ratio are the most common regulatory indicators and requirements, the regulator applies a more sophisticated approach to establish capital requirements for financial institutions. This section is quite technical and really delves into regulation. It is not strictly necessary to read this section in order to understand the rest of the book; nevertheless, it can serve as a manual and reference guide for some important regulatory aspects of capital.

The Basel Committee on Banking Supervision, which is the main standard and policy setter with respect to bank laws and regulation, established the so-called Basel II framework, which recommends a three-pillar approach to determine capital requirements for banks. This three-pillar approach is widely used by regulators around the world and is summarized below.

10.3.1 Pillar I

Pillar I provides tight guidelines for establishing minimum capital requirements for financial institutions. In order to calculate this minimum capital requirement, Pillar I distinguishes three risk categories. The minimum capital requirement is found by aggregating the capital requirements for each of the individual risk categories. The three risk categories and the process for calculating the associated capital requirement are described below.

Table 10.1 Risk weights for sovereigns

Credit rating	AAA to AA−	A+ to A−	BBB+ to BBB−	B+ to B−	Below B−	Unrated
Risk weight	0%	20%	50%	100%	150%	100%

Table 10.2 Risk weights for banks and securities companies

Credit rating	AAA to AA−	A+ to A−	BBB+ to BBB−	B+ to B−	Below B−	unrated
Risk weight	20%	50%	100%	100%	150%	100%

Table 10.3 Risk weights for corporates

Credit rating	AAA to AA−	A+ to A−	BBB+ to BB−	Below BB−	Unrated
Risk weight	20%	50%	100%	150%	100%

Credit Risk

This relates to those assets and activities that a bank employs that have credit risk associated with them and do not form part of the trading activities of the bank. If it does form part of the trading activities of the bank, it is deemed to be market risk. In this case, the capital requirement arises from the calculations specific to market risk.

Credit risk capital requirements can be calculated in one of three ways. The first method is most basic and is called the standardized approach. This standardized approach attaches, to each credit-related instrument, a specific risk weight. These risk weights depend on the credit quality of the assets on the bank's balance sheet. Regulation attaches different risk weights to different types of credit-related assets and issuers.[2] The following credit-related assets can be distinguished:

- *Claims on sovereigns.* A risk weight for a claim on a sovereign depends on the credit rating as set out in Table 10.1.
- *Claims on banks and securities companies.* The risk weights for this category are defined in Table 10.2. When comparing Table 10.1 and 10.2, one finds that there are slight differences.
- *Claims on corporates.* This category includes all corporates (excluding banks and securities companies), whose risk weights are set out in Table 10.3.

[2] An issuer, such as a government or a corporate, can issue a credit-related instrument such as a bond. When a bank buys such a bond, the bank has to hold capital against this bond to cover the credit risk, assuming that the bond is not a trading position.

- *Claims secured by residential mortgages* have a 35% risk weight.
- *Claims on retail products (excluding residential mortgages)*, such as credit card loans, overdrafts, and small business loans, have a 35% risk weight.
- *Claims secured by commercial real estate* have a 100% risk weight.
- *Claims on overdue loans* have a risk weight between 100% and 150%.
- *Cash* has a risk weight of 0%.
- *Claims on BIS, IMF, ECB, EC and MDBs (multilateral development banks)* have a risk weight equal to 0%.
- *All other assets* have a risk weight of 100%.

The above explains the standardized approach for calculating the RWAs for credit risk. To actually determine the minimum capital requirement associated with credit risk one has to multiply the RWAs by 8%.

The second method to calculate the capital requirement related to credit risk is the 'Foundation Internal Rating-Based' (F-IRB) approach. In this approach, banks use their own models, provided they are approved by the regulator, to estimate the probability of default (PD) over a 1-year horizon of credit exposures. With F-IRB, banks are still required to use regulatory prescribed parameters such as loss-given defaults (LGD) and exposures at default (EaD). Given these parameters, a capital requirement can be established.

The third method that banks can use to determine the capital requirement for credit risk is the 'Advanced Internal Rating-Based' (A-IRB) approach. With this approach, banks can use their own models to estimate the parameters (e.g. PD over a 1-year horizon, LGD, EaD) necessary to calculate the capital requirement for credit risk.

In order to determine the capital requirement for credit risk, it is important to make a distinction between expected loss (EL) and unexpected loss (UL). Expected loss can be calculated by multiplying a best-estimate 1-year probability of default (PD) per credit risk exposure with a best-estimate loss-given default (LGD) and a best-estimate exposure at default (EaD). In formula form, this reads as:

$$\mathrm{EL} = \mathrm{PD} \times \mathrm{LGD} \times \mathrm{EaD} \tag{10.1}$$

Expected loss should be covered by loan–loss provisions and impairments and is simply a cost of doing business. Hence, a bank does not need to hold capital for expected losses. However, a bank does need to hold capital for unexpected losses. Unexpected losses are defined

as the difference between the *worst-case* loss associated with a 99.9% confidence interval and the expected loss. In formula form:

$$\text{UL} = \text{VaR}(99.9\%) - \text{PD} \times \text{LGD} \times \text{EaD} \tag{10.2}$$

where

VaR(99.9%) is the credit loss associated with 99.9% confidence.

So, once banks can quantify VaR(99.9%), they can quantify unexpected loss and thus the capital requirement for credit risk. The way to quantify VaR(99.9%) is to lever up the best-estimate 1-year PD per credit exposure and to determine a downturn LGD. The meaning of a levered-up PD is to determine the probability of default associated with VaR(99.9%) rather than a best-estimate PD. The levered-up PD can be established with the aid of Merton's (1974) single asset model. The basic premise of Merton's model is that a borrower defaults because it can no longer meet its obligations because the value of its assets drops below the value of its liabilities. In order to model this, Merton assumed that the change in value of a borrower's assets are normally distributed. Because a bank has already established a best-estimate probability of default (for example, based on historical experience), taking the inverse of the normal distribution to this PD gives the threshold for the value of assets where the borrower defaults. In order to determine the threshold associated with a higher confidence interval, 99.9% instead of the lower confidence interval associated with PD × LGD × EaD, the single-factor model of Vasicek is used. The Vasicek model says that the PD associated with a 99.9% confidence interval can be higher because of portfolio risks. That is, if obligor firms are highly correlated, the portfolio risk increases. Furthermore, the Vasicek model assumes that portfolio risk only springs from one single, economy-wide risk factor. This economy-wide risk factor is established by determining the default threshold – associated with a 99.9% confidence interval – of the overall economy. In line with the Merton model, this is determined by taking the inverse of the normal distribution to 99.9%. Overall, the levered-up PD (PD(99.9%)), associated with the 99.9% confidence interval can be determined as follows:

$$\text{PD}(99.9\%) = N\left[\frac{N^{-1}(\text{PD}) + \sqrt{\rho}\, N^{-1}(99.9\%)}{\sqrt{1-\rho}}\right] \tag{10.3}$$

where

N = cumulative standard normal distribution
N^{-1} = inverse of cumulative standard normal distribution
ρ = measure of correlation between returns on the assets of the borrowers in the portfolio.

PD (99.9%) needs to be multiplied by the downturn LGD and the EaD in order to get to VaR(99.9%) per obligor firm (credit exposure). These can subsequently be summed up to get the overall capital requirement for credit risk. A bank can build an internal model to determine the downturn LGD.

Market Risk

This relates to the trading activities of banks. In other words, the assets in a so-called trading book are subject to a market risk capital requirement under Pillar I. At this stage it is good to note that capital requirements for trading assets (i.e. assets in the trading book) are determined by assessing the market risk, whereas capital requirements for other assets (i.e. banking book assets) are determined by assessing the credit risk. This different approach (i.e. market risk) for trading assets stems from the feature that trading assets have a short-term holding period and can easily be disposed of on the market. In a trading book, positions are taken opportunistically and are subsequently closed at an opportune moment with the specific aim of realizing a gain. Hence, a bank can choose whether to hold a trading position or not. In this perspective, trading positions are short term as a bank can theoretically trade out of all its trading positions within a day. This contrasts with other assets that a bank holds in its banking book, where the bank typically does not have a choice whether to hold on to the position or not. Asset investments in the banking book can, for example, be against long-term deposits. Therefore, the bank needs to have an investment allocation for the deposited amount, for the term of these deposits.

Now that the difference between credit risk and market risk has been explained, an explanation can now be given of how one would go about determining the capital requirement related to market risk. In Pillar I, a bank can either use the standardized or the Value at Risk (VaR) approach to determine the minimum capital requirement for market risk. The standardized approach is similar to the one used for credit risk,

but is a little more complex. The standardized approach for market risk distinguishes several market risk factors, among others:

- Interest rate risk
- Foreign exchange rate risk
- Equity price risk
- Commodity price risk
- Option price risk.

The standardized approach tries, for every market risk factor, to determine a general market risk charge and a specific risk charge.[3] For interest rate risk, this means that the specific risk of fixed-income securities is based on the credit risk and is calculated in a similar way to the standardized approach for credit risk. However, the risk weights might differ due to the difference between a trading position and a pure credit position. The general market risk charge for interest rate risk is calculated by multiplying the modified duration[4] by an expected interest rate move over a short-term horizon (taken as 1 year in the standardized approach[5]) times the size of the position. For equity positions, the standardized approach distinguishes capital requirements for general market risks and diversifiable exposures. The general market risk capital charge is calculated by multiplying the net equity position (i.e. longs and shorts are netted) by 8% (i.e. 100% risk weight). The diversifiable capital risk charge is calculated by multiplying the gross equity position (i.e. longs and shorts are aggregated) by 4% (i.e. 50% risk weight).

The standardized approach for credit risk is already a very rough assessment. However, for market risk the standardized approach is even more impetuous. Hence, there is a second, more commonly used approach under Pillar I, namely Value at Risk (VaR), which is similar to the economic capital concept. VaR represents a numeric cutoff point associated with a predetermined likelihood (S) such that the chance that an event occurs where the loss exceeds VaR is less than the indicated likelihood, S. The concept of VaR is best explained by means of an example.

[3] For foreign exchange rate risk it is hard to differentiate between general market risk and specific market risk. Hence the standardized approach simply prescribes a capital charge of 8% (i.e. 100% risk weight) of the larger of a bank's net long and net short positions.

[4] Measures the price sensitivity to changes in interest rates.

[5] One could argue that a 1-year time horizon is rather long for a trading position.

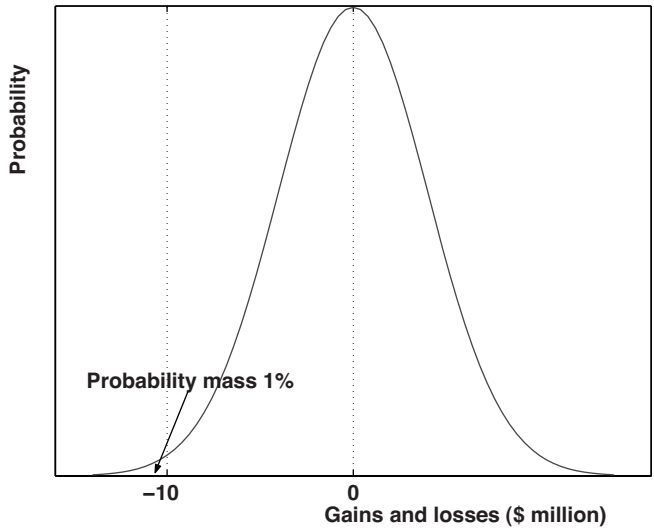

Figure 10.2 Example of VaR(99%).

Suppose a bank has a certain trading position. The bank has mapped all possible *daily* gains and losses to create a probability distribution. In other words, for each possible *daily* gain or loss, the bank has determined the chance that an event occurs that exceeds that specific *daily* loss. The *daily* gains and losses for the bank's position appear to be normally distributed. The probability mass associated with a loss greater than $10 million appears to be 1%. In this example, VaR(99%) is equal to $10 million (see Figure 10.2). In order to calculate the market risk capital requirement, a bank needs to determine the 10-day VaR(99%) and multiply this number by 3, 4, or 5. This multiplication factor is ultimately at the discretion of the relevant regulator. The 10-day VaR(99%) can easily be derived from the *daily* VaR(99%). One can simply multiply the *daily* VaR(99%) by $\sqrt{10}$ to get to the 10-day VaR(99%).

The above shows that the VaR approach for market risk is basically an internal model that has to be approved by the relevant regulator. There are various VaR models, but the most commonly used are given below.

- *Variance–covariance (parametric approach)* basically assumes a lognormally distributed function of returns. In order to calculate VaR for a specific trading position, one simply has to make assumptions with respect to the standard deviation of lognormal returns for the relevant variables. This enables one to plot a probability distribution

of the incremental change of the relevant variables. These incremental changes can be multiplied by the associated price sensitivity of the trading position to this variable in order to plot the gain and loss distribution. The loss associated with the 99th percentile is the VaR(99%). When several variables are involved, such as equity returns, interest rate returns, and foreign exchange returns, one also has to make correlation assumptions. These correlation assumptions enable a bank to model a joint probability distribution (i.e. depends on several variables) of gains and losses. The standard deviation assumptions and the correlation assumptions are typically based on historical data. From this joint probability distribution one can easily derive the VaR.

- *Historical VaR* calculates a VaR number based on historical observations of the daily returns of the variables on which the trading portfolio depends. In contrast to a parametric approach, historical VaR (HVaR) performs a full revaluation of the position (using the changed variables) to establish the gain or loss, whereas a parametric approach uses price sensitivities and subsequently calculates (by multiplying by the incremental change in variable) the gain or loss for the position. Hence, one gathers, for example, 1-year's worth of historical data of daily returns for all variables on which the trading portfolio depends. These daily returns[6] are subsequently used to fully revalue the portfolio. The profit and loss outcomes, arising from these daily returns are plotted. To determine the VaR(99%), one simply has to take the third worst day, assuming there were 300 days of historical data.

  There are three main reasons why a bank would prefer the HVaR method over a parametric approach. The first reason is that one does not make any assumptions with respect to the distribution of the returns of the variables. Indeed, the returns are based on actual and realized historical data. If one *assumes* that past returns are a fair reflection of future returns, then HVaR would be much more accurate than a parametric approach. Furthermore, HVaR captures so-called 'fat tails', where a parametric approach does not, as it assumes a normal distribution. This is quite an important feature to take into account as markets typically display the feature: *when it goes wrong, it really goes wrong.* This means that, if something goes wrong,

[6] Daily returns of all the variables the portfolio depends on, e.g., equity prices, interest rates, oil prices, etc.

markets do not behave normally, and losses will be much greater than expected. The second major advantage of HVaR is that a bank does not have to make any correlation assumptions between variables as these are implicit in the daily returns. Indeed, correlation measures the extent to which variables move in sync. This is exactly captured in the historical data. The third advantage is that HVaR accurately captures non-linear risks. A parametric approach is not able to take non-linear risks into account accurately. Indeed, a parametric approach calculates the potential gain or loss by multiplying the incremental change in a variable by the sensitivity of the trading position to this respective variable. This means that a parametric approach does not take into account the fact that the sensitivity to a variable changes if the variable itself changes. For linear risks this is a valid assumption, but for non-linear risks, sensitivities can change materially if the variable changes. Obviously, there are also disadvantages related to HVaR. One of the main disadvantages is that HVaR is only representative when the past is a good indicator of the future. To mitigate this concern, some HVaR models place more weight on more recent historic observations compared to observations that lie further in the past. The underlying assumption for this refinement is that more recent observations possess more predicting power for future events. Another disadvantage is that, depending on the amount of historic data, HVaR can be a data-intensive and time-consuming approach.

- *Monte Carlo VaR* is a hybrid of the HVaR and the parametric approach. Monte Carlo VaR, like a parametric approach, also makes assumptions (e.g. standard deviation and correlation) as to the probability distribution of the incremental change of the variables (e.g. equity prices, interest rates). However, when it comes to determining the probability distribution of the gains and losses of the actual trading position, Monte Carlo VaR does not use a sensitivity approach, but rather, like HVaR, uses a full revaluation of the position for each incremental change of variables. The way Monte Carlo VaR works is that, given the parameters that define the distribution of the motion of the variables, a significant number of scenarios is generated and for each scenario the trading position is fully revalued to establish the associated gain or loss. For each profit and loss (P&L) interval, the probability is established by dividing the number of observations that fall into this interval by the number of generated scenarios. Assuming that enough scenarios have been run, the 'law of large numbers' proves that this quotient converges to the actual probability. This

scenario analyses ultimately results in the P&L distribution of the trading position.

Monte Carlo VaR is obviously more sophisticated than a parametric approach because it can do everything that a parametric approach is able to do. In fact, if a trading position has only linear risks and the parameters chosen to generate the scenarios are the same as the parameters used for the parametric approach, Monte Carlo VaR and a parametric VaR will lead to the same outcome. However, Monte Carlo VaR can do more. It can choose to generate scenarios based on a more sophisticated probability distribution of the parameters. Furthermore, Monte Carlo VaR can accurately capture nonlinear risks, but will typically *not* take 'fat tails' into account.

The reason that one would choose Monte Carlo VaR over HVaR is typically because the past is not trusted to be a good predictor of the future, and one would wish to tailor the parameters in order to best reflect the expectations of the future by personally choosing the parameters.

Figure 10.3 summarizes the three different VaR methodologies and discusses their pros and cons.

Operational Risk

This is associated with the risks involved in executing the financial institution's everyday business. This is a very broad definition, but one can think, among others, about the following operational risks:

- **Fraud risk** can be both internal fraud (e.g. traders who intentionally mismark their positions, tax evasion) or external fraud (e.g. theft, hacking);
- **Clients, products and business practice risk** relates to churning, fiduciary breaches, market manipulation, improper trade, etc.
- **Business disruption and system failures** relate to utility disruptions, software failures, hardware failures.
- **Execution, delivery, and process management risk** is about (basic) human errors such as data entry errors, accounting errors, failed mandatory reporting, and negligent loss of client assets.

There are three approaches to calculate operational risk. Again, the first method is the most basic and is called the Basic Indicator Approach (BIA). BIA prescribes that banks need to calculate the capital requirement for operational risk as a fixed percentage (typically 15%) of the

VaR Methodology	Description	Pros	Cons
Variance Covariance	*Translates a parameterized motion distribution of underlying variables into a P&L distribution of the trading position by multiplying P&L sensitivity with the incremental change of variable.*	• Is intuitive • Is least data intensive and least time-consuming	• Assumes motion parameters for underlying variables • Is based on correlation assumptions • Does not capture non-linear risks • Does not capture 'fat tails'
HVaR	*Determines a P&L distribution by applying historic incremental moves of the underlying variables to the trading position and fully revalues the position.*	• Is intuitive • Correlation is implicit in historic data • Captures non-linear exposures • Captures 'fat tails'	• Assumes that the past is a good indicator of the future • Can be data intensive and time-consuming
Monte Carlo	*Generates scenarios based on an assumed motion distribution of the underlying variables. The scenarios are used to fully revalue the trading position and to determine the P&L impact. The law of large numbers enables one to derive a P&L distribution out of the generated and applied scenarios.*	• Captures non-linear exposures • Enables one to tailor the VaR model to expert based expectations of the future	• Assumes motion parameters for underlying variables • Is based on correlation assumptions • Does not capture 'fat tails' • Is data intensive and time-consuming

Figure 10.3 Overview of VaR methodologies.

average positive annual gross income. Those years in which the annual gross income was negative or zero should not be included in the calculation. BIA is obviously very basic and is not recommended for banks that have significant (international) operations.

The second approach is the standardized approach. This approach is a bit more granular than BIA as it distinguishes eight different business

lines. For each business line a beta factor is set, based on the relationship between operational loss experience for that business line and the gross annual income, that is subsequently multiplied by the 3-year average gross annual income to get to the operational risk capital charge for that particular business line. The eight business lines that are distinguished by Basel II are: *corporate finance, trading and sales, retail banking, commercial banking, payment and settlement, agency services, asset management,* and *retail brokerage*.

The third approach that a bank can use to determine its operational risk capital charge is called the Advanced Measurement Approach (AMA). Under this approach a bank can develop its own, regulatory approved, statistical model to determine the minimum capital requirement for operational risk. This approach typically entails a combination of own incidents data and a sector-wide incident benchmark. These are used as inputs for relatively complex statistical models.

10.3.2 Pillar II

Pillar II is where regulators conduct their own evaluation of the risks of a bank. This evaluation can lead to a higher capital requirement than that was established under Pillar I. Indeed, Pillar I only considers credit, market and operational risk and, obviously, a bank faces more risks than those. Other risks that a regulator has to take into account are (non-exhaustive):

- *Interest rate risk in banking book*. Banks run significant interest rate risks because one of their main roles is maturity transformation. Banks attract money with a short duration such as savings (can be withdrawn on demand) and they invest these monies in assets with a long duration such as mortgages.
- *Business risk.* This is the risk that losses arise due to internal inflexibility or the inability to respond effectively to a constantly changing competitive environment. Business risk simply arises from being in business and can negatively affect the capital position. One can, for example, think about an asset management company where the fee structure is a fixed percentage of the assets under management (AUM). If there is a market downturn the fee income can reduce significantly because the AUM will drop. If the asset management company cannot reduce its fixed costs (e.g. employee costs) quickly enough, it could suffer losses. This is a risk inherent to the specific business in which

the asset management company operates and can negatively impact its position.

- *Liquidity risk.* There are two types of liquidity risk. The first is *funding liquidity risk* and relates to the risk that funding providers, such as depositors, will withdraw or not roll over their specific funding. The second is called *market liquidity risk* and is concerned with liquidity drying up in asset markets. Hence, assets that were once liquid and easily tradeable become illiquid.
- *Strategic risk.* There can also be risks associated with a certain strategy that can ultimately impact the capital position negatively. For example, if a bank embarks on a large-scale integration because it has acquired another bank, this can pose significant risks (e.g. not realizing expected cost synergies).

The above mentions only a few of the many risks that a regulator must take into account when determining the minimum capital requirement under Pillar II. Two important components of Pillar II are discussed below.

Internal Capital Adequacy Assessment Process (ICAAP)

This is a self-assessment conducted by banks in which they determine the desired amount of capital they would need to hold and compare this with their actual capital position. The basis and main determinants for the desired amount of capital are the actual risks that the bank runs and the credit rating a bank wants to maintain. To establish the desired capital amount, banks generally use economic capital calculations.[7] Thus, for each risk category (e.g. credit, market, operational, business, interest rate risk) the bank builds a P&L distribution. For this P&L distribution, the relevant time horizon is 1 year, except for market risk, where it is assumed to be 10 days. Once there is a realistic P&L distribution per risk category, a bank can relatively easily determine the associated economic capital. The only required additional input is the confidence interval $X\%$ such that the bank can determine an economic capital number that exceeds losses in $X\%$ of cases. Otherwise stated, in $1 - X\%$ of cases there will be a loss that is greater than the economic capital. The confidence interval $X\%$ depends on the credit rating a bank wants to maintain. If a bank wants to maintain an AA rating, the confidence

[7] Economic capital stands for the amount of capital that a bank needs to hold to cover the risks.

interval should be 99.97%. Theoretically, this means that only once in 3333 years will there be a loss that exceeds the economic capital number.[8]

Unlike Pillar I, banks typically take diversification effects into account when determining their overall economic capital number. Pillar I simply aggregates the economic capital numbers of credit, market, and operational risk and therefore implicitly assumes a correlation of 1 between these risk categories. However, it is not likely that all three risks become manifest at the same time. Hence, a bank will assume some diversification by using correlations between risk categories of less than 1.

In summary, overall economic capital of a bank resulting from ICAAP will be different to Pillar I capital because more risks have been taken into account. In addition, ICAAP generally uses a greater confidence interval in order to maintain a good credit rating. These two effects make ICAAP economic capital greater than Pillar I capital. However, ICAAP will also assume diversification between risks. This will, in turn, have a dampening effect on ICAAP economic capital compared to Pillar I capital. The combination of aforementioned effects typically results in an ICAAP economic capital that is greater than Pillar I capital.

Supervisory Review and Evaluation Process (SREP)

This component of Pillar II is really about the regulator's own assessment of the bank's risks. The SREP will use ICAAP as a basis and will first scale back from the confidence interval that the bank uses to maintain a certain credit rating to the confidence interval that the regulator finds appropriate (e.g. 99.90%). Once, the regulator has scaled back ICAAP it will impose prudential add-ons as it sees fit. This results in a SREP capital number, which really represents the minimum capital requirement for an individual bank.

10.3.3 Pillar III

This pillar tries to leverage market discipline to motivate prudent and honest management by establishing more transparency about the (financial) position of the bank by setting strict reporting requirements.

[8] This is obviously quite theoretical. During the credit crisis, some banks lost multiples of their economic capital.

10.4 CURRENT CAPITAL REQUIREMENTS FOR INSURANCE COMPANIES

The current capital requirements (Solvency I) related to insurance companies are not risk based. In other words, it does not take the riskiness of the overall balance sheet of an insurance company into account. Solvency I focuses only on the technical provisions (see section 3.2) of an insurance company when determining required capital. This means that the capital requirements only depend on the liability side of the balance sheet. Therefore, regardless of how riskily an insurance company invests its premiums, it will have the same capital requirement. Obviously, technical provisions alone are too narrow a measure to establish minimum capital requirements for insurance companies. Hence, a new regulatory framework for insurance companies will come into force at the end of 2012, called Solvency II. Nevertheless, because capital requirements for insurance companies will continue to be based on Solvency I until the end of 2012, this section briefly explains the dynamics of Solvency I.

For a life insurance company, the Solvency I capital requirement is roughly 4% of technical provisions. Indeed, 4% of technical provisions gives a good impression of the solvency requirements for life insurance companies. Nevertheless, there are some other components in order to calculate the Solvency I capital requirement, but these are small compared to the 4% technical provisions requirement. For completeness, the exact Solvency I capital requirements for life insurance companies are given below.

Solvency I minimum capital requirements for life insurance are calculated as the sum of (see Figure 10.4):

- 4% of the gross technical provisions for insurance policies where the insurance company runs investment risk (i.e. the investment risk of the premiums lies with the insurance company).[9]
- 1% of the technical provisions for insurance policies where the insurance company runs no investment risk (i.e. unit-linked policies)[10]

[9] To be exact, it is 4% of the gross technical provisions multiplied by the quotient, which should be at least 85%, of the gross technical provisions minus risk transfer because of reinsurance and the gross technical provisions at the end of the prior book year.

[10] It is specified in the insurance policy in which 'units' the insurance premiums are invested and that the risk of these investments lie with the customer.

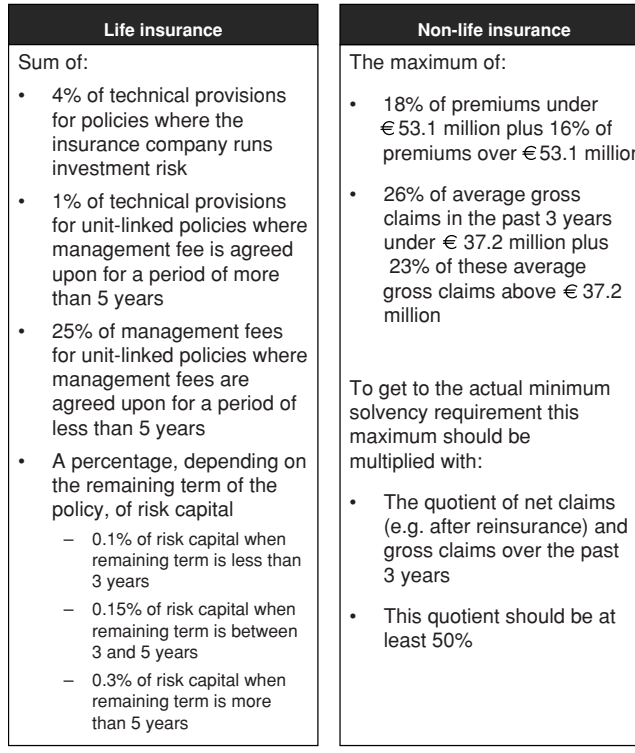

Figure 10.4 Solvency I minimum capital requirements.

and the associated management fees are agreed upon for a period of *over* 5 years.[11]

- 25% of the management fees for insurance policies where the insurance company runs no investment risk and the associated management fees are agreed upon for a period of *less* than 5 years.
- When it concerns insurance policies with risk capital,[12] 0.1% of risk capital in case of policies with a remaining term of less than 3 years, 0.15% for policies with a remaining term between 3 and 5 years, and 0.3% for policies with a remaining term of more than 5 years.

[11] Again, this component should be multiplied by the quotient, which should be at least 85%, of the gross technical provisions minus risk transfer because of reinsurance and the gross technical provisions at the end of the prior book year.

[12] This is defined as the difference between the policy cover when the policy holder dies and the current technical provision. Risk capital basically quantifies how much 'capital' an insurance company would have to put up in case a policy holder dies. When the technical provisions are greater than the policy cover, risk capital becomes negative. In that case, this component should be disregarded.

For non-life insurance, the solvency requirements depend on the maximum of earned premiums and gross claim experience (see Figure 10.4). This is quite different from the way in which solvency requirements are calculated for life insurance. The main reason for this difference is that life insurance policies are typically long-term products, whereas non-life (e.g. property and casualty, P&C) policies run, in general, only for a year and can subsequently be renewed. For P&C-type insurance policies, the annually earned premiums should ideally be sufficient to cover the claims in any given year.

Figure 10.4 shows that the minimum capital requirements for non-life insurance does not simply depend on the maximum of earned premiums and gross claim experience, but should also be multiplied by a quotient of gross and net claim experience. The rationale behind this additional multiplication is that non-life insurance companies are exposed to net claims (e.g. after reinsurance) rather than gross claims. Indeed, net claims actually affect the capital position of a non-life company and not gross claims. Since premiums are also based on gross claims, it is logical that even if the maximum is based on premiums rather than gross claims, it is still multiplied by the average quotient of net and gross claims over the past 3 years.

10.5 UPCOMING CAPITAL REQUIREMENTS FOR INSURANCE COMPANIES: SOLVENCY II FRAMEWORK

At the end of 2012, a new insurance capital requirements' framework will come into force, namely Solvency II. One of the main reasons that a new framework for capital requirements is introduced is because Solvency I is not risk based as it does not take the risks on the asset side of the balance sheet into account. Solvency II addresses this shortcoming and takes a risk-based approach to calculating capital requirements. The main characteristic of Solvency II is that it looks at the balance sheet of an insurance company on a market value basis. That is, for all balance sheet items a market value is determined. The available capital position is thus nothing more than the market value of assets minus the market value of liabilities. The available capital position is then compared with the risks on the balance sheet.

Solvency II has a similar three-pillar setup to Basel II and is described below.

