The Palgrave Macmillan

Credit Portfolio Management

Michael Hünseler

A Practitioner's Guide to the Active Management of Credit Risks

Credit Portfolio Management

Also available

Gianluca Oricchio
Private Company Valuation

Michael Wong and Wilson Chan
Investing in Asian Offshore Currency Markets

Jamie Rogers
Strategy, Value and Risk

Guy Fraser-Sampson
Intelligent Investing

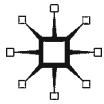
Ross McGill
US Withholding Tax

Credit Portfolio Management

A Practitioner's Guide to the Active Management of Credit Risks

Michael Hünseler
Managing Director, Assenagon Asset Management S.A.

palgrave
macmillan



Softcover reprint of the hardcover 1st edition 2013 978-0-230-39149-9

First published 2013 by
PALGRAVE MACMILLAN

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

Palgrave Macmillan is the global academic imprint of the above companies and has companies and representatives throughout the world.

Palgrave® and Macmillan® are registered trademarks in the United States, the United Kingdom, Europe and other countries

ISBN 978-1-349-35162-6 ISBN 978-0-230-39150-5 (eBook)
DOI 10.1057/9780230391505

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

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

A catalog record for this book is available from the Library of Congress.

10 9 8 7 6 5 4 3 2 1
22 21 20 19 18 17 16 15 14 13

To my family, Susi and Emmi, who are an inspiration beyond and above any words to me. With their patience, encouragement and trust, nothing seems impossible.

This page intentionally left blank

Contents

List of Tables

List of Figures

Foreword

The sound management of credit portfolios should be a core competency of banks. Even with the growth in complexity of financial services and instruments in recent years, providing credit through lending remains one of the essential functions of banks. Over the years, we have seen great examples of banks that do this well. Unfortunately, we have also seen the opposite.

Just in the course of my own career, there have been a number of crises, all linked to credit risk and credit portfolios, that have threatened or ended the existence of many an institution. As I write this, the world's financial institutions are grappling with European countries that are having trouble repaying their debts. This current crisis began to grow even as the previous one, which had US sub-prime lending at its core, was still resolving. About a decade ago, we had a credit crisis centered on accounting irregularities at large corporate borrowers (Enron, Worldcom, Parmalat). Before that, there were crises driven by Russian debt, US commercial real estate, Latin American debt – the list goes on. Credit portfolio losses remain the primary reason banks get into trouble, so we must strive to get better at this discipline. Fortunately, many practitioners have been doing just that.

The modern approach to managing credit portfolios is a relatively new field. During most of the history of banking, banks managed credit in a straightforward, but old-fashioned, way. They assessed individual borrowers and decided whether or not to grant a loan, and if they did, they held the loan until the borrower either repaid it or defaulted.

A new approach developed when credit practitioners began to understand that there are really two distinct businesses underlying credit. There's the business of creating loans (origination), and there's the business of holding a portfolio of credit assets. Different competencies drive the success of each.

Consider what would make a firm excel at the business of origination. It would need expertise in the industries in which it wanted to lend. It would need specialized knowledge and relationships with firms in that sector. For example, if a firm wanted to be a major lender to the telecommunications sector, it would need to understand that business and its financing needs, and it would need to have and cultivate relationships with the CFOs and treasurers of the companies in that sector. Bankers

would have an incentive to originate larger loans, as loan size is a stronger driver of revenue than of non-interest expense.

If a firm were successful at the business of origination, consider the type of credit portfolio that would result from its achievements: one that was concentrated in the names and industries where it had the most success. This is exactly the type of portfolio that a firm doesn't want if it wants to be successful at the business of owning credit portfolios, because in the portfolio business, you want credit assets that are diversified across industries and geographies, and that minimize single name concentrations.

More active approaches to managing credit portfolios evolved to reconcile these two businesses, so that the business of holding a portfolio wasn't just passively driven by the business of origination. This practice began with the largest banks, but was quickly adopted by others who needed to manage concentrations. It shouldn't be a surprise, for example, that Canadian and Australian banks, which have naturally concentrated customer bases in a limited number of industries, were some of the earliest adopters of more active approaches to credit portfolio management. In recent years, these practices have spread around the globe.

The modern credit portfolio management approach is challenging in that it is a multi-disciplinary endeavor. To do it well, you need many skills and tools.

To start with, you need a good foundation in traditional credit analysis – the fundamental quantitative and qualitative assessment of individual borrowers that is at the base of lending decisions. However, the nature of portfolios of credit risk, with their asymmetric distributions and 'fat tails', requires a deeper understanding beyond that of individual credits. You need the analytical knowledge and tools that have been developed in the last several decades that focus on identifying and measuring diversification, concentration, risk and return in credit portfolios.

Once you have measured and understood the risk that you hold, you must also have the ability to take action to manage it. When originating the credit you have to apply credit limits, which emerge from strategic decisions about a firm's risk appetite. Portfolio perspectives, either qualitative or quantitative, can also be incorporated into the origination process to complement the individual credit decision. Loan transfer pricing is one of several ways to approach this. Once a credit is in the portfolio, you must also have an understanding of the capital markets tools used to adjust and manage that exposure dynamically as the world changes. These range from guarantees and loan participations to credit default swaps, structured credit and securitizations, and other modern instruments for risk transfer and mitigation.

The list of requirements doesn't end there, however. You need to have practical knowledge of the organizational structures and processes that allow a firm to implement credit portfolio management, and the ability to manage the very human activity of changing business tactics. Then there are the rules imposed by accounting and regulation that must be understood and accommodated as well.

There is a lot to master in order to implement credit portfolio management well. Perhaps as a result, there are very few books on the totality of the subject. Certainly, there are many works that cover one or more sub-topics effectively and in detail, but few that cover the entire scope of knowledge that you need for credit portfolio management in an integrated way.

I am grateful to Michael Hünseler for writing such a book (the one you are now reading), and it is a good one, covering the breadth of topics one needs to understand as a credit portfolio manager. Michael is well positioned to provide a standard reference book on the subject. Since I have known him, he has demonstrated that he is a thoughtful implementer of these strategies, and has developed practical and creative solutions to difficult problems in the field. I have been very happy to have him contribute to the industry association for credit portfolio practitioners that I lead.

I hope that this book will be a useful reference for practitioners in our field, so that they are effective in their day-to-day work. Good credit portfolio management is the foundation for good banks, and as we have seen, the world can certainly use more of these.

Som-lok Leung
Executive Director
International Association of Credit Portfolio Managers
New York

Preface

Several years ago, the concept of Active Credit Portfolio Management (ACPM) was introduced at a large European financial institution with the aim of improving both origination pricing discipline and the risk metrics of a portfolio of multinational corporate loans. Shortly after a methodology was established for pricing loans consistent with credit spreads observable in capital markets, a senior commercial banker raised the question of why the transfer price for an undrawn backup facility was so negative. The banker argued that such lines are inherently risk-free in nature because (a) they have never been drawn in the past, (b) their only purpose is to please the rating agencies, (c) if the company did draw under the line this would be perceived by markets as a very negative signal, thus preventing the company from doing so even if it felt tempted, and – most importantly – (d) if the company got into trouble, he, the banker, would be the first to know because of his closeness to the company. On the other hand, the relationship manager concluded, there was some income from the commitment fee which allowed a few salaries to be paid even though the bank did not take any risk. In any case, the gap between market spreads and loan income, evidenced by the transfer price, had no relevance and there would be no way to cover it through revenues from ancillary business. He did not have to wait for the financial crisis to prove him wrong. When credit spreads started to increase in 2008, one of his corporate clients broke the taboo and fully drew the committed line only to invest the proceeds in higher yielding assets. This might have been seen as exceptional and inappropriate behaviour by the customer. But then came the financial crisis, bringing to an end the discussion about whether committed but undrawn lines are risk-free or not. In addition to the erosion of capital by losses from credit and market risks, a major threat to banks when the crisis hit was exactly the liquidity drain caused by the banks' customers drawing on their granted lines. As the crisis unfolded, corporates were quick to react to the looming credit crunch, either as a precautionary measure or because of a drop in their own liquidity. Unfortunately, the crisis did no favours to many credit portfolio managers either. Although portfolio management aims at protecting the bank from serious threats such as tail risks, it often did not live up to expectations. Portfolio managers suddenly had to deal with a variety of problems which, at least partly, were known in advance but seen as acceptable given the high-level objective of making the bank a better

place. Overconfidence in model results, basis risks from derivative hedges versus bond investments, failed securitizations, the introduction of significant mark-to-market volatility through hedges and an isolated view of credit which missed the connectivity of risks, to name but a few, did not help to provide comfort at the top management level of any financial institution. The underestimated market volatility, the massive economic downturn and the substantially reduced liquidity in financial markets came together in the perfect storm to shake the financial industry in an unprecedented manner, with the fallout still weighing on corporates, banks and sovereigns alike. However, while all portfolio managers had to cope with extreme credit market conditions, there were some which did better and managed to hold the course. Others, especially those with a lower level of management support, are struggling to find their new place. The hostile environment, developing from a subprime to a financial to a sovereign debt crisis, clearly forces financial institutions to find appropriate solutions to manage risks, as do regulators, stakeholders, rating agencies and, of course, the public. The social costs imposed by those banks that failed are immense and have led to a significant loss of faith in banks. However, the fundamental technical expertise required has increased significantly in recent years. Numerous mathematicians and physicians have opened up the field for scientific research. Enough historical time series are available, with significantly improved data quality and quantity, which is essential for credit risk quantification and for model validation. Mass data storage and computational power have become much more affordable. Portfolio models are ever more sophisticated. Notwithstanding the growing emphasis on models, we are now much more aware of the fact that there are limits to our ability to anticipate the future. Even if we manage to accurately forecast the data which are input into our models – and that was never the case – there is still a level uncertainty in correctly assessing the implications of those events. Models help in making educated decisions, but judgement and experience are not substitutable and should be the drivers of a conscious strategy that considers risk, return and capital.

The objective of this book is to provide practical guidance on the management of credit risk in a holistic way, based on experience gained before and during the years of financial turmoil. It is structured along the lines of the credit value chain. Part I deals with the definition of the credit risk strategy that serves as a map, a frame and a filter for business flow. Derived from the available capital, the strategy is expressed in terms of risk limits and targets, thereby addressing concentration risks, which are a major source of concern for financial institutions. Stress tests aim at raising awareness of the potential consequences of adverse developments

in those markets in which the institution operates. In Part II, conceptual aspects of ACPM are discussed. This discussion ranges from the description of the value proposition to a full credit cycle approach to portfolio management. Since in most organizations a loan transfer pricing scheme underpins the internal role of ACPM to optimize the risk *and* the return side of the credit portfolio, it is given some consideration. Acknowledging that there is no one-size-fits-all model, we review practical aspects of the implementation of ACPM. A chapter on the accounting symmetry of credit derivative hedges and loans outlines solutions to an issue which creates major headaches for many portfolio managers. More often than not, a key objective of portfolio management is regulatory capital relief, which is discussed in detail. Part III focuses on the back end management of a credit portfolio. Corrective actions are usually carried out using credit default swaps. However, the devil is in the detail, and the near accident of the Greek sovereign debt credit event raised serious concerns about this instrument's effectiveness. The text therefore provides a non-technical, in-depth description of the main features of this product of choice for credit risk transfer. A chapter on complementary hedging instruments such as Loan CDS and sub-participations adds to the discussion of the toolbox of a portfolio manager. Finally, hedge strategies, linear and non-linear, are considered. Many case studies are provided to illustrate these topics, using real life examples to highlight the issues and make the text livelier.

Acknowledgements

My very special thanks go to Erik Banks and Dr Dirk Schubert for invaluable advice and support. I would also like to thank Palgrave Macmillan for the patience and guidance offered to me. A big thank-you goes to Rüdiger Rohner for sharing his enthusiasm and expertise.

During the past decades, I have had the privilege of working with some of the best practitioners in credit portfolio management, risk management and financial research. Friends and colleagues at Assenagon, the IACPM, HVB/UniCredit, Deka Investment and elsewhere were tireless in their efforts to teach me the essentials of credit risk. I am grateful for their friendship and the deep knowledge they made available to me.

List of Abbreviations

ABS	asset backed security
ACPM	Active Credit Portfolio Management
ATM	at-the-money
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
bps	basis points
BRIC	Brazil, Russia, India and China
CAC	Collective Action Clause
CAD	Canadian Dollar
CBOE	Chicago Board Options Exchange
CDO	Collateralized Debt Obligation
CDS	Credit Default Swaps
CEBS	Committee of European Banking Supervision
CEEMEA	Central & Eastern Europe, Middle East, Africa
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CHF	Swiss Franc
CLN	Credit Linked Notes
CLO	Collateralized Loan Obligation
CPM	Credit Portfolio Management
CRD	Capital Requirements Directive
CRM	Credit Risk Mitigation
CRO	Chief Risk Officer
CSO	Collateralized Synthetic Debt Obligation
CVA	credit valuation adjustment
DC	Determinations Committee
DCF	discounted cash flow
DTCC	Depository Trust & Clearing Corporation
DKK	Danish Krone
EAD	Exposure at Default
EBA	European Banking Authority
EC	economic capital
ECB	European Central Bank
EL	Expected Loss
EST	Eastern Standard Time
EUR	Euro
EWS	early warning system

FASB	Financial Accounting Standards Board
FG	Financial Guarantee
FtD	first-to-default
FVO	Fair Value Option
FX	foreign exchange
GBP	British Pound
GSE	government-sponsored enterprise
HACR	Hedge Accounting for Credit Risk
HHI	Herfindahl–Hirschmann Index
HY	High Yield
ICAAP	Internal Capital Adequacy Assessment Process
IFRS	International Financial Reporting Standards
IG	investment grade
IMF	International Monetary Fund
IMM	Inside Market Midpoint
IR	interest rate
IRB	Internal Ratings-Based Approach
IRS	interest rate swap
ISDA	International Swaps and Derivatives Association
ITM	in-the-money
JPY	Japanese Yen
M&A	mergers and acquisitions
MIR	market implied rating
MtM	mark-to-market
NIG	non-investment grade
NOPS	Notice of Physical Settlement
LBO	leveraged buy out
LCDS	Loan Credit Default Swaps
LDN	London
LGD	Loss Given Default
LLP	Loan Loss Provision
LTRO	Long Term Refinancing Operations
OECD	Organisation for Economic Co-operation and Development
OTC	over the counter
OTM	out-of-the-money
P&L	profit and loss
PD	Probability of Default
PSE	public sector entity
PSI	Private Sector Initiative
RCF	revolving credit facilities
RWA	risk weighted asset
SNAC	Standard North American Corporate

STEC	Standard European Contract
TRS	total return swaps
U.K.	United Kingdom
UL	Unexpected Loss
U.S.	United States of America
USD	U.S. Dollar
VaR	Value at Risk
WACC	weighted average cost of capital

Part I

Charting the Course – Credit Risk Strategies

The intense challenges for financial institutions arising from the lasting difficult market conditions call for a systematic, proactive and sustainable approach to credit risk management. The public perception of the value that banks contribute to a society has been shaken and needs to regain confidence. Ever more demanding regulators push banks to measure, manage and monitor their risks in a prudent and consistent way, with the objective being to safeguard the firm's capital adequacy. A comprehensive framework for taking acceptable risks, the risk appetite, and derived credit-risk strategies aim at a coordinated and stringent approach to risks. Since the transformation of traditional banking into a credit risk structuring and distribution approach has effectively reversed, emphasis is again put on sound credit risk origination, management and control processes in order to meet stakeholder expectations and to guarantee the future of the organization. Part I of this book deals with the framework that charts the course in which credit risk is originated and managed. It is comprised of three chapters: the first provides a brief description of the role that credit risk played in the financial crisis and thereafter; the second deals with the credit risk strategies which aim at optimizing the risk/return profile of the portfolio under the condition of adequate capital; and finally the third chapter provides an introduction to stress tests which support a proactive and forward-looking approach to portfolio management by letting the improbable become quantifiable.