- **Pillar I** gives guidelines for calculating the solvency capital requirement, minimum capital requirement, and technical provisions and also defines the eligible capital components to satisfy these capital requirements.

  Solvency capital requirement (SCR) is a 'soft' capital (buffer) requirement that insurance companies should really fulfil. SCR represents the level of capital such that only in 0.5% of cases (i.e. 99.5% confidence) is the level of capital not sufficient to absorb loss events over a 1-year horizon. Although SCR is not a hard requirement, a breach of SCR will make insurance companies susceptible to regulatory intervention. An insurance company can use either a standardized approach to calculate SCR or regulatory approved internal models. Minimum capital requirement (MCR) is a 'drop-dead' capital requirement with which insurance companies have to comply at all times. A breach of MCR will immediately trigger the heaviest of supervisory interventions. MCR will be less than SCR, but it will have some link to SCR. The reason being that SCR uses a risk-based approach to quantify the required capital to cover the risks with 99.5% confidence. Hence, MCR is only a meaningful risk-based measure if it is linked to SCR, albeit that the confidence that the risks are covered is smaller. The current thinking is to define MCR as the level of capital such that in 85% of cases it is sufficient to cover loss events. This should be calculated in an auditable, robust, and simple manner. However, regardless of this calculation, MCR shall not fall below 25% nor exceed 45% of the SCR.

  Because available capital and technical provisions are interdependent (i.e. if technical provisions go up, available capital goes down), it is necessary to define the rules for establishing technical provisions under Pillar I.

  Since understanding Pillar I will be crucial for managing capital after Solvency II comes into force, section 10.7 gives a high-level overview of the standardized approach.
- **Pillar II** is concerned with the supervisory review process. This is where the regulator performs its own risk assessment to establish whether capital requirements under Pillar I suffice. If the regulator deems Pillar I capital insufficient, it can impose a surcharge or capital add-on.
- **Pillar III** is about public disclosure and market discipline.

10.6 LIABILITY SIDE OF THE BALANCE SHEET UNDER SOLVENCY II

Pillar I will be one of the most important elements of Solvency II for the reason that Pillar I defines the requirements and valuations of the entire liability side of the balance sheet of an insurance company. On top of that, the liability side will indirectly also quantify the risks of the total balance sheet (i.e. assets and liabilities) because of the solvency capital requirement (SCR). This section explains how Solvency II looks at the different components of the liability side of an insurance company.

Figure 10.5 displays the five main components of the liability side of an insurance company under Solvency II. Although there are five important insurance liability components, the two building blocks remain intact – namely, technical provisions and (available) capital. The remainder of this section explains how these two building blocks are subdivided under Solvency II.

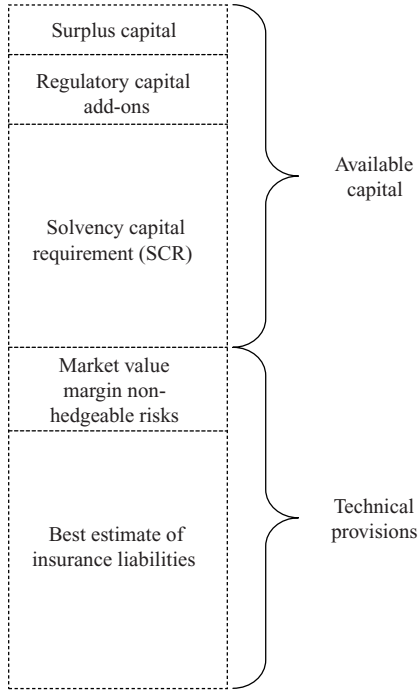

Figure 10.5 Components liability side of an insurance balance sheet under Solvency II.

10.6.1 Available Capital

Available capital is, implicitly or explicitly, subdivided into three components, namely:

1. *Surplus capital.* This is the capital in excess of the capital requirements established by the regulator. The regulatory requirement comprises a solvency capital requirement (SCR), which is established under Pillar I, and regulatory capital add-ons, which are established under Pillar II.
2. *Regulatory capital add-ons.* These add-ons are the result of the supervisor's own assessment of the risks that the insurance company runs, which form part of Pillar II. If the regulator deems the capital requirement of Pillar I to be insufficient, it can impose such capital add-ons.
3. *Solvency capital requirement (SCR).* This is the regulatory requirement defined under Pillar I, and although it is crucial to understand how SCR comes about, it is first of all important to understand the objective of SCR. The objective of SCR is to quantify the level of capital sufficient to absorb losses in 99.5% of cases, should risks materialize. In order to establish SCR, one has to look at all the risks and possible scenarios and quantify the loss associated with a 99.5% confidence (i.e. in 99.5% of scenarios the loss is smaller than SCR). Insurance companies can quantify SCR using their self-developed models, under the condition that these models are approved by the regulator. Insurance companies can also use the standardized approach, in which case the insurance company has to apply regulatory prescribed formulae to calculate SCR. In order to understand the heart of Solvency II, one needs to have a feel for the way in which SCR comes about. Therefore, section 10.7 provides a high-level overview of the standardized approach of Pillar I. Furthermore, Appendix C gives the exact details of the standardized approach.

10.6.2 Technical Provisions

Technical provisions can be subdivided in two categories.

1. Best Estimate of Insurance Liabilities

This component is nothing more than the net present value best estimate of all insurance cash flows (i.e. best estimate of future claims minus best estimate of future premiums). Best estimate means that the cash flow projection is based on expected scenarios of which a net present value is subsequently taken. For example, based on experience, mortality tables

give, for any given period or year, the probability that a person will die. The mortality tables can serve as a best estimate for a person's life expectancy and can be used to translate a life insurance policy into best estimate cash flows.

In practice, several aspects need to be taken into account to determine a best estimate of all insurance liabilities. Indeed, almost all insurance companies have (implicitly) written large guarantees to their policy holders.

Consider an endowment policy that is linked to the performance of the S&P index. At inception, the policy holder makes a down payment of $100 thousand. After 10 years, the policy holder will get his $100 thousand returned plus the performance of the S&P. However, the policy holder will always get $80 thousand even if the performance of the S&P has been worse. On top of that, if the policy holder dies within this 10-year period, he will get $115 thousand, regardless of the performance of the S&P. This policy has both insurance risk as well as market risk. The insurance risk stems from the policy feature that it is disadvantageous for the insurance company if the policy holder dies within 10-years, provided the performance of the S&P is less than 15%. This basically means that, as long as the performance of the S&P is less than 15%, the risk for the insurance company is that the policy holder dies early (i.e. mortality risk – risk of the policy holder living shorter than expected). Indeed, if the policy holder dies, the insurance company has to pay $115 thousand, which will cost the insurance company money if the performance of the S&P is less than 15%. If the performance of the S&P is more than 15%, the insurance company benefits if the policy holder dies early (longevity risk – risk of the policy holder living longer than expected). Indeed, in this case the insurance company is entitled to the performance of the S&P over and above 115%.

Apart from mortality risk, the policy is also exposed to market risks. If the S&P drops more than 20% in 10 years, the insurance company has to make up the difference. This means that the insurance company has effectively written an 80% put on the S&P for those policy holders that are expected to outlive the 10-year contract period. The value of this put can easily be derived from market prices and also has to be taken into account in the best estimate of insurance liabilities. Indeed, the chance that the policy holder dies early has to be taken into account when valuing the implicit 80% guarantee. Suppose that, every year, the chance that the policy holder dies goes up by 1%. This means that the chance of survival is 90% over the entire 10-year period. The market risk of this 80% guarantee can now be calculated as $90 thousand ($100 thousand times 90%) times the percentage price of a 10-year 80% put on the S&P. If we assume that the entire down payment of policy holders is invested in the S&P, there is another market risk. This is the risk associated with a policy holder who dies within the 10-year period and the S&P has a return of less than 15%. This basically means that the insurance company has a liability which has a value equivalent to a 115% put option on the S&P. However, this value only applies to policy holders that are expected to die. Hence, the value of this market risk liability equals $1 thousand times[13] the percentage price of a 1-year 115% put option

[13] 1% of policy holders are expected to die every year.

on the S&P plus $1 thousand times the percentage price of a 1-year 115% put on the S&P forward starting[14] in 1 year plus $1 thousand times the percentage price of a 1-year 115% put on the S&P forward starting in 2 years, and so on, up until $1 thousand times the percentage price of a 1-year 115% put on the S&P forward starting in 9 years.

Against the above-mentioned market risk liability, there is a market risk working in favour of the insurance company. Indeed, if the S&P has a performance exceeding 15%, the insurance company benefits from a policy holder who dies. This means that the insurance company basically owns a 115% call. Again this has to be valued on that portion of policy holders who are expected to die in a given year. In other words, the insurance company has a (positive) value coming from this policy equivalent to $1 thousand times the percentage price of a 1-year 115% call option on the S&P plus $1 thousand times the percentage price of a 1-year 115% call on the S&P forward starting in 1 year plus $1 thousand times the percentage price of a 1-year 115% call on the S&P forward starting in 2 years, 3 years, and so on, up to 9 years. The three market risks described above (which also implicitly take insurance risk into account) in combination with $100 thousand notional on the S&P determine the best estimate of insurance liabilities. The first two market risks (10-year 80% put and yearly 115% puts) and the $100 thousand notional on the S&P (which is fully hedged because the insurance company purchases $100 thousand notional on the S&P) need to be aggregated and the third market risk (yearly 115% calls) needs to be deducted to come to the overall best estimate of insurance liabilities of this endowment policy.

To summarize, the best estimates of insurance liabilities are derived from market prices incorporating actuarial best estimates. In this context, market prices need to be seen in the broadest sense. In other words, it is not only financial instruments that have a market price, but also, for example, catastrophe risks. In the above example, the combination of actuarial best estimates (i.e. 1% of policy holders die every year) and market prices of put and call options were used to calculate the best-estimate insurance liabilities.

Sometimes a distinction is made between hedgeable and non-hedgeable risks. Every risk that is hedgeable has, by definition, a market price attached to it and should therefore be used to establish the best-estimate insurance liabilities. For non-hedgeable risks no such market price exists, and another method has to be used to determine the market value. This is done through the *market value margin* approach discussed next.

[14] A forward starting option is an option that you buy today but only becomes effective from the forward start date.

2. Market Value Margin of Non-Hedgeable Risks

Non-hedgeable risks do not have a market value. Hence, it is important to have a consistent and coherent approach to estimate a market value. This is done by calculating the market value margin. However, first it is important to understand what non-hedgeable risks are. With respect to insurance liabilities, the most important non-hedgeable risk is underwriting risk. Underwriting risk is the risk that future losses or costs on the underwritten business will be greater than expected. This can easily happen with insurance policies as the expected future losses are based on actuarial assumptions. Not only are the assumptions susceptible to change, but the actual realized losses can also be different from the initial assumptions. The main underwriting risks with respect to insurance policies are mortality risk, longevity risk, lapse risk (e.g. more policy holders than expected surrender), and catastrophe risk. It is very rare to find market prices for these types of risks, but it is possible to derive a theoretical market price for such risks. The way to go about this is to place yourself in the position of a potential acquirer of these non-hedgeable risks. When an acquirer takes over non-hedgeable risks, he will need to set aside capital to cover losses should these unexpected risks materialize. However, there is a cost associated with holding capital. This is often referred to as the *cost of capital* and is nothing more than the return investors require on the capital they invest. Hence, once you know the cost of capital and the amount of capital that you need to put aside to takeover the non-hedgeable risks, one can calculate the market value of these non-hedgeable risks. Luckily, the amount of capital that needs to be put aside for non-hedgeable risks (most notably underwriting risks) is established by SCR under Solvency II (see section 10.7) and the cost of capital is set to be 6% over and above the risk-free rate.[15] These two inputs make it possible to determine a proxy for the market value of non-hedgeable risks. Since capital is typically invested at a risk-free rate, the cost that is relevant for market value margin purposes is only 6% of SCR. The following example clarifies the principle of market value margin.

Consider an insurance company with an SCR for its non-hedgeable risks of $1 billion in year 1, $0.5 billion in year 2, $0.25 billion in year 3 and zero from then onwards. Hence the cost of capital is $60 million (6% of $1 billion) in year 1, $30 million in year 2,

[15] Obviously, one can argue whether risk-free interest plus 6% is a reasonable cost of capital, but this is the level that has been fixed under Solvency II.

and \$15 million in year 3. The market value margin can now be calculated by taking the net present value of the cost of capital numbers for the respective years. Assuming that the risk-free interest rate is 3% (i.e. flat yield curve), this leads to a market value margin (MVM) of:

$$\text{MVM} = \frac{60}{1.03} + \frac{30}{1.03^2} + \frac{15}{1.03^3} = \$100.26 \text{ million} \tag{10.4}$$

10.7 STANDARDIZED APPROACH SOLVENCY II

Since Pillar I will be the driving force of Solvency II, this section[16] gives a high-level overview of that Pillar. In Appendix C more detail is provided. Even though the exact details of Solvency II are still being worked out, this section and Appendix C give an overview of the current status and thinking of the standardized approach of Pillar I. The Technical Specifications of the fourth quantitative impact study (QIS4) of Solvency II have functioned as a reference for this section and Appendix C.

Figure 10.6 gives an overview of the components and structure of SCR. The objective of SCR is that its components are mutually exclusive and collectively exhaustive. Appendix C describes in detail how each of the individual components can be calculated. As displayed by Figure 10.6, SCR has two major building blocks, namely 'Basic Solvency Capital Requirement' (BSCR) and 'Operational Risk'. Operational risk is defined as the loss arising from inadequate or failed internal processes, people, or external events. It is quantified by taking either a percentage – which depends on the type of insurance – of premium earned (excluding unit-linked) or technical provisions (excluding unit-linked), whichever is larger, plus 25% of the annual expenses related to unit-linked policies. Regardless of this calculation, operational risk can never be larger than 30% of BSCR plus 25% of the annual expenses related to unit-linked policies.[17]

BSCR is the most important building block of SCR and concerns all risks other than operational risk. It comprises five major risk categories that need to be quantified.[18]

1. **Market risk** arises from the level of volatility of market prices of financial instruments.

[16] All definitions and formulae stated in this section and Appendix C are based on *QIS4 Technical Specifications*, 31 March, 2008, European Commission.

[17] See Appendix C for the exact formula.

[18] Definitions are based on *QIS4 Technical Specifications*, European Commission.

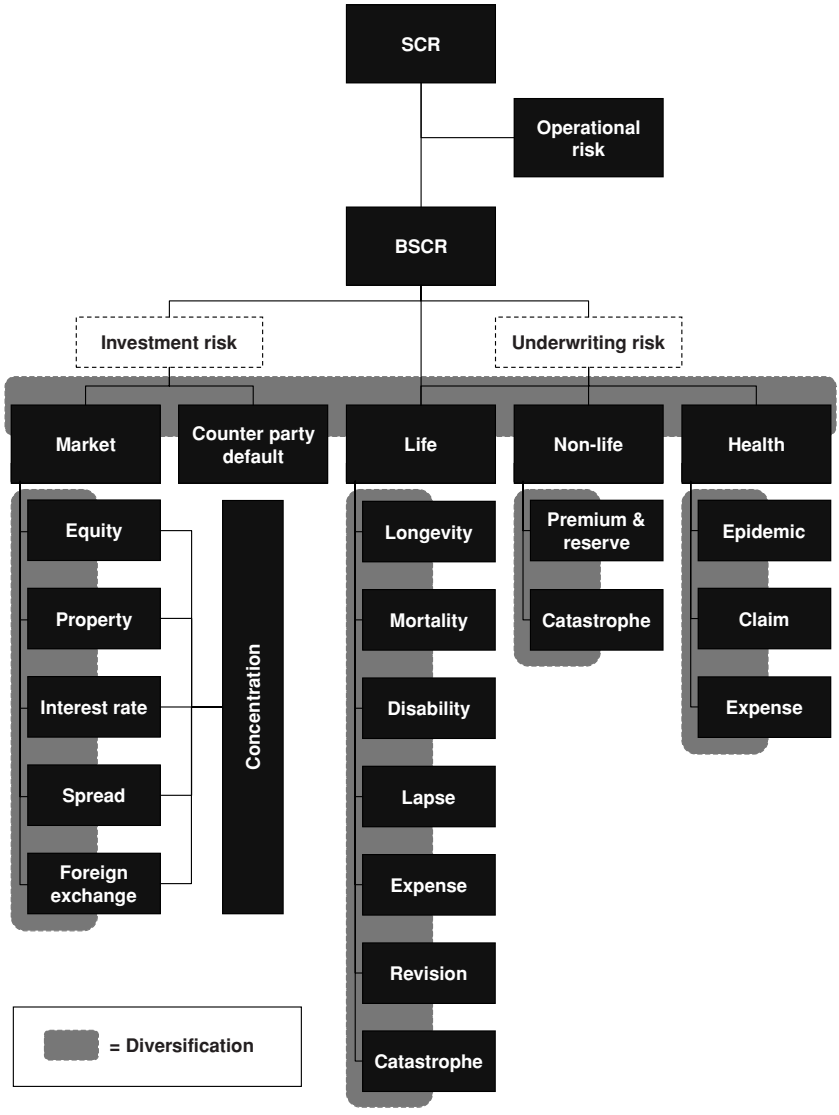

Figure 10.6 Solvency capital requirement (SCR) components and structure.

2. **Counterparty default risk** is the risk of possible losses due to unexpected default, or deterioration in the credit standing of the counterparties or debtors in relation to risk mitigating contracts.
3. **Life risk** concerns the risk arising from the underwriting of life insurance contracts.

Table 10.4 Standardized approach capital charge for risk subcomponents

Risk category	Risk subcomponent	Standardized approach capital charge (impact on market value of assets minus liabilities)
Market risk	Equity	32% downward shock to global equities and 45% downward shock to other equities
	Property	20% downward shock to real estate prices
	Interest rate	Maximum of downward and upward shock to interest rate curve
	Spread	Bond duration times rating specific factor
	Foreign exchange	Maximum of 20% downward and upward shock to foreign currencies
	Concentration	Rating specific charge against 'excess' counterparty exposures
Counterparty default risk		Charge based on probability of default and loss given default (counterparty default risk only applies to risk mitigating contracts such as derivatives and reinsurance)
Life risk	Longevity	25% decrease in mortality rates
	Mortality	10% increase in mortality rates
	Disability	35% increase in disability for the next year and 25% increase thereafter
	Lapse	Maximum of a 50% decrease and increase in lapse assumptions and an immediate surrender of 30% of policies (where a surrender leads to a loss)
	Expense	10% increase in expenses combined with a 1% per annum increase in the expense inflation rate
	Revision	3% increase in the annually payable amount of annuities that are exposed to revision risk
	Catastrophe	0.15% increase in mortality combined with 0.15% increase in morbidity over the next year
Non-life risk	Premium and Reserve	Volume measure for premium and reserves multiplied by a function of the standard deviation of combined ratio
	Catastrophe	Correlation weighted aggregation of net written premiums per business line multiplied by a business line specific factor
Health risk	Epidemic	6.5% multiplied by gross premium earned multiplied by market share
	Claim	Standard deviation of claim results over a 10-year period multiplied by 2.58
	Expense	Standard deviation of expense results over a 10-year period multiplied by 2.58

4. **Non-life risk** concerns the risk arising from the underwriting of non-life insurance contracts.
5. **Health risk** concerns the risk arising from the underwriting of health insurance contracts.

Solvency II divides the five major risk categories of BSCR into subcomponents, of which the risks can be quantified. Table 10.4 summarizes the capital charge calculations under the standardized approach.

Once the capital charge for each subcomponent is calculated, diversification matrices are used to establish the capital charge related to each of the five major risk categories. Subsequently, a diversification matrix is used to translate the capital charges for the individual risk categories into the actual BSCR. Readers who are interested in the exact details behind these calculations are referred to Appendix C, which can also be used as a reference guide.

11

Potential Changes in Capital Regulation

The credit crisis has made policy makers rethink capital definitions for banks. Over the past decade, almost all changes in regulation (e.g. Basel II) focused on required capital (e.g. risk weights to calculate RWAs) rather than changes to capital definitions (i.e. definitions with respect to available capital). However, regulatory changes concerning the definition of capital (i.e. available capital) have a much greater impact on the banking sector than changes with respect to capital requirements.[1] Indeed, required capital regulation generally focuses on the denominator of the BIS ratio (i.e. RWAs), which is so large in comparison to available capital, so that small regulatory changes barely affect the banking industry. In contrast, because the numerator of the BIS ratio is much smaller than the denominator, small changes in capital definitions (i.e. available capital) have a significant impact on the banking sector.

This chapter discusses the current thinking[2] on adequate changes in capital definitions. Although the chapter focuses on capital definitions for banks, one can easily apply the same principles to insurance companies. This chapter does not devote attention to Tier 3 capital. Since, as mentioned in Chapter 8, it is almost certain that Tier 3 capital will be abolished.

11.1 REGULATIONAL SHIFT TO CORE CAPITAL

The credit crisis has induced a rethink of the current capital definitions. Governments had to provide capital support to a great number of western banks even though most banks fulfilled all regulatory limits. This government support was mainly aimed at restoring confidence in a badly battered industry. Confidence had to be restored because investors were

[1] Because the minimum BIS ratio is 8% one can roughly say that changes in the definition of capital have 12.5 times more impact than changes in required capital.

[2] Readers who are interested in the exact details are referred to Bank for International Settlements, *Consultation Document: Strengthening the Resilience of the Banking Sector*, 2009.

uncertain about the capital position of banks and questioned whether they were in a position to absorb further losses. Part of the problem was also that different capital definitions indicated different things. For example, IFRS accounting generally exacerbated a gloomy picture, whereas economic capital and regulatory metrics painted, in some cases, too positive a picture. Even though the truth could probably be found somewhere in between all these metrics, stakeholders generally assumed that things could become even worse than that indicated by IFRS accounting.

Although regulatory capital ratios were more than sufficient, the doubts of investors concerned capital quality and whether this capital was able to absorb (uncertain) future losses. Hence, one can expect regulation to become more stringent with respect to capital quality, but it would be reasonable to assume that the 8% BIS ratio will remain.[3] The main changes will affect the capital composition, which will lean more toward high-quality capital (i.e. proportion of core Tier 1 will need to be higher). On top of that, the classification with respect to high-quality capital will become more stringent and hence core Tier 1 will be defined more narrowly by, for example, not fully including minority interests or partially deducting deferred tax assets. The potential changes to capital definitions are discussed in the subsequent sections. However, before getting into the details it is good to first outline the expected principles of any new capital regulation.

Any new type of capital regulation will likely use the following non-exhaustive list of principles:

1. *More high-quality (i.e. core) capital.*
2. *More narrow definition of core capital.* This will result in less core capital inclusions (e.g. preference shares, minority interests).
3. *Deductions to capital will come at the expense of core capital rather than lower quality capital.* One can, for example, think about partially deducting deferred tax assets from core capital.
4. *Clearer split between going concern capital (i.e. capital that absorbs losses in a going concern such as shares) and gone concern capital (i.e. capital that only absorbs losses for other creditors in liquidation such as cumulative subordinated debt).*

[3] 8% capital requirement seems to be the holy grail of capital regulation. On top of that, regulation can become more stringent without increasing this total capital requirement of 8% by simply imposing more strict conditions on high-quality capital.

5. *More stringent requirements for systemically relevant banks when it comes to gone concern capital.* Indeed, a systemically relevant bank will never turn into a state of gone concern as it will be bailed out by the government. One could therefore think about a clause in a subordinated debt contract which says that it will have to convert to equity in a case of government support.
6. *More dynamic capital regulation.* This translates into higher core capital requirements (as a percentage of total capital) in quiet periods and in periods of stress banks will be allowed to buffer-in on their core capital. This means that capital regulation will become counter-cyclical. The added advantage of this counter-cyclical capital regulation is that the so-called cliff effects diminish. Because current capital regulation is not dynamic, a reduction in core capital can also result in a reduction of total capital if certain limits are breached. To clarify this, consider the following example.

Bank A has Tier 1 capital of $1 billion and Tier 2 capital of $1 billion and hence a total capital position of $2 billion. Now suppose that bank A suffers a loss of $0.5 billion. As a result, the Tier 1 capital of bank A declines to $0.5 billion. Since, Tier 2 capital cannot be larger than Tier 1 capital, the total capital decreases by $1 billion to $1 billion. In other words, because of the static limits within the capital structure, a $0.5 billion loss ultimately results in twice as high a capital reduction. Dynamic capital regulation can resolve this cliff effect.

Notwithstanding the above, it is notoriously difficult to implement dynamic capital regulation. There are two critical success factors for dynamic capital regulation.

(a) *The ability of regulators to lean against the wind while at the same time gaining the confidence of the public and financial sector.* This means that, in times where everybody is bullish, the regulator is able to go against the flow and urge banks to be prudent when it comes to their capital position. Equally, when things go badly, regulators need to be willing to buffer-in on capital while at the same time restoring confidence. The latter is especially difficult and is contrary to human nature. When things go badly, confidence in the financial system generally deteriorates, which can easily be exacerbated if banks are allowed to buffer-in on their capital position.

(b) *The ability of regulators to call the bottom of a crisis.* If a regulator allows banks to buffer-in on their capital position, this regulator needs to be confident that this is the right thing to do. In order to be confident, the regulator needs to assess what part of the downturn can be attributed to irrationality and how deep, in economic terms, is the downturn going to be. Both aspects are extremely difficult as the regulator can only make a fair assessment if he is reasonably good at calling the bottom of a crisis.

All in all, dynamic capital regulation is a nice theoretical concept, but is extremely hard to implement and especially hard to execute in practice.

One can assume that capital structure definitions will remain broadly unchanged. The tiering of capital will likely remain. However, within this tiering, there will be a greater distinction between going concern and gone concern capital. There will likely be three dominant tiers:

1. ***Core Tier 1*** will play a more dominant role and is the highest quality going concern capital (i.e. fully loss absorbing and permanent). Core Tier 1 will likely be restricted to common equity.
2. ***Tier 1 non-common*** is going concern capital other than common equity such as hybrids and certain types of preference shares. However, these hybrids will probably not be able to carry all kinds of innovative features such as ACSM or incentives to redeem and there should be full coupon payment discretion.
3. ***Tier 2*** is basically gone concern capital (i.e. is only loss absorbing in a gone concern).

11.2 REGULATORY CLASSIFICATION PREFERENCE SHARES

Currently, non-cumulative and non-redeemable preference shares are considered core Tier 1 capital. As discussed in section 9.3, preference shares have many debt features. Because there will be more emphasis on high-quality capital, it is unlikely that preference shares will continue to classify as core Tier 1. Indeed, because only the coupons of non-cumulative preference shares are loss absorbing in a going concern (and the principal is not), preference shares do not fulfil the loss-absorption requirement in the broadest sense. In a revised and more stringent definition of core Tier 1 capital, the requirement will likely be that there should be maximum loss-absorbing capacity.

11.3 HYBRID REGULATION

During the credit crisis, hybrids demonstrated little loss-absorbing capacity in a going concern from the perspective of banks. However, investors in hybrids did lose out on a marked-to-market basis as the instruments they owned went down in value significantly. So, on an economic basis, hybrids had loss-absorbing capacity, but this did not benefit the issuing bank in a going concern situation. The only way for banks to make the hybrids loss absorbing in a going concern was to buy them back at a discount (see section 20.5).

Hybrid contracts were typically such that it was hard to defer a coupon, let alone cancel (i.e. forgo) a coupon. This was given in by specific contract clauses, but, especially in Europe,[4] reputational considerations also made banks afraid to defer or cancel coupons. The main reason of this fear stemmed from the fact that banks are very dependent on wholesale funding. Hence, if banks would lose the confidence of the wholesale market by deferring a coupon, this would not weigh up to the benefit of capital preservation (i.e. by not paying the coupon). This was particular to the credit crisis as banks had to operate in a liquidity crunch and could not afford to lose access to an important source of funding.

In summary, even though hybrids were meant to absorb losses in times of stress, specific contractual agreements and circumstances dictated that, even during the credit crisis (which can definitely classify as stress), very few banks cancelled or deferred any coupons. Even banks that were practically insolvent continued to pay coupons to hybrid holders, typically funded with government support.

Regulation will almost certainly respond by imposing stricter conditions to hybrids that classify as Tier 1. One could think of the following measures to make hybrid requirements more stringent:

- *The issuing bank needs to have full discretion over coupon payments.* This can, for example, mean that alternative coupon satisfaction mechanisms will no longer form part of regulatory capital instruments.[5]
- *Incentives to redeem, such as coupon step-up, can no longer form part of the contract.*
- *A clause that converts hybrids into common equity in times of stress (e.g. in case of government support, cf. section 11.4).* The question

[4] In the US it is much more common to defer or cancel coupons on hybrid instruments, whereas in Europe this is considered as a sign of weakness and can lead to far-reaching reputational damage.

[5] Other restrictions might be applicable, such as dividend pushers and stoppers.

is: How does one structure a conversion mechanism? In order to answer this question one needs to understand why such a conversion mechanism would be desirable in the first place. There are two major advantages of a conversion mechanism. The first is that, in times of stress, a financial institution needs more directly loss-absorbing capital in order to run the operation than in more quiet periods. Unfortunately, times of stress are also the times when it is hardest to raise equity. Part of this problem can be resolved by implementing counter-cyclical capital regulation (i.e. hold more capital in good times such that a financial institution can buffer-in on this cushion in bad times). Nevertheless, even with counter-cyclical capital regulation in place, a financial institution might still be in need of additional common equity in times of stress. The second advantage of a conversion mechanism is that one can overcome the issue of *debt-overhang*. This issue relates to the fact that, when a financial institution is in troubled waters and raises new equity, this new equity serves as a bail-out for subordinated debt holders. Indeed, this newly raised equity significantly improves the position of subordinated debt holders as it makes a default less likely. However, this comes at a cost to the providers of new equity as their money is mainly used to absorb the losses of business that has been done in the past before their investment starts to yield. In other words, the providers of new equity absorb losses that, in their absence, would have been borne by the existing debt holders. The issue of debt-overhang makes it hard to raise new equity, as it is a very unattractive proposition for new equity providers. Hence a financial institution finds itself in a catch-22 situation. In order to stabilize itself in times of stress it might be in the interest of all stakeholders (especially equity and debt holders) to attract more common equity, but at the same time it can only attract more equity at a very low share price as this is the only way to make the risk–reward for new providers of equity attractive. This can result in a downward spiral of the share price and ultimately of the entire financial institution. An easy way to solve the issue of debt-overhang is by introducing a conversion mechanism for subordinated debt. However, it is not easy to structure such a conversion mechanism in practice. Although there are some obvious events when subordinated debt should convert (e.g. government support or breach of regulatory requirements), there is a significant grey area. For example, during the credit crisis, a lot of financial institutions were in heavy distress even though they fulfilled all regulatory requirements. In order to overcome this problem,

one could say that conversion should be at the regulator's discretion. However, there are significant drawbacks of making conversion a discretionary power of the regulator. Indeed, if the regulator calls in a conversion, the market could perceive this as a vote of no confidence. This in itself could trigger a downward spiral.

The above shows that it is not easy to structure a conversion mechanism for subordinated debt for the reason that it should not work counterproductively, which can be the case if conversion is at the sole discretion of the regulator. Maybe more importantly, a conversion mechanism should also not kill the advantages of issuing subordinated debt. For one thing, subordinated debt has tax advantages. Another advantage of subordinated debt is that it is much easier to issue than to raise equity. Yet another advantage, which is often overlooked, is that leverage incentivizes efficiency and performance optimization. Indeed, if a financial institution has an overly prudent equity position, it is easier to become sloppy and relax underwriting standards or create a high cost base. Leverage is one of the means to ensure that companies optimize their performance.

Ideally, a conversion mechanism is structured such that the advantages associated with debt remain, but that the issue of debt-overhang is resolved. To ensure that both of these objectives remain, a conversion mechanism should only be triggered in times of heavy distress. This means that, in normal circumstances, subordinated debt holders do not have to worry about their debt being converted. However, once stress occurs, the conversion should be triggered.

One could, for example, think about the following conversion mechanism. The issuing institution has the option to convert subordinated debt into common shares if the subordinated debt instruments trade below par, or the original value, by a significant amount (e.g. 60% of par value). This condition ensures that subordinated debt holders are unlikely to be converted. At the same time it also resolves the debt-overhang issue as this is most likely to arise when subordinated debt is trading at a significant discount. The question then becomes: What is the conversion price in case the issuing institution exercises this option?

It is important that, upon conversion, the subordinated debt holders get a fixed number of shares per dollar subordinated debt. The reason being that, if the subordinated debt holders are guaranteed that they get at least the value of their subordinated debt, the share price can end up in a downward spiral as arbitrageurs can start playing shares

against subordinated debt and effectively force the issuing institution to convert. In this case (i.e. when the share price goes to zero), the financial institution is effectively given to the subordinated debt holders and the shareholders are fully diluted.

To summarize, a mechanism that converts hybrids into common equity should ideally satisfy the following characteristics:

1. *Each hybrid contract that classifies as Tier 1 and potentially even Tier 2 has a conversion clause.*
2. *The exact conversion details (e.g. conversion ratio) are, within some (minor) boundary conditions (e.g. not too large a dilution in case of conversion), determined by the market.*
3. *A conversion is at the discretion of the issuer and should not be automatic.*[6]
4. *The number of shares that the hybrid is converted into is fixed in advance as of the issuance date.*
5. *The trigger point beyond which the issuer has the option to convert is dependent on the price of the hybrid so that the debt-overhang issue can be diminished.*

Consider the following example:

An investor buys $100 million worth of subordinated debt at a time when the share price of the issuing institution is $10. It is agreed that the issuing institution can convert when the subordinated debt drops below 60% of its original value. Upon conversion, the subordinated debt holder receives 20 million shares. A year later, the subordinated debt is worth only $50 million and the issuing institution decides to convert. In this same period, the share price has dropped to $3. Hence, the $50 million of subordinated debt is converted into $60 million worth of equity. Note that the conversion mechanism was chosen such that even if the share price drops by 70% and the subordinated debt by 50%, the market value of instruments that the subordinated debt holders hold increases upon conversion into equity. This is desirable, as it ensures that the financial institution converts only when it is really necessary as there is a sort of penalty involved.

The above example shows how a conversion mechanism can be structured.[7] Although, there are trade-offs associated with this conversion mechanism, it does ensure that the advantages associated with subordinated debt are broadly maintained while at the same time minimizing the issue of debt-overhang.

[6] Potentially, conversion can also be subject to regulatory approval.

[7] This is merely an example and assumes that both the hybrids and shares are listed.

11.4 SUBORDINATED DEBT FOR SYSTEMICALLY RELEVANT BANKS

In a going concern, subordinated debt has very limited loss-absorbing capacity, and in some cases even none at all. Therefore, the loss absorption of the subordinated debt of banks comes mainly into play when a bank goes bankrupt (i.e. a gone concern). However, as became apparent during the credit crisis, systemically relevant banks will never go bankrupt because they will be bailed out by the government. When governments bailed out financial institutions they let the shareholders bleed, but the hybrid holders and subordinated debt holders did not suffer from a credit perspective, i.e. no default occurred (on a marked-to-market basis subordinated debt holders did feel the pain). Hence a government bail-out prevents subordinated debt from ever fulfilling its loss-absorbing function in a state of gone concern. One can therefore expect that, in order to classify as capital, subordinated debt will be required to have a clause that ensures that subordinated debt converts into equity in the case of a government bail-out.

In order to avoid the discussion about the criteria that determine when a bank is systemically relevant, one can simply say that a bank is systemically relevant when it is bailed out by the government. Hence, each hybrid contract, regardless of whether a bank is deemed systemically relevant today, should have a clause that says that the hybrid is converted into equity in a case of government capital support.

11.5 POSITIVE REVALUATION RESERVES

It is difficult to see what will happen to the capital treatment of positive revaluation reserves. Currently, for banks, there is a so-called prudential elimination filter for positive and negative revaluation reserves of interest-bearing securities.[8] Positive equity revaluation reserves are treated differently and are classified as Tier 2 capital. The question is whether positive revaluation reserves related to non-interest-bearing securities will still classify as capital. More in general, it remains unclear what will happen to revaluation reserves due to changing accounting regulation. The question is: Until the accounting changes take effect, will the regulator still accept positive revaluation reserves as capital, albeit Tier 2? There is no black-and-white answer to this question, but one can look at it from several angles. Figure 11.1

[8] For insurance companies no such prudential filter exists.

Capital treatment positive equity revaluation reserves	Pros	Cons
Include in Tier 2	• Theoretically, the bank could sell the assets and realize the positive revaluation reserve through the profit and loss statement	• The reason that a positive revaluation has arisen in the first place is because the bank has an intention to hold the assets to maturity and can therefore not realize any gains

Figure 11.1 Pros and cons for including positive revaluation reserves of non-interest-bearing securities in Tier 2 capital.

gives the pros and cons for including non-interest-bearing positive revaluation reserves in Tier 2 capital.

11.6 MINORITY INTERESTS

In the current capital definition for banks, minority interests are considered to be core capital.[9] However, as Chapter 8 explained, it is questionable whether minority interests can qualify as fully loss-absorbing capital for the 'parent' company. Indeed, minority interests are participations from third parties in one of the subsidiaries of a financial institution. While these third-party interests might be able to absorb losses in the subsidiary, they will not absorb losses in other parts of the financial group (i.e. the financial institution cannot write off losses – stemming from parts other than the subsidiary – at the expense of minority interests in that subsidiary). Because minority interests cannot classify as fully loss-absorbing capital for the 'parent' company, it will likely not be fully included in the capital definition of core Tier 1. However, this begs the question of how it should be dealt with. Indeed, if minority interests are not included at all, a discrepancy arises between the risks that are considered (risks of the subsidiary are fully consolidated)

[9] Assuming that this minority interest represents a share participation. As long as the minority interest is a share interest it is core capital. When it is an interest in hybrids it is generally Tier 1 capital. Thus, depending on the quality of the minority interest investment will it classify as core Tier 1, Tier 1, or Tier 2.

and the capital position (capital of subsidiary is not fully consolidated). So, if minority interests are not included in the capital position of the group, regulation should also not consolidate part of the risks of that subsidiary. An alternative methodology would be to only include, in the capital position of the group, that part of the minority interest that covers the minimum capital requirement of the subsidiary and not any excess capital. One can even go one step further, because the latter treatment could cause the same bank to have a lower capital ratio with a minority interest than in the absence of a minority interest, assuming that the bank is capitalized above the minimum capital ratio. Hence, a cleaner approach might be to include that part of the minority interest so that the subsidiary has the same capital ratio as the group (without minority interest), but no capital in addition to the capital ratio of the group.

11.7 DEFERRED TAX ASSETS

As discussed in Chapter 8, deferred tax assets (DTAs) are contingent on a financial institution realizing sufficient profits. Indeed, DTAs typically arise due to net loss carry forwards and can reduce the future tax expenses by releasing it against future profits. This means that, if a financial institution does not expect to post a profit for the foreseeable future, it cannot release the DTAs and hence should be devalued, perhaps to zero. That would result in a corporate loss to the tone of the amount of the DTAs, which in turn reduces the capital position by the amount of the DTAs. To summarize, if the contingent events never materialize (namely corporate profits in the case of DTAs), the core capital position is overestimated by the amount of the DTAs. Furthermore, because DTAs represent a value that will only crystallize in the future, the amount of core capital that can absorb losses instantaneously excludes DTAs.

One can expect that any new capital regulation will take due account of the abovementioned DTA features. Especially, the fact that the 'DTA-part' of the capital position does not have an immediate loss-absorbing capacity. On the other hand, one needs to acknowledge that DTAs represent a value that will boost the capital position going forward, provided that sufficient profits are made. Hence, it is conceivable that new capital regulation will allow core capital to comprise (some) DTAs, provided they do not form a material part of the core capital. One could, for example, think of a threshold (e.g. 10% of core capital) above which DTAs need to be deducted from core capital.

11.8 PARTICIPATIONS IN OTHER FINANCIAL INSTITUTIONS

Equity stakes in other financial institutions (see section 8.5) typically have to be deducted for 50% from Tier 1 and for 50% from Tier 2 capital. This will likely change. Probably all deductions will go straight from core Tier 1. For financial institutions with significant interests in other financial institutions, this could imply a significant reduction of their core Tier 1 capital. This comes on top of any other measures to give core Tier 1 a more dominant position in new capital regulation.

11.9 LEVERAGE RATIO LIMIT

To tackle the problem of highly leveraged banks, policy makers will likely put specific limits in place with respect to leverage of banks (total assets divided by total tangible equity).[10,11] In the US, such a leverage limit is already used in practice. However, in Europe there is no such thing as leverage ratio regulation. Regulation with respect to leverage ratios is a complicated topic and subject to much debate. The danger of a leverage ratio is that people forget to take into account the actual riskiness of the assets in which a bank invests. Indeed, it is only logical that a bank with very risky assets has a lower leverage than a bank with very safe assets. Therefore, merely basing supervision on one single leverage ratio limit would be too narrow. It is also important to focus on the embedded leverages in certain assets on the balance sheets of banks rather than just using a single measure such as total assets divided by tangible equity. However, even though a leverage ratio limit is not the complete solution, it could guide banks and force them to establish profitable growth based on sound business models rather than just levering up. A leverage ratio limit can be seen as complementary to the current risk-based regulatory framework. Indeed, if a leverage ratio is low this should not be used as a signal that a bank is safe. An investment bank investing in very risky assets should also have a low

[10] Parts of this section have been copied from de Weert, F.J., *Banking Solutions – Aligning the Banking System with Society.*

[11] For the purpose of comparing leverage ratio to core Tier 1 ratio, subsection 10.1 defined the leverage ratio as the reciprocal of total assets divided by tangible equity, i.e. tangible equity divided by total assets. However, in every day life, leverage ratio typically refers to total assets divided by tangible equity, i.e. how many times is a bank's tangible equity invested in assets?

leverage and even then the risks could be far greater than a retail bank with a very high leverage ratio.

The introduction of a leverage ratio limit in combination with a securitization market that has gone out of fashion can create a negative and downward spiralling effect with respect to available credit. The reason that the securitization market has grown so large in the US is mainly because of this leverage ratio limit. The leverage ratio limit prevented US banks from fulfilling the demand for credit. The securitization market was the perfect solution to satisfy the high demand for credit without levering up the banking system. Due to the credit crisis, this securitization market has come under pressure all over the world. The introduction of a leverage ratio limit in Europe would thus constitute a highly procyclical measure. The timing of the introduction of such a leverage ratio limit is therefore crucial and would ideally be appropriated with a transition phase. However, it is likely that regulation with respect to leverage ratios will be introduced in the (near) future. If, internationally, they cannot come to an agreement on a hard limit, it will probably form part of Pillar III.[12] This means that banks will be required to report their respective leverage ratios transparently in the hope that market discipline will force banks to maintain a responsible leverage ratio (i.e. aligned with the risks that a bank takes).

11.10 FINANCIAL AUTONOMY

Apart from direct regulatory changes with respect to capital, one could also think of some more indirect changes. One of the measures that is being thought about is to ensure that each subsidiary of a financial institution is autonomous. This means that a subsidiary can operate and survive independently of the 'parent' company. Obviously, when subsidiaries need to operate their finances autonomously, this will have capital implications. The main consequence is that a financial institution can no longer look solely at its capital position on a consolidated basis, but also needs to ensure that there is sufficient capital in each of the subsidiaries. Hence, financial autonomy is a measure that moves away from consolidated supervision towards solo supervision (i.e. each subsidiary is supervised separately). In banking, the main practice is

[12] The definition of a leverage ratio could then be defined under Pillar I or Pillar II. However, a harmonized definition could be difficult to achieve because of the many different co-existing accounting systems.

currently consolidated supervision, whereas insurance companies are supervised primarily on a solo basis. If regulators were to introduce financial-autonomy-type measures, this would mean that they break the trend of consolidated supervision. One could say that this would be a far-reaching measure, but not unthinkable. One of the reasons that this would be a far-reaching measure is because it would disincentivize diversification from a strategic perspective. Indeed, if all business units need to operate their finances autonomously, it is hard to realize synergies and therefore diversification cannot add value from a strategic point of view. However, from a regulatory point of view, diversification is crucial in the sense that it can stabilize the financial system. History has shown that undiversified financial institutions have had a hard time to survive (e.g. savings and loans crisis in the US). So, even though, in the credit crisis, diversification did not provide much protection to the severity of events, this does not mean that diversification is not healthy. In fact, more often than not, diversification is one of the best way to stabilize earnings and to create a more robust financial institution. Figure 11.2 presents the pros and cons for introducing regulation that would

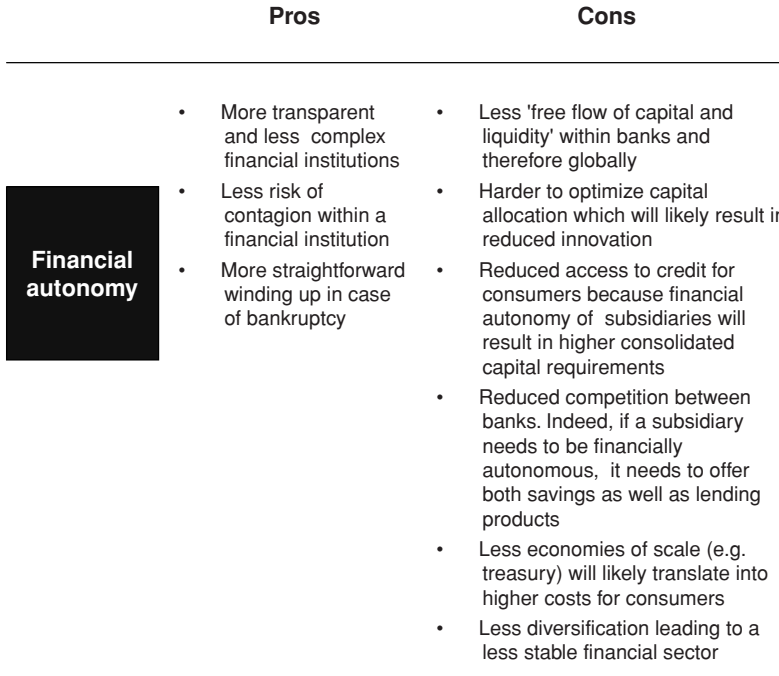

Figure 11.2 Pros and cons for introducing financial autonomy regulation.

require each subsidiary to be financially autonomous. From the pros and cons it becomes clear that reduced systemic risks need to be weighed against less prosperity, competition, and innovation. Philosophically, it is important to acknowledge that no agent can survive on its own. Hence, financial autonomy regulation might not only have prosperity, competition and innovation repercussions, it could well be an illusion altogether. Therefore, it might be better that regulation focuses on the extent of financial autonomy rather than complete financial autonomy.

12

Reserve Adequacy Test

Since technical provisions make up such a large part of the balance sheet of an insurance company, it is important to assess whether these provisions accurately reflect the liability that an insurance company has towards its policy holders. Whether this is the case is established through the reserve adequacy test, which is performed by the regulator. The main reason that the regulator wants to test the adequacy of the technical provisions (i.e. reserves) is because the provisions are based on accounting and actuarial principles which might not result in the best estimate of the insurance liabilities. In the reserve adequacy test, the regulator uses its own insurance parameters (e.g. estimates for mortality, morbidity, lapse) and own yield curve to discount liabilities, and premiums to determine the best estimate insurance obligation.[1] If the test shows that the accounting provisions are greater than the best estimate, the technical provisions can be classified as prudent. This means that the 'real' liability is most probably smaller than the technical provisions. In this case, the regulated institution might even request for the recognition of a higher available capital position. Indeed, if the best estimate of the regulator becomes reality, the capital position of the regulated institution improves with the difference between the technical provisions and the best estimate of the regulator. If the best estimate of the regulator is in fact higher than the technical provisions, the regulator will adjust the available capital position downwards by this difference. This is logical as, according to the best estimate of the regulator, the insurance liabilities currently accounted for do not suffice. Hence, over time, the capital position of the regulated institution will deteriorate.

Since, under Solvency II, it will be standard to determine technical provisions on a best estimate basis, the reserve adequacy is in fact explicitly incorporated in the framework.

[1] The reserve adequacy test also looks at the asset side of the balance sheet. If assets are accounted for at cost price, but the market value of these assets is below book value, this is taken into account in the reserve adequacy test. Indeed, the best estimate insurance liability is increased by the amount that the *hold to maturity* assets are under water.

13

Materializing Diversification Benefits through Capital Structures

Bank regulators apply upward consolidation to determine both available capital as well as required capital. This means that leveraged bank holding companies are fully consolidated when determining required and available capital for a bank. This is different for insurance companies where capital requirements link in at individual legal entities,[1] even if the legal entities are part of a greater insurance conglomerate. This is called solo-supervision, which means that each legal entity is considered separately and needs to fulfil the regulatory capital requirements. From a business perspective this is strange as there might be diversification benefits between legal entities, but, for regulatory purposes, this does not translate into a lower capital requirement at consolidated level. However, because insurance regulators do not apply upward consolidation, insurance companies can materialize part of these diversification benefits through smartly chosen and leveraged holding structures.

This chapter shows how an insurance company or any other financial institution for which regulators do not apply upward consolidation (e.g. bancassurance) can still realize diversification benefits, even though they are not acknowledged by the regulator. Although this sounds like exploiting a regulatory loophole, it is merely based on sound business principles. Diversification benefits might not arise from regulation, but can nonetheless be achieved through smartly chosen capital structures. To illustrate how diversification benefits can be materialized in a solo-supervision context, consider the following example.

[1] In Europe the IGD and Fico directives also apply some level upward consolidation by restricting the level of leverage.

Life insurance company A has a geographically well-diversified business. It has a presence in the US, Europe, and Asia. Suppose that each geographical business line is a separate legal entity and has a capital requirement of $8 billion.[2] Nevertheless, the parent decides to capitalize each of the entities with $10 billion. Hence, A needs $30 billion worth of capital at consolidated level. However, in practice there are diversification benefits between the geographically diversified businesses to the tone of 15%. This means that, realistically, A only needs to hold $25.5 billion (85% of $30 billion) worth of capital at consolidated level instead of $30 billion. A can materialize these diversification benefits by setting up a holding company, of which the three legal entities are subsidiaries. This holding company is financed partly with debt and partly with equity. In this example, the holding company would be financed with $25.5 billion of equity and $4.5 billion of debt. The total financing of this holding company would then be $30 billion, which can subsequently be injected as equity in the three legal entities (i.e. subsidiaries). This means that the liability side of the balance sheet of the holding company comprises $25.5 billion of equity and $4.5 billion of debt. The asset side of the balance sheet of the holding company is simply composed of the equity stakes in the three legal entities, each of which is worth $10 billion. Figure 13.1 displays the balance sheet composition of A's holding company. Figure 13.2 visualizes the holding structure of insurance company A by means of an organization chart.

The above example shows that one can materialize diversification benefits within an insurance conglomerate by creating a holding company that is partly debt financed. The underlying subsidiaries of this holding company are subsequently capitalized with equity using the proceeds of the equity and debt financing of the holding. Practically, debt at the holding is converted into equity at subsidiary level. Regulators that supervise the solo-entities (i.e. subsidiaries) recognize the entire $10 billion of equity, even though part of this equity is financed with debt, as long as the equity provider (in this case the holding company) cannot freely access the equity of its subsidiaries. On top of that, regulators do perform a test at holding level even though the holding company itself is a non-regulated entity. This test says, among other things, that the holding company needs to have sufficient equity to cover the sum of the minimum capital requirements of the solo-entities. In the example above, this test is met, as the sum of the minimum capital requirements is $24 billion (three times $8 billion) and available equity at holding level amounts to $25.5 billion. Nevertheless, debt providers at holding level enable insurance company A to materialize diversification benefits by creating excess capital at legal entity level. This excess capital is

[2] In practice insurance legal entities are much more thinly spread than a continent granularity. It can even be more thinly spread than country-level or State-level.

Figure 13.1 Balance sheet of holding company A.

partly debt-financed. The reason being that the holding of A does not need to attract the full $30 billion equity, but can also finance part of it with debt. Since debt has a lower cost of capital[3] than equity, this holding structure has 'cost' benefits for insurance company A. However, it is important to realize that this partly debt-financed holding structure introduces leverage.[4] This means that equity investors in the holding company will achieve enhanced returns when things go well, but are hit extra hard when things turn sour. In other words, the equity providers

[3] Cost of capital stands for the return that investors require on their investment.

[4] Leverage refers to a situation where a company owns more assets than its net worth. In other words, part of the assets is financed with debt in order to increase investment returns.

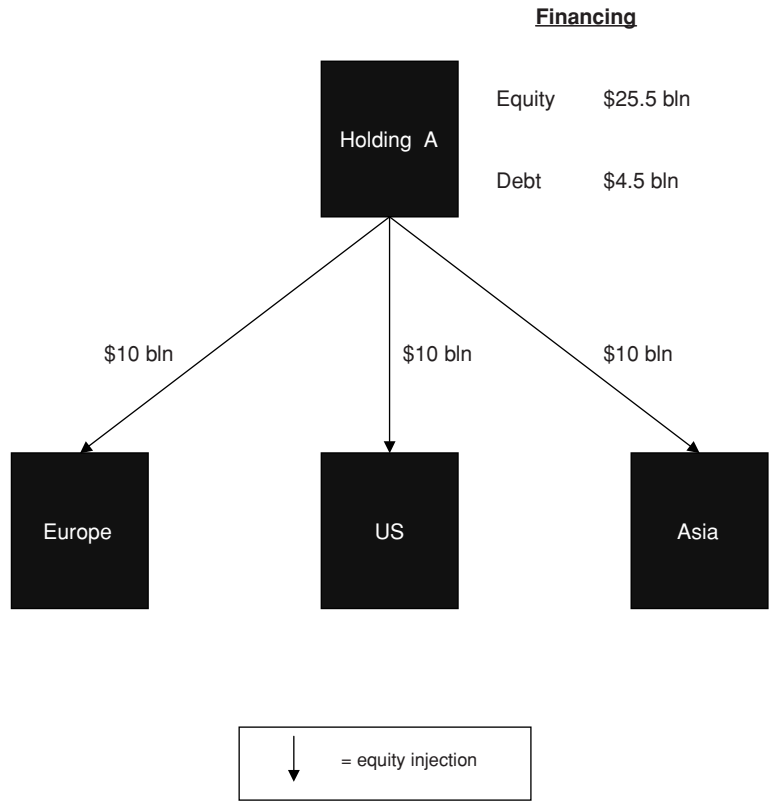

Figure 13.2 Visualization of the holding structure of insurance company A.

of the holding company try to enhance their returns by increasing the risks they run, so that risks and capital position are better aligned. This can be illustrated by means of a numeric example.

Suppose that the three subsidiaries (Europe, US, and Asia) achieve positive returns of 20% a year. This means that the holding will make $6 billion in one year before servicing of debt. Suppose further that it costs 6% a year to finance the debt at holding level. This translates into an interest expense of $270 million (6% of $4.5 billion debt). This means that the total profits for the holding amount to $5.730 billion, which is equivalent to a return of 22.5% ($5.730 divided by $25.5) for the equity holders. In other words, a 20% return at subsidiary level translates, by means of the leveraged capital holding structure, into a 22.5% return for the shareholders in the holding. Conversely, if the subsidiaries yield a negative return, the return on equity for the shareholders in the holding will be

even more negative. Indeed, if the return at subsidiary level is −20%, then the total loss at holding level is minus $6.270 billion. This is equivalent to a negative return on equity for shareholders in the holding of 24.6% ($6.270 divided by $25.5). However, the latter situation does not recognize the diversification benefits that exist between the three geographical business lines, because well-diversified businesses should not become loss-making at the same time.

It is not only within insurance companies that holding structures can be used to materialize diversification benefits. Also, bancassurance companies (groups with bank as well as insurance activities) have diversification benefits that do not naturally flow out of the regulatory framework. Indeed, insurance companies and banks have separate regulatory capital requirements that do not take into account potential diversification between the two activities. Although the bancassurance model has several shortcomings and synergies are hard to materialize, there is diversification between insurance and bank activities of which the most pressing are interest rate diversification, or even interest rate off-sets and liquidity off-sets (bank is short liquidity whereas an insurance company is long liquidity). The insurance activities of a bancassurance company are typically negatively exposed to declining interest rates, which are offset by the interest rate position of the banking activities that benefit from declining interest rates. Hence for bancassurance companies, one can also think about a holding structure that is partly debt-financed to realize diversification benefits and risk off-sets.

14

Risk-Weighted Assets Optimization

Section 10.1 discussed the importance of bank capital ratios, such as core Tier 1 ratio. Investors, and financial markets in general, focus on these bank capital ratios constantly and view this as an indicator of the solidity of a bank. This is quite logical as the difference between the actual capital ratios of a bank and the minimum capital ratios (e.g. 8% BIS ratio, 4% Tier 1 ratio) represent a cushion that can absorb losses before a bank breaches regulatory requirements. In other words, the difference between actual capital ratios and the minimum capital ratios reflects the so-called 'distance-to-default' for a bank.

From a solidity perspective, a bank likes to have as high a capital ratio as possible. However, in order to satisfy investors, a bank also needs to realize an acceptable return on capital. The latter can be achieved more easily when the capital position is as low as possible; since a capital ratio divides available capital by risk-weighted assets, it pays for a bank to optimize its RWAs in order to improve its capital ratios. Obviously, a bank can also improve its capital ratios by attracting more capital, but this goes at the expense of a good return on capital. Hence, optimization of bank capital ratios is typically put in practice by optimizing the RWAs. This can be best illustrated by means of two examples.[1]

Consider a bank with common shareholders' equity of $10 billion. This bank has total assets of $100 billion of which $2 billion is a triple A (AAA) securitization with a risk weight of zero. Suppose the total risk-weighted assets of this bank are $75 billion. This means that the bank has a core Tier 1 ratio of 13.3%. If the securitization is downgraded to CCC (risk weight of 1250%), the risk-weighted assets increase by $25 billion ($2 * 1250\%$). Hence, the core Tier 1 ratio decreases to 10%. The strange thing is that, from a capital management perspective, the bank has an incentive to sell the securitization. Even if the bank sells the securitization at a 50% loss, the capital ratio increases from 10% to 12%.

[1] The first example is copied from *Banking Solutions – Aligning the Banking System with Society* by Frans de Weert, published in 2009 by Uitgeverij Paris.

Indeed, by selling the position at a 50% loss, the common shareholders' equity position decreases by $1 billion to $9 billion, but the risk-weighted assets also go back down to their original level of $75 billion.

This example shows that, from a capital management perspective, securitizations are attractive to hold when they have a high credit rating, and can be very punitive when they are downgraded. In this case, one can optimize the RWAs and hence the capital ratio by selling heavily downgraded securitizations. It would be beyond the scope of this book to explain the shortcomings of the current regulatory securitization framework; however, the book *Banking Solutions – Aligning the Banking System with Society* by F.J. de Weert explains this in detail. This book also gives suggestions on how this framework can be improved such that it will work less procyclically.

As a second example, consider a universal bank A with an investment banking subsidiary, IB. Suppose that this subsidiary holds $1 billion of core capital and has RWAs worth $12.5 billion. This means that this investment banking subsidiary has a core Tier 1 ratio of 8%. Suppose further that the core capital of the remaining activities of A amounts to $10 billion which carry RWA of $100 billion. Hence, the core Tier 1 ratio of the remaining activities of A equates to 10%, and the overall core Tier 1 ratio of A is 9.8% ($11 billion of capital divided by total RWAs of $112.5 billion). If A decides to sell IB, it will almost certainly improve its core Tier 1 ratio. Indeed, even if A sells IB for nothing, the core Tier 1 ratio of A simply becomes the core Tier 1 ratio of the remaining activities and hence improves from 9.8% to 10%. So, it is only if A realizes a negative sales price[2] in excess of $200 million (i.e. a loss of more than $1.2 billion as the book value of IB is $1 billion) that the core Tier 1 ratio will decline. Indeed, a negative sales price of $200 million for IB results in a core capital position of $9.8 billion for A on the remaining RWAs of $100 billion, thus resulting in a core Tier 1 ratio of 9.8% for A's remaining activities. A negative sales price of $200 million for IB therefore reflects the break-even point with respect to A's core Tier 1 ratio. Interestingly, if A sells IB at book value (i.e. $1 billion, neither loss nor gain), A's core Tier 1 ratio increases from 9.8% to 11% (core capital remains $11 billion and the RWAs decrease to $100 billion).

From the second example one might be tempted to conclude that it is almost always advantageous to sell subsidiaries with a lower capital

[2] A negative sales price can occur when (significant) operational losses are to be expected.

ratio as it can be an easy way to increase capital ratios.[3] However, one has to bear in mind that, although a divestment might be an easy way to increase capital ratios, it will also reduce profits and, hence, return on capital. Indeed, the divested RWAs do generate a much better yield than the cash proceeds of the divestment: (1) because assets generally have a higher yield than cash; but more importantly, (2) the capital of a bank is highly leveraged and therefore generates a relatively even higher yield compared to the cash proceeds of the divestment. Apart from strategic considerations, a bank would therefore only divest subsidiaries if it needs to reduce risks, improve capital ratios, or can achieve a higher return on capital by reallocating the capital of the respective subsidiary.

[3] If the subsidiary that is to be divested has a much higher capital ratio than the remaining activities, it is very important to get a good sales price in order to maintain certain capital ratios. The sales price cannot be too much below the book value. However, it can be a little bit below the book value as a divestment naturally results in a reduction of overall RWAs.