1
The Case for Credit Portfolio Management

The unprecedented dynamics of credit markets as well as reinforced regulatory and shareholder pressure requires banks to reassess their conventional methods of transacting business and often leaves them in an enduring transition phase. With investors again in search of yield enhancements and portfolio managers in need of hedging and return on capital improvement, a new equilibrium with generally lower liquidity but improved transparency and counterparty risk management seems to be found. Additionally, the formerly distinct loan, corporate bond and credit derivative markets increasingly merge as alternative sources for acquiring credit risk and for refinancing, serving the needs of both investors and borrowers. A record-setting new issuance of corporate bonds in 2010, 2011 and again in 2012 bears witness to the decision of corporate treasurers to prefer reliability of available funds over flexibility in terms and conditions that only loans offer. As a Bloomberg article[1] noted, the amount that firms borrowed in the form of syndicated loans and credit lines fell by a hefty 13 per cent for the U.S. and 25 per cent for Europe in 2012 compared to same period in 2011, while corporate bond issues in Europe now account for 52 per cent of the €467 bn total new funding volume, overtaking loans for the first time in history. This is certainly also owed to the increased reluctance of banks to provide sufficient liquidity to corporates when they needed it the most during the financial crisis. On the other hand, with some banks having to turn to central banks for last resort lending, the traditional monetary supply transmission mechanism appears to be disturbed. Consequently, an integrated approach to credit and liquidity risk management has become one of the major objectives of portfolio management at financial institutions. While the details of Basel III and Solvency II were still under development, banks started to

[1] See Bloomberg, 'Libor Scandal Threatening to Turn Companies Off Syndicated Loans', July 10, 2012.

anticipate the rules with effects already coming through. Standard and Poor's predicts that Eurozone corporates will bear the brunt of additional debt costs when borrowing at banks, with estimates ranging from €30 bn to €50 bn per year when the new regulations are fully implemented in 2018.[2] Regardless how accurate Standard and Poor's prediction of the rise of the cost of debt is, the cornerstones of Basel III will very likely lead to a more restrictive lending and in particular will make certain credit products economically less attractive. For instance, banks have to put in place capital and liquidity for credit commitments even when those loans remain undrawn and are likely to pass on the extra costs to their clients wherever possible. Hence, corporate treasurers will have no choice but to pay the price. In turn, they are expected to increasingly tap financial markets for funding. Banks may find a new niche in advising those clients that think about alternative sources of funds, thereby leveraging on their role as the borrowers 'agent' with the lending relationship serving as a kind of certification of credit worthiness for other capital market investors.[3] While the prospects for debt capital markets business appear to be rosier, the perspectives for proprietary and non-proprietary trading are not as bright. Significant additional capital charges for over-the-counter derivatives will eat up a reasonable chunk of the return on equity for trading, with possibly pronounced negative implications for the liquidity of secondary markets for debt securities and derivatives. The round trip of investor-initiated trades, which usually ends up with one of the bulge bracket investment banks before finally being passed on to another investor at a later point of time, may have seen its best time. All these developments accumulate in a changed landscape in which portfolio managers operate. They may respond by reviving credit risk mitigation techniques other than credit derivatives, i.e. guarantees or sub-participations to fine tune their credit portfolios. At the same time, European corporate debt pricing will probably soar when the debt market catches up with its U.S. counterpart which still accounts for a dominant share of the global corporate bond market. In addition, the concerns about the European sovereign indebtedness currently contribute to a hefty increase in risk premiums. As a consequence, if the gap between loan margins and hedge costs widens further, it is increasingly unlikely to be closed by client revenues generated from cross-selling. However, the convergence of bank loans and debt capital market instruments will not only create feedback loops for pricing of loans. The connectivity of credit-risk prices will also enhance the ability

[2] Standard and Poor's (2011a).

[3] The concept of a loan as an implicit credit worthiness certificate for corporates issuing debt at public debt markets is described in Chapter 4.7 'Bridging Distinct Worlds: Loans, Bonds and Credit Derivatives'.

to value credit instruments based on markets risk premiums, even though client relationship managers for obvious reasons tend to dismiss profitability measures based on shadow prices derived from financial markets. A cross debt asset classes view permits a dynamic credit portfolio management by adopting an asset-manager-like approach. Determining relative value and finally deriving the optimal portfolio composition even for less liquid credit risks may sound challenging but it is a unique advantage that integrated credit markets offer – and implicitly underpins the role of an active credit portfolio management of a bank.

1.1 Evolution and innovation: ups and downs of credit

Credit risks remain the dominant challenge for regulators as well as for risk managers. The regulatory framework for credit risk is in continuous revision mode since it was introduced in 1988. According to the *Financial Times*, financial services companies were confronted with an average of 60 regulatory changes every working day in 2011.[4] Numerous initiatives accompany the Dodd-Frank Reform Act and Basel III, but international and domestic approaches appear to be not well coordinated. After decades of spectacular growth, the new Basel III rules will let the banks tighten their belts. An estimated additional core Tier 1 capital of $1.3 trn has to be raised by banks worldwide until 2015 to comply with the standards. If no new capital is available or is available but too expensive, lenders will have to shed assets. Cutting risk-weighted assets, or optimizing the balance sheet as banks prefer to call it, often takes place by adjusting models and parameters rather than squeezing the asset base or raise equity when share prices are battered. Consequently, it receives close scrutiny by regulators since it represents a cheaper way of improving the capital ratio while not necessarily enhancing the ability to absorb losses. However, even within models and ratings there is (economically justifiable) room for discretion. The complexity of measuring credit risks to determine appropriate amounts of capital to hold for losses and to manage portfolios of credit risks still attracts a great deal of scientific research. Although the activities of credit portfolio managers who are engaged in selling, hedging, structuring, securitizing and repackaging became a highly profitable business for investment banks, the post Lehman default era will see a back-to-the-roots reversal of the practices of financial institutions to manage their credit risks. The prevailing and unsettling uncertainties over the future and function of banking and finance and the corresponding

[4] See *Financial Times,* December 9, 2011: 'Financial sector "drowning" in regulation flood'.

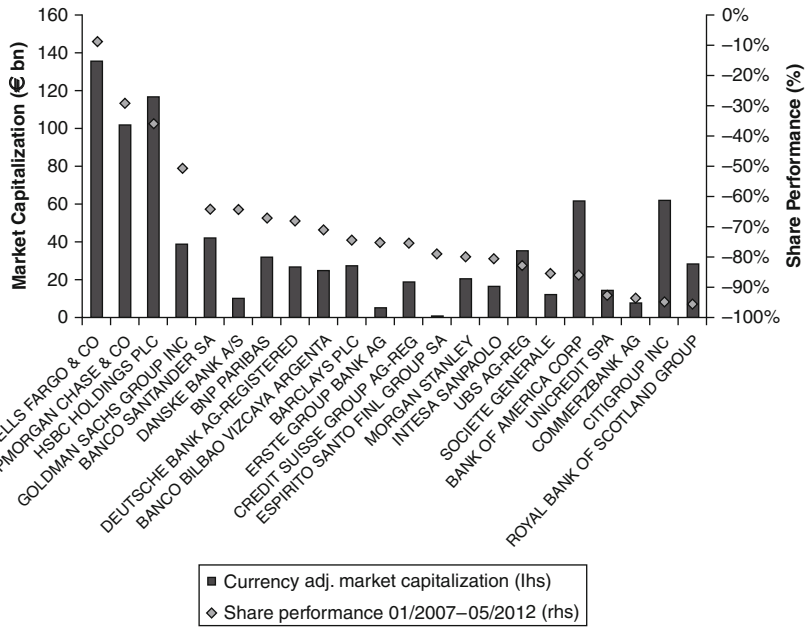


Figure 1.1 Performance of bank shares and market capitalization[5]
Data source: Bloomberg.

implications for the global economy make it paramount for both business and risk managers of financial institutions to take responsibility. Part of that responsibility might be expressed by a change in the mental attitude towards models, fundamental assumptions and risk in general. The sophisticated quantification of risks by means of probability distributions and correlations more than ever needs to be complemented by experience, intuition and expert judgement, with regular questioning of risk and return to become a usual habit when the lessons taught by the financial crisis should have any effect. The in many cases disappointing performance of bank shares over the last couple of years confirms that the financial industry faces challenging times.

1.2 The age of credit crises

These days, one of the most penetrating phrases of Wall Street trading rooms is the 'black swan' event, depicted by the 2007 bestseller of Nassim

[5] * Share Price Performance: May 25, 2012 versus January 3, 2007. ** Market Capitalization Currency adjusted at EUR/USD 1.2515; EUR/GBP 0.7999; EUR/CHF 1.2011; EUR/DKK 7.4306.

Taleb. In his book *The Black Swan: The Impact of the Highly Improbable*, the former option trader got the timing right. Only shortly after publication of the book in May 2007, the subprime crisis devastated the global financial landscape, with banks suffering from at least $188 billion of writedowns and shockwaves still roiling markets many years later. For some it might look as a flock of black swans found their new home in global financial markets. A black swan event is rare by definition and for sure it's not meant to happen regularly and frequently, but once or twice in a lifetime like an eclipse of the sun. The low probability of occurrence combined with a high impact makes for the definition of tail risk. However, large-impact events became more frequent during the last decade with the subprime crisis, the Lehman default and Greek tragedy being the most prominent ones. Statistically, tail risk is understood to become reality with a 2.5 per cent chance under the standard normal distribution. And not all these once-in-40-years events may fulfil the big impact criteria. The scope of the high impact rare events, known as *fat tails* in quantspeak because this is what the bell curve shape is similar to when plotted, causes some distress in self-confidence of risk managers. It basically raises the question whether there is a way of accurately predicting risks or if stress tests – designed to describe and forecast risks – and models are flawed by definition, utterly useless and consistently underestimating

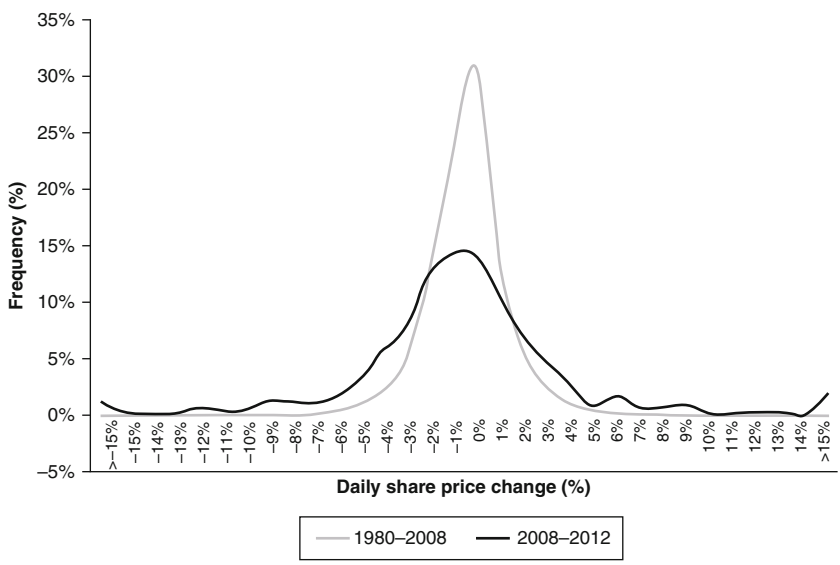


Figure 1.2 Distribution of daily share price changes of Bank of America
Data source: Bloomberg.

risks which might eventually break financial institutions. Or as a senior executive at a European bank puts it: '*Normal distribution is man made. Life is negatively skewed.*' A permanent change from the low-volatility environment to more unstable and uncertain conditions seems to be confirmed by the distribution of daily price moves of the larger banks and brokers. For decades, the majority of daily stock price moves have been small with the bulk of them concentrated around +/–1 per cent. Since 2008, when the subprime crisis fully unfolded, the distribution of changes in equity value shifted significantly to larger moves, reflecting the increased volatility and risks in the financial industry.

One of the reasons for this paradigm shift is the overwhelming growth of difficult-to-value assets and investments during the last decade, which turned into unprecedented losses during the financial crisis. Many financial experts and highly skilled professionals were forced to realize that they knew little about what they took for granted: the ability to assess and correctly price risks. The aftermath of the events has shaken the confidence of markets and the foundations of commonly used models alike. A prominent example is the capital asset pricing model (CAPM) which serves as the basis for modern finance theory and is widely accepted by portfolio managers around the world. The model helps to determine the required return for an asset, given its contribution to the diversification of a portfolio. In a simplified way, input factors are the expected return of a risk free asset, the asset's correlation to systemic risk (non-diversifiable risk) and the expected return of the market. However, the risk free rate is defined as an investment with no risk of financial losses, usually the yield of short dated U.S. government bonds. Unfortunately, government securities are no longer considered to be risk free and barely show a AAA rating. These days, corporates can be less risky then governments and government default risk can be largely determined by external factors like bank rescues or bailouts of other sovereigns.[6]

As a response, regulators are increasing their efforts to keep step with the dangerous environment the financial industry is in. But many of the problems which led to the formation of the Basel Committee on Banking Supervision (BCBS) are still prevalent and growing. Neither early warning systems nor resolution regimes for international banks have passed the test of time so far. To be sure, while most know Basel as setting the standard for the capital that banks should hold to withstand unfavourable operating conditions, the ratio has been revised and newly defined by politicians as part of their efforts to solve the threat of the Greek default.