15

Balance Sheet Analysis as Integral Part of Valuation

More than in any other industry, it is important to complement a discounted earnings valuation[1] or any type of valuation with a balance sheet analysis of a financial institution. There are two reasons why a balance sheet analysis is such an integral part of an overall valuation of a financial institution.

1. *Regulatory capital requirements.* Unlike other companies, there are strict regulations for financial institutions with respect to their minimum capital position. This means that one cannot simply take a discounted earnings analysis as a basis for a valuation. Indeed, one of the major assumptions of a discounted earnings valuation is that the current capital position is sufficient and appropriate to generate the expected future earnings. For an energy company this might be a fair assumption, but for a financial institution this is by no means certain. Depending on the quality and composition of the balance sheet, the regulator might require additional capital. This means that, if a discounted earnings valuation tells you that a fair market capitalization of a financial institution is $10 billion, but the regulator requires an additional $1 billion of capital, the value is really $9 billion. Indeed, only if the acquirer puts up $1 billion will he be able to generate $10 billion of value in future earnings.
2. *High leverage.* Inherent to their business model, financial institutions operate with a significant amount of leverage. This means that a large proportion of their assets are funded externally (i.e. debt-like funding). Indeed, banks have large deposit bases and other external debt and insurance companies have significant insurance obligations (i.e. technical provisions). This contrasts with an energy company such as Shell where only a small part of its assets is debt-funded.

[1] A discounted earnings valuation takes the projected future annual net cash earnings and discounts each of them with the appropriate discount rate to subsequently aggregate the outcomes. The discount rate depends on the returns that equity investors require (i.e. cost of equity).

However, some technology companies are highly leveraged as well (i.e. significant amount of debt compared to its capital position). Hence for these companies a discounted earnings analysis should also always be complemented with a balance sheet analysis and valuation. But why is a balance sheet analysis so important for highly leveraged companies? The answer has, in a way, already been given in Chapter 13. As explained in that chapter, companies that are highly leveraged significantly outperform when things go well, but are more exposed and at risk when things turn sour. Take, for example, a bank with a leverage of 50. In other words, the assets that the bank owns are 50 times larger than its capital position (i.e. 49 times its capital position is funded with debt-like instruments). This means that, if all assets go down by only 2%, the entire capital position of this bank is wiped out. It is therefore crucial to assess the quality of the balance sheet and determine whether the capital position is not overly exposed to risks on the balance sheet.

The above gives two reasons for conducting a balance sheet analysis when valuing a financial institution. Indeed, a balance sheet valuation can serve as a sanity check, but can also, especially in times of stress, be leading when valuing a financial institution. Although the above reasons are quite abstract, they are by no means theoretical. The next example makes the relevance of a balance sheet valuation apparent.

Consider bank A with earnings power (on a net basis) of $5 billion and regulatory capital of $30 billion. Suppose further that A has $10 billion goodwill on its balance sheet. Bank B wants to takeover A. A is advised by a valuation expert to accept 10 times the net earnings, i.e. $50 billion, as a takeover price. The valuation expert explains to bank A that accepting 10 times its earnings is reasonable because this came out of a comparison of recent bank takeovers. Furthermore, the valuation expert explains that the $30 billion regulatory capital is necessary to keep bank A in operation and to be able to generate $5 billion of net earnings a year. Hence, according to the valuation expert, there is neither a value nor a 'liability' in the capital position. Driven by the recommendations of the valuation expert, the management of bank A accepts, conditional to shareholder approval, a $50 billion takeover price from bank B. At the next shareholders meeting, the shareholders of bank A vote against the takeover price of $50 billion. They argue that it is indeed reasonable to accept 10 times net earnings for a bank. However, they add that this only holds for banks with no goodwill amortization. The comparison analysis of the valuation expert was correct, but the takeover targets he looked at did not have any goodwill amortization. This means that the pricing of 10 times earnings of bank A should be adjusted upwards for goodwill. The reason being that, excluding goodwill amortization, net annual earnings are

actually $6 billion instead of $5 billion. Since $30 billion core capital excludes goodwill, the amortization of goodwill is not needed to replenish the core capital position. Hence, the $1 billion annual goodwill charges are actually freely distributable to the shareholders. Based on this, $60 billion would be a more realistic takeover price for A.

The above example shows how important it is to conduct a thorough balance sheet analysis when valuing a financial institution. When it comes to assets that have already been taken into account in the capital position, and whose realization depends on the future profitability (e.g. goodwill, deferred tax assets), one should align a discounted earnings valuation with what is really freely payable to shareholders. Goodwill is, similar to deferred tax assets (DTAs), activated up-front and therefore inflates IFRS equity. However, regulatory core equity is adjusted downwards for goodwill. In other words, goodwill is deducted from IFRS equity to get to regulatory core equity. This means that, if goodwill is amortized and thus reduces net earnings, more of net earnings are in fact freely payable to shareholders. Therefore, if an acquirer wants to keep the regulatory core equity position at the same level, he can do a discounted earnings valuation where the earnings are adjusted upwards to neutralize any goodwill amortization. Under the current regulatory framework, DTAs are not deducted when calculating the regulatory capital. Therefore, the release of DTAs against profits does not increase the regulatory capital position and hence earnings do not need to be adjusted for DTAs. However, this might change under a revised regulatory framework where DTAs might be partially deducted for regulatory capital purposes. Section 20.4 discusses these principles in more detail.

It is important to understand that goodwill and DTAs need to be realized in the future. Because of this uncertainty, DTAs and goodwill are always points of negotiation in takeover situations. The takeover target will argue that goodwill and DTAs are accounted for realistically, whereas the acquirer will generally argue that it is unlikely that all the goodwill and DTAs will be realized. Hence acquirers tend to value goodwill and DTAs below their value shown on the balance sheet.

Apart from assessing the impact of goodwill and DTAs on a valuation, one should also make an assessment of the riskiness of more *tangible* assets. If there is much uncertainty about the value of tangible assets, one should always make a provision for that in a valuation.

In section 20.2, another important valuation principle is discussed. This concerns the difference between market capitalization and enterprise value.

Part III
Risk and Capital Management Perspective

Capital management can only be conducted in close cooperation with risk management. Part III explains why these two disciplines are closely linked and how they should be aligned in order to optimize performance (i.e. optimizing return on capital). Chapter 17 shows where risk and capital management meet and what their critical success factors are. In addition, Chapter 17 explains that, apart from the more quantitative aspects, there is also an often overlooked soft side to capital management. Chapter 18 shows how a financial institution can use risk-adjusted measures to assess performance. In this context, risk-adjusted return on capital (RAROC) is explained. The last chapter of Part III builds on this concept to explain the strategy, risk, and capital management cycle.

Risk and capital management have one joint objective, namely to optimize performance (i.e. optimize return on capital). This part purely focuses on this joint objective, and not on the other capital management objective of optimizing the capital structure. Hence, all topics discussed in this part should be placed in the context of performance optimization (i.e. optimizing return on capital) rather than capital structure optimization (i.e. optimizing cost of capital), apart from Chapter 16, which deals with the investment of capital and how a balance sheet segmentation can make the management of capital easier.

16

Investment of Capital and Balance Sheet Segmentation

Part II deals in depth with available capital and required capital. It discusses, among other things, why available capital should be permanent and sufficient to absorb unexpected losses. However, another question is: How should the available capital of a bank or insurance company be invested? That is the focus of this chapter. Furthermore, this chapter shows how a segmentation of the balance sheet can help capital managers to get a firmer hold on the management of capital.

16.1 INVESTMENT OF CAPITAL FOR BANKS

It has already been mentioned that one of the main functions of capital in a bank or insurance company is to buffer against unexpected losses. This begs the question: How should capital be invested? For banks this question is easier to answer than for insurance companies. Banks have a history of taking risks in the business and ensuring that the capital position is, at all times, sufficient to cover, within a reasonable level of confidence, unexpected losses. This entails that banks need to make sure that the capital position only changes as a result of business activities. Hence, a bank should be able to rely on the capital itself at all times and all capital investments should be risk-free. Indeed, if capital is invested in risky assets, the capital position can deteriorate even though the risks that are run by the business might not materialize. This means that, if the risky assets go down in value, the bank is no longer in a position to use its capital as a buffer for unexpected losses. In a way, if capital is invested in a risky manner, a bank cannot fully rely on the fact that capital will always be present and, hence, capital loses its permanent nature. To solve this issue, banks have realized early on that capital needs to be invested in risk-free assets and is therefore generally invested in government bonds. That is why banks typically have a so-called *capital*

book,[1] in which the entire capital position is invested in a risk-free manner. Because retained earnings are added to the capital position, these need to be invested risk free as well.

Now that it is clear that capital needs to be invested risk-free, the question is: How can capital be invested in a risk-free manner? Because perpetual assets, such as shares, are never risk free, one will always end up investing capital in debt securities. But, even if capital is invested in government bonds it will never be completely risk-free. Even a government can default. Hence, risk-free debt securities only exist in theory. Furthermore, fixed rate debt securities have a certain level of interest rate risk. If interest rates rise, the fixed rate debt security becomes less valuable, and if interest rates go down, the fixed rate debt security becomes more valuable. For variable rate debt securities, the *coupon* compensation resets every day. These debt securities do not have any interest rate risk as their value does not fluctuate when interest rates fluctuate. Indeed, if interest rates go up, the holder of a variable rate security is compensated by means of a higher coupon. Therefore, variable rate government bonds are as close to being risk free as it can be. If variable rate government bonds are not available, a bank can relatively easily replicate this by buying a fixed rate government bond in combination with a payer swap, i.e. pay fixed rate and receive floating (overnight) rate.

Although short-dated government bonds are the *cleanest* risk-free option in which to invest capital, many banks take an asset–liability management (ALM) approach when determining the duration of invested capital. This is because the regulatory capital requirement for interest rate risk is not only determined by the interest rate duration of the business, but also by the interest rate duration of the invested capital. In other words, if capital is invested with a certain duration this can increase or decrease the interest rate risk capital requirement of a bank. Because banks are in the business of transforming maturity (i.e. attract short-dated liabilities and write long-dated assets), the capital of a bank tends to have a positive duration (duration of assets is longer than duration of liabilities). A positive duration of capital means that the capital position goes down if interest rates go up, and vice versa.

[1] One could make a distinction between equity capital and subordinated debt capital. However, especially because regulators recognize different forms of subordinated debt as capital, it makes sense to invest none of the capital in a risky manner, not even subordinated debt that qualifies as capital.

This means that, if capital is invested in longer-dated government bonds, the duration of capital becomes even longer and therefore the interest rate capital charge will go up. Hence, this increase in the interest rate capital requirement needs to be weighed against a potentially higher yield associated with longer-term government bonds. In order to make this concrete consider the following example.

A bank has $10 billion worth of capital with an annual cost of capital of 10% and is trying to determine how to best invest its capital. If the bank decides to invest in 10-year government bonds, it receives an additional annual yield of 2% compared to short-dated government bonds, but its interest rate capital requirement increases by $1 billion. As part of its ALM strategy, the bank wants to economically optimize the investment of capital. This means that the additional costs associated with a higher interest rate capital requirement for 10-year government bonds need to be weighed against the additional yield of these government bonds. In this case, the additional yield amounts to $200 million per year whereas the additional costs are only $100 million per year (10% cost of capital of $1 billion). Hence, purely from an economic perspective, the bank can best invest its capital in 10-year government bonds.

It is important to note that, if a bank invests its capital with a certain duration, this has an impact on the overall capital requirement. This means that a bank needs to ensure that it is sufficiently capitalized, including the impact on the interest rate capital requirement of the invested capital itself. Another important point to note is that, if a bank economically optimizes the duration of its invested capital, its capital position only retains its permanent nature if the additional capital requirement sufficiently covers the additional risks. Because regulatory capital requirements always work with a certain level of confidence, one can think of (extreme) situations in which the additional interest rate capital requirement is not sufficient to cover the interest rate losses on the invested capital. Hence, if a bank decides to economically optimize its investment of capital, it will always give up a (small) part of the permanent nature of its capital in favour of additional yield.

16.2 INVESTMENT OF CAPITAL FOR INSURANCE COMPANIES

Insurance companies have not had the discipline to invest their capital risk free even though this is the only way to ensure that capital is

permanent. Why capital investment principles between banks and insurance have historically diverged is unclear. However, one explanation could be that banks have an unfavourable liquidity position whereas insurance companies have a favourable liquidity position. This means that banks have to worry much more about events that could further destablize their liquidity position. One such event could be a low capital position or even an insolvent bank (i.e. capital is negative). Therefore, it makes sense that banks do not want to take any chances with their capital position. In contrast, an insurance company does not have to worry about liquidity. In fact, as long as the expected insurance risks are properly priced into the insurance policies, an insurance company can make sure that it has sufficient liquidity to satisfy any payment obligations. Even if customers surrender their policies on a large scale, an insurance company is generally in a position to satisfy these surrenders, provided that the surrender penalty was properly priced. Because of this favourable liquidity position, insurance companies can afford to worry less about irrational customer behaviour and therefore have to pay less attention to their capital position. Hence, insurance companies can operate with negative equity for a prolonged period and can therefore afford to take more risk with their capital position. On top of that, the current regulatory framework (Solvency I) for insurance companies could even incentivize to invest capital in a risky manner. For example, under Solvency I, insurance companies are required to hold a percentage of technical provisions as capital. The features of insurance policies can be such that the level of technical provisions depends on the level of a risky index (e.g. emerging markets stocks). This means that, if this risky index becomes more valuable, the insurance company needs to hold more capital and, if the index becomes less valuable, it can hold less capital. Thus, in order to optimally fulfil the regulatory requirements, the capital position of the insurance company could best be invested in the same risky index. However, given the new regulatory requirements that are coming into force in 2013, insurance companies will need to pay more attention to their capital position. This will probably induce insurance companies to invest their capital risk free.

Because, under Solvency II, insurance companies will need to hold capital against interest rate risk, insurance companies can, similar to banks, economically optimize the duration of the investment of their capital. Because the capital of an insurance company tends to have a negative duration (duration of liabilities is longer than duration of assets), an insurance company can lower its interest rate capital requirement

by investing its capital in longer-term government bonds. In a low inflation environment, where longer-term government bonds tend to yield more than short-term government bonds, this is a win–win situation for insurance companies. In this case, insurance companies can earn additional yield by investing their capital in longer-term bonds, while at the same time reducing their interest rate capital requirement.

16.3 INVESTMENT OF CAPITAL: DURATION DIFFERENCES FOR BANKS AND INSURANCE COMPANIES

From an economic perspective, investment of capital is simply a risk–reward question between the income that can be earned on the risk-free investment of capital and the additional interest rate risk capital requirement that is attached to it. Roughly, one can say that, in a low inflation rate environment this risk–reward optimization is very attractive for insurance companies, while in a high inflation rate environment this risk–reward optimization of the investment of capital is more attractive for banks. Indeed, in a low inflation rate environment an insurance company can reduce the regulatory requirement for interest rate risk by investing its capital in long-term government bonds while at the same time earning more income than if capital were invested in short-term government bonds. For banks, it is more difficult to decide whether to invest in short-term or long-term government bonds as an investment in long-term government bonds generally increases the interest rate risk profile of a bank and thus results in a higher capital requirement for interest rate risk. This higher capital requirement needs to be weighed against the additional income that can be received on longer-term government bonds.

In a high inflation rate environment, the risk–reward optimization of the investment of capital is more difficult for insurance companies than for banks. Indeed, in a high inflation rate environment, one can expect the yield of longer-term government bonds to be lower than the yield of short-term government bonds. Hence, an insurance company would need to weigh a lower yield by investing in long-term government bonds against a decrease in its interest rate risk capital requirement. Alternatively, if a life insurance company invested its capital in short-term government bonds in a high inflation rate environment, it might earn additional income, but it does not get the benefit of a reduction in its interest rate capital requirement. For banks, a high inflation rate environment makes the risk–reward optimization of the investment of

capital more easy as shorter-term government bonds earn extra income and do not increase the interest rate risk capital requirement, whereas longer-term government bonds earn the bank less income and also increase the interest rate risk profile of the bank.

16.4 SEGMENTATION OF THE BALANCE SHEET

Segmenting the balance sheet is a useful technique to better manage capital and the overall balance sheet. A good segmentation makes risks more transparent and the associated returns that these risks generate. The counterfactual of a good segmentation is that it becomes impossible to map business activities to risks and economic capital and to assess the performance of these businesses (see Chapter 18). However, one can only estimate economic capital per line of business, if the balance sheet is properly segmented such that the risks can be quantified in terms of capital. Furthermore, a segmented balance sheet makes it transparent where liabilities and assets are linked and form part of the same business. Apart from assessing performance, segmentation also helps to read the balance sheet and quickly gauge the real amount of risk. In order to make a segmentation more tangible, this section briefly explores how a typical insurance and bank balance sheet can be segmented.

For insurance companies, the main business is to sell policies that result in technical provisions. One way to segment the balance sheet of an insurance company is displayed in Figure 16.1. This segmentation makes transparent what risks the business is actually taking and how its asset and liability business decisions are linked. This enables good performance management as the economic capital associated with the risks that a business takes can be properly quantified. The payoff related to the technical provisions can be fully replicated with financial instruments such that the liabilities are fully hedged with financial instruments on the asset side. In this perspective, the risk is zero. However, if an insurance company were to do that, the return would very likely be limited. Therefore, an insurance company tends to invest the technical provisions, not according to the replicating portfolio, but in a riskier manner. The replicating portfolio can serve as a benchmark for these riskier investments. In other words, as long as the riskier investments outperform the replicating portfolio the business is generating money. However, this also introduces risks as the riskier investments are not offset by the replicating portfolio. For this risk, capital needs to be put aside, which needs to be earned back through the outperformance of the riskier investments over the replicating portfolio.

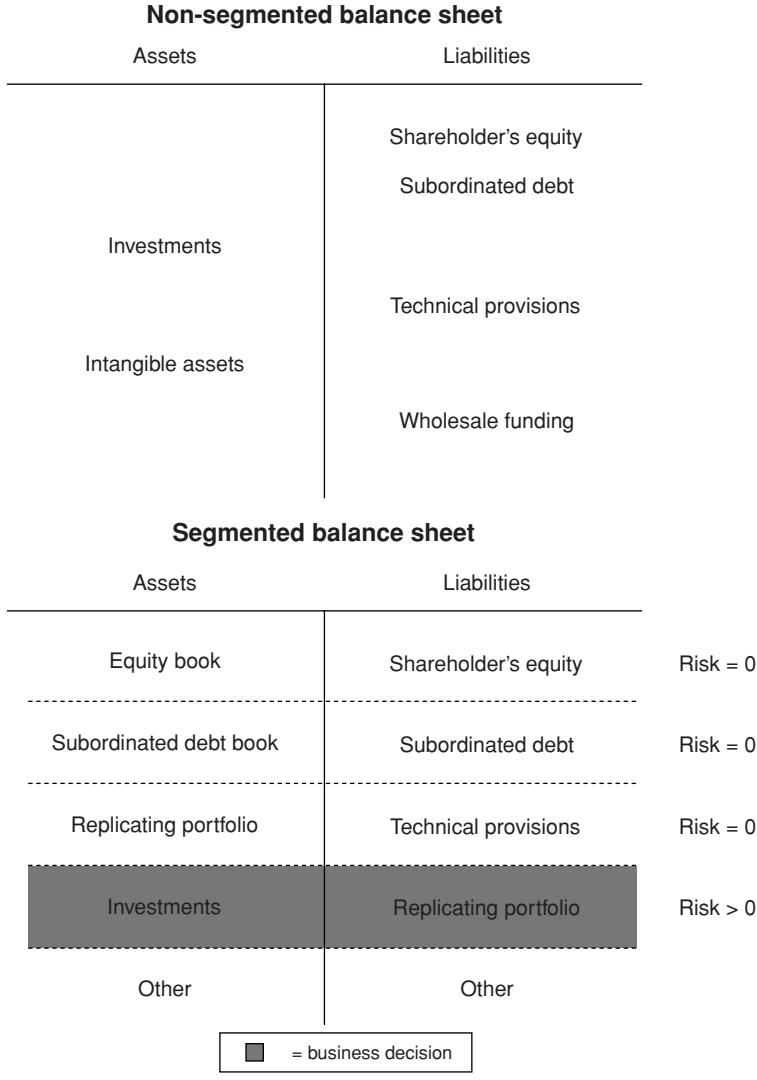

Figure 16.1 Segmentation of the insurance balance sheet.

The balance sheet of a bank can also be segmented. In order to do this, it is generally easiest to distinguish between three types of businesses:

1. *Deposits are invested in (liquid) assets.*
2. *Deposits are used for lending.*
3. *Wholesale funding is attracted for lending purposes.*

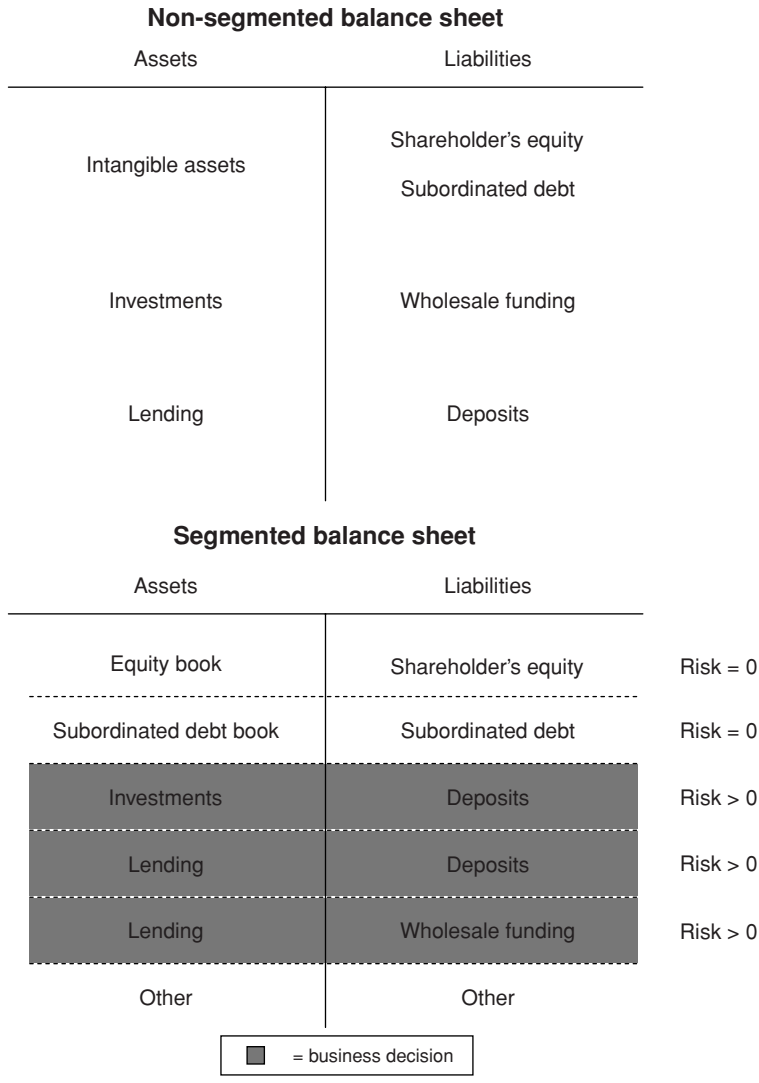

Figure 16.2 Segmentation of the bank balance sheet.

These three businesses lie at the basis of a segmentation of a bank balance sheet and make transparent what the associated risks and returns are for each type of business. It is also useful to determine the interest margin for the three types of businesses. The segmentation is shown in Figure 16.2.

17

Alignment between Risk and Capital Management

During the credit crisis it became apparent how important it is to have close alignment between risk and capital management. Many financial institutions were late in recognizing that their capital position was a greater risk to their existence than the inability to generate profits. Not only were they late in recognizing this, but many financial institutions were also not flexible enough to switch from a mode of maximizing return on capital to capital preservation. This chapter explores the interlinkages that exist between risk and capital management and unveils the crucial components and critical success factors of these disciplines. In this chapter, risk and capital management are always used in conjunction as capital management cannot be effective without risk management, and vice versa. Risk and capital management are different sides of the same coin; they have an interdependent relationship. One cannot assess capital adequacy without knowing what the risks are, and one cannot state the risk appetite without knowing the capital position.

17.1 WHERE RISK AND CAPITAL MANAGEMENT MEET

Over the past 10 to 15 years, risk management has grown to be one of the most important departments in a financial institution. Risk management is all about managing the risks to which a financial institution is exposed. Unfortunately, as the credit crisis has shown, this is easier said than done. There are several critical success factors of effective risk management. One of the critical success factors that is almost always overlooked is a strong link between risk management and capital management. Indeed, before one can start thinking about risk management, one has to establish the risk appetite (i.e. how much risk is a financial institution willing to take), which in turn depends on the capital position of the specific financial institution. Interestingly, when it concerns our own individual

finances, almost everybody is aware of the strong link between risk and capital management. This can be illustrated by the following example.

Consider an individual, John, with $1 million who knows that, in one year's time, he will buy a house of $800 thousand. Until John actually purchases his new house, he wants to put his $1 million net worth to work. If John would be prudent, he could invest $800 thousand risk free (e.g. 1-year government bonds) and invest the remaining $200 thousand as he pleases. If he were to do that, he would secure the $800 thousand needed to purchase his new home in one year's time. In this scenario, John has effectively conducted a capital management strategy, albeit an (overly) prudent one. Because it is such a prudent strategy, from a capital preservation perspective, there is no need to risk manage the investments. Nevertheless, it would still be wise to risk manage his positions with the objective of maximizing his investment returns. Implicitly, in this scenario, John first looks at his capital position and his future obligations to determine his risk appetite, and thus establishes a link between risk and capital management. John realizes that he can significantly enhance his returns if he also 'leverages' the $800 thousand and invests these monies in a riskier manner. He convinces himself that, although this investment strategy puts his capital at risk and jeopardizes his ability to purchase his new house in one year's time, he can manage these additional risks. Even if the risky investments drop by more than 20% he will have sufficient time to close the positions and can ensure that he still owns $800 thousand in one year's time. John decides to embark on this second investment scenario. However, in this case, risk management should not only manage risks with the intention of maximizing investment returns, but it should also take into account the additional constraint of preserving at least $800 thousand worth of capital. Ideally, John already defines a risk management strategy before he puts on the risky investment positions. For example, John can tell himself that he will start reducing risks (e.g move from stocks into corporate bonds) once he loses more than $50 thousand. This can be a continuous process, i.e. de-risk as long as he is losing more than $50 thousand. Furthermore, it would also be prudent if John defines a stop-loss. That is, if John's investments hit this stop-loss, he closes out the positions all together. This stop-loss level represents the Rubicon beyond which it is no longer responsible to continue to make risky investments. For John the stop-loss could, for example, be that the value of his investments drop below $850 thousand.

In this second investment scenario, risk management not only needs to judge whether the risks in isolation are acceptable and have a healthy risk–reward, but it also has an active duty to preserve capital.

Although it sounds obvious to make risk appetite dependent on the capital position, within financial institutions few are aware of the strong interlinkages between risk and capital and even fewer take this factor into account when managing either capital or risk. This is unfortunate because every financial institution is leveraged. Hence, a small drop

in the value of the assets or an increase in liabilities can wipe out the entire capital position of a financial company. Therefore, especially in financial institutions, it is crucial that risk management focuses on capital preservation. The main reasons that there is such a weak link between risk and capital management are:

- *Capital is rarely a constraint for viable businesses.* Only in distressed circumstances is a viable financial institution unable to attract capital. One of the most pressing examples is the recent credit crisis, during which only governments were willing to provide capital to financial institutions. Hence, within many financial institutions, capital management is predominantly viewed as an executional department that ensures that the capital requirements are met at all times (e.g. attract capital when necessary) rather than a strategic department. Only in times of stress does capital management become a strategic topic.
- *Risk managers have lost touch with their main responsibility of capital preservation.* Risk management has almost become an art in itself because it requires such in-depth (quantitative) expertise to determine whether investment positions have a healthy risk–reward. Obviously, it is good that risk management has taken such a prominent role on the corporate agenda of financial institutions. However, because of its complexity, it has also resulted in risk management departments that are no longer in touch with one of their main objectives, namely capital preservation. In other words, risk managers are so much taken up by their everyday activity that they no longer keep the bigger picture in mind. As an example, some positions might make sense from an (economic) risk perspective, but from an accounting perspective it could have detrimental effects on the capital position. The reverse also holds true. This already shows that there are active decisions to be made that weigh both the (economic) risks and the potential short- and long-term capital impacts. This requires risk managers to have a broad understanding of capital management and vice versa. However, risk managers typically do not have enough capital management knowledge to be able to weigh these decisions themselves.
- *Some capital managers have insufficient knowledge of risk management to be able to hold risk managers accountable for preserving capital.* Some capital managers have not been able to keep up with the difficult (quantitative) risk concepts and are therefore taken out of the loop of many risk management decisions. Since almost all risk management decisions have to be taken in the context of

capital preservation, this has been an undesirable development. On top of that, because capital managers are not actively involved in risk management, they treat all impacts on capital resulting from these decisions as given rather than actively trying to preserve their capital. In other words, capital managers are not actively challenging risk management on their decisions, let alone holding them accountable.

The above describes some of the root causes of the misalignment between risk and capital management. Unfortunately, in order for any financial institution to achieve a healthy return on capital it is imperative that both departments are fully aligned. Indeed, because there is no unconditional access to capital, both risk and capital management have the objective to achieve, facilitate, or guard a sufficiently high return on capital under the constraint that the capital position does not drop below a certain threshold. To put things in a broader perspective: one of the two main objectives of capital management is to ensure that a financial institution achieves a sufficiently high return on capital with the boundary condition that available capital exceeds economic capital.[1] In times where this boundary condition is not met, all stakeholders should at least feel comfortable with the capital position. Indeed, if stakeholders are no longer comfortable with the capital position, the financial institution is no longer in charge of its own destiny. It has effectively put management into the hands of other stakeholders (e.g. government). One way to always ensure that a financial institution can manage its own business is to ensure that available capital exceeds economic capital.