[6] The vicious circle of government struggling to cope with bank bailouts became evident again when Spain sought as much as €100 bn to recapitalize its larger banks in June 2012, followed by another €40 bn in December 2012.

That increasing politicization of financial regulation – the Basel Committee is answerable to the G10 group of central bank governors, who in turn are accountable to their parliaments – is not new but will make a big difference going forward. In the early stages of Basel and to the surprise of the supervisors, banks were keen to implement Basel I[7] as the credibility associated with it was a convincing and motivating factor. However, the U.S. actually never implemented Basel II[8] which rules are suspected to have contributed to the crisis due to the procyclical effects caused by the methodology of calculating risk-weighted assets, the determination of the capital ratio, as well as the loopholes which have led to systematic capital arbitrage. With Basel III[9] at the front door, not only banks but also nations wrangle with the potential distorting effects on global competitiveness. Concerns continue to exist that uneven playing fields may be created. Jamie Dimon, CEO of JPMorgan Chase, goes as far as calling Basel III 'blatantly anti-American'.[10] All in, significant steps have been taken to make financial institutions a safer place. To some extent, they have required or contributed to speeding up improvements in risk management in various ways. Moreover, the Basel II Pillar 2 Internal Capital Adequacy Assessment Process (ICAAP) has turned into a lucrative field of activity for consultancy firms advising banks on complex issues attached to it. But they nevertheless cannot replace the efforts of financial institutions to strengthen their risk management capabilities to cope with the demanding and difficult operating environment.

No doubt that the consequences of the market turmoil, be it the costs of continued regulatory tightening or the uncertainty-driven difficult market environment which continuously makes dents in the operating profit of banks, will prove to have a larger detrimental effect on the financial industry. Tighter regulations call into question the sustainability of the pre-crisis business models of many investment and commercial banks. Easy profits of the boom years are gone and are unlikely to return. But the continued deterioration of banks and brokers earnings also reflects how slow the process of adaption to the new world gets going. In addition, the practice of some banks to mark down their own debt to market

---

[7] See Basel Committee on Banking Supervision (2000).

[8] See Basel Committee on Banking Supervision(2006).

[9] See Basel Committee on Banking Supervision (2011).

[10] Interview with the *Financial Times*, September 12, 2011: New international bank capital rules are 'anti-American' and the U.S. should consider pulling out of the Basel group of global regulators, Jamie Dimon, chief executive of JPMorgan Chase, has said. 'I'm very close to thinking the United States shouldn't be in Basel any more. I would not have agreed to rules that are blatantly anti-American,' he said. 'Our regulators should go there and say: "If it's not in the interests of the United States, we're not doing it."'

values makes earnings look less poor, it nevertheless does not reflect the economic truth. Increased costs of funding, a result of growing concerns of markets about creditworthiness of financial institutions and significantly damaging their bread-and-butter business of granting loans to clients, is turned into a positive for the profit and loss statement – in line with or even driven by prevalent accounting rules. Imagine this applied by heavily indebted nations like Greece or Italy. The public debt surplus from this would be stunning. This is just one example where accounting, regulatory and economic realities significantly differ. And large parts of new banking regulations are yet to become effective. Combined with a looming recession or potential stagnation for Europe and the U.S., there is reason to worry. As it seems, the need and the problem for banks to stay profitable, at least to attract investors for capital and liquidity, is given little thought in current discussions on the new roles financial institutions should take these days. The call for altruistic financial intermediation, serving entirely the public needs, can only be realized by public banks which are non-profit. The devastation from the financial crisis, particularly observed in Germany, where public sector banks have been among those which were hit the hardest, is confirmation to the thought that the social costs of banks without a sustainable business model can be way in excess of zero or slightly negative profit.

All this, increasing risks, their eroding impact on the banks's capital as well as strained profitability, weighs heavily on banks. There are various

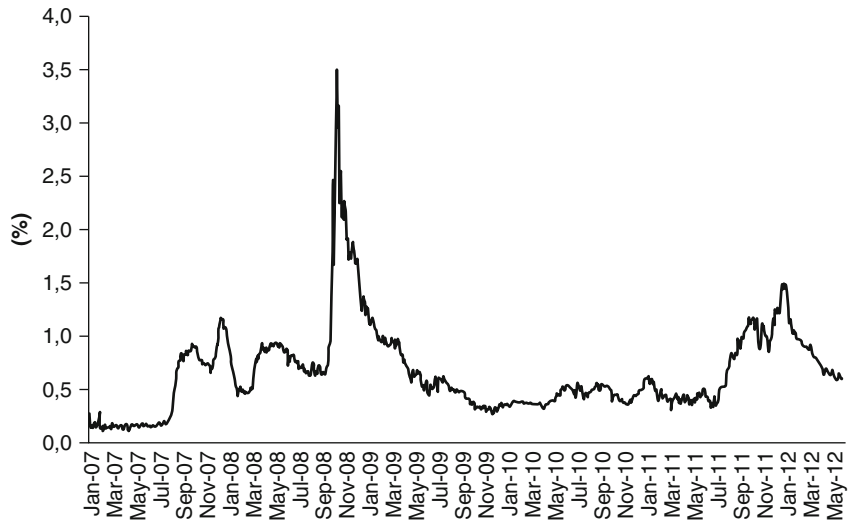


Figure 1.3 TED spread Europe
Data source: Bloomberg.

measures for these kind of stress and the financial crisis barely left any one of them unnoticed. Additionally, credit problems do not come on their own. Distress within funding gauges is observed with great attention because for banks, a squeeze of liquidity is fairly equal to a sudden death. One of these measures is the Ted spread, the gap between three-month Libor interbank rates and U.S. Treasury bill yields for the U.S. and Bund yields versus Euribor for Europe. When banks start to mistrust each other, meaning that there are concerns about each other's ability to repay loans, the Ted spread begins to rise as banks are then perceived to be riskier compared to riskless government debt.

Clearly, one of the reasons for the pain being felt in Europe is linked to the sovereign crisis of late. European sovereign debt is widely distributed and concentrated among European banks and other financial institutions, but also outside Europe significant holdings have been noted with approximately €359 bn of Italian government bonds dwarfing the €81 bn of Greek debt. Even though the ECB did its best to spread liquidity into the system by a substantial increase of the Long Term Refinancing Operations (LTRO) and the in principle unlimited bond-buying program Outright Monetary Transaction (OTM), by this means easing the problem of interbank liquidity, the concerns for sovereign debt remain. Indeed, MF Global, the U.S. futures broker, has become the first financial institution outside Europe to fall victim to the Eurozone debt crisis. The firm failed at the end of October 2011, after placing a $6.3 bn bet on securities of highly indebted European sovereigns that went sour. Given the far-reaching implications of a European country default on financial stability and the world economy, the nervousness of capital markets – expressed by volatility of stock markets and spreads for credit risks – seems understandable. Ensuring the orderly functioning of financial markets and the stability of the financial system in the EU as a whole is part of the responsibility of the European Banking Authority (EBA).[11] Stress tests are carried out regularly for an early identification of trends, potential risks and vulnerabilities. However, when its predecessor, the Committee of European Bank Supervisors (CEBS) conducted a stress test on 91 banks in July 2010, the stress scenario did incorporate an adverse economic development including a macroeconomic and a sovereign risk shock, but did not assume a sovereign default. That was in line with the establishment of the EFSF and EFSM which were set up to support struggling Member State governments. At that time, 51 out of the participating 91 banks would still have had a Tier 1 capital ratio of more

[11] Articles 21 and 32 of the EBA Regulation give the EBA powers to initiate and coordinate the EU-wide stress tests, in cooperation with the European Systemic Risk Board (ESRB). http://www.eba.europa.eu/EU-wide-stress-testing.aspx

than 8 per cent under the severe adverse scenario which was double the then regulatory minimum requirement.[12] Only seven banks would have had a capital ratio below 6 per cent[13] which has been set as a benchmark for the stress test exercise, none of which were the Bank of Ireland and Allied Irish Banks. While those two banks passed the exam, only months later AIB needed a government bailout. Anglo Irish Bank Corp. which was not tested, suffered a similar fate. The EU and IMF rescue package for the two troubled banks amounted to a whopping €85 bn. To counter the widespread criticism of the reliability of the tests, the 2011 stress tests were designed to build in harsher macroeconomic conditions and a larger degree of transparency, in particular regarding banks' exposures and capital composition, which allowed analysts to perform their own assessments based on individual stress assumptions. This time, eight banks did not surpass the threshold of 5 per cent core Tier 1 ratio while another 16 banks settled in the danger zone between 5 and 6 per cent core Tier 1. Since the impact from the sovereign crisis in the meantime moved on from losses only related to credit to restricted access to funding, the stress test again was argued to not reveal the full picture of potential risks and vulnerability. Dexia, the troubled French-Belgian-Luxembourgian lender, did have sufficient capital, according to the stress test results, to withstand the assumed write-downs on its sovereign debt holdings. But when the sovereign debt crisis further unfolded, lenders became more wary of each other and Dexia's heavy reliance on rolling short term funding became a problem, which was eventually solved by another government sponsored bailout. Two issues related to the EBA stress tests became apparent. The first was the capability of the tests to adequately identify hidden vulnerabilities given the interconnectedness of risks and to appropriately determine the stressed capital position, thereby identifying potential gaps. The other concern related to the perception that the modelled test results failed to correctly predict a bank failure. In December 2011 EBA finally published a formal recommendation concerning European banks' recapitalization[14] as part of a broader European package, previously agreed by the European Council on 26 October and confirmed during the ECOFIN Council on 30 November. The objective of the plan was to restore stability and confidence in the markets. In total, a capital shortfall of almost

[12] Directive EC/2006/48 – Capital Requirements Directive (CRD). The CRD regulatory minimum Tier 1 capital adequacy ratio amounts to 4%, while the minimum for the overall capital adequacy ratio is set to 8%.

[13] For results of EBA 2010 stress tests, see http://stress-test.c-ebs.org/documents/Summaryreport.pdf.

[14] For the EBA published 'Recommendation and Final Results of Bank Recapitalisation Plan as Part of Co-ordinated Measures to Restore Confidence in the Banking Sector', see www.eba.europa.eu.

€115 bn across Europe has been identified after requiring banks to meet by end of June 2012 an exceptional and temporary buffer such as the core Tier 1 capital ratio level of 9 per cent. Measures to comply with the new capital threshold include retained earnings, scrapped dividends, capital increases by means of new issuance of common equity and qualifying contingent capital as well as other liability measures and restricted bonus payments.

Although it is of great importance that banks have sufficient capital in place to absorb major losses and thereby avoid the implications of a failure on the economy, the willingness and ability of international investors to provide additional equity is limited. On the other hand, government buy-ins not only distort the functioning of the markets, they also create knock- on effects which potentially undermine the credit standing of the country. While it is understandable that adequate bank capital remains the prime source of concerns for regulators, they have to strike a balance to avoid discouraging banks from performing their roles as financial intermediators for credit. Financial institutions in turn may defuse the situation by strengthening the first and last line of defence: the credit-risk strategy and the credit portfolio management.

1.3 Credit risk management at the forefront

In many banks, investments in skilled and qualified personnel, technology and IT infrastructure, methodologies and processes have been substantial to not only satisfy regulatory demands but also to remain a competitive edge in an increasingly difficult and uncertain environment. **M**easuring, **m**odelling, **m**anaging and **m**onitoring credit risk have become the '**4m**' mantra of modern banking. Although banks have been encouraged by regulators to step up their efforts in order to comply with Basel II and the upcoming Basel III rules, sound credit risk management practices are not just a formal requirement but a condition for relevance to management decision taking, thereby contributing to enhance the business performance. Of course, the introduction of Basel II supported a harmonization of the risk language, where Probability of Default (PD), Loss given Default (LGD), Exposure at Default (EAD) and Expected Loss (EL) have become standards, allowing all parties to communicate efficiently and for increased comparability of risk assessments between various business segments and even whole financial institutions. Unfortunately, there is no unique way to measure risks as evidenced by differing, sometimes contradicting, views of regulators and accounting standard setters. Integrating the different methodologies to the extent possible ensures cost-efficient and consistent risk management and reporting. In some cases, conceptual

differences, as for instance in case of determining loan loss provisions, highlight the diverging purposes of Basel II and IFRS. While the regulatory objective is to safeguard the stability of the financial system as a whole, accounting rules aim at transparency and precision with respect to financial statements. Consequently, Basel II emphasizes Expected Loss and Unexpected Loss, whereas IFRS focuses on incurred losses.[15] At the same time, IFRS explicitly acknowledges changes in economic conditions as a reason for adjustments on Loan Loss Provisions (LLPs), provided that a deterioration of those conditions results in a measurable decrease of the estimated cash flows of certain assets, while Basel II instead prefers more stable capital ratios and thus capital requirements through the credit cycle. The diverging approaches have considerable ramifications on credit portfolio management objectives and decision. for example, some credit-risk mitigations will be recognized for capital relief but not

Figure 1.4 Dimensions of credit portfolio management

[15] IAS 39 distinguishes three Loan Loss Provision (LLP) categories under the IFRS methodology: (1) Specific LLP which are individual, (2) General LLP and (3) Portfolio LLP.

from an accounting perspective when it comes to offsetting LLPs. So, while portfolio managers are provided with extended and improved data to fulfil their tasks, the regulatory and accounting implications of their activities of course have a notable influence on their decisions. Hence, a credit portfolio manager must take a multidimensional view which connects the dots of accounting, regulatory and economic dimensions, while developing an integrated risk-management approach. Doing so requires skills in a range of different dimensions in order to develop optimal solutions for defined objectives.