Achieving a sufficiently high return on capital is outsourced by capital management to the commercial businesses. Nevertheless, capital management needs to constantly challenge these businesses on their realized return on capital. If a commercial business fails to realize a satisfactory return on capital, capital management should reduce the capital allocation for that specific business. On the other hand, if a commercial business exceeds expectations, capital management can decide to allocate more capital to that business or even attract more outside capital. Basically, capital management challenges the commercial businesses on *what* return on capital they achieve (i.e. the result). However, it is also important to challenge the commercial businesses on *how* they achieve

[1] There might be times where available capital does not exceed economic capital. Indeed, available capital is meant to absorb losses in times of stress (i.e. when the uncertain event happens).

their return on capital. The reason that *how* is so important is because this determines whether the return on capital is sustainable. Because challenging businesses on how they generate return on capital requires in-depth expertise of the businesses and products, capital management has to outsource this to more specialized people, namely risk management. Risk management needs to constantly challenge the commercial business on their activities and assess whether they all make sense from a risk–reward point of view. In this case, risks should be assessed in the broadest sense possible. Hence, reputational risks caused by, for example, unduly underwriting standards should also be taken into account. Furthermore, risk management needs to proactively intervene when risks turn sour (i.e. reduce exposure where possible). The latter task ensures that sufficient capital is preserved and it has the positive side effect that it brings discipline to the business in establishing a sustainable business proposition.

To summarize, there is clear link between risk and capital management. In fact, one can say that capital management outsources the more specialized tasks of challenging the business on *how* they generate a healthy return on capital to risk management. However, risk and capital management have the joint responsibility to guard a satisfactory return on capital under the condition that, in the eyes of stakeholders, available capital sufficiently covers economic capital. The latter is a *conditio sine qua non* and basically means that a financial institution puts its fate into the hands of other stakeholders if this condition is not satisfied. It also means that, if a financial institution comes close to not meeting the capital requirements expected by stakeholders, it should switch to a mode of capital preservation. In other words, capital preservation overrides realizing a high return on capital. Indeed, if the financial institution is not successful in preserving capital at that point, it will never be able to realize high returns on capital as it will lose management control.

When it comes to fulfilling the responsibility of generating a high return on capital under the condition that, in the eyes of stakeholders, available capital sufficiently covers economic capital, capital management needs to have the bigger picture in mind and fulfil this responsibility on a consolidated level, whereas risk management needs to fulfil this responsibility on business level.[2] This joint effort can only be effective

[2] Risk management also has a responsibility on a consolidated level by, for example, ensuring that the different businesses do not concentrate exposures.

if there is close alignment between risk and capital management and each department appreciates the role and expertise of the other.

17.2 CAPITAL PRESERVATION AS A KEY CONDITION FOR PERFORMANCE OPTIMIZATION

In section 17.1, in the context of optimizing performance, it was mentioned that capital preservation is a key responsibility of both risk and capital management. Capital preservation is specifically discussed here as it is so often overlooked and forgotten. Risk and capital managers have a tendency to see the impact of business activities on the capital position as an exogenous variable that they cannot influence. In other words, risk and capital management determine the boundaries within which the business operates and the results are merely an output and the sole responsibility of the business. Obviously, the core of risk and capital management is that they bring the business to a higher level because of their continuous monitoring, challenging, and proactive intervention. This should ultimately lead to a higher return on capital. Capital managers are, in some respects, investors in a variety of commercial business activities. Although they do not conduct the business activities themselves, they do decide to invest in them (i.e. allocate capital). A good principle of investing is that you let profits run and cut losses early. In other words, capital managers have an active role to play in the consolidated return on capital and can, as investors, influence the results. On top of that, capital managers outsource the daily monitoring, challenging, and proactive intervention on a business level to risk management. Risk management should prevent nasty surprises to the capital position and ensure that the business puts its capital to work efficiently. The interaction between risk and capital management, in the context of optimizing return on capital, is illustrated by the following example, which clearly shows the importance of capital preservation.

Consider a bank with three types of businesses, namely retail, commercial, and investment banking (see Figure 17.1). The bank has $30 billion worth of capital to allocate (economic capital) to the different businesses on a total capital position of $32 billion. Because the bank wants its activities to be balanced, the capital manager has allocated $10 billion to each of the businesses. Retail, commercial, and investment banking generated an average of 15%, 20%, and 25% return on capital respectively over the past 3 years. The capital manager notices these differences and challenges retail banking on its performance.

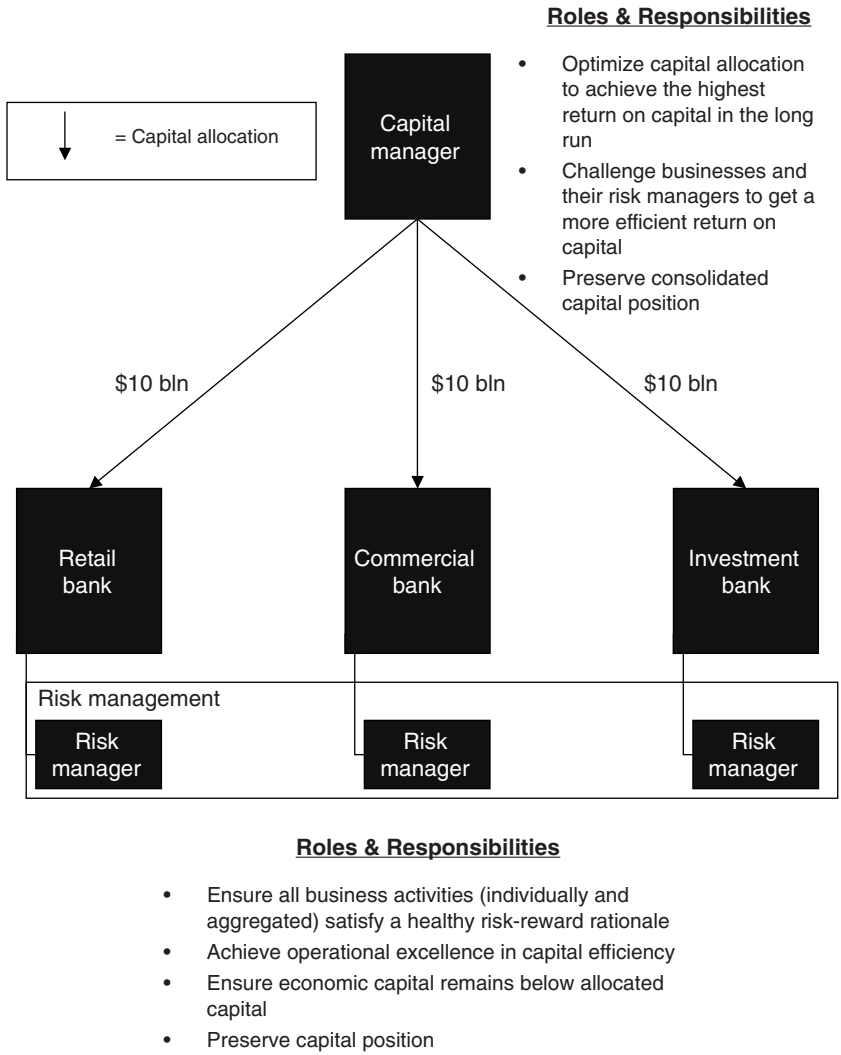

Figure 17.1 Roles and responsibilities of capital and risk management.

Retail banking responds that it is not running at full capacity as it only has $8 billion economic capital whereas commercial and investment banking use their entire capital position. Because retail banking is only using $8 billion worth of capital it is effectively generating a return on capital of 18.75% ($1.5 billion divided by $8 billion). Nevertheless, it is still below the 20% that commercial banking is generating and significantly below the 25% that investment banking is generating. Since investment banking has room to expand, the capital manager decides to reallocate $2 billion worth of capital from retail

to investment banking. Furthermore, the capital manager tells retail banking that it has 2 years to improve its return on capital from 18.75% to over 20%. The capital manager is not trying to get the retail bank to a return on capital of 25% because he is aware that the investment bank has much larger tail risks than the retail bank.[3] The next year, the investment bank again generates a return on capital of 25%, but this time on capital of $12 billion instead of $10 billion. Hence the profits at the investment bank rise by $0.5 billion. The retail bank improves its return on capital to 20% and hence increases its profits by $0.1 billion. However, the year after, the investment bank incurs losses of $0.5 billion in the first quarter. The chief risk manager at the investment bank decides that it is time to start preserving capital. He forces the business to close down positions and de-risk. By doing that, he reduces economic capital of the investment bank from $12 billion to $10 billion. The risk manager communicates this to the capital manager who, in turn, reallocates this $2 billion to the commercial bank. In the second quarter the investment bank again posts a loss of $250 million. The chief risk manager had already communicated to the business that he would continue to reduce risks as long as the investment bank is loss-making. He therefore decides to reduce economic capital with yet another $1 billion. Again the chief risk manager of investment banking communicates this to the capital manager, who in turn reallocates this freed-up capital to the retail bank.

This is a textbook example of how risk management should intervene when losses arise and how they should optimize capital efficiency. If risk management fails to do so at the business level there is always the safety net of corporate risk management that can act on a consolidated level. As a last security there is always capital management that can reallocate capital from underperforming businesses to better performing ones.[4] In this way capital management can still ensure a satisfactory return on capital at a consolidated level. However, this example also shows that risk and capital management should be flexible and should not be married to a certain allocation or a certain return on capital. Typically, risk and capital managers find it hard to switch from improving capital efficiency to preserving capital. Once losses arise, risk and capital managers should be quick to adapt to a mode of capital preservation.

Figure 17.1 also gives a high-level summary of the roles and responsibilities of risk and capital management, in the context of optimizing

[3] Economic capital measures the loss on a confidence of 99.95%, but it does not tell you anything about the loss if such an event occurs. The capital manager considers the tail-loss (i.e. the magnitude of the loss if an event occurs that falls outside the 99.95% confidence) to be greater for the investment bank than for the retail bank.

[4] Ultimately the CEO decides if and how capital is re-allocated. However, capital management plays an instrumental role as key advisor and co-pilot to the CEO.

performance.[5] The first two roles specified for risk and capital management clearly relate to maximizing return on capital. The last role for capital management, and the last two for risk management, relate to their capital preservation responsibilities. All these responsibilities are necessary to optimize performance and, hence, optimize return on capital.

Risk management is mainly concentrated at business level. However, there should always be a corporate risk management function that has the same responsibilities as risk management at business level. Even if risk management perfectly performs its roles and responsibilities at business level, it could still be necessary to intervene at consolidated level. For example, the retail, commercial, and investment banks can have similar exposures that are individually acceptable but on a consolidated level they do not facilitate a healthy risk–reward trade-off. During the credit crisis, many well-diversified financial institutions appeared to have high asset concentrations at the consolidated level, which resulted in large losses. Nevertheless, the better risk management does its job at business level, the less does corporate risk management need to do. However, also at corporate level, risk management needs to realize that the success at business level depends, to a large extent, on how much it challenges risk management at business level.

17.3 THE SOFT SIDE OF CAPITAL MANAGEMENT

It has already been mentioned in the previous sections that it is important to ensure that the capital position of a financial institution is satisfactory in the eyes of stakeholders. Since stakeholder expectations of the capital position are susceptible to change, capital management is also about preparing for changing expectations. Not only do financial institutions need to prepare for changing stakeholder expectations, but they also need to actively manage the expectations of stakeholders.

The credit crisis was a wake-up call that capital managers need to prepare themselves for changing stakeholder expectations. Indeed, during the credit crisis, depositors and other liquidity providers wanted to have more security about the soundness of the capital position. Among other things, they wanted capital components to be of higher quality (e.g. equity instead of hybrids) and they simply wanted higher capital

[5] Although optimizing the capital structure (i.e. optimizing cost of capital) is another objective of capital management, it is not named here because these responsibilities purely focus on the objective of optimizing return on capital.

ratios than the previous standard. Although these type of changes in expectations are hard to predict, capital managers can be guided by the nervousness in the market. Once the nervousness increases it is always good to increase buffers for the reason that nervousness almost always has a significant portion of irrationality. Since trust is the cornerstone of each financial institution, it is just sound business to minimize your exposure to irrationality. Some people might argue that raising capital in increasingly nervous circumstances can actually provoke irrational behaviour of stakeholders (e.g. bank run) because it may seem that the financial institution knows something that the stakeholders do not (e.g. large corporate losses). This argument does have some merit, but is typically a very short-term problem. In fact, stakeholders are always appreciative when financial institutions take action pre-emptively rather than later.

One could call the assessment of changing stakeholder expectations 'the soft side of capital management'. Capital managers should be very aware of this stakeholder dynamic as it can mean the difference between managing capital yourself or allowing capital management to be dictated by stakeholders who may behave irrationally. The latter is detrimental to the position of any financial institution. Hence, stakeholder management for capital managers should be aimed at making certain that they do not have a reason to behave irrationally. This can, in turn, be established with a capital position with which all stakeholders feel comfortable.

Obviously, there might be tensions between different stakeholders with respect to a satisfactory capital position. For example, shareholders generally want financial institutions to be 'thinly' capitalized (i.e. just about sufficient to fulfil regulatory requirements and keep clients happy) to achieve the highest return on capital. On the other hand, debt holders want as much security as possible and therefore want capital levels to be as high as possible. When trying to find a balance between these conflicting stakeholder expectations, capital managers have to map the tolerance level towards capital of each stakeholder against the impact of potential irrational behaviour in case this tolerance level is breached. Determining such a *heat map* can be illustrated by the following example.

Consider bank X with a large deposit base. X has access to a diversified mix of funding sources (e.g. deposits, interbank, secured borrowing). However, the bank has decided to predominantly fund itself with retail deposits, and also fund itself through unsecured interbank lending, albeit for a smaller proportion. X has plotted a heat map, which

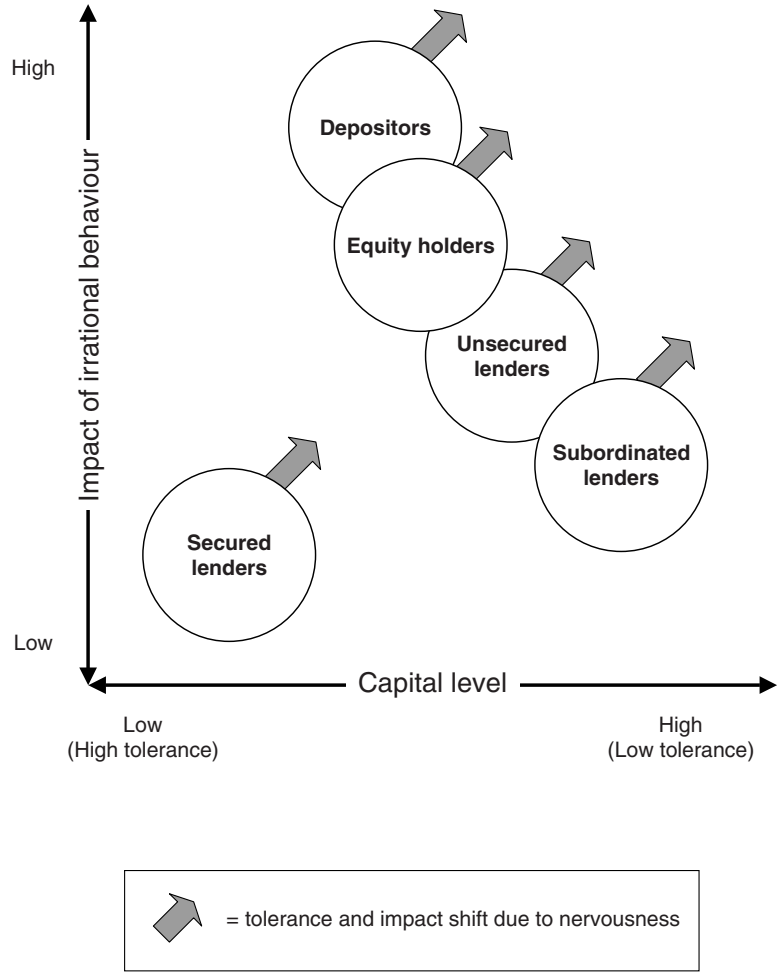

Figure 17.2 Capital tolerance versus impact of irrational behaviour.

tries to quantify the tolerance of each of its stakeholders towards the capital position and the impact of potential irrational behaviour should X breach this tolerance level. Figure 17.2 displays the outcome of this stakeholder analysis, and shows that X has little to worry about secured lenders as it has significant collateral that is eligible under secured lending agreements. On top of that, X has access to the emergency window of the central bank. Subordinated debt holders appear to be the least tolerant in terms of capital. However, the impact of a breach of tolerance of subordinated debt providers is manageable as this capital can, in the worst scenario, be refinanced with more expensive equity capital. Unsecured lending providers are slightly more tolerant than subordinated debt providers. However, the impact if X breaches its tolerance level is greater as X is

partly dependent on this source of funding. Although the impact is greater, a breach remains, to a certain extent, manageable because X has such a large contingent funding position (e.g. significant eligible collateral for secured funding). This means that X can refund potential withdrawals of unsecured funding with secured borrowing.

The behaviour of depositors is obviously highly unpredictable. Hence, should X breach the tolerance level of depositors, the irrational behaviour will be significant and the probable effect will be that X will be forced into bankruptly because of a bank run. Nevertheless, the tolerance of depositors is typically greater than people think, mainly due to information asymmetry (i.e. other lenders and equity providers have more information). Furthermore, depositors are typically well protected through deposit guarantee schemes. Lastly, depositors generally only react after most other stakeholders have already given up on the bank. Interestingly, one can expect equity providers to have a lower tolerance towards X capital position than depositors because equity providers know that X will no longer be viable if depositors start to behave irrationally.

X updates this stakeholder analysis semi-annually. After half a year, economists have changed their outlook and are more gloomy on the future performance of the real economy. X notices this and also notices an overall nervousness in the interbank funding market. Hence, X deems it wise to shift both tolerance levels (stakeholders become less tolerant) as well as the impact of irrational behaviour of stakeholders should X breach these tolerance levels. After updating the heat map, X notices that it is very close to breaching the tolerance level of unsecured lending providers and it has already breached the tolerance level of subordinated debt holders. Because the nervousness has not yet jumped over to equity providers, X decides to raise additional capital through a rights issue before it is too late. Initially, this rights issue raises suspicion with all stakeholders, but X manages to convince equity providers that it is purely aimed at strengthening capital buffers and to potentially finance takeovers should a shake-out occur.

It is very useful to produce a heat map of capital tolerance versus impact of stakeholders. However, one has to realize that these heat maps might differ from company to company. Indeed, it depends on the business model how impacted a financial institution is in the event of a breach of tolerance. Since X had vast amounts of eligible collateral it did not have to worry so much about a breach of tolerance of unsecured lenders. However, should X not have sufficient eligible collateral, the impact would be much greater and could even jeopardize X's very existence. Interestingly, the business model also influences the tolerance of stakeholders. Equity investors are much more tolerant towards a financial institution with a diversified mix of funding sources than towards a bank that is solely dependent on the securitization market for its funding (i.e. originate-to-distribute).

All in all, the soft side of assessing stakeholder expectations is, however hard it may be, a crucial part of capital management. It is basically a *conditio sine qua non* for maintaining control over your own capital

management. Such a stakeholder assessment enables financial institutions to determine their actual distance to default, i.e. how much capital losses can be absorbed before the financial institution defaults on obligations. Typically the distance to default that comes out of the stakeholder analysis is significantly lower than a distance to default that is purely based on regulatory requirements.

17.4 EMERGING ROLE OF RISK AND CAPITAL MANAGEMENT

Over the past decades, risk and capital management have fulfilled an increasingly prominent role on the corporate agenda of financial institutions. However, most financial institutions have not been able to make risk and capital management an integral part of the strategic decision-making process. Financial institutions have mainly built risk capabilities and, as a result, almost all financial institutions can monitor risks and capital well. Unfortunately, most financial institutions still need to make the next step to actively manage risks and capital. This means that, in the interest of risk–reward trade-offs and capital, risk and capital managers need to direct business activities rather than the other way around. The next step on the maturity ladder is that risk and capital management become fully integrated. The last step is that risk and capital management become an integral part of the strategic decision-making process and act as real business partners without losing their independence. Figure 17.3 visualizes the emerging role of risk and capital management. Most financial institutions are trying to make the step from risk and capital monitoring to actually managing risks and capital, but very few financial institutions have been able to fully master this second step, let alone integrate risk and capital management. Nevertheless, once risk and capital departments start to really manage, the step towards an integrated approach is relatively small. The reason is that, when trying to manage either risk or capital properly, risk and capital managers will notice that they need constant interaction with each other. In other words, to really manage either risk or capital an integrated approach is almost imperative. The last step of risk and capital management acting as a business partner is very hard because risk and capital management need to remain independent from the business and be able to overrule agreed-upon decisions when or if more information becomes available. Nevertheless, it is crucial that risk and capital fulfil their roles as business partners. This means that they need to be involved in all strategic decision making

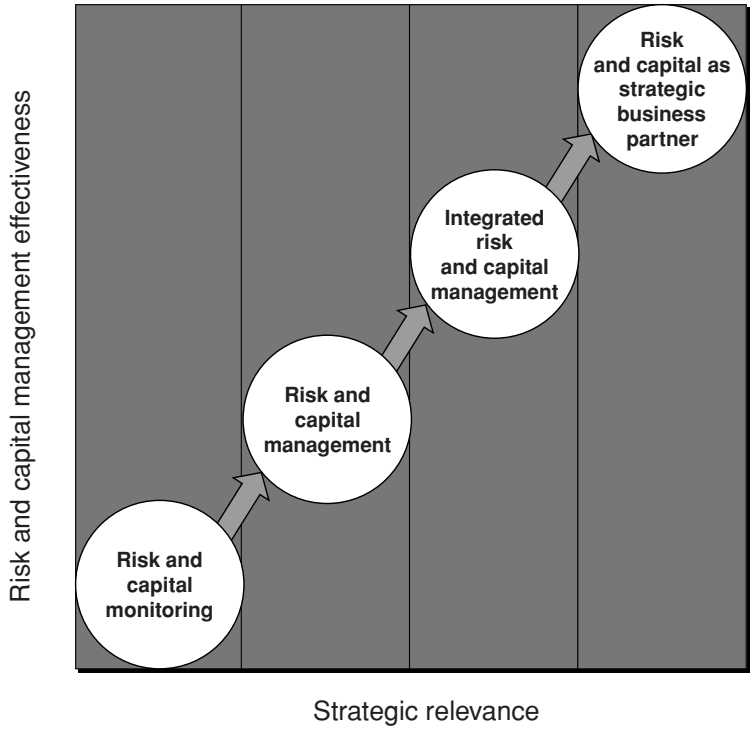

Figure 17.3 Emerging role of risk and capital management.

because that is the time when healthy prevention measures can still be implemented. Once a strategic decision has been made, it is very hard to let the business change course in the interest of risk or capital. In other words, risk and capital management need to co-determine if and how strategic decisions are operationalized and executed. At the same time, risk and capital always need to be able to reconsider agreed-upon decisions once new information shows that the previous decision was not healthy.

It is important to realize that risk management is involved in both corporate and business strategy, whereas capital management is only involved in corporate strategy. Indeed, risk management predominantly focuses on business strategy; however, corporate risk management is also involved in corporate strategy decision making. A corporate strategy defines the scope of businesses (e.g. type and geography) that a corporation wants to pursue, whereas a business strategy describes how an individual business plans to compete. For example, consider a bank

where the corporate strategy is to pursue retail banking in US and global investment banking. The business strategy subsequently defines how retail banking and investment banking plan to operate in the competitive environment. The business strategy for retail banking in the US could, for example, be that it focuses on mass affluent clients and the business strategy for the global investment bank that it focuses on providing risk management and financing solutions for multinationals.

17.5 CRITICAL SUCCESS FACTORS OF RISK AND CAPITAL MANAGEMENT

The success of risk and capital management with respect to capital preservation depends, to a large extent, on the ability of risk and capital management to shift the burden of proof to the business at the right time in the decision-making or review process. Indeed, one of the easiest trigger points for the burden of proof to shift to the business is when performance is below expectation. Risk management should act proactively when these trigger points are breached and be convinced (by the business) that there is no need to reduce risks. If risk management cannot be convinced, it should act decisively and ensure that risks are reduced.

The success of achieving an optimal return on capital depends largely on a good risk and capital management framework and a process that periodically reviews capital allocation. Capital preservation, and thus the ability of risk and capital management to shift the burden of proof, forms part of this framework (see point 6 of the critical success factors below).

This section discusses the main critical success factors of risk and capital management[6] and can be summarized as follows:

1. *Capital management and corporate risk management help to actively shape corporate strategy.* Corporate strategy concerns the type of businesses the financial institution wants to pursue. Capital management and corporate risk management should be actively involved in the creation of this corporate strategy as the choice of businesses will ultimately determine the return on capital. Capital management should subsequently allocate capital to each of the

[6] This subsection focuses mainly on strategic capital management and does not discuss the critical success factors of tactical capital management (i.e. how to achieve an optimal cost of capital) and executional capital management such as how to best raise capital.

chosen businesses. However, this is typically an iteractive and reflexive process. In other words, the capital allocation depends on the corporate strategy, but the corporate strategy also depends on the question: What is a responsible capital allocation?

2. *Translation of corporate strategy into capital allocation.* The corporate strategy of a financial institution needs to be translated into an adequate capital allocation. If the corporate strategy of a European life insurance company is to expand in the US, capital management should allocate additional capital to this line of business.
3. *Risk management helps to actively shape the business strategy.* Risk management should be actively involved in the choices made on how to operate in a competitive environment. This means that risk management needs to be involved in what type of products are sold, what type of clients the business wants to focus on, etc.
4. *Translation of business strategy into risk limits.* The business strategy of the European life insurance company describes how the US subsidiary will expand. In other words: How is the US business unit going to operate in the competitive environment and what is its customer value proposition? This is where risk management plays an important part. Risk management makes a drill-down of the entire business and establishes appropriate risk limits. If the business strategy of this life insurance company is to expand by selling products with mainly longevity risk to blue-collar workers, this should be reflected in the risk limits.
5. *Risk and capital as integral part of the budgeting cycle.* It is of crucial importance that risk and capital limits are aligned with budget targets. This means that the budget target of a business line should be such that a sufficient return on capital is warranted. Typically, financial institutions do this well. However, they sometimes forget that the drill-down of budget targets, that support this overall budget target, should have appropriate risk limits as well. If risk limits are too tight, the (sub)businesses will never be able to reach their targets. Generally, this leads to (sub)businesses exceeding their risk limits to try to hit their targets nonetheless, which in turn means that these risk limits lose relevance. On the other hand, risk limits that are too loose result in suboptimal capital efficiency.
6. *Pre-agreed points of intervention on which risk management responds proactively.* As stated earlier, it is imperative that, if businesses underperform, their capital allocation is reduced. This holds true for any business, but in particular for financial institutions

because the downside risks are typically much greater. Once a business underperforms, it is not risk management that should convince the business that things need to change, it is the business that needs to convince risk management that it is wise not to change. If the business cannot convince risk management, the business needs to reduce risks. Generally, this system works best if risk management and the business agree periodically about the trigger points. One could, for example, think about a trigger point that says that risks need to be reduced if losses exceed a certain number.

7. *Close alignment between risk and capital management.* It has already been discussed in section 17.1 that close alignment between risk and capital management is a critical success factor because they show strong interlinkages and also because the actions of the one can heavily impact on the other. More importantly, they have a joint responsibility of optimizing performance in order to achieve an optimal return on capital. This joint responsibility can only be fulfilled if risk and capital management are closely aligned.
8. *Incorporation of stress tests in risk management framework.* In order for risk management to be effective, stress testing needs to be a crucial component of all decision making. It means that losses caused by stress scenarios unfolding should be in proportion to the earnings that a business is trying to generate. In other words, if a business is trying to generate $100 million earnings a year and, in a stress scenario, it loses $200 million, the business is probably putting too many eggs in one basket. Hence it should diversify more. Financial institutions ideally have a drill-down of stress test limits. These limits should be in proportion to the earnings that a business is trying to generate, taking into account the duration of earnings. Duration of earnings is important because businesses can be inherently different. For example, a life insurance company generates earnings on its business for a longer period of time than a retail banking business. This means that stress test limits for a life insurance company should be in relation to the earnings generated over the entire duration of the portfolio, which can be 5 years, whereas for a banking business it should be in relation to its duration of say 1 year.

   Although stress testing is widely used in the financial sector, especially in trading businesses, financial institutions make too little use of the information captured by stress tests. On top of that, financial institutions generally only apply stress tests on a consolidated

level where it is useful at all levels. Financial institutions should therefore make a framework of stress test limits that drills down into the entire organization. A positive side effect of having stress test limits is that it forces the business to continue to look for commercial opportunities and not put all its eggs in one basket.

9. *Risk-adjusted incentives.* Although a widely discussed topic, very few financial institutions pay their employees on a risk-adjusted basis. This means that if a business makes a lot of money but has taken disproportionate risks, the employees should not be paid a bonus. However, if a business makes a lot of money with very little risks it could be healthy to pay a bonus and even try to scale this business. Basically, employees should only be paid bonuses once they exceed a certain threshold return on economic capital.

   It is crucial that all employees know up front what their payment incentives are. These incentives should be transparent, easy to understand, risk-adjusted, and applied religiously. In this way, employees can take this into account in their everyday business and it will motivate them to get the best return on capital.
10. *Transparent and understandable reporting of risks.* It is very important to increase risk awareness throughout the organization in order to establish healthy and sustainable businesses. This means that all reporting should be transparent and easy to understand. It also means that everybody is aware of the rules of the game. For example, all business people should know what happens if they breach a risk limit or when they do not pass a stress test.

17.6 DIFFERENCES IN RISK MANAGEMENT PER LINE OF BUSINESS

There are vast differences in the way risk management is applied to different types of businesses. For example, risk managing a trading business is completely different to risk managing insurance companies or retail banks. The luxury of risk managing a trading business is that an investment bank does not need to be invested at all times. This means that, if risks turn sour, a risk manager can simply decide to close positions. On top of that, trading positions are very short term and hence the risk manager knows much sooner when it is convenient to intervene. Retail banks do not have the luxury to not be invested. Indeed, retail banks need to invest deposits in something, either in mortgage

lending or liquid securities. If risks turn sour on the asset side it is much harder to change positions. Hence, risk management should be much more involved in the actual decision making of what to invest in. However, this does not exonerate risk managers from making tough decisions at times. Nevertheless, one needs to acknowledge that, even if a risk manager at a retail bank wants to cut positions, the proceeds need to be invested in something else. For risk managers at an insurance company, this problem is even more pronounced because the duration of the risks is even longer. This means that, once a risk is taken on board, the insurance company is stuck with it for a long time. Nonetheless, also in this case, risk managers need to be prepared to act decisively. Some insurance companies are quite good at this, but most are not. When a risk manager at an insurance company intervenes, he faces the same problem as the retail banking risk manager, namely that proceeds need to be reinvested. Hence, the only thing that risk managers at insurance companies and retail banks can do is de-risk, which means that they move out of risky asset classes into less risky ones (e.g. from equities into bonds).

Figure 17.4 shows the risk management characteristics for the different types of businesses. From this figure one can see that, if risk management is more involved in the phase prior to when the risks are actually taken on, risk management needs to intervene less. However, it is a mistake to think that risk management need no longer intervene when it has been more involved in the selection of risks.

Figure 17.4 illustrates the inherent risk management differences per business model. It shows, for example, that risk management has relatively little involvement in the pricing of trading businesses, but the intervention frequency is high. For the underwriting of insurance, the opposite holds. Because it has such long-term commitments with significant capital impacts, risk management is fully involved in the pricing. In fact, risk management is the owner of the pricing. This does not mean that risk management will never intervene at a later stage; indeed, it could be that client behaviour changes and that the pricing needs to be adjusted. The insurance premiums that follow from insurance underwriting need to be invested, and, generally, risk management fulfils a prominent role when making the selection of these investments. Again, the reason being that these investments have such a long-term nature that they need to be selected carefully.

When it comes to deposits, risk management typically also plays a dominant role (although this can differ from bank to bank). ALCO

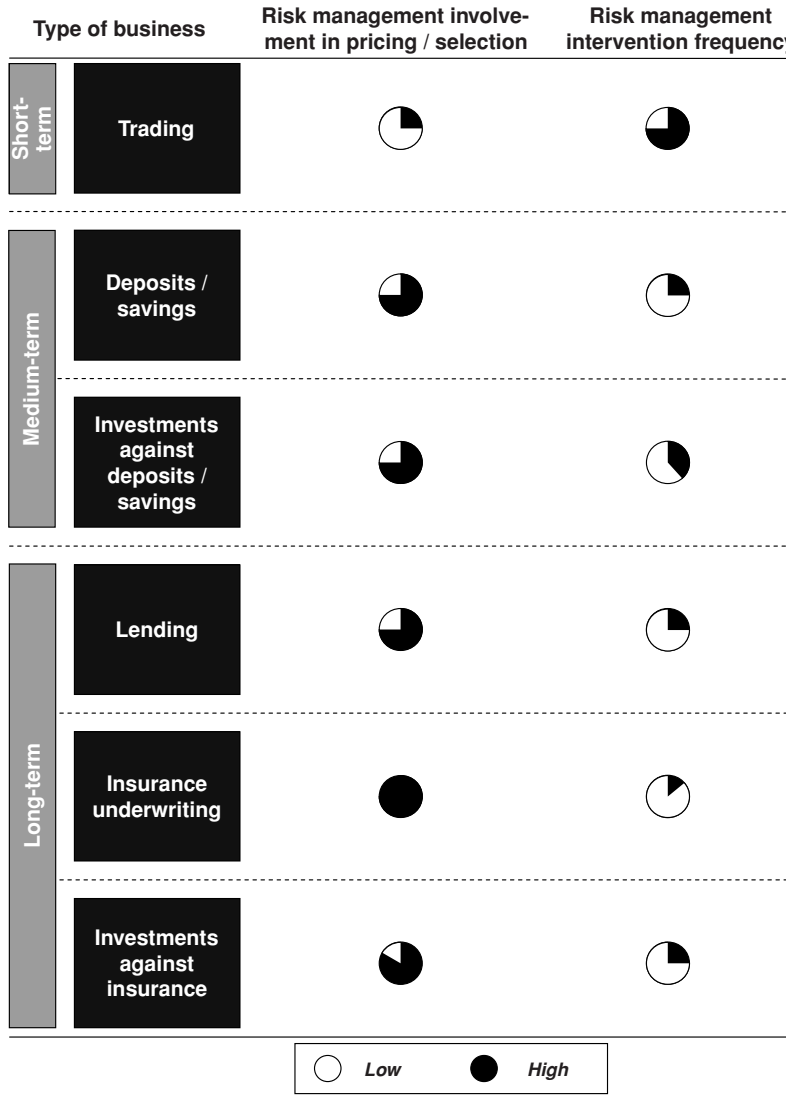

Figure 17.4 Risk management characteristics per product line.

(asset and liability management committee) is generally the owner of the transfer pricing mechanism, in which risk management is represented. This mechanism determines how much margin is acknowledged for deposits that pay a certain rate. For example, if the transfer price of money is set to be 3% and deposits have been sold that pay a 2% rate,

the margin is 1%. Risk management uses this transfer pricing mechanism to manage the balance sheet. For example, if risk management wants more deposits it advises ALCO to increase the transfer price and if it wants less, to decrease the transfer price. Because risk management has an important voice in ALCO, and thus a say over the transfer pricing tool, it is indirectly actively involved in the pricing of deposits.

18

Risk-Adjusted Return on Capital and Economic Profit

The risk-adjusted return on capital (RAROC) is a framework for analysing the risk-adjusted financial performance, with the aim of providing a consistent view on profitability across businesses. RAROC is a powerful tool that enables financial institutions to manage their businesses. The best thing about it is that, once you understand the concepts behind economic capital, RAROC is easy to grasp.

Although RAROC stands for the risk-adjusted return on capital, in practice it tends to specify the expected return on economic capital rather than the expected return on available capital.[1] For the purpose of this book RAROC is defined as

$$\text{RAROC} = \frac{\text{expected net earnings}}{\text{economic capital}}.$$

The reason that, in this book, the numerator of RAROC is defined as *expected net earnings* rather than *risk-adjusted net earnings* is because the latter can lead to confusion as it might be unclear which types of risks need to be adjusted for. Expected net earnings covers exactly the types of risks that need to be adjusted for – mainly risk costs. This will be elaborated on later in this chapter, but one can, for example, think about an adjustment for the costs associated with expected defaults on a mortgage portfolio. The denominator of RAROC comprises economic capital, which quantifies the unexpected loss. Hence, conceptually on can think of RAROC as:

$$\text{RAROC} = \frac{\textit{expected} \text{ net earnings}}{\text{absolute value } \textit{unexpected} \text{ losses}}.$$

This contrasts with the return on capital (RoC) that simply specifies:

$$\text{RoC} = \frac{\text{Net earnings}}{\text{Available capital}}.$$

[1] In practice, when people talk about RAROC they actually mean RARORAC (risk-adjusted return on risk-adjusted capital).

Thus, where RoC simply measures the accounting return on available capital, RAROC is a real indicator of commercial performance as it measures the return that is generated on the risks that a business takes. This also means that one has to carve out those earnings that are the result of the risks that are being taken. As specified in section 6.7, if a business has more available capital than economic capital, it is generating a risk-free return on the difference between those capitals that has nothing to do with the risks that are being taken. Hence, this risk-free benefit on the difference between available capital and economic capital needs to be deducted from earnings to determine RAROC for a specific business. For example, if a business of financial institution A has an economic capital of $1 billion, an available capital of $2 billion, and an overall expected net earnings of $150 million, a further adjustment needs to be made to the expected net earnings for the fact that this business receives a risk-free benefit on the difference between available capital and economic capital. That is, if the risk-free interest rate is 3%, expected net earnings need to be adjusted downwards with $30 million (3% of $1 billion). Therefore, RAROC is 12% ($120 million divided by $1 billion), but RoC is only 7.5%. Although RAROC gives insight in the actual performance, it does not give accurate information about the return that a business is generating for its capital providers. Indeed, if a business is taking less risks than its capital position and target credit rating allow, RAROC is higher than the return that is actually being generated for capital providers. Nevertheless, because financial institutions want to maximize their returns, one can assume that they will capitalize themselves and their businesses close to the economic capital associated with their target credit rating. If they overcapitalize, they are effectively targeting a higher credit rating, which might not be in the interest of shareholders.[2] Furthermore, if the issue is that a financial institution has a high RAROC and a low RoC, this can easily be resolved. Indeed, the financial institution can either take more risk so that it is maximally putting its capital to work, or, if there are no commercial opportunities to take more risk, the financial institution can return money to shareholders.

RAROC is particularly useful when evaluating the performance of individual businesses because it measures how well a business (unit) performs, taking into account how much capital it is putting at risk. Whether all capital is put at risk should be mainly a concern of capital

[2] See section 20.3.

management at group level. Businesses should be concerned with exploring and materializing commercial opportunities and generating business with a healthy risk reward. If capital management allocates capital to a certain line of business and it appears that, commercially, it only makes sense to put half of this amount to work, it is the responsibility of capital management to reallocate this excess capital to another line of business or return money to shareholders. Hence, generating a RAROC that is as high as possible is a responsibility of the business, and ensuring that all available capital is put to work is a responsibility of capital management.

Now that it is clear why RAROC is a good indicator of (commercial) performance for a line of business, it is useful to understand how it is calculated. The denominator in the formula of RAROC is the economic capital that a line of business 'consumes'. The way this is calculated was explained in Chapter 5. The numerator part of RAROC specifies the expected net earnings. This is the difficult part to establish. Indeed, one needs to make adjustments to the net accounting profits to establish the expected net earnings. This means that one needs to adjust net accounting profits so that expected (annual) risk costs are taken into account properly. Furthermore, adjustments need to be made to ensure that the commercial performance is adequately captured. When the RAROC of a line of business is greater than the cost of capital at group level, the line of business is creating value. To clarify the adjustments that need to be made to earnings, below are the main items to take into account when determining the RAROC.

- *Free funding adjustment.* If available (equity) capital exceeds economic capital, the business effectively has a free source of funding which is invested at the risk-free rate and thus inflates earnings. Hence, in this case, not all earnings are related to the risks that the business is taking. In order to adjust for this, one has to deduct the risk-free income that is generated on the difference between available capital and economic capital. This is a charge from the group to the business and is simply to adjust for the benefit of free funding that a business receives for having more available capital than economic capital.
- *Risk costs*. These should adequately reflect the expected (annual) costs associated with the risks that are being taken. Typically, provisions with respect to loan-losses are incorporated in the net accounting profit of banks. However, these may not adequately reflect the expected (annual) losses. Hence, one should adjust the accounting profits so that

the expected risk costs are taken into account properly. For insurance companies one should also ensure that risk costs associated with mortality, lapse, morbidity, casualty, etc. are adequately reflected in the expected net earnings. This means that accounting profits should be adjusted to ensure that the expected net earnings reflect the expected (annual) costs associated with insurance risks (e.g mortality, lapse, morbidity, and casualty).

- *Hybrids*. If hybrids are lent-on from the group to the individual businesses, one does not have to make adjustments with respect to the servicing costs associated with hybrids. The reason being that the cost of capital at group level is simply the cost of equity. Hence, as long as the RAROC (calculated including servicing costs of hybrids) is greater than the cost of equity at group level, a business is adding value to the group.
- *Goodwill*. Some accounting methodologies amortize goodwill. This charge does not give a fair reflection of the commercial performance of the line of business. Hence, goodwill charges should be added back to accounting profits to get to expected net earnings.
- *Taxes*. With respect to taxes, one should always filter out any one-off tax benefits or charges.
- *Extraordinary items.* Any one-off charges and benefits should be taken out of accounting profits to get to the risk-adjusted net earnings.

If the RAROC is greater than the cost of capital at group level, a business line is creating value. One could also say that, if the economic profit of a line of business is greater than zero, value is being created. Economic profit is in this case defined as:

$$\text{EP} = \text{Expected net earnings} - r_{CoC} \times \text{Economic capital}, \qquad (18.1)$$

where

$$\begin{aligned} \text{EP} &= \text{economic profit}, \\ r_{CoC} &= \text{cost of capital at group level} \end{aligned}$$

It is important to realize that, economically, value is created as long as economic profits are positive. This means that it is not wise to simply close down a business based on the fact that its RAROC is lower than that of other lines of business. If a financial institution does so, even though economic profits are positive, and without reallocating the freed up capital, the financial institution is actually destroying value. A financial institution could decide to reallocate the freed up capital to a business that would actually generate higher economic profits and hence create

more value. However, merely closing down a business that is generating economic profits, but has a below-average RAROC and subsequently returning any freed up capital to capital providers, is actually value destroying. The best way of managing the performance of businesses is to drive growth in economic profits. This is not to say that RAROC is not a useful measure. RAROC enables financial institutions to compare relative performances of businesses that are very different in size. This is the main pitfall of economic profit. A more sizeable business can have higher economic profits than a smaller business even though its relative performance (RAROC) is worse.

One should never fare blindly on the RAROC. It is based on a certain confidence interval, but does not say anything about the extent of the loss if an unexpected loss occurs.

A business can have a very high RAROC, but if an expected loss occurs and it is likely to be twice as large as a business with a lower RAROC, the high RAROC business might well be a less attractive investment than the low RAROC business. There are ways to work around this shortcoming by calculating the RAROC on the basis of even further adjusted earnings. The way to adjust earnings (on top of all the other adjustments) is to take *tail-VaR* into account. Tail-VaR reflects the weighted average loss should an unexpected loss occur that falls outside the confidence interval. Since the confidence interval specifies how often a loss occurs that falls outside the confidence interval, one can adjust earnings downwards with tail-VaR divided by the number of years before such a loss occurs.

Consider a bank with economic capital, based on 99.9% confidence, of $1 billion and a tail-VaR of $3 billion. Suppose that this bank has earnings of $100 million. Because once every thousand years a loss occurs that is greater than $1 billion, and if such a loss occurs it is (on average) $3 billion, the expected earnings can be further adjusted with $3 million (= $3 billion divided by 1000). This means that the tail-VaR RAROC (TVRAROC) is 9.7% ($97 million divided by $1 billion), whereas the RAROC is 10%.

Although the TVRAROC is more accurate than the RAROC, it assumes that a financial institution has very sophisticated models to be able to calculate tail-VaR. Even if the models are very sophisticated, it is unlikely that tail-VaR will accurately reflect reality. Furthermore, as the above example shows, only in very extreme circumstances will the TVRAROC significantly deviate from the RAROC.

19

Strategy, Risk, and Capital Management Cycle

Until now, the several aspects of risk and capital management have been presented. This chapter explains how strategy, risk, and capital management link together. It is important to emphasize that strategy, risk, and capital management should not be seen as independent and subsequent steps. In fact, strategy, risk, and capital management are part of iterative processes that together make up a crucial part of the management of a financial institution. Figure 19.1 displays the strategy, risk, and capital management cycle. The different components of this cycle are elaborated on below.

- *Create corporate strategy.* Each financial institution needs to create its own corporate strategy. This means that it determines the scope of businesses that it wants to be involved in and what can be expected of each business. The latter is generally established by target setting.
- *Translate strategy into capital allocation.* Once the scope of businesses is determined, capital management translates this strategy into capital allocation. If the corporate strategy expects a lot from a certain business, capital management might allocate more capital to that line of business. In other words, capital allocation and corporate strategy need to be aligned. If the corporate strategy is to acquire investment banking activities in Asia, capital management needs to ensure that it has sufficient capital to finance this takeover. It might even need to attract outside capital. All in all, the right capital conditions need to be put in place such that the corporate strategy can be executed well.
- *Optimize economic profit per business line.* If all businesses within a financial institution have been allocated capital, they need to realize a certain return on this capital. They do this by formulating a clear business strategy that specifies how a certain line of business has to compete. The risks that arise as a result of this business need

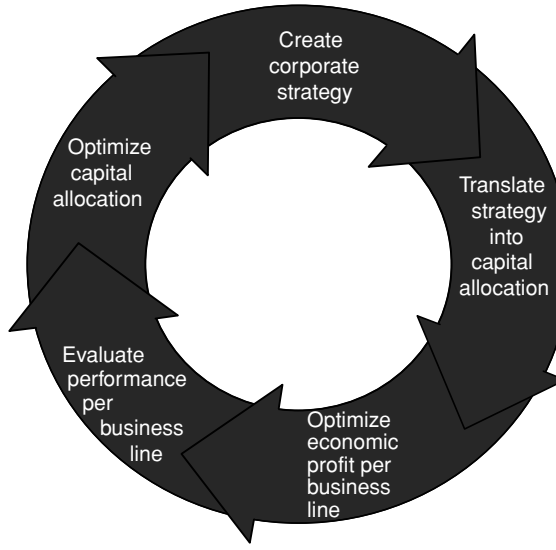

Figure 19.1 Strategy, risk, and capital management cycle.

to be managed well, and there should be a constant process of increasing the capital efficiency by the business line itself. Basically, the individual lines of business should enhance their economic profits constantly.

- *Evaluate performance per business line.* Periodically, a financial institution should evaluate the performance of each line of business. In this perspective, each line of business that generates economic profit is creating value. If the economic profit of a certain business line is sub-zero, a financial institution should ensure that the economic profit reaches a level of more than zero quickly. If not, it should decide to close down the business. With RAROC, a financial institution can even assess the relative performance of all its businesses. The one with the highest RAROC performs relatively best.
- *Optimize capital allocation.* Based on the performance assessment of all the individual businesses, a financial institution should determine how it can generate the highest return on capital over the long run. Businesses that are not generating economic profit should be closed down or restructured such that they will be economically profitable. In principle, each business that generates an economic profit can stay afloat. If a certain business has a significant RAROC, it might be attractive to raise more capital in order to finance the growth of

this business. However, if access to capital is constrained, a financial institution might want to reallocate capital from one business to another that has a higher RAROC. All in all, the performance assessment should be input for capital reallocations. This can, in turn, be input for major or minor changes in the corporate strategy.

Part IV
Corporate Finance Perspective

The main aims of capital management are to optimize the capital structure (i.e. optimize the return on capital) and performance. The previous parts discussed the accounting, regulatory, and risk ingredients as inputs for this optimization process. Although crucial elements, they are merely inputs for the optimization of the capital structure. The actual capital structure optimization process evolves around corporate finance concepts, such as weighted average cost of capital, which are discussed in this part. The last section of this part concludes this book.

20

Corporate Finance Decision Making

Capital management considerations are crucial in corporate finance decisions and vice versa, and it is particularly imperative to understand the capital implications associated with debt financing and acquisitions. This chapter discusses questions that need to be answered, which are, among many others: What is the impact of an acquisition on the capital ratios of the acquiring company? How does the capital structure influence the takeover price? What role does enterprise value play in takeover prices? What is the optimal level of debt financing?

20.1 ROLE OF RWAs IN BANK TAKEOVERS

Since financial markets typically closely follow bank capital ratios such as core Tier 1, it is important to assess the impact that a takeover can have on these ratios. It is obvious that a takeover has an impact on the capital ratios of the acquiring bank since the acquirer takes on all the assets and liabilities of the takeover target. Since assets have a risk weight attached to them, a takeover will naturally increase the total RWAs of the acquiring bank. This means that, if the bank does not attract any additional capital, the capital ratios of the acquiring bank deteriorate. Indeed, if the total amount of capital stays the same and the RWAs increase, capital ratios go down. However, when a bank acquires another bank it will generally seek to attract additional capital to finance the takeover. Hence, the impact of a bank takeover on the capital ratios of the acquiring bank depends on the amount of capital that is attracted versus the RWAs that are taken onboard. This can be best illustrated by means of an example.

Consider bank A who wants to purchase bank B. Bank A has $10 billion worth of core capital and total RWAs of $100 billion, and the shares are trading exactly at book value (i.e. market capitalization equals book value). Therefore, the core Tier 1 ratio of bank A is 10%. Bank B has $5 billion worth of capital on total RWAs of $40 billion, resulting

in a core Tier 1 ratio of 12.5%. Bank A acquires bank B at book value through a share transaction. This means that A will issue new shares to the shareholders of bank B that represent a value of $5 billion. Hence, A's capital increases to $15 billion, of which its original shareholders now own $10 billion and the former bank B shareholders own $5 billion. Due to this deal, the new core Tier 1 ratio of bank A improves from 10% to 10.7% ($15 billion worth of equity divided by $140 billion worth of RWAs). If A pays only $4 billion in newly issued shares to B shareholders, A effectively realizes 'badwill' of $1 billion. This means that the book value of B is more than what A pays for it, which is the reverse of goodwill. As long as there is no economic reason for this badwill (e.g. large corporate losses are expected), it can be booked as a profit. Indeed, because A acquires both assets and liabilities which represent a value of $5 billion and A pays only $4 billion for it, A makes an immediate profit of $1 billion. This means that, due to the transaction, A's core capital still increases by $5 billion of which $4 billion comes from newly issued shares and $1 billion from the immediate profit on the transaction. In this case the only difference is that the shareholders of A are diluted less. Indeed, the original A shareholders 'own' $11 billion worth[1] of A shares, whereas the former B shareholders 'own' only $4 billion of A shares. The effect on capital ratios is the same, regardless of whether A pays a compensation of $4 billion in shares and realizes $1 billion badwill or whether it simply pays out the book value of $5 billion in shares. If A pays more than the book value in shares, the impact on capital ratios remains unaffected, regardless of whether the accountant accepts the goodwill or not, because, for regulatory purposes, goodwill is filtered out of core capital. However, from an IFRS equity standpoint it does matter whether the accountant acknowledges goodwill (e.g. future profitability increases due to synergies). To illustrate this, consider that A pays $7 billion for B in shares. This takeover price is at a premium of $2 billion to book value, of which the accountant recognizes only $1 billion as goodwill. In this case, A needs to take an up-front loss of $1 billion. This means that, although A attracts $7 billion worth of capital through B shareholders (A pays in shares), A's IFRS equity increases by only $6 billion to $16 billion. This means that A's IFRS equity is $1 billion lower than if the full $2 billion were recognized as goodwill. The core capital position after the takeover is $15 billion. Indeed, IFRS equity of $16 billion needs to be adjusted for $1 billion goodwill to get core capital. Hence, the core Tier 1 ratio still increases from 10% to 10.7%.

The above example shows that acquisitions can have a material impact on regulatory capital ratios and, hence, are a consideration when taking over another bank. In general, if a takeover is fully financed and the capital ratios of the takeover target are better than those of the acquiring bank, the capital ratios of the acquiring bank improve. However, if the capital ratios of the takeover target are worse than those of the acquiring bank, the capital ratios of the acquiring bank deteriorate. This is under

[1] This assumes that, directly after the takeover is announced, the market capitalization of A increases to $11 billion because shareholders are aware that a $1 billion value transfer from B to A shareholders is associated with the takeover.

the assumption that any potential badwill is accounted as profit through the P&L.

20.2 ENTERPRISE VALUE VERSUS MARKET CAPITALIZATION

Enterprise value is a crucial indicator for company valuations. In order to fully grasp the concept of enterprise value, and why it is imperative to use it in any type of valuation, this section discusses each component of enterprise value in more detail. Furthermore, it explains how different valuation ratios should be used and compared. Enterprise value tries to quantify the overall value of a company. Market capitalization, in contrast, only quantifies the price tag of a company. In other words, market capitalization measures how much needs to be paid to acquire all the assets and liabilities of the company. The reason that enterprise value and market capitalization are so often confused is because people mistakenly equate the value of a company to the price of a company. However, market capitalization is only concerned with the equity value, but the business activities of a company generate significantly more value. Indeed, a company also needs to generate value in order to finance debt holders. This value is not taken into account when looking at the equity value of a company, which is understandable because shareholders only have a claim on the equity value. Hence market capitalization only considers the value of a company after debt holders and other stakeholders (e.g. inland revenue) have been financed and therefore does not take this *incremental* value into account.

Enterprise value is typically defined as what the market believes the ongoing operations of a company are worth. This definition enables one to quantify enterprise value as there is sufficient market information to determine the value of the ongoing operations of a company. Indeed, both equity and debt holders have a claim on the value of these ongoing operations. Hence, one can calculate the enterprise value as:

1. *Market capitalization*[2] *of a company*, **plus**
2. *Market value of debt (including preference shares and subordinated debt)*, **minus**
3. *Excess cash.*[3]

[2] This is simply calculated as the number of shares times the share price.

[3] Excess cash is defined as those cash and cash equivalents that are not needed to support the ongoing operation.

The reason that excess cash is deducted from market capitalization plus market value of debt is because this cash could be used to reduce either debt or equity and the company would still be able to run the same operation. That is why it is so important to only deduct those cash and cash equivalents that do not jeopardize the operation. This distinction between cash that is needed to support the operation and excess cash is particularly important for financial institutions. Indeed, financial institutions need to carry significant cash positions to be able to continuously finance its obligations or weather unexpected liquidity shocks (e.g. deposit withdrawals) and in order to meet central bank reserve requirements. Hence, a financial institution always has a large amount of cash and cash equivalents, but the institution needs a significant proportion of that simply to operate. This proportion should not be deducted from market capitalization plus market value of debt to get to enterprise value. Another way to look at enterprise value is the cost to buy all shares and debt instruments (including preference shares and subordinated debt). From this definition it immediately follows that one has to aggregate market capitalization and market value of debt and deduct excess cash to get the enterprise value. Indeed, once all shares and debt instruments have been acquired, one retains full ownership of excess cash. This excess cash can thus be used to reduce the cost price of acquiring all shares and debt instruments. One final perspective to show that it is logical to deduct excess cash in order to quantify enterprise value is to realize that the market capitalization and the market value of debt are based on the (excess) cash position. In other words, if there is no excess cash, the market capitalization and market value of debt are less than if there is excess cash.

To make the importance of enterprise value a bit more concrete, it is advantageous to see how it works in practice. Moreover, comparing enterprise values enables one to determine whether a company is undervalued or overvalued.

Consider bank A with a market capitalization of $14 billion and net earnings (after interest and tax) of $1 billion. Hence bank A has a price/earnings ratio of 14. Bank B has a market capitalization of $15 billion, net earnings of $1.5 billion, and thus a price/earnings ratio of only 10. Based on price/earnings alone, bank B seems to be undervalued compared to bank A. However, when taking into account the net debt position (debt minus excess cash) of both banks, bank B is in fact more expensive than bank A. Indeed, bank B has $30 billion worth of net debt with an annual associated after-tax cost of $1.5 billion. Hence, the ratio of enterprise value (EV) to earnings before interest after tax (EBIAT) is

15 (45/3). Since A has no net debt, enterprise value equals market capitalization and hence the EV/EBIAT ratio is also 14. So, based on the price/earnings ratio, bank A is more expensive than bank B, whereas an EV/EBIAT ratio indicates the opposite. The question now is: Which ratio should be leading when trying to compare company valuations? The answer is that one should always compare value on an enterprise level and not solely on a market capitalization level as the value should be independent of capital structure. Indeed, value is created through the operations of a company and the capital structure only determines how this value is allocated to the different financiers in this structure. On top of that, if one only looks at market capitalization versus net earnings, one assumes that debt liabilities never have to be paid back. Obviously, debt financing continues to be a liability until it is paid back. Indeed, a significant part of the $1.5 net earnings of bank B needs to be used to repay the heavy debt burden of $30 billion, whereas bank A has free discretion over its $1 billion earnings (e.g. reinvest, pay as dividend to shareholders). Moreover, debt financing has considerable refinancing risks, which a price/earnings analysis assumes to be non-existent.

All in all, it is useful to compare company values independently of capital structure and an EV/EBIAT ratio is one of the best proxies to do that. EBIAT is a less common metric than earnings before interest and tax (EBIT), but tells you more about the earnings that are actually generating value. Indeed, tax will need to be paid at some point and should therefore be taken out of the equation from a company value perspective.

It is important to realize that generating more value out of operations does not necessarily mean that a company is also generating more value for its shareholders. This depends on the capital structure and the financing terms. If a company has cheap guaranteed financing from the government, this can result in more value for the shareholders even though the operations generate less value. Hence, after one has determined the operational value generating powers of a company, the second step is to determine whether the capital structure can be optimized further to increase the value for shareholders.

20.3 WEIGHTED AVERAGE COST OF CAPITAL AND THE OPTIMAL LEVEL OF DEBT FINANCING

Cost of capital is a term used to describe the return that investors require for the capital they provide. It is by no means an easy subject, especially because of the difficulty of interpreting academic research in a practical context. This section discusses the different aspects of cost of capital.

Each source of capital, be it equity, preference share, or debt, carries its own cost. Indeed, shareholders expect a certain return on their investment, which is either reinvested in the business or paid out in dividends. Debt holders are typically compensated by means of coupon payments. The weighted average cost of capital (WACC) is the average cost of each capital component weighted with its respective market value. Equation (20.1) defines WACC in formula form:

$$\text{WACC} = \sum_{i=1}^{n} r_i \frac{M_i}{\sum_{k=1}^{n} M_j} \tag{20.1}$$

where

r_i = required return for capital component i,
M_i = market value of capital component i, and
$\sum_{k=1}^{n} M_j$ = market value of the sum of all capital components.

In the above definition of WACC, it is very important to weigh each capital component according to its *market value* and not, for example, its book value. The reason is that an investor can only invest in a certain capital component by paying its market value, and it is this investment on which the investor requires a return. The above formula needs to be adjusted slightly when a capital component has certain tax breaks attached to it. For example, coupon payments on debt instruments are, in general, tax deductible. Tax breaks can be incorporated in equation (20.1) as follows:

$$\text{WACC} = \sum_{i=1}^{n} r_i(1 - t_i) \frac{M_i}{\sum_{k=1}^{n} M_j}, \tag{20.2}$$

where

t_i = tax advantage associated with capital component i.

In the case of equity financing, t_i is zero, where debt financing has a tax advantage to the tune of the company's corporate tax rate (assuming that the company is profitable). The question is whether WACC is a function of the capital structure or is it merely a function of the operating profile or riskiness of the company? Modigliani and Miller showed that, assuming that there are no tax breaks, WACC is independent of the capital structure and therefore solely relates to the riskiness of the business activities in which a company engages. This is often referred to as the *capital irrelevance principle*. In other words, the cost of capital

financing (disregarding deposits or technical provisions) is independent of the type of securities with which the company is financed. Since WACC ultimately determines the value[4] of a company, this corresponds with the statement, made in section 20.2, that enterprise value is independent of the capital structure. Apparently WACC is constant no matter what type of financing a company chooses to attract. This means that the cost per type of financing changes with the way in which a company is financed. This is quite intuitive: a company with more leverage poses more risk to both equity holders as well as debt holders and therefore their costs go up. However, since a company, that is leveraging itself, swaps expensive equity funding for cheaper debt funding WACC can stay constant even though both equity as well as debt funding become more expensive because of the leveraging. To illustrate this, consider the following example that assumes a zero corporate tax regime.