Notwithstanding the increase in risk management sophistication which will ultimately add value for all stakeholders, a prime incentive for banks to adopt Basel II relates to the prospects of lower regulatory capital requirements. As banks are reluctant to increase their capital when their stocks are trading at or close to historical lows, balance sheet optimization is seen as a suitable alternative. Part of that effort is a more active approach to portfolio management. Advanced risk management usually becomes only visible when risks are apparent. Even before the financial crisis has spured further efforts to improve risk management at financial institutions, the Committee of European Banking Supervisors (CEBS) has set out the regulatory requirements on risk management:

> Risk management includes ongoing identification, measurement and assessment of all material risks that could adversely affect the achievement of the institution's goals. The procedures for risk monitoring and assessment need to be updated regularly. The management body (both supervisory and management functions) should set the risk strategy, the risk policy, and accordingly the riskbearing capacity of the institution.[16]

In order to facilitate internal discussions and debates about portfolio risks, with some pushing for short term volumes and revenue generation while others taking a more conservative stance towards risks, adequate risk measurement and reporting technologies are a necessity and a prerequisite for balanced and prudent risk-taking. Especially within larger, multinationally or internationally operating and consequently more complex organizations, there is a strong need for effective risk-management functions which address, in a coordinated and consistent way, the risks taken across the various levels and sub-entities. According to a report from the European Commission, the *European Financial Stability and Integration Report 2010,*[17] large cross border banks categorized as coordinated

[16] See Committee of European Banking Supervisors (CEBS) (2006a).
[17] See European Commission (2011).

centralized adopt an integrated risk-management approach defined by a common strategy, standards and practices that ultimately allows to balance complexity and achieve efficiency. Moreover, an effective risk management is vital to sound and sustainable business activities characterized by regionally, culturally, attitude and product specific diverse business practices:

> Integrated risk management requires a bank-wide approach that addresses risks across all levels and entities in the organisation, bank-wide risk policies and standardised concepts to facilitate effective implementation across the bank. It presumes that risks across the bank are aggregated, monitored and managed on a comprehensive basis. In an integrated approach, risk management is incorporated into the overall business planning and decision-making process. This is achieved through a risk management framework, based on economic capital, measured using risk-adjusted performance metrics. It is then executed through operational limits that control the level of risks run by the group, business lines and regions.[18]

Setting a suitable risk strategy in line with the capital position of a financial institution is at the heart of the credit risk strategies. It should be noted that the connectivity of risks does not allow for an isolated view of credit risk only. Any credit portfolio strategy has its foundations in the risk appetite setting which allocates capital and liquidity to all sources of risks. The challenge here is also very much about translating high level targets into operating, day-to-day goals for a successful achievement of objectives expressed in the risk strategy. The elements of risk and capital-adjusted decision making are connective tissues for a top-to-bottom system with portfolio management at the centre of the risk, capital and liquidity process and execution.[19]

However, what seemed to be the right balance for taking risks at the time of decision making might be seen as too risky later as there is a tight borderline separating reasonable from excessive risk taking. Sound risk and portfolio management therefore is very much also about taking appropriate and sometimes corrective measures, based on rational and educated decisions and using reliable internal control systems. Nonetheless, the next phase of Active Credit Portfolio Management (ACPM) evolution will be beyond micro risk management by hedging single obligor credit risks. Four main drivers for reviewing ACPM can be identified: (a) achieving

[18] See European Commission (2011).
[19] See Bain and Company (2012).

adequate regulatory and economic capital when capital is scarce (b) overhaul of business models of financial institutions in face of tightened restrictions (c) the necessity to improve liquidity ratios and (d) constantly changing and demanding regulatory requirements. The far-reaching implications of the hostile market conditions, coupled with the efforts of regulators to prevent from bank runs when banks become troubled, call for strategic solutions. In fact, the reluctance of financial institutions to sell down or exchange assets in sufficient amounts to improve capital ratios and liquidity to the level set by regulators or governments may be ultimately brushed off by sovereigns not willing or no longer able to absorb further potential losses from banks. In this new environment, a dedicated credit portfolio management is no longer just a competitive advantage, as heralded at the early days of ACPM. It is a prerequisite for attracting new shareholder money and is very often pointed at in this context. It is a must-have to cope with the new paradigm of fast-changing business models and the holistic view of the company needed to stay on track.

2
Credit Risk Strategies

Basel II regulations, incorporated into national law by many countries, request banks to develop and implement effective risk management strategies and processes. Aside from regulatory requirements, banks have a vital interest in a proactive management of risk and return that encompasses all sources of risk. A continuous and purposeful asset allocation supports the competitiveness of a bank towards its peers and creates value, thereby satisfying the stakeholders. Profound risk management operations, a suitable risk culture spread throughout the firm, adequate methods, processes, instruments and organizational structures which are all part of the Risk Governance enables a bank to successfully respond to a dynamic and volatile operating environment. The increasing complexity of banking business but also the tremendous opportunities arising from a fast-changing and globally interconnected business environment call for a comprehensive and integrated approach to the management of risks. The formulation of consistent strategies and the implementation of capable controlling processes are ultimately within the responsibility of the management of the bank. Consequently, the management must be in a position to assess holistically the prevailing risks and take informed decisions on the management of those risks and, in some cases, on counterbalancing efforts which aim at improving the overall situation.

2.1 The risk appetite framework

The continued challenging operating conditions for financial institutions make a sound understanding and management of risks on an aggregated basis a necessity to find a sustainable balance between risk and return. This is the key objective of a comprehensive risk appetite framework. Risk appetite is defined as the risks that an organization is willing to take to achieve its strategic objectives and meet its obligations

to stakeholders.[1] Since risk is an expression of volatility, the risk appetite implicitly addresses the variability of returns which is accepted by senior management to accomplish a corporate strategy. The importance of a clear formulation of a bank's risk appetite and related disclosure[2] cannot be overstated and is subject to an ever increasing scrutiny of regulators, rating agencies, investors and market participants in general and other stakeholders. For instance, rating agencies carefully assess the risk appetite when conducting a rating which in turn expresses the agencies judgement of the credit riskiness of a bank. According to Standard and Poor's, a strategy could lead to a weaker business position if 'Management's risk appetite, strategies, financial targets...are more aggressive than average for the industry.'[3] A well defined and focused risk appetite contributes to the level of comfort investors take in the firm. The interests of bondholders, which are in favour of low risk given their limited participation in the upside but significant downside potential of their corporate bond investments, conflicts to a certain extent with the mantra of shareholders calling for a higher return on equity and dividend payments – but both of them actually prefer predictable, stable and solid growth. The focus of regulators on financial strength and capital adequacy makes them prime addressees of the risk appetite settings. Moreover, stakeholder expectations such as customer satisfaction and reliability of services to local communities, as well as corporate identification of employees are necessarily to be considered.

The cornerstone of any risk appetite is the capital adequacy, in terms of regulatory required capital and internal or risk capital which is measured using complex portfolio models that recognize correlation structures within the portfolio. While the composition of regulatory capital is clearly defined, the layers of capital considered for risk capital have to be set out.[4] The level of risk capital that covers and limits unexpected losses serves as a constraint which should not be exceeded in order to guarantee

---

[1] Towers Perrin (2010).

[2] An adequately transparent governance of a bank to its shareholders, depositors, other relevant stakeholders and market participants demands the disclosure of the risk appetite: 'The bank should also disclose key points concerning its risk tolerance/appetite (without breaching necessary confidentiality), with a description of the process for defining it and information concerning the board involvement in such process.' BCBS (2010), III. Sound corporate governance principle, F. Disclosure and transparency, Principle 14, Article 130.

[3] Standard and Poors (2011b).

[4] Approaches to harmonize risk and regulatory capital differ in that for example some firms include forecasted profit, goodwill or the net present value of capitalized tax while others do not. Moreover, internal capital is derived from confidence levels and risk horizons which in turn is indicative of the target credit quality an institution wants to achieve.

the survival of the firm. It is usually referred to as the risk-taking capacity or risk-bearing capacity. Since the risk-taking capacity is defined as the maximum risk that the institution can stand, it usually includes a buffer to the target risk profile. It furthermore serves as a basis for setting risk limits such as concentration limits for credit risk or value-at-risk limits for market risk. The capital cushion or difference between the risk-taking capacity and the capital to be deployed to execute the business strategy is derived from the risk appetite, ensuring that the bank's capital position remains sufficient at all times, even under sustained negative conditions. Hence, the risk appetite is integrated into the business strategy which details the bank's targets in respect to markets, clients, product offerings, etc., and a general assessment of its positioning. The alignment of the risk appetite with the business strategy allows for a coherent, risk/return optimized capital allocation and target portfolio, taking into account the operating conditions and competitiveness of the firm.

Articulated in terms of qualitative but also selected quantitative targets, triggers and limits, the risk appetite elaborates on the strategic objectives and sets the boundaries within which the organization must operate. For financial institutions, relevant risk-appetite measures may comprise of

- credit quality;
- capital ratios;
- liquidity ratios;
- balance sheet composition;
- profitability;
- shareholder value metrics.

These measures define in a forward-looking, flexible and stringent manner the risk a financial institution is prepared to take when executing the corresponding business strategy. If effective and underpinned by robust risk data, it helps to improve the firm's strategic and tactical decision making capabilities and communication. Key pillars of an effective risk appetite framework are **accountability**, **incentives** and **constraints**. Business ambitions, capital and risk allocations must be translated into operational metrics to be applied in day-to-day business.

> Risk management generally encompasses the process of: monitoring and assessing decisions to accept particular risks, risk mitigation measures and whether risk decisions are in line with the board-approved risk tolerance/appetite and risk policy.[5]

[5] BCBS (2010), III. Sound corporate governance principle, C. Risk management and internal controls, Principle 6, Article 69.

In a broader sense of a **risk mission statement**, the risk appetite becomes more immediate with the definition of the risk tolerance level or risk thresholds that safeguard the adherence of risks the firm takes to the boundaries set by the risk appetite. They are defined by key risk indicators that are specific and measurable.[6] Inter-risk correlations and feedback loops among different types of risk such as credit risk, market risk, liquidity and operational risk as the main risk sources are addressed by the risk appetite framework in a comprehensive way. Risk strategies identify the optimal risk profile given the risk appetite, thereby making high level strategic objectives actionable at the business unit front desks. It should be noted that risk limits are derived from capital; they do not incorporate profitability or return aspects. However, the objective of risk strategies is to specify the optimal portfolio composition that is within the limits, based on risk/return attributes exhibited by the existing stock and by the revenue and capital allocation for new business. Risk strategies elaborate on how an organization deals with specific risks, considering both quantitative and qualitative aspects. Moreover, they provide the basis for reporting and monitoring procedures, hence allowing the management to verify or review the risk appetite and derived strategies. Risk appetite triggers serve as an early warning system to develop or implement mitigating activities to reverse the trend. When risk appetite limits are breached, pre-defined contingency plans become activated to ultimately prevent from a failure of the firm.

2.2 Risk culture

Full transparency and a common understanding of the firm's strategic plan and the associated target risk profile, facilitated by a shared risk appetite language throughout the organization helps to foster the acceptance and execution discipline. The Basel Committee of Banking Supervision pointed out that

> Senior management contributes substantially to a bank's sound corporate governance through personal conduct (e.g. by helping to set the 'tone at the top' along with the board) by providing adequate oversight

[6] In the BCBS (2010) document, the terms 'risk appetite' and 'risk tolerance' are mostly used in combination. This is due to the fact that there is no consensus among supervisors or banks as to how to clearly distinguish between the two terms. In this book and following a suggestion of the Basel Committee of Banking Supervision (BCBS (2010)), risk appetite describes an overarching and forward-looking approach to risks which are in principle and a priori acceptable to a bank in the sense of a risk mission statement. In contrast, risk tolerance is a more immediate definition of the risk appetite and thus allows the monitoring and reporting of the risk appetite.

> of those they manage, and by ensuring that the bank's activities are consistent with the business strategy, risk tolerance/appetite and policies approved by the bank's board.[7]

Due to their importance, supervisors will critically assess the risk governance processes, risk management standards and discipline which all contribute to forming the risk culture of an institution. A powerful risk culture has its origins in shared values and goals and the commitment to execute the firm's strategy within the defined risk appetite at the top management level. However, the risk-appetite framework will only become effective when communicated in a transparent and straightforward manner. Although the risk culture is a soft concept as it refers to behavioural norms that are shown in the actions of individuals, there are some more precise measures which gauge the level of a common purpose, understanding and attitude. Four areas representing the risk culture of a firm can be identified[8]:

Transparency: Unclear or imprecise formulation of risk appetite and risk strategy may create confusion or purposeful interpretation in favour of the risk taker. Allocation and communication of responsibility provides the authority to conduct a task but also supports accountability. Internal competition, overlaps and redundancies are not just inefficient, they also create improper incentives such as the first come, first served principle, thereby potentially putting the interest of the people concerned over those of the firm. A sound risk appetite statement enables managers to explicitly determine whether operations comply with the mission. As markets and conditions change constantly, a regular and continuous communication of the risk appetite is helpful – even if no adjustments are made.

Acknowledgement: Overconfidence can undermine consciousness of risk taking. In particular when a business unit is very successful or a market performs extraordinarily well, adequate care and attention may become replaced by a sense of superiority. Openly challenging each other, for instance regarding the quality of the result of operations, the assumptions used for strategies and actions and even the approach taken to run certain businesses, should become a norm rather than an exception, encouraged by the management at various hierarchy levels.

---

[7] BCBS (2010), III. Sound corporate governance principle, B. Senior Management, Principle 5, Article 66.

[8] See also Banks (2002), McKinsey (2010) and Institute of International Finance (2009). Banks provides an excellent and comprehensive text of various aspects of the risk governance chain. It discusses the essentials of risk management, including concepts such as the risk appetite – well before other literature or even regulators picked up on it after the financial shocks from 2008. No doubt, a thorough read would have helped to avoid many of the failures of the recent years.

Responsiveness: Silo thinking where people care only about issues in their area of responsibility but not about those of others falls short of recognizing the interconnectedness of risks. More often than not, banks are organized along the main sources of risks: credit risk, market risk, liquidity and operational risk, thereby ignoring the increasing complexity of banking. An integrated approach towards risk requires a high level of experience, specialization and expertise but also a broader, overarching view and understanding of risks as well as a common sense of responsibility for the firm. Passivity or slow responsiveness may result from an overly hierarchical organization where people do not feel valued or recognized for their contributions. Especially during times of cost cutting, headcount reduction and uncertainty, people may not be prepared to go the extra mile. In order to counter dangerous complacency, managers should foster team spirit and common sense.

Recognition: Purposeful disregard for risk, either because of personal convictions that are incompatible with the risk appetite or because of a habit of beating the system when it has no serious consequences will let any risk strategy become meaningless. If limits are not taken seriously as a matter of principle or occasionally bowed, giving revenues and budgets a priority, the consequences can be disastrous and can inflict damages throughout the organization. Near misses or near failures can substantially contribute to improving the standards or eliminating the sources of errors – if the corrections are encouraged with appreciation rather than blame.