Bank A has $1 billion worth of equity with an associated cost of 10% and $0.6 billion worth of debt with an associated cost of 8%. This means that the weighted average cost of capital of A is 9.25%. Suppose that bank B has an exactly equivalent risk profile to A, but is financed with $0.9 billion worth of equity and $0.7 billion worth of debt. Since banks A and B have exactly equivalent risk profiles, theory tells us that the weighted average cost of capital should also be 9.25%. However, due to the higher leverage, both the cost of equity as well as the cost of debt are higher for bank B, but the weighted average cost of capital still needs to be calculated as 9.25%. This appears to be the case, because the cost of equity is 10.125% and the cost of debt is 8.125%. Hence, the weighted average cost of capital for bank B equals

$$\frac{0.9 * 10.125\% + 0.7 * 8.125\%}{1.6} = 9.25\%.$$

When looking at the theory above, it seems as if a company can never optimize its weighted average cost of capital. Even worse, given the existence of tax advantages associated with debt financing, equation (20.2) shows that it is best to have no equity at all as this is the allocation where the cost of capital is lowest. However, these are very theoretical arguments. In practice, however, the weighted average cost of capital

[4] To illustrate this, consider a company with annual positive cash flows of $100 thousand. If the WACC is 10%, the company is worth $1 million (100/10%) whereas, if the WACC is 20%, the company is worth only $500 thousand (100/20%).

is never constant, not even in a zero-tax regime. If a bank or insurance company levers up too much, investors are generally not prepared to provide capital at any price (see section 17.3). This basically means that a non-stable capital position has an infinite weighted average cost of capital. This is quite logical as the purpose of equity capital is to make a company more stable and prevent a company from going bankrupt. If a company has little to no equity capital, a small operational loss can trigger a debt holder to initiate bankruptcy proceedings. The going concern of a highly leveraged company is highly uncertain and hence equity providers require an almost infinite return. On top of that, for a highly leveraged company, debt will take over the function of equity in the sense that it needs to absorb losses. However, debt instruments are not structured to absorb losses in the sense that holders can immediately call in bankruptcy proceedings once one default occurs. Hence, in practice, weighted average costs of capital are much more unruly than theory predicts them to be. As a consequence of this feature, companies need to optimize their weighted average cost of capital. In other words, if a company has no debt financing at all, it does not have an optimal capital structure. Because of tax advantages related to debt financing, the company can immediately reduce its weighted average cost of capital by starting to partly finance itself with debt. Completely at the other end of the spectrum would be a company that is entirely financed with debt. This company also does not have an optimized weighted average cost of capital because the company is so unstable that the cost of debt is incredibly elevated. The capital structure that produces an optimal WACC is a combination of equity and debt. However, the exact proportions of debt versus equity are different for each company and are ultimately determined by the level of debt that stakeholders are comfortable with (see section 17.3). Companies whose operations bear little risks can be leveraged more than companies that have very risky operations. This is simply the result of the fact that risky operations already threaten the going concern when there is a small amount of leverage, whereas low-risk operations need only a small equity buffer to protect the going concern of the operations.

It is important to realize that the main reason that companies want to be partly financed with debt is because of the tax advantages that this type of financing brings. Because equity is the only capital component that has real loss-absorbing capacity, any company needs equity. Equity capital protects the going concern of the company and is a stabilizing factor in the costs associated with capital instruments. One could also

say that equity is a *conditio sine qua non*. How much equity a company needs depends on the riskiness and stability of its earnings. A more risky company needs more equity to stabilize the cost of capital instruments.

Interestingly, for financial institutions there is an additional factor that needs to be taken into account when optimizing WACC. This factor concerns the regulatory capital requirements that a financial institution needs to meet, and hence WACC can only be optmized within the boundary constraints imposed by regulation.

20.4 FINANCIAL INSTITUTION EQUITY VALUATION

Enterprise value tells an investor something about the value of the ongoing operations of a company. This measure is independent of capital structure. Although enterprise value is the best way to compare company valuations and see whether they are undervalued or overvalued, one should also be able to determine the price tag of a company or the 'equity' value. Typically, this is determined by conducting a discounted earnings analysis. The question is: What earnings should form the basis for a valuation of a financial institution? Ideally, one should take those earnings that are freely payable to shareholders. This, in turn, depends on the capital position that is required to run the operations of a financial institution. From an equity value perspective, it is best to determine the level of regulatory core equity (including any prudence) necessary to run the business. This regulatory core equity requirement subsequently determines the amount of other financing (e.g. hybrid, debt) and its impact (due to interest costs) on earnings that are freely distributable to shareholders.

It has to be said that it is by no means easy to carve out that proportion of earnings that is freely distributable to shareholders while keeping the core regulatory equity, that is required to run the operation, intact. This section explains, by means of an example, how to value a financial institution when regulatory core equity requirements are deemed to be the minimum level necessary to run the operation and other types of financing are not a constraint (e.g. hybrid equity and debt financing). However, before these examples are discussed it is important to understand the discount factor that should be used to perform a discounted earnings valuation and the items that impact this discount factor. As a discount factor, one should use the cost associated with common equity. This means that, if a financial institution is financed with common equity, hybrid equity as well as debt, the discount rate should be just the cost of common equity (i.e. cost shareholders demand) and should therefore

not be a weighted average of cost of equity and cost of hybrid equity. Obviously, the cost of equity is impacted by the amount of hybrid equity and debt financing. If there is a significant portion of debt financing, the cost of equity goes up as there is more risk as a result of the leverage. On top of that, the other sources of financing need to be repaid at some point and hence equity holders demand a higher return. Indeed, the proportion that needs to be repaid is not freely distributable to shareholders, and shareholders should thus be compensated with higher returns. The following example makes the valuation of a financial institution more concrete.

Consider bank A with an available regulatory core equity of $50 billion and a regulatory core equity requirement of $45 billion. This means that A could reduce its available regulatory core equity by $5 billion and would still be able to run the operation. The cost of equity is 12.5% per annum. The net earnings of A are $5 billion per annum. In these net earnings, the following items are included,

- $1 billion charge for goodwill amortization;
- $1 billion post-tax interest cost for hybrid equity instruments (notional value of hybrid equity is $16.67 billion and the post-tax interest cost is 6%);
- $0.5 billion one-off gain on investments;
- $0.5 billion of higher than normal loan-loss provisions.

The question is: What earnings should be discounted with 12.5% (assuming there is no earnings growth) to establish the 'equity' value of A? To determine the relevant earnings, one needs to assess the earnings that are freely distributable to the shareholders. Goodwill does not form part of regulatory core equity and amortization charges are therefore not needed to replenish available regulatory core equity. Hence the $1 billion charge can be added back to net earnings. If A continues to finance its operations with hybrid equity and there is no refinancing risk, the associated interest cost is a real cost to the shareholders and should thus be taken into account in the earnings. Hence no adjustment is made for this item. The one-off gain on investments increases net earnings with $0.5 billion, but is not a sustainable income stream that is distributable to shareholders. Hence earnings should be reduced by $0.5 billion for the purpose of a discounted earnings valuation. The last item of $0.5 billion higher than normal loan-loss provisions can be added to earnings as this is basically an extraordinary charge. If one aggregates all these effects, the earnings that need to be discounted to determine the value are $1 billion higher than net earnings (i.e. $6 billion). Since the discount rate is 12.5% and it is assumed that there will be no earnings growth, the 'equity' valuation of A calculates to $48 billion (6/12.5%). However, there is an additional $5 billion value in the fact that the available core equity exceeds the regulatory core equity requirement. Hence, the overall 'equity' value of A is $53 billion. That is, over the life of the company, $53 billion of net present value will be transferred to shareholders.

Whether a potential acquirer B will be able to pay $53 billion for bank A depends on whether B is able to run A on the same financing. Suppose that B is not comfortable with the hybrid financing of A and wants to replace this with equity financing.[5] This means that B will replace $16.67 billion worth of hybrids with common equity. However, because the hybrids are replaced with equity, the earnings that are distributable to shareholders increase by $1 billion per annum to $7 billion. On top of that, because A is now less leveraged, the cost of equity drops from 12.5% to 11%. So, the total value that B would be willing to pay for A is $52 billion. This can be derived as follows.

- $63.63 *billion discounted earnings valuation (7/11%)*, **plus**
- $5 *billion of excess core regulatory capital*, **minus**
- $16.67 *billion equity injection by buying all hybrid equity.*[6]

To summarize, in order to determine the equity value of a company one can do a discounted earnings analysis. The earnings used to discount should be fully distributable to shareholders. One should therefore first determine the regulatory core equity position that is needed to run the operation (this can differ per financial institution). Combined with the discount rate, the relevant earnings and the available regulatory core equity position, the 'equity' value can be determined as follows:

$$\text{EqV} = \frac{\text{Ear}}{\text{CoE}} + (\text{ARCE} - \text{RRCE}) \tag{20.3}$$

where

EqV = equity value,
Ear = earnings that are freely distributable to shareholders,
CoE = cost of equity,
ARCE = available regulatory core equity,
RRCE = required regulatory core equity.

When establishing the earnings that are freely distributable to shareholders one has to potentially adjust net earnings with:

[5] This means that B is satisfying all of A's capital requirements with common equity even though $16.67 billion of the capital requirements can be satisfied with hybrid equity rather than common equity.

[6] This assumes that, in order to satisfy A's capital requirements, there needs to be $16.67 billion worth of hybrid equity on top of the $45 billion of common equity. Because B makes an active choice to satisfy the $16.67 billion additional capital requirement with common equity rather than hybrid equity, this has an impact on the price B is willing to pay for A.

- *Goodwill*. Because goodwill is filtered out of the definition of regulatory core equity, net earnings should be adjusted upwards with any goodwill amortization charges.
- *Interest rate charges*. One has to determine the interest rate charges associated with debt financing, given an available regulatory core equity position that equals required regulatory core equity. Indeed, if it appears that a bank needs to attract more hybrid equity in order to satisfy total required capital, it should adjust net earnings downwards to the amount of the incremental (post-tax) interest expense.
- *Deferred tax assets*. Under the current regulatory framework, earnings do not need to be adjusted for taxes. However, once the DTAs are (partially) deducted from IFRS equity to get to the regulatory core equity, any release in DTAs results in an increase of regulatory equity. Hence, in this case, more of the earnings are actually freely distributable to shareholders. However, if the DTAs are partially deducted, then earnings or regulatory equity (with the amount of DTAs that is expected to be realized over time) need to be adjusted upwards.
- *Extraordinary items.* Earnings should be adjusted for all one-off items or items with an extraordinary nature. This can either be a reorganization charge or higher (or lower) than normal loan-loss provisions, higher (or lower) than normal mortality rate, etc. In other words, everything should be based on fair expectations – thus, expected loan-loss provisions, expected mortality rates, etc.

20.5 CAPITAL BUY-BACKS

In section 8.1 it was discussed that market value changes of debt issued by financial institutions can have an impact on the IFRS equity position. Indeed, if a financial institution accounts for its listed debt (i.e. traded on an exchange) on a market value basis and the price of its debt drops in value, the liabilities reduce as well. This reduction in liabilities is reflected as a profit in the P&L statement and, as such, increases IFRS equity through retained earnings. However, because of prudential filters (see section 8.1), this increase in IFRS equity is disregarded when determining regulatory capital. It is quite logical that profits caused by a deterioration in a financial institution's own credit worthiness is, for regulatory purposes, not reflected in the definition of capital. Indeed, the profits that arise from market value changes of own-issued debt are not even loss absorbing in a gone concern, let alone in a going concern, because market value changes do not affect the claim that creditors

have on the company. Market value changes are only a reflection of the likelihood that the claim of creditors is fully recovered, but does not impact the claim itself.

Nonetheless, there is a way for financial institutions to benefit from a deterioration of their own credit worthiness. Indeed, a financial institution could decide to repurchase its own debt and lock in any paper profits. For example, if a financial institution issues debt with a face value of $\$X$ (i.e. the proceeds of the issuance are $\$X$) and after one year it repurchases this debt at 80% of the original value, it posts a profit of $\$X$ times 20%. However, in order to post such a profit it does need to have, or obtain, the finances to actually pay for this debt on the open market. The easiest way to do that is when the financial institution has excess cash. It can then buy its own debt (i.e. swap cash assets for own-debt assets) and subsequently cancel the debt (i.e. cross out own-debt assets against debt liabilities). Unfortunately, the problem is that financial institutions do not generally have sufficient excess cash to finance this repurchase. An even greater problem might be that, if the debt is subordinated and counts as capital, the repurchase actually reduces regulatory capital by the amount of the repurchase price. Because the repurchase price is at a discount to face value, the regulatory capital reduction is less than the outstanding subordinated debt capital. The reason being that the discount to face value results in a profit that has the highest capital quality. This means, that, due to the repurchase, part of the subordinated debt capital is transformed into higher quality equity capital (i.e. the discount part that is responsible for the profit) and the remaining capital is cancelled. In other words, lower-quality capital has been swapped for less capital, but of a higher-quality.

A financial institution A has $\$X$ worth of Tier 2 capital that it repurchases for 80% of face value. In this case A's core capital increases by 20% times $\$X$, while the overall capital position (i.e. Tier 1 plus Tier 2) reduces by 80% of $\$X$. In order to prevent this reduction in total capital, A can decide to issue new capital to the tune of 80% of $\$X$, of which the proceeds are subsequently used to repurchase all Tier 2 capital. In this scenario, the overall capital position remains the same. However, the capital composition will change. First of all, 20% times $\$X$ of Tier 2 capital is transformed into core Tier 1 capital due to profits. Moreover, depending on the capital quality of the new issuance that finances the repurchase, the capital composition might change even further. If the new issuance is of similar quality as the Tier 2 instruments that are being repurchased, nothing else will change. However, if the newly issued instruments are of higher quality than the Tier 2 instruments, the quality of the capital composition increases even more.

The above example shows that a financial institution can improve its capital quality if it repurchases debt that trades at a discount. However, this almost seems too good to be true and everybody knows that there is no such thing as free money. The trade-off for financial institutions is typically that (1) they are prepared to reduce their total regulatory capital position in order to post a profit by repurchasing discounted debt instruments, or (2) they refinance the total repurchase with newly issued capital and post an up-front profit at the expense of future profitability. The first option can be attractive if the financial institution has sufficient regulatory capital. However, if this is not the case it has to issue new capital instruments. Because the debt capital instruments trade at a discount, the (perceived) credit worthiness of this financial institution has worsened and hence it will be more expensive to issue new capital. This means that, although the financial institution can make an up-front profit by repurchasing outstanding debt capital, it will have to pay for that going forward because it has to pay a higher yield on the newly issued capital. Nevertheless, there might still be reasons for a financial institution to repurchase discounted debt capital through the issuance of new capital. A financial institution would do this for the following reasons:

1. *Improve the quality of the capital position today.* Indeed, as mentioned previously, the profit that is made on the repurchase enables the financial institution to transform part of the lower-quality capital into core capital. However, because the newly issued capital will carry a higher compensation, the future additions to equity through retained earnings will be less. This might still be an attractive trade-off because the financial institution might be in need of additional loss-absorbing capital *today* rather than in the future.
2. *An arbitrage opportunity exists between realizing a profit today and paying for it in the future.* This reason can best be explained by means of an example.

Consider $1 billion worth of Tier 2 capital which was initially issued at par and carries a coupon of 7%. This Tier 2 capital can be repurchased for $600 million. Suppose that the cost associated with issuing $600 million new equity capital is 12%. In this case the financial institution can make an up-front profit of $400 million today. However, the future additional costs associated with refinancing $600 million are $30 million per annum (12% − 7% = 5% times $600 million). The net present value

of an everlasting yearly additional cost of $30 million is $250 million.[7] This means that there is an arbitrage between realizing an up-front profit and paying for it in the future to the tune of $150 million ($400 - 250 = \$150$ million). Moreover, there is an additional benefit to the repurchase transaction – namely, the financial institution swaps Tier 2 capital for core capital which is of higher quality and receives $150 million on top of that.

[7] To calculate the net present value one needs to discount by 12% because it is forgone profit that should yield 12% per annum. Once, the discount rate is known there is an easy formula to calculate the net present value, namely $1/y$ times the yearly cost, where y is the discount factor (1/0.12 in this case).

21
Strategic Diversification

One of the objectives of capital management is to optimize the return on capital. If one looks at this objective in isolation, several questions arise. Why do financial conglomerates exist with diversified sets of businesses? Why do financial conglomerates not purely focus on the business that generates the highest RAROC? These are very valid questions and cannot be left unanswered in a text about capital management. In this chapter, these questions are answered in the context of strategic diversification rather than financial diversification. In other words, what are the strategic reasons to diversify? Once these strategic reasons are understood, one may see that diversification can also make sense from a financial point of view. At the end of this chapter, we will return to this because equity investors sometimes argue that companies do not have to diversify as they can diversify themselves by simply holding a portfolio of different shares.

In order to answer the above questions in a strategy context, one first needs to understand the different roles that parents (holding companies) can fulfil and the parental strategies that exist.

Generally, three types of parental roles can be distinguished.

1. *Parental developer.* In this role, the parent adds value by leveraging its own capabilities to develop its subsidiary businesses.
2. *Synergy manager.* In this case, the parent adds value by stimulating its subsidiary businesses to cooperate and ensure that synergies are fully exploited.
3. *Portfolio manager.* This means that the parent simply views its subsidiary businesses as investments and adds value by acting as an agent for capital markets. This assumes that the parent possesses capabilities such that it is able to realize higher investment returns than capital market participants. An example of a portfolio manager is Berkshire Hathaway.

Very few companies can justify operating as a portfolio manager as it is built on the premise that the parent is a better investor than other market participants.

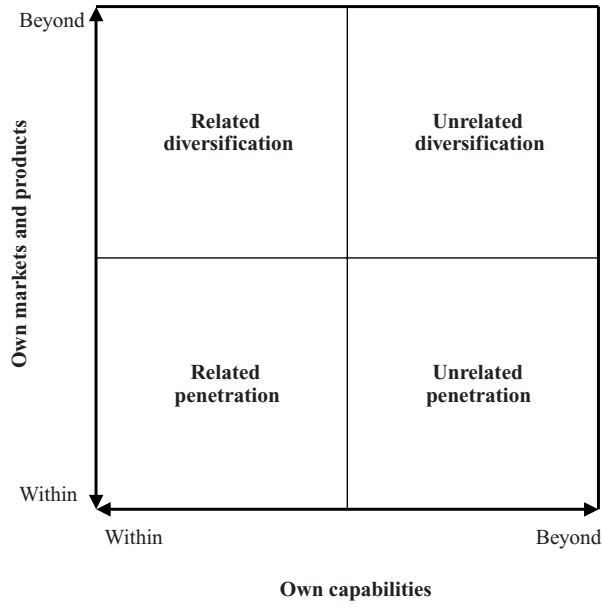

Figure 21.1 Parental strategy matrix.

When considering the parental developer and the synergy manager, a parent can pursue four types of strategies, which are presented in the *parental strategy matrix* of Figure 21.1. In this book, diversification is defined as pursuing activities that are either beyond its current markets or products or both. This might differ from traditional strategy textbooks, where diversification is defined as activities that are beyond its current markets *and* products. The matrix in Figure 21.1 shows that there are four basic parental strategies:

1. *Related penetration.* This means that the parent pursues activities that are within its own capabilities and within its own markets and products. In this case, the parent focuses on what it knows best and tries to further penetrate the markets in which it currently operates. It basically tries to extract more value out of the markets in which it is competing. The parent can either do this organically or by acquiring competitors.
2. *Related diversification.* In this case, the parent diversifies away from its own markets *and/or* products, but it already possesses the right

capabilities to compete successfully in these new markets or with these new products.

3. *Unrelated penetration.* This is when the parent pursues activities that are within its own markets *and* products, but beyond its own capabilities. In other words, the parent tries to extract more value out of its current markets *and* products by developing or acquiring new capabilities. One can, for example, think about a bank that currently competes in its markets *and* with certain products through its branch network. If it decides to acquire an internet bank, it leverages new capabilities to compete in the same market and with the same products.
4. *Unrelated diversification.* This relates to a parent who embarks on activities that are beyond its own markets *and/or* products and beyond its own capabilities. It basically means that the capabilities of the parent do not provide an edge by which it can employ these new activities more effectively than its competitors. Depending on the extent of the diversification, it might add commercial synergies such as cross-selling or economies of skill. However, this is generally only successful if it diversifies into *either* new products *or* new markets. If a parent executes an unrelated diversification strategy where it diversifies into both new markets and new products, it is very hard to realize commercial synergies. The chance of successfully executing such an unrelated diversification strategy is low. Furthermore, in this case, one should question the grounds for this strategy as it might well indicate *gamble for resurrection.* In other words, the current business model(s) employed by the parent are unsustainable and the parent hopes to solve its problems by gambling on something completely new and unfamiliar.

After this short background introduction about parental roles and strategies, let us try to answer the questions raised at the beginning of this chapter. Why do financial conglomerates exist with diversified sets of businesses and why does a financial conglomerate not purely focus on the business that generates the highest RAROC? These two questions can be combined and translated into one question, namely. *Does diversification add value?* When we think of unrelated diversification into *both* new markets *and* new products, this is highly questionable. Indeed, this is almost like starting a new company. The question then becomes: Why not fully depart the old business and only focus on the new one? This is basically what Nokia did when it transformed itself from a boots

manufacturer into a mobile phone manufacturer. Nevertheless, there are possibilities for adding value with an unrelated diversification strategy, but it generally means that the parent diversifies in *either* markets *or* products. Although the chance of success is lower than for related diversification, there are basically five reasons for executing unrelated diversification into either markets or products. The best unrelated diversification strategies exploit all these five reasons.

1. *Exploit commercial synergies.* These synergies help both existing business(es) as well as a new diversification business to compete. In the case of diversification into new products, commercial synergies typically evolve around cross-selling. For example, a life insurance company that diversifies into non-life insurance can try to realize cross-selling on both sides. It can, for example, offer non-life riders[1] on life insurance policies (e.g. a life insurance product with an additional non-life feature such as a life insurance that also covers disability). Commercial synergies with respect to diversification into new markets often evolve around economies of skill and increasing sales by selling one product in multiple markets. For example, a life insurance company that sells complicated products needs to sell in multiple markets in order to generate sufficiently high sales and attract the necessary skills to structure and manage these products.
2. *Exploit cost synergies.* By diversifying into *either* new markets *or* new products one might be able to achieve cost synergies by, for example, integrating threshold capabilities[2] such as IT and administration. Again, if one diversifies into *both* new markets *and* new products it is much harder to achieve cost synergies.
3. *Gain market power.* By diversifying or, more generally, by creating scale, a company might be able to gain market power. For example, a property and casualty insurance company that operates in several markets will have more bargaining power against large and globally operating reinsurance companies.
4. *Leverage new capabilities to add value to current business(es).* Ideally, the capabilities needed to be successful in the business that the company is diversifying towards can also be of value to the current business(es). For example, a life insurance company

[1] Riders are additional insurance features to a regular insurance policy.

[2] These are imperative capabilities for any company that wants to compete, but these capabilities do not give a competitive advantage.

that currently only sells through intermediaries and buys a non-life insurance company that sells directly via the internet, can leverage this direct selling capability for its current life insurance business.

5. *Generate more robust and less volatile earnings in the long run.* This is sometimes referred to as spreading risk. However, spreading risk has a rather defensive connotation and it is hard to see why this would generate value. However, when diversification is aimed at making earnings more robust and less volatile, it makes the company more stable and can be a value-adding strategy. This is based on the notion that any type of business is exposed to cycles during which it encounters both good times as well as bad times. If a company is diversified, it is better able to survive bad times because its other businesses continue to operate well. For example, during the credit crisis, life insurance companies suffered, whereas non-life insurance companies were holding up quite well. An insurance company with both life as well as non-life businesses was therefore better able to survive the credit crisis and can also benefit more when times improve.

   In most strategy textbooks, spreading risk as a reason for diversification is not seen as a primary reason for adding value. It is generally classified as a nice side effect. However, a company that diversifies, even though its business with the highest RAROC has still room to increase economic profits, must have 'spreading risk' as one of its primary reasons. Indeed, as long as the business with the highest RAROC is able to increase its economic profits, it is better to allocate capital to this business rather than to businesses with a lower RAROC. Nonetheless, it might be very valid to diversify as a means to better manage business cycles, firstly, because one can never fare blindly on RAROC – or TVRAROC (see Chapter 18) for that matter – and, secondly, depending on where the business is in the cycle, it might be opportune to diversify. Indeed, if a business is at a point in the cycle where it is likely to start incurring heavy losses, the RAROC will be negative for the next couple of years, which can obviously destroy significant value. On top of that, if things really turn sour, financing will become more expensive and will ultimately jeopardize the company's very existence. A diversification strategy might enable this company to earn its way out of this difficult period and subsequently benefit from potentially even higher returns because of reduced competition (e.g. some competitors will not have survived). It helps if the current business(es) also add value

to the (new) diversification business. This is exactly why related diversification is much more attractive than unrelated diversification.

When looking at related diversification, all the above-mentioned points hold, except point 4, which actually changes to:

Add value to the new business by leveraging its own capabilities.

Although only point 4 changes, this is quite a material one for the reason that the company can actually add value to the newly diversified business. This means that there is actual value for this new business to be part of this greater company. This is so material that it also becomes easier to realize the remaining four points. One can conclude that, from a strategic point of view, related diversification can add value and has a good chance of success. Although the RAROC is important, one has to acknowledge that any business is exposed to cycles. So, even high RAROC businesses can benefit from being part of a company with several non-synchronous businesses.

Unrelated diversification is, in general, only successful if the diversification relates to products *or* markets. Even then, it can be hard to realize the theoretical value-adding possibilities, particularly, because the diversifying business cannot benefit from capabilities of the greater company. This makes it harder to justify the diversification and also harder to realize the theoretical benefits.

Now that it is clear that, from a strategic point of view, it can make sense for a company to diversify, the question becomes: *Does diversification also add value on a macro financial level?* To make this question more concrete, it can be rephrased as: *Does diversification actually add value to shareholders?* In other words, can there be benefits to a shareholder to own a share in one bank with a retail and commercial unit rather than owning two separate shares in the retail unit and the commercial unit? The answer to this question is 'yes' as business cycles can cause either the retail or the commercial unit to go bankrupt while the combination of the two would have a good chance of survival. This means that the shareholder with two separate shares in the retail and commercial unit has a return of minus 100% on one share and, on the other, it might realize a return of, for example, 20%. Hence, due to business cycles, the shareholder with two separate share holdings in the retail and commercial unit has a higher chance of substantially negative returns than the shareholder with a holding in the combination of the retail and commercial unit. Thus, even for shareholders there can

be advantages to diversification. A capital manager should take this into account when determining the portfolio of businesses to which he allocates capital. It is important that the choice of portfolio of businesses is aligned with the expectations of shareholders (and other stakeholders). This is also a good example of where capital managers can manage the expectations of shareholders as they can explain to them that there can be advantages to owning a share in a portfolio of businesses rather than shareholders owning a portfolio of shares in different businesses.

22
Conclusions

In order to manage the capital of financial institutions well, one has to take several different perspectives. What makes capital management of financial institutions difficult, but also interesting, is that one has to oversee all of these perspectives to create value. The main perspectives that need to be understood are discussed in Parts I to IV respectively:

1. *Accounting*
2. *Regulatory*
3. *Risk and capital management*
4. *Corporate finance.*

There are other perspectives, such as the perspective of rating agencies, that are not discussed in this book. However, once one is familiar with the accounting, regulatory, risk and capital management, and corporate finance perspectives, one possesses the main ingredients to create value with capital management.

Ultimately, capital management has two primary objectives:

1. **Optimize the capital structure** in order to achieve an *optimal cost of capital*.
2. **Optimize performance** so that, given a certain capital structure, a financial institution achieves an *optimal return on capital.*

One can only achieve these objectives if one understands and appreciates the different capital management perspectives. Moreover, one needs to be able to apply techniques that are specific to the different capital management perspectives. Simply having a rough understanding of the different perspectives is not sufficient. How to achieve the two primary objectives of capital management and how the different perspectives facilitate this is summarized in Figure 22.1, which is a respect of Figure 1.1. The different perspectives of capital management are expressed in the activities that need to be employed to achieve an *optimal cost of capital* and an *optimal return on capital*. How the activities presented in Figure 22.1 need to be put in practice is explained in the various chapters of this book. Although this book provides the necessary strategic

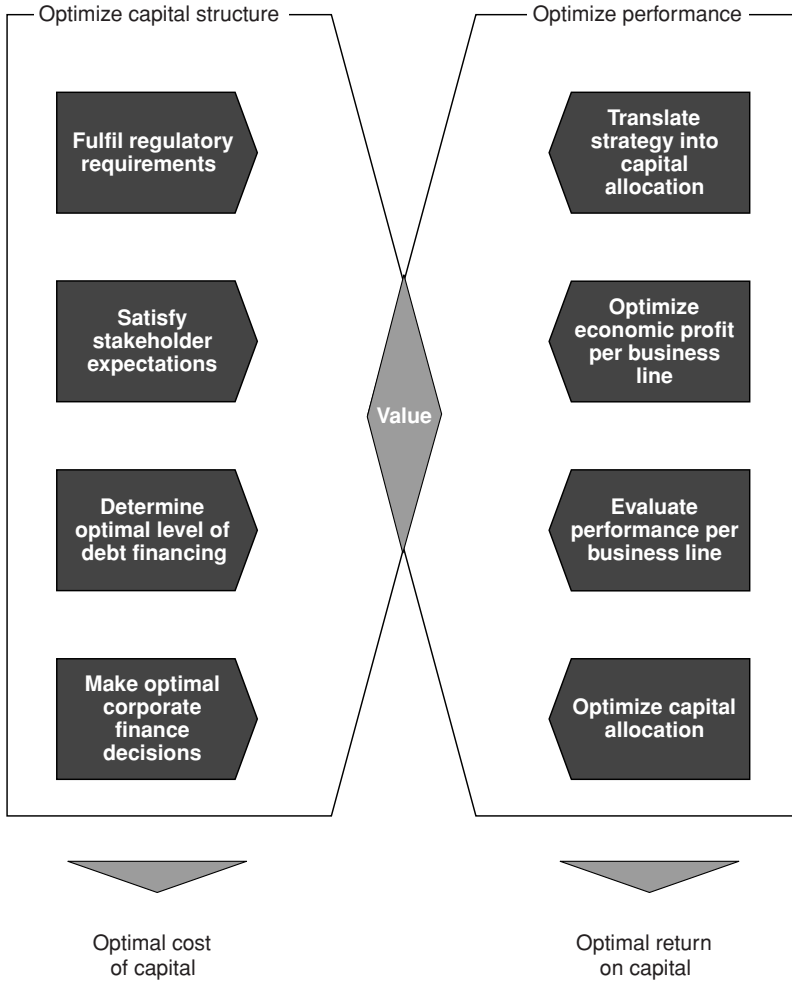

Figure 22.1 The two objectives of capital management.

and tactical considerations of capital management, its real execution can only be mastered in practice. Nevertheless, anybody who wants to understand capital management and create value by managing capital should become familiar with the contents of this book. Hopefully, this book can jump-start practitioners into the world of capital management and help senior management at financial institutions, regulators, students and interested individuals to dissect the interesting world of capital management.

22.1 CAPITAL MANAGEMENT PERSPECTIVES

In order to relate the different perspectives to capital management, this book concludes with a short summary on each perspective.