Developing a risk culture throughout an organization is a journey that only starts at the top. It does not refer solely to decisions being taken and executed but, equally important, to the way senior management arrives at a decision. There are various examples that indicate weaknesses in the risk culture of some firms, from trading scandals and rogue traders to poor decisions resulting from unsound analysis. The lack of challenge to the quality of management actions has been cited as a notable factor in the demise of the Royal Bank of Scotland (RBS):

Case Study 1: The Failure of the Royal Bank of Scotland

In October 2008, after incurring substantial losses, the former U.K. banking champion RBS had to be nationalized by the U.K. government by receiving a capital injection and an Emergency Liquidity Assistance from the Bank of England. As of December 2011, the government still owned an economic total of 82 per cent of the RBS Group.[9] In the years prior to the failure, RBS grew

[9] See www.investors.rbs.com/equity_statistics.

significantly in terms of profit and balance sheet, becoming the fifth largest bank worldwide by market capitalization.

Requested by the Treasury Select Committee, the U.K. Financial Services Authority (FSA) conducted an investigation into the reasons for RBS failure with the explicit purpose of finding grounds for enforcement action, i.e. charges for breaches of FSA rules. On December 12, 2011, the FSA published its Board's Report into 'The Failure of the Royal Bank of Scotland'.[10] The FSA report identified several factors that caused RBS collapse, among which were a weak capital position resulting from the ABN Amro acquisition, over-reliance on short term funding, concerns about RBS's asset quality, and substantial losses from credit trading which eroded the market confidence. Although the financial crisis swept away a number of financial institutions, in RBS's case a flawed risk culture in combination with an already extremely vulnerable firm made the demise inevitable. Particularly, the FSA report notes the 'the poor decisions made by RBS management and Board which made RBS highly vulnerable to failure, and the underlying aspects of RBS's management style, governance and culture which may have contributed to those poor decisions'. The FSA outlines that important decisions have been taken without a sufficient understanding of the risks involved, based on inadequate monitoring and risk mitigation, knowingly accepting high levels of risk and expanding in markets where there were already showed signs of deterioration. However, some practices and decisions were not too dissimilar to those observed at other banks, including the remuneration practices which incentivized the management to prioritize revenues over risks. After having analysed the CEOs leadership and capability and management style, the FSA concluded that these factors ultimately contributed to RBS's weak position. That view confirmed an observation made by the FSA prior to the review carried out for the report that the challenging management culture led by the RBS CEO raised particular risks that had to be addressed, although it remained open if any kind of action followed. Anecdotal evidence of the U.K. government's displeasure with the former CEO, Frederick Goodwin, was given when the Queen annulled his knighthood in 2012 because of allegations that he had brought the honours system into disrepute.

However, RBS is not a case on its own. Also the failures of Enron, WorldCom and Long Term Capital Management (LTCM), to name but a few, clearly exhibit shortcomings in the risk culture. Similarly, trading scandals at Société Générale or UBS witness deficiencies in the risk culture. While the conclusion that those firms which weathered the storm may have benefitted from a superior risk culture could be misleading, there are some institutions though which are frequently praised for their attitude to managing risks. A regular rotation of managers between risk management and business operations, indicating a level playing field between the two, has often been cited as success factor at Goldman Sachs. Indeed, although

[10] See FSA (2011).

Goldman has not always met expectations as concerns ethical standards,[11] the firm appears to have a solid track record in managing risks.

2.3 Credit risk strategies

While the risk appetite can be seen as a mission statement, a more detailed road map of specific long term risk and business strategies along the lines of business segments or regional locations ensures a coherent approach throughout the organization. Embedded in a holistic risk strategy and risk management approach, the credit risk strategies are the concrete deployment of the high level targets of the risk appetite of the institution concerning credit risks. They specify where and how the risk capital should be allocated in order to maximize the risk-adjusted portfolio return. Credit risk encompasses all risks arising from an obligor that fails to meet its obligations when due, including issuer, counterparty and settlement risk, both on balance and off balance sheet.

In general, risk is the commodity that any financial institution deals with. The objective of the risk strategies, therefore, must be to optimize rather then minimize risks. At the same time, risk is very often seen as an outcome of business operations rather than a conscious decision that contributes to determining business budgets. A portfolio optimization reveals all those possible combinations that are within the risk limits while maximizing the risk/return, hence connecting the business and risk strategy while recognizing capital constraints.

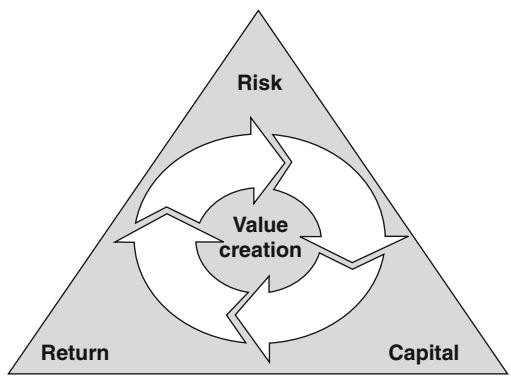


Figure 2.1 Credit risk strategy triangle

[11] In 2010, the CEO of Goldman, Lloyd Blankfein had to defend at a U.S. senate hearing why the firm sold investments to clients that were dismissed by the bank's own staff as junk. It should be noted that Goldman Sachs too had to receive a capital injection in 2008.

2.3.1 Key requirements for an effective credit risk strategy

A successful execution of credit risk strategies banks on three prerequisites:

1. An intense and **permanent communication** and alignment of the intention of the strategy – horizontal between top management and vertical from top to bottom to ensure the buy-in of units involved, founded on knowledge and understanding;
2. **Targets and limits** based on observable and manageable measures since high level measures are often dismissed as non-operational and therefore irrelevant, and
3. A timely and **frequent monitoring** of portfolio trends and developments, verifying that business operation adheres to the approved credit risk strategies – and, in case they do not, followed by an adjustment of the risk strategy or corrective actions.

The formulation of a risk strategy is a balancing act. A very granular and strictly defined strategy supports the applicability but reduces the managerial discretion and flexibility to adjust to a changing operating environment and taking on business opportunities. In addition, the efforts to monitor the implementation of a granular risk strategy may become intense although it may provide useful information on the state of credit operations on a micro level. On the other hand, a generic strategy will probably fail to find acceptance and risks to create confusion if not sufficiently specified. A credit risk strategy that meets the purpose of making the risk appetite transparent and enforceable therefore needs to have first of all an agreement of the top management on the overall targets and the measures which appropriately represent the ambitions, hence diminishing the room for interpretation. Regular and ad hoc reviews of the credit risk strategy enable the firm's decision makers to keep track of the portfolio development and to react on a timely basis to undesired deviations to the approved credit risk strategy. Based on the results of the monitoring of the credit risk strategy, informed discussion can take place and may further stipulate the exchange of views and expectations between members of the top management of the firm and my finally encourage them to critically asses the situation the bank is in.

2.3.2 Credit risk strategy measures

Ensuring consistency between the Basel II metrics of Pillar 1 and Pillar 2, that is to align business goals with risk and capital measures as required by ICAAP, represents a challenge given the involved and iterative nature of the process. The objective of credit risk strategies is to translate a

strategic mission into applicable, manageable and measurable day-to-day operative rules and restrictions in order to match top-down ambitions with bottom-up reality. This can be done by targets and limits, both on a portfolio and segment level. Sub-level strategies for products or business lines additionally improve the applicability of the strategy. Measures relevant for formulating a credit risk strategy are, among others, growth rates of loan exposure and Exposure at Default (EAD), profitability thresholds, regulatory and economic capital, as well as the relative and absolute Expected Loss (EL). Portfolio migrations, the ratio of impaired to performing loans and the share and evolution of the portfolio subject to early warning signals are further criteria which will complete a risk strategy. Although the focus of this text is on credit risk, an integrated risk strategy must consider all elements of risk as well as their interconnectedness. Moreover, concentration risk limits on portfolio, single name, sector, and country level support the allocation and usage of internal or risk capital. Qualitative lending standards are suitable to fine tune business operations in addition to targets and limits. For instance, financing principles which address the minimum borrower credit quality, eligible credit products, financing terms and accepted collateral serve as a first line of defence since they provide an effective and timely at-the-gate selection mechanism even before a transaction enters into the credit approval process.

The forward-looking nature of the credit risk strategy addresses the positioning of a credit portfolio for an expected development of the macroeconomic environment and credit markets. An essential element of the risk strategy is to anticipate the changes in the portfolio credit quality due to economic and other developments. Any quantitative optimization of a business plan or portfolio must incorporate the feasibility and likelihood of execution. For instance, while the risk/return profile of the portfolio stock serves as a rough guidance for potential new business, in most cases it cannot be replicated infinitely. Typically, business segments with very appealing risk/return profiles attract competitors or new market entries which consequently decrease the future returns in what is known as the law of diminishing marginal return. In order to achieve a constant or higher return, disproportional risks would have to be taken over time. The most obvious example is the tremendous growth of the structured credit business in the years prior to the financial crisis, in particular synthetic CDOs and CDOs of ABS, which were designed to generate high margins for the structurer and superior returns for the investor. When credit spreads declined during the period of economic prosperity from 2005–2007, more complex and opaque structures like CDO^2 have been developed where increased leverage was used to compensate for the decreasing coupons of the bonds and CDSs that served as collateral.

The complexity of the transactions allowed investment banks to charge significant upfront fees for the structuring of the deals while the risks taken by the investors were ever rising. These risks, sometimes masked by solid investmentgrade ratings from the rating agencies that benefitted from the flood of sophisticated credit products by taking substantial charges for their rating services, clearly exceeded the risk-taking capacity (RTC) of many investors. The spectacular demise of the U.S. insurer AIG or the German bank IKB are the most striking examples, confirming that the risk appetite was largely disconnected from strategic planning and prudent business decision making.

2.4 Risk limits: framing the credit risk strategy

Credit risks arise from systematic risk and idiosyncratic risk. Systematic risk is the impact that unexpected deteriorations of the macroeconomic environment have on all portfolio constituents. Since economic conditions affect all borrowers, although to a varying degree, systematic risk cannot be eliminated completely by diversification. In contrast, idiosyncratic risk is described as risks that are specific to an individual debtor, which, on a portfolio level, diminish with an increasing granularity. In other words, the smaller the share a particular borrower has in a portfolio, the less impact i.e. a borrower which accounts for only 1% has a smaller impact than another which accounts for 2%. Granular portfolios are typical for retail banks while wholesale banks run credit portfolios with bulky exposures, reflecting the nature of their business which is mostly serving large caps or multinationally operating clients. But also smaller, usually specialized or regionally active banks exhibit concentration risks in their credit portfolios. Risk concentration is acknowledged as a primary reason for bank failures. By contrast, a well diversified portfolio can help to withstand even adverse economic conditions since the impact of certain factors will be not equally severe across the portfolio. Concentration risks arise from different kinds of imperfect diversification. In general, credit concentration risks exist on single name, but also on industry, country and other levels. For instance, industry and country concentration risk denotes the risk resulting from the sensitivity of the credit quality of borrowers to economic conditions of a particular sector or country.

An extreme case of concentration risk losses from a common cause surfaced when the U.S. housing bubble bursted, which was one of the root causes for the financial crises back in 2007. A combination of unsatisfactory credit standards and complex structured credit transactions collateralized by mortgages that were granted to low credit quality borrowers

became known as the subprime crisis and caused a series of bank failures and bailouts. The common factor which has been identified as the trigger of the subprime meltdown has been a decrease of house prices which led to unsustainable indebtedness of many home owners.

The subprime crisis also made visible another source of concentration risk, the default contagion risk. Default contagion is the significantly negative, potentially default-triggering impact from the default of one borrower onto another, even though they are possibly belonging to different industries and regions. Reasons for default dependency between obligors are business or financial interconnections such as profits generated predominantly from a single customer or a critical share of funding provided by only one creditor. Hence the survival of the borrower is conditional to the survival of the customer or the creditor.[12] In particular, the interconnectedness of financial institutions is a major concern for the financial stability with the potential of huge economic losses and social costs attributed to it. Interbank contagion, where the failure of one financial institution leads to the failure of other financial institutions, is the subject of various practical and empirical studies.[13] As one would intuitively assume, if connectivity of banks is high, an unequal distribution of interbank claims increases the risk of second-round effects after the default of a financial institution. In case of interconnected banks, an equal distribution of claims is seen as the best shock absorber because of its superior diversification.[14] However, addressing contagion risk remains a challenge because banks' databases usually do not allow to capture business links between otherwise independent customers in a formal, quantitative way. Also, the exposure of the company that is conditional to the default of the banks' client would have to be added to the credit portfolio, which is especially difficult to do if no direct relationship to this company exists.

However, the financial crisis did reveal other material weaknesses of concentration risk concepts which have since been intensively discussed by regulators and scientific research alike. In particular, regulators expect a holistic approach to concentration risk management which must cover concentration risks across risk sources, risk products, locations and books. The Committee of European Banking Supervision (CEBS)[15] issued in 2010 comprehensive guidelines on the management of concentration risks

[12] Contagion risk therefore describes a situation where the default probability of a borrower conditional to the default of another borrower is higher then the unconditional probability of default for the same borrower.

[13] For an overview of relevant literature, see Sachs (2010).

[14] See Sachs (2010).

[15] See Committee of European Banking Supervisors (2006b).

which are rather exhaustive but also challenging from the perspective of supervisors and financial institutions. Concentration risks arise *intra-risk*, i.e. concentration of risk within a single risk category, and *inter-risk,* which describes links between different risk exposures across different risk categories. The decisive factor for inter-risk concentration is a common underlying risk driver or interacting risk drivers. The wider definition aims at overcoming silos where concentration risks are assessed only in isolation and thus conceptually underestimate the full picture. Exposure to an entity or closely related groups of exposure in form of different products, i.e. loans, bonds, stocks, derivatives, guarantees or other collateral etc., booked in different locations and books, i. e. trading and banking book, have to be aggregated to assess the full concentration risk. However, concentration risk does not solely relate to credit. A bank may also exhibit concentration within its funding structure, within the sources of revenues and non-credit risk such as market, liquidity and operational risk.

Bulk risks weigh on a bank's ability to absorb losses, not only because of serious loan losses in the event of default but also because substantial amount of revenues from the defaulted borrowers will not materialize as planned. Nonetheless, diversifying away concentration risks should not come at the expense of taking assets for which there is no sufficient expertise. Concentration risk limits have to ensure that a bank is not exposed to connected risks beyond the point of adequate capital. Mitigations for concentration risks are a combination[16] of

- **risk limits**, where comprehensive credit limit systems allow monitoring of large individual exposures or connected counterparties and risk appetite for concentration risks, either in terms of credit limits on some kind of exposure or economic capital;
- **active portfolio management**, which is responsible for the monitoring and corrective measures of existing or anticipated concentration risks;
- **loan pricing**, which incorporates the marginal contribution to portfolio diversification, thus incentivizing transactions which add to diversification and penalize those which decrease diversification;[17]
- **risk transfer and risk mitigation**, as a systematic approach by means of asset sale, hedging, securitizing, using collateral, guarantees or sub-participations among others;

[16] See Committee of European Banking Supervisors (2006b).

[17] According to a survey on credit risk concentration performed by the Concentration Risk Group of the Research Task Force of the Basel Committee on Banking Supervision, only a minority of banks used pricing tools that explicitly account for concentration risk. See BCBS (2006).

- **capital buffers**, where capital in addition to the minimum regulatory capital has been allocated to general rather then specific concentration risk.

Risk limits are especially important during times when asset selection and risk mitigation is constrained by market conditions. Several times in the past, execution of risk strategies and in particular risk transfer has been hampered by market liquidity, forcing portfolio managers to sell what they were able to sell, rather what they wanted to sell. As a result, fewer liquid assets might become larger portfolio components than initially intended, contributing to unfavourably skewed portfolio allocations. At times, banks are left with sticky assets and even the loan syndication market, which is less sensitive to short term volatility in credit and stock markets, has been effectively shut for a sustained period of time, for instance in 2009 and, although to a lesser degree, again in 2011. By then, larger tickets from M&A financing or backup facilities which were not syndicated into the market remained on the balance sheets of the originating banks for longer, sometimes creating major headaches for both the bank as well as their regulators. Loan syndication or underwriting limits will not prevent assets from getting stuck on the balance sheet but avoid new deals piling up until the pipeline is successfully cleared.

Case Study 2: MF Global Holdings Ltd.

A more recent example of an investment manager getting into trouble because of unbalanced risks includes MF Global Holdings Ltd. which filed for bankruptcy protection on October 31, 2011. The New York based company, run by former Goldman Sachs legend Jon Corzine, did amass $6.3 bn of bonds of some of the most heavily indebted European nations which sparked regulatory concern and a credit rating downgrade. The default happened less than four months after the issuance of $325 mn notes which prospectus included a passus that in the event of departure of Mr. Corzine as the company's full time chief executive officer,[18] the notes' interest rate will be increased by 100 bps, highlighting the perceived value of the managerial expertise of Mr. Corzine to the futures broker. However, within a week the notes lost more than 65 per cent of market value as it emerged that managerial wisdom was not sufficient to come up against the sovereign debt caused market turmoil. With hindsight, the investment strategy that was 'strongly advocated' by Mr. Corzine at least

[18] The passus states: '… the departure of Mr.Corzine as our full time chief executive officer due to his appointment to a federal position by the President of the United States and the confirmation of that appointment by the United States Senate; …'. Source: Prospectus supplement to the $325,000,000 6.250 per cent Senior Notes due 2016 of MF Global Holding Ltd., S-18.

should have been flanked by appropriate risk limits to discipline the asset allocation in order to protect for major damages. The aggressive style of MF Global allegedly reminded market participants of Refco, another futures broker that went bust in 2005, blaming also the corporate culture as a main driver of the risk attitude.

The broker's collapse heightened once again attention to the role of rating agencies which kept their ratings unchanged until the week prior to the default.[19] As it turned out, the rating agencies mistook the bulk risk of sovereign debt investments and only got alerted when they were told about the regulator's requirement to increase the amount of capital held against those bonds and because of a later drawing on revolving credit lines by the company.[20]

2.4.1 Forms of credit concentrations and regulatory view

The assessment of regulatory capital consistent with Basel II rules is based on portfolio invariant risk weights for assets, meaning that the capital charge of a loan or debt instrument is determined exclusively by borrower specific risk measures such as Exposure at Default (EAD), Probability of Default (PD) and Loss Given Default (LGD). As a result, the capital consumption of the credit portfolio can be calculated by the sum of the capital charges of the portfolio constituents. For portfolio invariance, it is necessary to assume that the risk contribution of any single obligor is vanishingly small, leaving the portfolio exposed to systematic risk only as idiosyncratic risk is diminished due to the level of portfolio diversification. The systematic risk is determined by a single factor. Hence, the single risk factor assumption of the Asymptotic Single Risk Factor (ASRF) model of Basel II therefore excludes effects from single obligor, sector or other portfolio concentrations. The correlation of two obligors is derived by the sensitivity of each obligor to the one systematic factor. These assumptions are, of course, an oversimplification accepted by the Basel Committee of Banking Supervision because of their preference for an easier to validate bottom-up approach where the risk of a credit portfolio can be assessed by each single obligor. Under Basel II, a portfolio consisting of exposure

[19] On October 24, 2011, Moody's Investors Service downgraded the long-term ratings of MF Global Holdings Ltd. ("MF Global"), including its senior, unsecured debt rating to Baa3 from Baa2. The rating was placed on review for possible further downgrade. Three days later, the rating was lowered to Ba2 and remained on review for further downgrade. On the day of bankruptcy, October 31, 2011, the rating was revised to Caa1 and still remained on review for further downgrade. Standard and Poor's Ratings Services placed its 'BBB-' counterparty credit rating on MF Global Holdings Ltd. on CreditWatch with negative implications on October 26, 2011. The rating was changed to 'D' and removed from CreditWatch negative after MF Global Holdings Ltd. filed for chapter 11 bankruptcy protection.

[20] *Financial Times,* January 29, 2012.

from one obligor or one sector only will result in the same regulatory capital charges as a portfolio which is equally distributed among a variety of single borrowers or sectors. Since credit portfolios are neither perfectly granular nor dependent on one systemic factor only, the portfolio risk attributable to concentration may be underestimated. As a result, the capital charges are set too low, which opens a gap between regulatory capital and economic capital that explicitly incorporates correlation structures of a portfolio. However, banks are requested to hold sufficient capital to cover all kind of risks. The assessment of capital adequacy under Basel II Pillar 2 has to explicitly consider the extent of credit risk concentrations. Consequently, supervisors expect banks to address concentration risks and allocate additional capital where necessary, net of risk mitigation. Portfolio concentrations vary with financial institutions given their differing nature of business, scale and presence in countries, regions and markets. The level of concentration risk which is adequate for a financial institution has to be assessed in relation to its capital, thus its capability to absorb losses from concentrations. Specialized lenders or regionally focussed banks may have an advantage due to their expertise and market position which may result in superior asset selection and, to a certain extent, may offset disadvantages from being exposed to risk concentrations. An important step for the assessment of concentration risks within a portfolio is the analysis of common sensitivities of exposures to key risk drivers. Wrong assumptions about correlations will badly affect the conclusion about adequate capital required for given concentration risks or the level of concentration within a credit portfolio constraint by the prevailing capital. Different forms of credit risk concentrations arise from:[21]

- Significant exposures to an individual counterparty or group of related counterparties;
- Credit exposures to counterparties in the same economic sector or geographic region;
- Credit exposures to counterparties whose financial performance is dependent on the same activity or commodity; and
- Indirect credit exposures arising from a bank's credit risk mitigation activities (e.g. exposure to a single collateral type or to credit protection provided by a single counterparty).

Banks have to develop effective internal policies, systems and controls to identify, measure, monitor, and control their credit risk concentrations. Supervisors are asked to review the results of a bank's stress test

[21] Basel Committee on Banking Supervision (2006), Article 773.

and to take action if concentration risks are not managed appropriately or not sufficiently considered by the assessment of capital adequacy of the institution. High level guidance for financial institutions and supervisors on the management of concentration risks has been provided by the Committee of European Banking Supervisors (CEBS)[22], setting out what the institutions should consider concerning concentration risk in their ICAAP,

> under which it is the institution's own responsibility to adequately manage (i.e. identify, measure, monitor and control) these risks and allocate internal capital, where considered necessary, in support of concentration risk in a structured manner.

Moreover, CEBS required national supervisors as part of the Supervisory Review and Evaluation Process (SREP) to enforce that institutions hold internal capital which is in line with the level of concentration risk, considering the nature, scale and complexity of activities at the respective firm.

In 2010, the Basel Committee on Banking Supervision published its new regulatory framework, called Basel III.[23] Recommended by the G20, the directive is to be translated into national law by the end of 2012. A proposal made by the EU Commission, the CRD IV,[24] seeks to prevent unacceptable risk of loss due to excessive concentration of exposures to a single client or group of connected clients. In order to determine a group of connected clients and aggregating their exposures into a single risk, the risk arising from a common source of significant funding also has to be taken into account.

2.4.2 Measurement of concentration risk

Although there have been considerable efforts to measure concentration risks such as single name, industry, region or country risk, the challenge remains to put these risks into perspective to regulatory capital or economic capital as demanded by capital adequacy within Basel II. In the absence of a regulatory recommendation as to how concentration risks have to be quantitatively assessed, banks are left to find their own approach to meet the regulatory requirements. So, how much more capital actually should be set aside, in addition to the regulatory capital, to cover concentration risks? Surveyed in 2006,[25] selected best

[22] CEBS (2010b).
[23] Basel Committee on Banking Supervision (2011).
[24] CRD IV consists of a) Capital Requirements Directive and b) Capital Requirements Regulation published in July 2011.
[25] CEBS (2006b).

practice banks indicated that they were using a combination of vendor and in-house models to assess concentration risk. Simple concentration indicators such as Simpson's Equitability Index, Shannon-Wiener index, Pielou's evenness index, Moody's Diversity Score or Gini coefficients are used for an ad hoc assessment of portfolio granularity. A popular indicator of portfolio concentration is the Herfindahl–Hirschmann Index (HHI),[26] defined as the sum of squared shares of each constituent of the total portfolio:

$$H = \sum_{i=1}^{N} b_i^2$$

or normalized as

$$\frac{\sum_{i=1}^{N} b_i^2}{\left(\sum_{i=1}^{N} b_i\right)^2}$$

where

b = Portfolio share of borrower

N = Number of borrowers in portfolio.

The HHI displays the level of concentration on a continuous scale from 0 for a fully granular portfolio to 1 for a portfolio consisting of only one asset. However, the HHI does not provide any information on the change in the riskiness of a portfolio because of risk concentration and is therefore of limited use for determining a capital surcharge. An increasing HHI value reflects a rising concentration and would in principle suggest a higher capital surcharge or granularity adjustment to Basel II IRB capital. Preferably, concentration risk indicators are based on risk sensitive measures, i.e. economic capital allocated to the borrowers concerned, RWA or Expected Loss. Although the HHI can be applied on the economic capital consumption of an obligor, thereby introducing implicitly correlation aspects, portfolio models are clearly superior to measure the effects from concentration risk as they specifically incorporate default dependencies, exposure distribution and credit quality. Since the effect of single name bulk risks on economic capital is determined by correlations assumptions, the outcome of different portfolio models can vary significantly. An indicative calculation provided by the Basel Committee on Banking

[26] The Herfindahl or Herfindahl-Hirschman Index is widely used to measure the level of competition within certain markets in order to detect monopolies or antitrust practices. For those purposes, the HHI is in particular useful as it assesses the market concentration without the necessity to define a optimal market diversification.

Supervision (BCBS)[27] of the contribution of idiosyncratic risk to economic capital, constrained by the maximum concentration resulting from application of the EU large exposure rules results in estimated 13–21 per cent higher portfolio value-at-risk compared to a perfectly granular portfolio with otherwise the same characteristics. For larger portfolios in excess of 4,000 exposures that are more typical, the effect is less pronounced with about 1.5–4 per cent increase in value-at-risk. Smaller portfolios with 1,000–4,000 exposure likely display a more significant increase in the range of 4–8 per cent.

2.4.3 Concentration risk limits

Concentration risks arising from single exposures or group of exposures have been stressed by Basel II[28] as the most important cause of major problems in banks because of their potential to produce losses which could threaten the bank's ability to continue its core operations. The Basel Committee on Banking Supervision requests that concentration risk limits have to be set in relation to a bank's capital, total assets or, where adequate measures exist, its overall risk level. Please note that single name and industry concentration have to be looked at in distinction. A perfectly diversified portfolio with regards to sector distribution can exhibit large single name concentrations within the industries. Also, a very granular portfolio can be concentrated on few industries as it is often the case for specialized lenders. CEBS explicitly noted that in particular financial institutions which are highly dependent from profits out of a single business sector and/or a single geographic area may be more affected by sectoral or regional business cycles.[29] While the competitive advantage of specialized lenders may to a certain extent counterbalance their vulnerability to adverse developments in those segments where they are active, they will ultimately suffer disproportionately from a prolonged downturn due to the concentration. Banks have to take into account these dependencies along with the exposure to correctly assess their overall concentration risks. Since the purpose of a credit risk limit system is to ensure that the actual risk position complies with the stated risk appetite, a consistent set of risk measures needs to be implemented. The development of risk limits comprises of four steps:

1. **Definition** of credit risk limits by
   a. Limit **object**
   b. Limit **measure**

[27] See BCBS (2006).
[28] See BCBS (2006), Articles 770–777.
[29] See CEBS (2010).

2. **Determination** of the limits
   a. **Quantitative** limit setting
   b. **Qualitative** limit setting
   c. **Consistency** check
3. Limit **controlling**, monitoring
4. **Management** of limit **breaches**, escalation procedure.

Risk limits aim to protect the bank from excessive risk taking but at the same time must leave sufficient room to execute the business plan which is reflected in the risk appetite and the credit risk strategy. Hence, determining appropriate risk limits is not a purely formulaic process but requires in-depth knowledge and understanding of the business and risks concerned. Any periodic or ad hoc review of business plan and risk strategy immediately affects the corresponding risk limits, potentially necessitating a limit revision.

2.4.3.1 Definition of risk limits

Credit risk limits typically entail a variety of dimensions and risk measures to arrive at a limit framework which is sufficiently detailed to match the specific business and risk characteristics. Since no single risk metric fits all purposes of the limit setting, a combination of different metrics may achieve the objective.