22.1.1 Accounting Perspective

The accounting perspective can be viewed as the backbone of capital management. Almost all capital management concepts and activities somehow relate to accounting. Generally, accounting lies at the basis of capital definitions, capital instruments, regulatory requirements, risk management actions, and corporate finance decisions. In addition, it is imperative to understand how accounting works so that one can understand the implications for IFRS capital, which in turn determine regulatory capital.

22.1.2 Regulatory Perspective

In the financial sector, the regulatory perspective is a crucial component of capital management. Since capital regulation has a clear business rationale, understanding the regulatory perspective facilitates an understanding of the corporate finance side of capital management.

The reason that the regulatory perspective is so important is because any financial institution needs to fulfil the regulatory requirements with respect to the amount and composition of capital. It is basically a constraint that a capital manager needs to take into account when optimizing the capital structure. Even if, from a business perspective, it makes sense to choose a certain capital structure that does not fulfil the regulatory requirements, this is simply not possible. Hence, the capital structure of a financial institution can only be optimized within the regulatory constraints.

22.1.3 Risk and Capital Management Perspective

The perspective of the risk and capital manager is particularly important when trying to optimize the return on capital, given a certain capital structure. There are several risk and capital management aspects to this optimization process:

1. *Translate strategy into capital allocation.* Once a corporate strategy has been formulated, available capital needs to be allocated in line

with this strategy. This requires significant fine tuning with the different businesses in terms of how and when this capital is actually allocated. Indeed, the allocated capital has to be in line with the size of the business. Even if the strategy is to expand a certain business, this is not done overnight. Hence, capital needs to be allocated over time, in line with the business strategies of the individual businesses.
2. *Optimize economic profit per business line.* Once capital has been allocated, the individual businesses and business risk management are responsible for getting the most out of this capital. In other words, the individual businesses need to continually improve their economic profit. Risk management challenges the individual businesses on the business they undertake and sets guidelines within which these businesses need to operate. Optimization of economic profit per business line is not a responsibility of capital management, but rather of the business and business risk management.
3. *Evaluate performance per business line.* Performance evaluation is again a responsibility of capital management. As part of this activity, capital management evaluates how well businesses are performing and challenges them on how these individual businesses can improve their performance. Part of this performance evaluation is to compare the RAROC and economic profit growth potential.
4. *Optimize capital allocation.* Based on the performance evaluation, capital management should optimize its available capital allocation. This could mean that it has to reallocate capital from poorly performing businesses, or businesses with little growth potential, to well-performing and high-growth businesses.

The perspective of risk and capital management is not only important for optimizing performance (i.e. return on capital), but also for optimizing the capital structure. Any financial institution needs to fulfil stakeholder expectations. In section 17.3 this was referred to as *the soft side of capital management*. It means that a financial institution needs to understand what level of capital the stakeholders feel comfortable with. Just like regulatory requirements, stakeholder expectations are a constraint in the context of capital structure optimization.

22.1.4 Corporate Finance Perspective

The corporate finance perspective lies at the core of the objective to optimize the capital structure in order to achieve an optimal cost of

capital – particularly when determining the optimal level of debt financing. This is not an exact science. In other words, there is no mathematical formula that tells you what the optimal level of debt should be. Ultimately, the optimal level of debt financing is mainly determined by what stakeholders find acceptable.[1] In general there is a clear link between what level of capital stakeholders find acceptable and the riskiness of the business. In other words, stakeholders require a higher level of capital for higher risk businesses. Therefore it is absolutely key that capital managers constantly monitor and understand the expectations of stakeholders.

[1] And if it is within regulatory requirements.

Appendix A
Accounting Classifications

The International Financial Reporting Standards (IFRS) distinguish four accounting categories for financial assets.[1]

- *Fair value* (FV). This category applies to 'trading positions' with a short-term investment horizon which are held with the intention of trading out of them opportunistically to realize a profit. Fair value accounting prescribes that assets are accounted for on a mark-to-market basis and all (unrealized) gains and losses resulting from market value changes go straight through the profit and loss statement. Examples of assets booked at fair value are stocks, bonds, and derivatives that are being held for trading purposes and typically with a short-term horizon.
- *Loans and receivables* (L&R). Loans or claims that are held with the intention of holding them to maturity are considered loans and receivables under IFRS accounting. This means that these assets are accounted for at amortized cost with an impairment correction. In this case, impairments are based on a sound credit analysis as to how much of the loan or claim is expected to be recovered. Own originated mortgages are a typical example of loans and receivables assets.
- *Held to maturity* (HTM). Assets, which are not a loan or a claim, where the intention is to hold them to maturity, and where there is also a possibility to do so, are accounted for as held to maturity. This means that these assets are, like loans and receivables, booked at amortized cost with an impairment correction. Bonds that have been bought with the intention of holding them to maturity are typically accounted for as held to maturity. However, there is a so-called rule under IFRS that when a bank sells only a small piece of its held to maturity portfolio early, the entire portfolio becomes tainted and has to be impaired down to the market value.
- *Available for sale* (AFS). This category covers basically all other assets. This means that typically bonds and even strategic stock

[1] This appendix has been sourced from De Weert, F.J. (2009) *Banking Solutions – Aligning the Banking System with Society*.

investments, which are not held with a short-term trading intent but a longer-term horizon, fall into this category. Furthermore, because of the stringent rules of held to maturity, bond investments, as part of a bank's asset liability management (ALM), are typically booked under available for sale as banks can never be sure that changing circumstances (e.g. savings outflow) will not force them to sell a small part of their ALM portfolios.

Under AFS, assets are booked at fair value, but unrealized gains and losses do not appear in the profit and loss statement; they go straight through equity and are specified in the so-called revaluation reserve.

Appendix B
Credit Ratings

There are three leading credit rating agencies, namely Standard & Poor's (S&P), Moody's, and Fitch.[1] All three use similar rating scales as set out in Table B.1[2] based on the approximate probability of default[3] over 5 years.

Table B.1 Standardized credit rating scale

Description	Scale			Approximate probability of default over 5 years
	S&P's	Moody's	Fitch'	
Investment grade				
Extremely strong	AAA	Aaa	AAA	1 in 600
Very strong	AA	Aa	AA	1 in 300
Strong	A	A	A	1 in 150
Adequate	BBB	Baa	BBB	1 in 30
Subinvestment grade				
Less vulnerable	BB	Ba	BB	1 in 10
More vulnerable	B	B	B	1 in 5
Currently vulnerable	CCC	Caa	CCC	1 in 2
Currently highly vulnerable	CC		CC	
Default	D	C	D	

[1] This appendix has been sourced from De Weert, F.J. (2009). *Banking Solutions – Aligning the Banking System with Society*.

[2] *Source*: Based on Reserve Bank of New Zealand, *Bulletin*, Vol. 71, No. 3, September 2008.

[3] The approximate, median likelihood that an investor will not receive repayment on a 5-year investment on time and in full, based upon historical default rates published by each agency.

Appendix C
Standardized Approach of Solvency II

In this appendix the subcomponents of the standardized approach of Solvency II are discussed and how it quantifies the associated risk capital charge.

C.1 MARKET RISK

To quantify the risks associated with the level or volatility of market prices of financial instruments, six subcomponents are distinguished.[1]

1. **Equity risk** refers to all assets and liabilities whose values are sensitive to changes in equity prices.[2] Under the standardized approach, two types of equity classes are considered: 'Global' and 'Other'. Global comprises equities listed in EEA and OECD countries and Other comprises equities listed in emerging markets, non-listed equities, hedge funds, and alternative investments. To determine the capital charge related to equity risk, an insurance company needs to apply a 32% downward shock to Global equities and a 45% downward shock to Other equities. These are the shocks defined in the technical specifications of the fourth quantitative impact study. In light of the severity of the credit crisis, one can expect these shocks to be increased (e.g. 45% for Global equities and 60% for Other equities).

   The shocks for Global and Other equities need to be applied to the Global and Other equity exposures respectively. The total capital charge related to equity risk can now be calculated by correlating the impact of the Global shock and Other shock with 75%.

$$Mkt_{eq} = \sqrt{Mkt_{Global}^2 + 2 \times 0.75 \times Mkt_{Global} \times Mkt_{Other} + Mkt_{Other}^2}, \tag{C.1}$$

[1] See European Commission (2008), *TS.IX.A of QIS4 Technical Specifications.*
[2] See European Commission (2008), *TS.IX.C of QIS4 Technical Specifications.*

where

Mkt_{Global} = impact of Global shock to equity portfolio
Mkt_{Other} = impact of Other shock to equity portfolio.

It is likely that, in the final Solvency II proposal, the capital charge related to equity risk will be refined, especially in relation to Global equities. The reason for this is that, if the market has gone up for a while it is more likely to drop; conversely, if the market has already dropped significantly it is less likely to drop even further. This phenomenon can be captured by the equity 'dampener' formula and relates only to Global equities.[3] Furthermore, the dampener formula only relates to those liabilities with a duration of more than 3 years. For completeness, the current thinking about the dampener formula for Global equities is given in equation C.2.

$$Mkt_{Global} = MVEP \times \left[\alpha \times \left[F(k) \times G(k) \times \left(Y_t^{10} - Y_t^{261}\right)\right] + (1-\alpha) \times 32\%\right] \quad \text{(C.2)}$$

where

$MVEP$ = the market value of the Global equity portfolio
k = duration of liabilities
α = share of technical provisions with commitments over 3 years
Y_t^{10} = mean of the equity index of the last 10 trading days
Y_t^{261} = mean of the equity index of the last year

and $F(k)$ and $G(k)$ are coefficients defined in Table C.1.[4]

Table C.1 Duration dependent coefficients

Duration of liabilities (k)	$F(k)$	$G(k)$
3–5 years	29%	20%
5–10 years	26%	11%
10–15 years	23%	8%
Over 15 years	22%	7%

[3] The reason that the dampener only relates to Global equities is because one can only assume mean-reversion for a well-established and sufficiently mature market. On top of that the equity portfolio of the insurance company should also be representative for the overall market. The latter is not a constraint in the current thinking of Solvency II.

[4] See European Commission (2008), *TS.IX.C.22 of QIS4 Technical Specifications.*

Table C.2 Upward and downward shocks to interest rate curve structure

Maturity (t) years	1	2	3	4	5	6	7	8	9	10
$s^{down}(t)$	−0.51	−0.47	−0.44	−0.42	−0.40	−0.38	−0.37	−0.35	−0.34	−0.34
$s^{up}(t)$	+0.94	+0.77	+0.69	+0.62	+0.56	+0.52	+0.49	+0.46	+0.44	+0.42
Maturity (t) years	11	12	13	14	15	16	17	18	19	20+
$s^{down}(t)$	−0.34	−0.34	−0.34	−0.34	−0.34	−0.33	−0.33	−0.32	−0.31	−0.31
$s^{up}(t)$	+0.42	+0.42	+0.42	+0.42	+0.42	+0.41	+0.40	+0.39	+0.38	+0.37

2. **Property risk** is quantified by measuring the immediate impact on the net value of assets and liabilities in the event of a 20% fall in real estate prices, taking into account the insurance company's direct and indirect exposure to property prices.[5] This is relatively straightforward. One just applies a 20% downward shock to real estate prices and takes the P&L impact as the capital charge for property. The only thing one has to watch out for is potential embedded leverage in real estate funds. For example, if an insurance company has invested $100 million in a fund that has 20% leverage, the insurance company should apply the shock to $125 million ($100 million divided by 0.8) rather than $100 million.
3. **Interest rate risk** concerns the sensitivity of assets and liabilities to changes in the level of interest rate, the term structure of interest rates and interest rate volatility.[6] To determine the capital charge related to interest rate risk, one has to apply term specific downward shocks and upward shocks to the assets and liabilities and take the maximum of the two (negative) impacts (i.e. take the largest loss). For each annual term, the altered term structure is determined by multiplying the current interest rate curve with $(1 + s^{down}(t))$ and $(1 + s^{up}(t))$ respectively. $s^{down}(t)$ and $s^{up}(t)$ are defined for each annual term as specified by Table C.2.[7]

   In other words, if the 10-year interest rate has a level of r_{10}, then the altered downward 10-year interest rate will be $r_{10}(1 - 0.34)$ and the altered upward 10-year interest rate will be $r_{10}(1 + 0.42)$. The impact on net value of assets minus liabilities is determined

[5] See European Commission (2008), *TS.IX.D of QIS4 Technical Specifications.*
[6] See European Commission (2008), *TS.IX.B of QIS4 Technical Specifications.*
[7] See European Commission (2008), *TS.IX.B.5 of QIS4 Technical Specification.*

for both the altered downward and upward term structure and the most negative impact is taken as the capital charge. This is quite a straightforward exercise. However, it is important to also take the market value margin into account when conducting this exercise. Indeed, MVM is dependent on the level of interest rate.

4. **Spread risk** measures the risk related to a change in credit spread over the risk-free interest rate term structure. The capital charge for spread risk comprises three components.[8]

$$Mkt_{sp} = Mkt_{sp}^{bonds} + Mkt_{sp}^{struct} + Mkt_{sp}^{cd} \tag{C.3}$$

where

$$\begin{aligned} Mkt_{sp}^{bonds} &= \text{capital charge related to spread risk of bonds} \\ Mkt_{sp}^{struct} &= \text{capital charge related to spread risk} \\ &\quad \text{of structured credit products} \\ Mkt_{sp}^{cd} &= \text{capital charge for credit derivatives.} \end{aligned}$$

The capital charge for the three credit risk components are calculated as follows:

$$Mkt_{sp}^{bonds} = \sum_i MV_i \times m(dur_i) \times F(rating_i) + \Delta Liab_{ul} \tag{C.4}$$

$$Mkt_{sp}^{struct} = \sum_i MV_i \times n(dur_i) \times G(rating_i) \tag{C.5}$$

$$\begin{aligned} Mkt_{sp}^{cd} = \max[&\Delta Val_i(300\% \text{ widening}), \\ &\Delta Val_i(75\% \text{ tightening})] \end{aligned} \tag{C.6}$$

where

$$\begin{aligned} MV_i &= \text{exposure at default of instrument } i \\ \Delta Val_i(300\% \text{ widening}) &= \text{change in value of credit derivative } i \\ &\quad \text{in case credit spreads widen with 300\%} \\ \Delta Val_i(75\% \text{ tightening}) &= \text{change in value of credit derivative } i \\ &\quad \text{in case credit spreads tighten with 75\%} \\ dur_i &= \text{modified duration of instrument } i \end{aligned}$$

[8] See European Commission (2008), *TS.IX.F of QIS4 Technical Specifications.*

Table C.3 F and G functions for spread risk

$rating_i$	$F(rating_i)$	$G(rating_i)$
AAA	0.25%	2.13%
AA	0.25%	2.55%
A	1.03%	2.91%
BBB	1.25%	4.11%
BB	3.39%	8.42%
B	5.60%	13.35%
CCC or lower	11.2%	29.71%
Unrated	2.00%	100.00%

$$\Delta Liab_{ul} = \text{impact on liabilities because of guarantees kicking in for unit linked policies as a result of a drop in value of the units. The drop in value is determined as } m(dur_i) \times F(rating_i).$$

The functions $F(rating_i)$ and $G(rating_i)$ are defined in Table C.3. Lastly, the function m and n are defined as follows.

$$m(dur_i) = \begin{cases} \max[\min(dur_i, 8), 1] & \text{if } rating_i = \text{BB} \\ \max[\min(dur_i, 6), 1] & \text{if } rating_i = \text{B} \\ \max[\min(dur_i, 4), 1] & \text{if } rating_i = \text{CCC or lower or unrated} \\ \max[dur_i, 1] & \text{otherwise.} \end{cases}$$

$$n(dur_i) = \begin{cases} \max[\min(dur_i, 5), 1] & \text{if } rating_i = \text{BB} \\ \max[\min(dur_i, 4), 1] & \text{if } rating_i = \text{B} \\ \max[\min(dur_i, 2.5), 1] & \text{if } rating_i = \text{CCC or lower} \\ 1 & \text{If unrated} \\ \max[dur_i, 1] & \text{otherwise.} \end{cases}$$

Although the formulae to determine the capital charge for spread risk are quite convoluted, the actual calculation is nothing more than a substitution exercise. One important element to take away from the formulae is that they do not acknowledge diversification benefits. Indeed, the credit charge is calculated for every individual credit instrument (e.g. bond) and the outcomes are merely aggregated without any correlation assumptions. Again, credit exposures to OECD and EEA countries are exempted from the above calculations. Also,

exposures linked to unit-linked policies are also not taken into account in the spread risk charge calculation, except where the credit event also results in a guarantee kicking in.

5. **Foreign exchange risk** is the risk related to fluctuations in currency exchange rates.[9] Under the standardized approach of Solvency II, the capital charge related to foreign exchange risk is calculated by taking the more onerous impact of a 20% upward and downward shock to all other currencies against the local currency in which the insurance company prepares its regulatory accounts.
6. **Concentration risk** is the risk relating to accumulation of exposures with the same counterparty.[10] The objective of this risk category is to disincentivise an insurance company to accumulate exposure to one counterparty. However, Solvency II does not 'punish' an insurance company for concentration risk as long as the exposures stay below a certain threshold. Basically, concentration risk capital charge only kicks in once an insurance company has so-called excess exposure to an individual counterparty.

   The concentration risk capital charge is calculated as:

$$Mkt_{conc} = \sqrt{\sum_i conc_i^2} \tag{C.7}$$

   $conc_i$ are the concentration risk charges for each of the individual counterparties (excluding concentrations on OECD and EEA countries and assets that form part of unit-linked policies). A two-step approach is now used to calculate $conc_i$. First the 'excess' exposure on counterparty i (XS_i) is established through the following formula:

$$XS_i = \max\left[0, \frac{E_i}{\text{Assets}} - CT\right]$$

   where

E_i = net exposure at default to counterparty i

Assets = amount of total assets excluding those where the policy holder bears the investment risk,

[9] See European Commission (2008), *TS.IX.E of QIS4 Technical Specifications*.
[10] See European Commission (2008), *TS.IX.G of QIS4 Technical Specifications.*

Table C.4 CT and g functions for concentration risk

$rating_i$	CT	g_i
AAA	5%	15%
AA	5%	15%
A	5%	18%
BBB	3%	30%
BB or lower	3%	73%

and CT is a function of the credit rating of the counterparty and is defined in Table C.4. The second step is to determine the risk concentration charge per name, which is calculated as

$$conc_i = \text{Assets} \times XS_i \times g_i + \Delta\text{Liab}_{ul}$$

where g_i is defined in Table C.4 and

ΔLiab_{ul} = impact on liabilities because of guarantees being in place for unit-linked policies as a result of a drop in value of the units. The drop in value is determined as $m(dur_i) \times F(rating_i)$.

As specified in equation (C.7), the total capital charge for concentration risk is the simple sum of the squared concentration charges per individual name. This means that the correlation between the concentration risks of individual names is assumed to be zero.

C.1.1 Total Capital Charge: Market Risk

The total market risk charge can now be calculated as

$$Mkt = \sqrt{\sum_i \rho_{i,j} Mkt_i Mkt_j} \tag{C.8}$$

where

$\rho_{i,j}$ = correlation between Mkt_i and Mkt_j as defined in Table C.5, and

$Mkt_i Mkt_j$ = capital charges for the individual market risks.

Table C.5 Correlation between individual market risks

$\rho_{i,j}$	Mkt_{eq}	Mkt_{prop}	Mkt_{int}	Mkt_{sp}	Mkt_{fx}	Mkt_{conc}
Mkt_{eq}	1					
Mkt_{prop}	0.75	1				
Mkt_{int}	0	0.5	1			
Mkt_{sp}	0.25	0.25	0.25	1		
Mkt_{fx}	0.25	0.25	0.25	0.25	1	
Mkt_{conc}	0	0	0	0	0	1

C.2 COUNTERPARTY DEFAULT RISK

This risk only relates exposures to counterparties that stem from risk mitigating contracts such as derivative and reinsurance policies. The main inputs for determining counterparty default risk are

1. *Probability of default (PD_i).* This is the chance that counterparty i will default;
2. *Loss given default (LGD_i).* This the loss if a default of counterparty i actually occurs.

Typically, one can quantify the counterparty default risk by multiplying PD_i by LGD_i and EaD_i (exposure at default). Under QIS4, the LGD calculation is very convoluted. Since, it is likely that this calculation will be refined, it is not presented here. However, readers who are interested in the exact calculation are referred to European Commission (2008), *TS.X.A of QIS4 Technical Specifications.*

C.3 LIFE RISK

In order to quantify life risk, seven subcomponents are distinguished.[11]

1. **Longevity risk** refers to the risk of policy holders living longer than expected. This risk is quantified by assessing the impact on the net value of assets minus liabilities of a 25% decrease in mortality rates.
2. **Mortality risk** refers to the risk of policy holders living a shorter period than expected. This risk is quantified by assessing the impact on the net value of assets minus liabilities of a 10% increase in mortality rates.

[11] See European Commission (2008), *TS.XI.A of QIS4 Technical Specifications.*

3. **Disability risk** is quantified by assessing the impact on the net value of assets minus liabilities of a 35% increase in disability for the next year and a 25% increase in disability rate at each age in the following years.
4. **Lapse risk** relates to an adverse impact on the net value of assets minus liabilities as a result of a change in lapse rate assumptions (includes lapses, cessations and surrenders). This is quantified as the maximum of a downward, upward and mass shock to lapse rates. In formula form this can be made explicit:

$$Life_{lapse} = \max[lapse_{down}; lapse_{up}; lapse_{mass}] \qquad \text{(C.9)}$$

where

lapse_{down} = impact on net value of assets minus liabilities of a 50% reduction in assumed rates of lapsation

lapse_{up} = impact on net value of assets minus liabilities of a 50% increase in assumed rates of lapsation

lapse_{mass} = impact on net value of assets minus liabilities of an immediate surrender of 30% of all policies where a surrender leads to a loss.

5. **Expense risk** is the risk that expenses related to the servicing of insurance contracts increase. This is quantified under the standardized approach by increasing all expenses by 10% and an increase of 1% per annum of the expense inflation rate. For policies where the insurance company has the discretion to increase its charges within 12 months, it is assumed that 75% of these additional expenses can be recovered from year 2 onwards.
6. **Revision risk** tries to capture the risk of an increase in annuity payments as a result of an unanticipated revision. The capital charge related to this risk is calculated by assessing the impact on the net value of asset minus liabilities of a 3% increase in the annually payable amount of annuities that are exposed to revision risk.
7. **Catastrophe risk** is the risk arising from extreme or irregular events. It is quantified by assessing the impact on the net value of assets minus liabilities of an absolute increase of 0.15% to the rate of policy holders dying over the next year in combination with an absolute increase of 0.15% in morbidity rates over the following year.[12]

[12] One-third of the policy holders experience morbidity for 6 months, one-third for 12 months, and one-third for 24 months.

Table C.6 Correlation between individual life risks

$\rho_{i,j}$	$Life_{long}$	$Life_{mor}$	$Life_{dis}$	$Life_{lapse}$	$Life_{exp}$	$Life_{rev}$	$Life_{cal}$
$Life_{long}$	1						
$Life_{mor}$	−0.25	1					
$Life_{dis}$	0	0.5	1				
$Life_{lapse}$	0.25	0.	0	1			
$Life_{exp}$	0.25	0.25	0.5	0.5	1		
$Life_{rev}$	0.25	0	0	0	0.25	1	
$Life_{cal}$	0	0	0	0	0	0	1

C.3.1 Total Capital Charge: Life Risk

The total capital charge associated with life risk can now be calculated as:

$$Life = \sqrt{\sum_i \rho_{i,j} Life_i Life_j} \tag{C.10}$$

where

$\rho_{i,j}$ = correlation between $Life_i$ and $Life_j$ as defined in Table C.6, and

$Life_i Life_j$ = capital charges for the individual life risks.

C.4 NON-LIFE RISK

In order to quantify health risk, two subcomponents are distinguished.[13]

1. **Premium and Reserve risk** – premium risk relates to the risk that expenses plus volume of losses are greater than the premiums received; reserve risk arises because claim provisions may be mis-estimated and because actual claims will fluctuate around their statistical mean value. The capital charge is calculated as:

$$\text{Non-life}_{pr} = f(\sigma) \times V \tag{C.11}$$

[13] See European Commission (2008), *TS.XIII.A of QIS4 Technical Specifications.*

where

V = volume measure
σ = standard deviation of the combined ratio
$f(\sigma)$ = function of the standard deviation such that, assuming a lognormal distribution, the risk capital charge is consistent with VaR (99.5%)

V and σ are determined via a three-step approach:

(a) For each line of business, the standard deviations of premium and reserve risks are determined. The standard deviation for reserve risk will be largely prescribed by Solvency II. Also, the volume measure for premium risk, which is dependent on the earned and written premium, and the volume measure for reserve risk, which is dependent on the best estimate of claims outstanding, are determined.
(b) For each line of business, geographical diversification is determined.
(c) The standard deviations and volume measures for premium and reserve risk in the individual lines of business are aggregated.

2. **Catastrophe risk** relates to the risk of extreme or irregular events that are not sufficiently captured by the charges for premium risk and reserve risk. The capital charge associated with this risk is calculated as:

$$\text{Non-life}_{cat} = \sqrt{\sum_{t\neq 3,4,10,12} (c_t \times P_t)^2 + (C_3 \times P_3 + c_{12} \times P_{12})^2 + (c_4 \times P_4 + c_{10} \times P_{10})^2}$$

where P_t is an estimate of the net written premium for business line t in the forthcoming year. Furthermore, c is defined for each line of business in Table C.7.

C.4.1 Total Capital Charge: Non-life Risk

The overall capital charge for non-life risk can be calculated as:

$$\text{Non-life} = \sqrt{\sum_i \rho_{i,j} \text{Non-life}_i \text{Non-life}_j} \qquad \text{(C.12)}$$

Table C.7 c_t factor

Line of business	c_t
1. Motor third party	0.15
2. Motor other	0.075
3. Marine, aviation transport (MAT)	0.5
4. Fire	0.75
5. Third-party liability	0.15
6. Credit	0.6
7. Legal expenses	0.02
8. Assistance	0.02
9. Miscellaneous	0.25
10. Reinsurance – property	1.5
11. Reinsurance – casualty	0.5
12. Reinsurance – MAT	1.5

where

$$\rho_{i,j} = \text{correlation between } \textit{Non–life}_i \text{ and } \textit{Non–life}_j \text{ as defined in Table C.8}$$

$\text{Non–life}_i\,\text{Non–life}_j$ = capital charges for the individual non-life risks.

C.5 HEALTH RISK

In order to quantify health risk,[14] three subcomponents are distinguished.[15]

1. **Epidemic risk** arises from outbreaks of major epidemics. It is calculated as:

$$\text{Health}_{ep} = 6.5\% \times MC \times \frac{P}{MP}$$

Table C.8 Correlation between individual non–life risks

$\rho_{i,j}$	$\textit{Non–life}_{pr}$	$\textit{Non–life}_{cat}$
Non–life_{pr}	1	
Non–life_{cat}	0	1

[14] In this appendix only the capital charges for long-term health risks are discussed. There are also capital charges related to short-term health risks and workers' compensation underwriting risks. For more information see European Commission (2008), *TS.XII.B of QIS4 Technical Specifications.*

[15] See European Commission (2008), *TS.XII.B of QIS4 Technical Specifications.*

where

MC = claims expenditure for the year in the health insurance market
P = gross premium earned for the accounting year
MP = total gross premium earned for the accounting year in the health insurance market.

2. **Claim risk** covers in fact three types of risks:
   (a) Actual per capita loss is greater than the loss assumed in the pricing of the product.
   (b) Release of technical provisions due to deaths is lower than assumed in the pricing of the product.
   (c) Release of technical provisions due to cancellations is lower than assumed in the pricing of the product.

   The capital charge related to claim risk is calculated as the standard deviation of the results on the above three risks over a 10-year period multiplied by the gross premium earned for the accounting year multiplied by 2.58. The multiplication by 2.58 is introduced to get a capital charge that exceeds claim losses in 99.5% of cases (i.e. 99.5% VaR).
3. **Expense risk** refers to the risk that the costs incorporated in the pricing of a product are insufficient to cover the actual costs accruing in the accounting year. The capital charge for expense risk is calculated by multiplying the standard deviation of the expense results over the past 10 years by the gross premium earned over the accounting period by 2.58. The multiplication by 2.58 is introduced to get a capital charge that exceeds expense result losses in 99.5% of cases (i.e. 99.5% VaR).

C.5.1 Total Capital Charge: Health Risk

The total capital charge associated with (long-term) health risk can now be calculated as:

$$Health = \sqrt{\sum_i \rho_{i,j}\, Health_i\, Health_j} \tag{C.13}$$

Table C.9 Correlation between individual health risks

$\rho_{i,j}$	$Health_{ep}$	$Health_{cl}$	$Health_{ex}$
$Health_{ep}$	1		
$Health_{cl}$	0	1	
$Health_{ex}$	0	0.5	1

where

$\rho_{i,j}$ = correlation between $Health_i$ and $Health_j$ as defined in Table C.9, and

$Health_i Health_j$ = capital charges for the individual health risks.

C.6 BSCR

Once the capital charges related to each of the risk categories have been calculated, one can calculate BSCR as[16]

$$BSCR = \sqrt{\sum_i \rho_{i,j} RC_i RC_j} \tag{C.14}$$

where

$\rho_{i,j}$ = correlation between RC_i and RC_j as defined in Table C.10, and

$RC_i RC_j$ = capital charges for the individual risk categories.

C.7 OPERATIONAL RISK

Operational risk[17] is the risk arising from inadequate or failed internal processes. It is calculated as:

$$OR = \min[0.3 \times BSCR; BOR] + 0.25 \times Exp_{ul} \tag{C.15}$$

[16] See European Commission (2008), *TS.VIII.C of Technical Specifications.*
[17] See European Commission (2008), *TS.VIII.C of Technical Specifications.*

Table C.10 Correlation between individual risk categories

$\rho_{i,j}$	RC_{Mkt}	RC_{CD}	RC_{Life}	$RC_{Non-life}$	RC_{Health}
RC_{Mkt}	1				
RC_{CD}	0.25	1			
RC_{Life}	0.25	0.25	1		
$RC_{Non-life}$	0.25	0.5	0	1	
RC_{Health}	0.25	0.25	0.25	0.25	1

where

Exp_{ul} = amount of annual expenses in respect of unit-linked business

BOR = basic operational risk charge for all business other than unit-linked business.

Mathematically, BOR is defined as

$$BOR = \max[0.03 \times Earn_{life} + 0.02 \times Earn_{nl} + 0.02 \times Earn_h; \\ 0.003 \times Tp_{life} + 0.02 \times Tp_{nl} + 0.002 \times Tp_h]$$

where

$Earn_{life}, Earn_{nl}, Earn_h$ = total earned premium of respectively life, non-life and health

Tp_{life}, Tp_{nl}, Tp_h = Total technical provisions for respectively, life, non-life, and health.

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