2.4.3.1.1 Risk limit object A coherent set of risk limits starts with the definition of the limit object or limit dimension. Most common are risk limits for single obligors, sectors or industries and countries. Other dimensions include a limit for a predefined subset of borrowers, for instance the top five or top ten large exposure groups, limits on products such as asset-based financing (i.e. leveraged finance, project finance, commodity finance, structured credit), and constraints for certain geopolitical risks, for instance assets or obligors with increased political influence or interest.[30]

2.4.3.1.2 Risk limit measures Risk measures suitable for limits must be risk sensitive and directly manageable by ways of active risk mitigation.

Gross EAD serves as an indication for a worst case loss but it is neither sensitive to changes in the credit risk of the obligor nor do active risk

[30] Examples of political influence or interest are the nationalization of YPF, owned by the Spanish utility firm Repsol, in Argentina in 2012 or the forced insolvency and subsequent distribution of the assets of the once dominant Russian oil conglomerate Yukos in 2004.

Table 2.1 Parameters for limit risk measures

		Measure				
		Gross Exposure	**Net Exposure**	**Expected Loss, EL**	**Regulatory Capital**	**Economic Capital**
Parameter	Exposure at Default, EAD					
	Loss Given Default, LDG					
	Probability of Default, PD					
	Regulatory Capital Weights					
	Correlation					

mitigation measures impact the gross EAD, except via an outright sale or when declining to refinance a maturing loan. Single name specific risk mitigation such as collateral, Credit Default Swaps (CDS), Financial Guarantees (FG) and sub-participations decrease either the PD or the LDG, depending on instrument and respective Basel II rule, hence making the net EAD or EL a better suited risk limit measure, at least in combination with the gross EAD. It should be noted, though, that the introduction of risk sensitive measures in connection with stepped risk limits (i.e. higher limits for better credit quality and lower limits for worse rated borrowers) exposes the bank to passive limit breaches which may occur due to a deterioration of the risk profile of an obligor that was hitherto limit-compliant. EAD limits furthermore contain a certain degree of volatility since the EAD arising from revolving credit lines or backup facilities varies with the amount drawn.

While informative and in principle useful, limits on regulatory or economic capital consumption are subject to model risk and are challenging to implement as an operative limit since loan originators have to assess potential limit breaches before requesting credit approval from the authorized credit officer. Thus, a real-time simulation of a new deal must be performed to evaluate ex ante the compliance of the transaction in discussion with the capital limit which is difficult to do when whole portfolios have to be modelled. Alternatively, reasonable proxies based on observed economic capital of comparable transactions may serve the purpose sufficiently well. In order to become operational, limits must be properly communicated and understood by relationship managers and credit risk managers, which speaks for a more simplified set of measures for which timely data are available.

2.4.3.2 Determination of risk limits

The second step of the limit-setting process encompasses the determination of qualitative and quantitative limits, followed by a plausibility

and feasibility check. When deriving risk limits, the perimeter subject to those limits has to be defined. For example, single obligor concentration risk limits based on economic capital may be applicable only for borrowers or groups of borrowers exceeding a predefined minimum EAD or economic capital threshold. The rationale for identifying a specific perimeter for each limit category is that limits should correspond to the portfolio characteristics. For example, single obligor concentration risk limits are less relevant for a granular credit portfolio consisting of private individuals, whereas the same portfolio may exhibit significant regional concentrations if the bank is only regionally active, hence requiring regional concentration risk limits to reduce the bank's sensitivity to that region and to encourage increasing the portfolio diversification through active portfolio management.

2.4.3.2.1 Quantitative risk limits Since limits are the expression of the Risk Appetite and Risk Taking Capacity, they are derived from the bank's capital position. Economic capital, either actual or target, allows recognition of the correlation structure of the credit portfolio; this is in particular relevant for those limits where correlation is a predominant source of risk, for instance for country risk limits which deal with the correlation of a sovereign default to transfer risk for the companies domiciled in the defaulted country. A cushion between actual economic capital and available risk capital ensures that the Risk Taking Capacity will not be exceeded, even under stress. For example, the buffer of the German based lender Commerzbank amounts to 20 per cent of the economic capital.[31] In other words, Commerzbank deployed only 80 per cent of its capital that serves to absorb losses from risks taken to retain its ability to manoeuvre even under severe adverse circumstances. Specific Stress Tests provide insights into the development of economic capital under stress, hence allowing verification of the sustainability of a Credit Risk Strategy, flanked by the various risk limits, under the stressed conditions. Determining limits for PD ranges, analogous to the rating scale of Standard and Poor's or Moody's with a limit amount decreasing for increasing PDs, recognizes the higher correlation of weaker obligors which are more sensitive to an adverse macroeconomic development. On the other hand, the economic capital of a very high rated customer, even with a substantial exposure, is probably very low. A net EAD limit, in addition to an economic capital limit for a borrower, protects the bank from becoming vulnerable from single obligor losses when either the rating underestimates the credit risk or the rating rapidly deteriorates with

[31] See Becker (2008).

no measures available to reduce the exposure. Individual obligors subject to the concentration risk monitoring often consist of sub-groups of firms which are economically or legally interconnected. The definition of connected clients provided by the CRD (Directive 2006/48/EC) encompasses the control a client has over another and the interconnectedness due to a common economic dependency.[32]

For setting sector limits, a segmentation where sectors show high asset correlation among borrowers of the same sector and low correlation to obligors of others is necessary to achieve reasonable model results. However, in contrast to a more intuitive and clearer geographical segmentation, the definition of sectors is less straightforward. This is usually a limitation to industry concentration risk assessment since correlations are unstable and highly dependent on available and accurate data. A widely accepted official sector classification is the Global Industry Classification Standard (GICS®), developed by MSCI and Standard and Poor's (S&P). It consists of 10 sectors, 24 industry groups, 68 industries and 154 sub-industries, hence suitable for a levelled approach towards industry concentration risk limiting.

2.4.3.2.2 Qualitative risk limits: underwriting standards Loan origination is the first line of defense when it comes to appropriate lending. Loan officer surveys monitor the development of standards and best practices and also restrictions to gauge the increase in risks banks are taking. When lending criteria become too strict, the liquidity position at corporates may be negatively affected. A prolonged credit crunch can have severe effects and ultimately drive an increase in insolvencies. A successful loan origination process incentivizes net revenues after risk costs rather than volumes and sheer balance sheet size. In the past, some leveraged loans have been issued with little protection for credit quality deterioration, dubbed covenant lite loans. These were a clear reflection of relaxed lending standards prevailing at that time, unfortunately adding to losses when the financial crisis broke since many banks were left with loans they originally intended to distribute to other investors. Qualitative risk limits detail financing principles such as a minimum borrower PD requirement for uncollateralized transactions, eligible collateral, transaction tenors and other financing terms such as currency or margin grids, use of proceeds from borrowing, ranking of the claim (i.e. no subordination), covenants, eligible borrowers under a transaction (for instance holding company versus subsidiaries) and constraints concerning credit products (i. e. term loans, revolving credit facilities, guaran-

[32] See also CEBS (2009). The guidelines provide further information and clarity as regards the definition of connected groups.

tees etc.). While the financing principles are very detailed and more of a business restriction rather than a limit, they serve as a complement to quantitative limits to fine tune daily operations with the objective of shaping the credit portfolio to a pre-defined target portfolio by actively selecting new business that meets the characteristics set out by the target portfolio.

2.4.3.2.3 Consistency check Once the limits have been deterministically derived from the bank's capital position, the consistency to the business and risk strategy must be proved. As a general rule, limits must allow business operations to execute the business plan to which Risk Appetite and Credit Risk Strategy correspond while observing the respective limits. Since in some cases volatile moves of FX rates or seasonal patterns of drawing of credit lines can have a measurable impact on the limit usage, the setting of limits must take into account expected or simulated trends to avoid 'passive' limit breaches. In general, the limit headroom reflects the relative attractiveness and strategic relevance of the sub-segment. In particular for those areas where the bank feels less comfortable with the exposure or the future prospects, a stricter limit may be set, hence accelerating the reduction of that segment and triggering counterbalancing measures earlier.

2.4.3.3 Limit monitoring

Regular and frequent limit reporting is a prerequisite for a portfolio development that complies with the approved Credit Risk Strategy. In order to perform limit analyses, sufficiently capable data systems must be in place. Weaknesses in the IT infrastructure results in unsustainable manual efforts to improve data quality, to the detriment of the timeliness and content focus of those limit reports. Highly automated report generation incorporates several layers of quality checks to reduce manual corrections to a minimum. High quality limit reports, analysed and commented on by skilled experts, raise awareness of loan origination units about the relevant limits and support management in steering the organization on the path laid out by the Credit Risk Strategy.

2.4.3.4 Management of limit breaches

The full circle of concentration risk limits consists of four parts: limit setting, recognition of the limits within the credit approval process, regular limit monitoring and finally, management of bulk risk limit breaches.

Concentration risk limit breaches occur due to different reasons:

- New business;
- Drawing under existing credit commitments;

- Deterioration of credit quality;
- Automatic rating downgrade when the regular credit review timeline has been missed;
- Stuck syndications;
- Merger or takeover to form a larger entity.

Countermeasures can be categorized into two groups: organic and active mitigations. Organic solutions include a credit review with a potentially better credit quality assessment where appropriate, hence assigning a higher limit that would cover the actual risk. Requesting collateral mitigates the net EAD and EL and is usually the first attempt to solve bulk risk limit breaches for clients for which no capital market hedges are available. Optimizing the credit product mix so that corresponding risk measures such as gross EAD and net EAD improve are other solutions which can be considered for larger firms that use a broad spectrum of credit products. Depending on the procedure to derive the relevant PD for a borrower group, an internal reallocation of credit lines to those obligors which have a better credit quality may also help to eliminate concentration risk limit breaches. Active risk mitigations refer to credit risk transfer techniques which include outright sale or syndication, hedging via credit derivatives, sub-participations and Financial Guarantees and securitization. Since the objective of all these measures is to reduce either the EAD, the PD or the LDG of a borrower, the same holds in principle for industry concentration risk limit breaches as long as the limits are expressed in risk measures which are sensitive to the techniques listed.

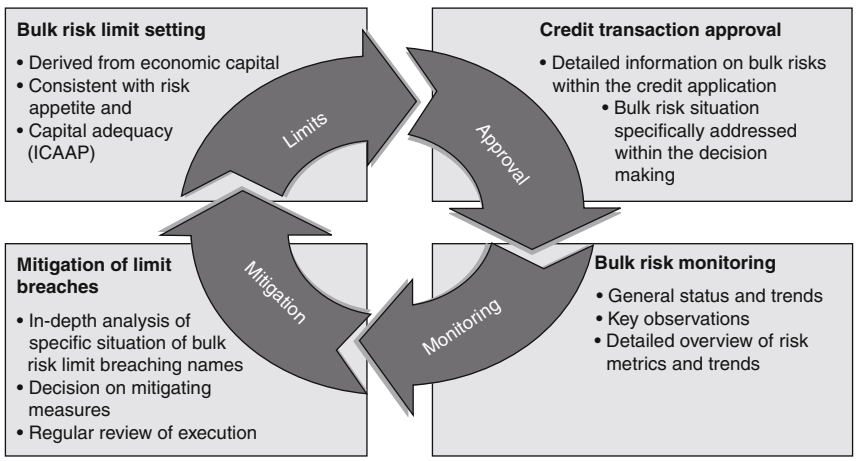


Figure 2.2 Concentration risk limit circle

2.4.4 Syndication risk limits

Syndicated loans are defined as those loans which are provided by more than one lender, the so called syndicate, to one borrower or a group of related borrowers under a common legal documentation framework. Unlike bilateral loans, which are characterized by highly individual loan agreements between the bank and the client, syndicated loans benefit from comparably higher standardization and tradeability. They are most often larger transactions where core banks of a client provide the borrower with the funds requested, i.e. banks keep a chunk of loans financing M&A transactions on their books to retain the client relationship and orchestrate the further distribution of the rest of the loan to other lenders. An exception is the club deal where a group of banks jointly originate a loan with the intention of holding the asset to maturity. The terms and legal documentation of a syndicated loan are negotiated by the mandated lead arranger(s) while the bookrunners are in charge of managing the distribution, or syndication, of the loan. During the primary syndication phase, the lenders that are part of the syndicate either underwrite the loan or commit to sell the loan on a best effort basis. After completion of the general syndication, when the lenders participating in the syndicated loan received their allocations, a secondary market sell down starts. Hence, the underwriter to a syndicated loan takes the risk that either the loan may be undersubscribed or that the subsequent selling of the loan in full or in parts fails if no other investor emerges to buy the asset at the suggested price. In general, the syndication process takes place within three months. However, if the loan is severely mispriced or the demand for syndicated loans drops due to a significant adverse change in market conditions after the underwriting of the transaction, the bank may be left with a commitment to the client. Although at that stage the loan itself is not signed, the bank would run a substantial legal and reputational risk when walking away from the deal. Moreover, when a transaction has been fully underwritten, in some cases also the loan has been signed even before the syndication phase which exposes the underwriter to the risk of funding the drawdowns under the terms of the loan.

Even though the market for syndicated loans is only loosely connected to and correlated with other debt markets, a general risk off attitude will negatively affect the trading liquidity of those loans too. When this happened during the financial crisis, banks had to digest stuck loans which sometimes greatly exceeded their risk appetite and limits. Nevertheless, syndicated loan limits serve as a restriction to business operations to avoid piling up new underwriting risks while the pipeline of deals has not yet been cleared. They do per se not prevent larger transaction from being kept on the bank's book for a considerable time when becoming

unmarketable once the internal credit approval has been granted and the loan underwritten. It should be noted that the phrase limit does not imply any capital consumption. In contrast to concentration risk limits for which capital has to be set aside to cover those risks, syndicated loan limits aim at a prudent and precautionary restriction to avoid ongoing loan origination when the market is effectively shut, which prevents a successful syndication. Since syndicated loans refer to different asset classes such as asset backed financing, i.e. leveraged loans or project and commodity finance, and large corporate debt, limits may be applied on a transactional and asset class level. An aggregated limit further complements the limit system. Additionally, a bridge to bond limit for those loans which will be replaced by bonds issued at a later stage provides protection for market conditions that do not allow for bond issuance, thus hindering a refinancing of the loan.

3
What If: Credit Risk Stress Testing

In many credit risk managing organizations there is a rift between fundamental and quantitative-oriented portfolio managers. This partly reflects the belief in real facts versus questionable data manipulating, or empirical versus statistical analysis. The mathy quants rely more on view-from-the-top when constructing portfolios, also to not get carried away with micro level convictions and lose sight of the balancing and construction of portfolios. So it's never been easy to find the right mixture or interface of top down to bottom up, quantitative to fundamental portfolio management. It is in fact a challenge to make the best use of the expert know-how of credit analysts, who specialize in single name and transaction analysis from a credit risk perspective but also a market risk perspective when it comes to marketable assets. In the current environment, where huge economic and financial trends are met with unpredictable political actions, making the right call is a much tougher proposition than ever before. As a direct result, there is an essential need for correctly assessing the consequences of positioning the portfolio which in turn has led to building in quant analysis as a core part of the portfolio managing process. Quant tools have been developed to provide an additional lense for the portfolio manager, to slice and dice through the different dimensions of a portfolio, adding new perspectives or raising awareness of hidden or underestimated risks. The more high quality and timely data are available, the better a sound quantitative portfolio model can help to make built-in biases visible, confirming or opposing the manager's intention. However, modelling and data are identified as recurrent pain points by a study by Moody's[1] on best practice of banks regarding stress tests, hence deserve both close attention and improvements to make the exercise viable. Better insights into

[1] See Moody's (2011).

sources of risk and return help the fundamentalists to position themselves to their strategic convictions with obvious reality checks of their performance. However, incorporating risk models into the investment process for improved risk analysis and management is a key ingredient for sound portfolio management, but it does not stop here. Portfolio models can also help to answer the what-if-I-am-wrong question which is a base requirement to portfolio managers and is especially valuable at times of elevated volatility and market disruptions. Here, model- based stress tests take the role of providing a picture of possible outcomes for any given scenario. This allows a better feel for unwanted consequences which can be mitigated by trimming positions down to the level of acceptable risk in line with a clearly defined risk tolerance. Stress tests also encourage a higher degree of discipline in formulating potential scenarios and in thinking through the chain of events, cascading down from high level macroeconomic moves into effects on the micro level, therefore ultimately on the credit quality of borrowers and the value of their debt. When the unexpected defaults of Enron and WorldCom rattled financial markets, investors were faced with unprecedented losses from their holdings in these firms but worse, spillover effects throughout the debt capital markets were felt for a long period of time. The shockwaves sent by the downfall of these large corporations did contribute to a substantial rise in credit spreads around the globe. Portfolio managers who correctly anticipated the credit events but did not consider second round effects might have trumped the performance of their competitors only for a short period of time. A similar fate was suffered by Morgan Stanley when at the height of the financial crises a combination of a hedge position in ABS equity and an investment in ABS super senior position first showed tremendous gains but when credit losses began to dent through the capital structure of those ABS, the losses on the long position far exceeded the gains from the short position, resulting in substantial net losses.[2] In this chapter, approaches to stress tests and the specific stress scenarios which form the basis for purposeful stress tests are explained. It describes the types of stress tests and explains their managerial applications.

[2] In 2007, Morgan Stanley CEO John J. Mack wrote in his annual letter to shareholders, '*The writedown that Morgan Stanley announced at year end in our mortgage-related business was the result of an error in judgment made by a small team in one area of fixed income and a failure to manage that risk appropriately. It was deeply disappointing to me – as I know it was to all of our shareholders.*' See www. morganstanley.com. On November 8, 2007, Morgan Stanley had to announce a $3.7 bn loss related to its U.S. sub-prime mortgage exposure which was the largest write down in the history of the firm. See www.reuters.com, 'Morgan Stanley sees $3.7 billion subprime hit'.

3.1 Definition and objective of stress tests

Stress tests are an essential managerial tool to define and confirm a sustainable strategy and thus they receive close attention from supervisors. They are ultimately located within the area of responsibility of the management body[3] and serve the purpose of revealing the connectivity of macroeconomic changes to key credit portfolio risk measures and assessing the implications of unfavourable developments for the resiliance of a financial institution. A precise qualitatively and quantitatively defined scenario, either hypothetical, historical or worst case, helps to quantify potential losses and to define trigger levels which, when reached, should activate countermeasures to limit further losses – as required by the bank's regulators. Specifically, the Capital Requirements Directive (CRD) and supervisory review process or second pillar of the Basel II capital adequacy framework requires banks to conduct rigorous stress testing to introduce a forward-looking view in the risk management, strategic and capital planning, thereby identifying possible events or changes in market conditions related to all the relevant risks (credit, market, operational, liquidity, financial investments, real estate, business risk) that could adversely impact the bank. Under Pillar 1, banks qualifying for the IRB approach perform stress tests to assess the robustness of their supervisory approved internal models and the cushions above the regulatory minimum capital.[4] That capital level is set to ensure solvency by covering unexpected losses, defined as unexpected tail risks at a specified confidence level and should not be confused with the stress testing of capital under Pillar 2 where stress tests reveal whether a bank is able to satisfy internal capital requirements when the adverse conditions as outlined in the stress scenario materialize.

Stressing a portfolio or investment strategy and testing for sustainability became very popular lately as a result of the financial crisis, with most market participants agreeing that, if the consequences had been clear beforehand, Lehman probably would not have been allowed to go bankrupt. Consequently, banks as well as their supervisors questioned whether the stress-testing practices prevailing at that time as part of the banks internal risk management were sufficient to cope with the crisis. The introduction of the CEBS or EBA stress test gained widespread attention from market professionals. From the perspective of a bank's management,

---

[3] See CEBS (2010b). Management body is defined as top management level of an institution, whereas senior management is the level of management below the management body.

[4] Banks applying an IRB approach are required to conduct stress tests as requested by CRD, Article 124.

however, these official stress tests often provide little value for steering risk management. This should come as no surprise, given the intention of EBA to calm fears of financial markets that the vulnerability of various banks to certain adverse economic or financial developments might be unacceptable high and would require a capital increase or other capital strengthening measures to avoid a systemic collapse of the financial industry. Consequently, the focus has been placed more on comparing the results of the participating banks and providing decent transparency, especially because only shortly after passing the CEBS stress test, four Irish banks went bust in 2010. The stress scenario defined by EBA in 2011 did recognize the rising risk of sovereign defaults in Europe but was not able to keep the pace by which the situation in Greece deteriorated. Also, the specific portfolio characteristics of each bank, in particular the big differences between wholesale and retail banks, were not considered appropriately. For a risk manager, the attention is on what could hurt the most, which is individual for every financial institution and does not comply with a one-size-fits-all approach.

Stress tests that are governed by top management as requested by CEBS and firmly embedded into the risk management framework and senior management decision making improve the competitiveness of the organization. Banks that established stress tests as a standard procedure with clearly defined roles and processes and secured management attention are perceived to have better withstood the crisis. Two major reasons that contribute to the comparably superior resilience of those institutions can be identified. First, regular and frequent stress tests allow risk and business managers to better anticipate the effects from downturns or shocks, both regarding the sequence and magnitude of events, and not get paralyzed when being caught by surprise. Based on that, institutions are enabled to take informed and timely decisions, thereby adequately responding to the development of the circumstances. The other advantage relates to consciously incorporating stress test results into the risk appetite and limit framework, which, if appropriately tested and set, diminishes the need for costly corrective actions when adverse scenarios materialize. A bank might be comfortable with the risk/return profile of a proposed business plan given the historical and expected conditions but hidden inherent tail risks might be intolerable for the bank. An example for such a case is the demise of leveraged structured credit products. Here, some banks have been active this business because of the very attractive margins prevailing at that time but later lost multiyear revenues when the market collapsed. With the benefit of hindsight, for some the decision to enter into that business segment would not have been taken if appropriate stress tests had been conducted, deemed plausible and the results taken seriously by the management.

Definition: a stress test assesses the financial health of a firm under a severe but plausible scenario. By quantifying the implications of those adverse conditions, in particular on key risk metrics such as loan losses or economic capital, stress tests contribute to improved decision making within the organization in order to better withstand the effects of a downturn or shock.

Objective: the key objective is to alert a firm's management to adverse unexpected outcomes related to a range of risks and to provide an indication of the magnitude of capital needed in order to absorb losses when large shocks occur.[5]

Supporting a bank's risk management, stress tests

- provide **forward-looking assessments of risks**, which are a key ingredient of meaningful risk management, in particular with respect to budgeting and strategy definition. To derive a robust risk strategy which flanks a proposed business plan, the sensitivity and viability of the budget to significantly worse than assumed operating conditions are tested to reveal hidden weaknesses underneath the business plan,
- contribute to **capital and liquidity planning** and to the **determination of the risk appetite** or tolerance and **capital adequacy** as required by ICAAP. Through determination of the necessary level of capital to hold for severe deterioration of the economic environment,[6] the solvency of a bank can be ensured even during times of crisis and stress,
- enhance external information by **increasing transparency** on the risk profile and capital position of the stress-testing institution under certain adverse circumstances, and
- help to develop solution-oriented **risk mitigation** measures and **contingency plans** as part of an effective crisis management, either preemptive or as a coordinated process to regain stability based on in depth information on risk sensitivities and interconnectedness.

Stress tests cover firm-wide risks, either as a whole or as separate components, i.e. sub-portfolios by region or business line or by type of risk. Firm-wide means all material risks to which an organization is exposed to but not as a simple aggregation of stress tests for parts. Although no specific frequency[7] has been outlined by regulators, CEBS asks to stress test

[5] See BCBS (2009).

[6] In other words, stress tests identify the amount of capital needed to restore the capital ratios to the precrisis level.

[7] CEBS (2010b) states that '*stress tests should be undertaken with appropriate frequency*' which should be proportionate to risk areas and the need of an institution for firm-wide stress tests, i.e. higher for large complex banks that have a number of risk areas

certain risk areas more often while firm-wide stress tests are performed with lower frequency. Beside that, ad-hoc stress tests are part of the stress testing program. The time horizon of stress tests is typically set in relation to the maturity profile and degree of liquidity of the stressed portfolio but also recognizing the assumed duration until the economy returns to some kind of equilibrium after the applied shock.

In order to measure the erosion of regulatory or economic capital of a financial institution resulting from the stress scenario, the level of increase in RWA due to rising obligor PDs, loan loss provisions, valuation adjustments and the shortfall are observed. Changes in credit quality metrics such as EAD, PDs[8], and LGDs[9] are either determined by the factors describing the stress scenario that are an input factor to the rating of the obligors, or through the parameterization of the credit portfolio model, defining the dynamic interaction of macroeconomic variables and the risk profile of the portfolio as well as interdependencies in form of correlation structures. Portfolio models also allow assessment of changes in the value of collateral and credit quality migrations, including a deterioration within the non-performing part of the portfolio.[10] Alternatively, the transmission of moves of economic factors and corresponding losses or changes in related risk metrics could be derived from judgemental assessment and internal or external expertise. Effects on revenues or off-balance sheet positions are evaluated similarly. The decision to base the transformation of scenario into impact on a model hinges very much on the availability of an appropriately sophisticated portfolio model and sufficient data of decent quality. However, a credit portfolio model might be better suited to deal with the non-linearity of changes in macroeconomic factors and corresponding stress on parameters, meaning that an acceleration of effects might result in an overproportionate impact which is often observable as a domino effect. Credit portfolio correlations are defined as an asset or default correlation, ensuring consistency of the approach throughout the credit portfolio; this is necessary to correctly estimate the stress impact on default rates which in turn contributes to deriving the corresponding impairments. On a portfolio level, the impact of stress is determined by the delta in conditional expected loss and other portfolio statistics. Stress tests are regularly performed at single risk level as well as on an integrated level,

requiring stress tests. It seems reasonable to assume that conducting an ICAAP stress test at least twice a year complies with this requirement.

[8] For those institutions permitted for the IRB approach.

[9] Provided that the bank uses its own LGD estimates for capital requirements calculation.

[10] These effects may be material and deserve attention.

and subsequently disclosed to the senior management. Stress tests come in a variety of approaches and with equally diverse goals, based on specific stressed scenarios.

3.2 Stressed scenarios

Stressed macroeconomic scenarios are designed to reveal the vulnerability of a bank's portfolio to *extreme* or *exceptional* but *plausible* events – although this definition originally introduced by the IMF is not clear cut as to how exceptional or plausible are defined. Scenarios are developed to provide answers to specific questions or concerns. In that sense, they can relate to a wider, macroeconomic crisis or downturn or to specific events or shocks which will directly affect certain portfolio segments or risk types and indirectly others through 2nd and 3rd round or spill over effects. Scenarios chosen for stress tests are discussed among research analysts, economists, portfolio managers, senior risk officers, industry and business specialists to assure economic relevance and to foster general acceptance. In particular, industry specialists can provide valuable insights as to whether a scenario and the chain of events are plausible. In general, stress test scenarios can be grouped into[11]

a) **Hypothetical** or macroeconomic scenario
b) **Historical** or shock scenario
c) **Worst case** scenario

3.2.1 Hypothetical or macroeconomic scenarios

For a broader assessment of the resilience of banks or the financial system as a whole to economic downturns, a corresponding scenario has to be developed, and translated consistently by a macroeconomic model into changes in various economic variables such as GDP growth, inflation, interest rates, oil prices, unemployment, etc. Thus, in a hypothetical scenario, banks and corporates are affected by simultaneous large moves of those factors. This kind of scenario is used most often because of the flexibility to test a broad range of combinations of changes in macroeconomic factors with the severeness unlimited as long as the scenario remains plausible. A baseline scenario with only moderate changes serves as a benchmark to put the results of severe stress into perspective. Alternative scenarios with different directions, i.e. a spike in oil prices results in either a significant rise in output and inflation as rising costs

[11] See also Bonti et al. (2006).

are passed through or a major decline in the economic growth due to price-driven collapse in consumer demand, provide additional information about the consequences if certain assumptions on the buildup of the scenario do not hold. A probability weighting of the alternative scenarios according to the expectation that the defined scenarios materialize increases the ability of portfolio management to position the credit portfolio accordingly. A complete scenario definition entails a 'story' with trigger events, that are politically or financially motivated, such as an introduction of a capital control by a government or a ban on certain hedging instruments, natural catastrophes or isolated events, i.e. a terrorist attack. Related movements of macroeconomic and other factors are then examined to provide a consistent and full picture of an unfolding adverse development with the impact being felt in a broad range of factors and corresponding market reactions. Knock-on effects rippling through following the initial events such as increased margin and collateral requirements, prudent valuation haircuts because of a market segment drying up, thus accounting for illiquidity, or built-in convexity of CDS hedges are further considerations for an exhaustive scenario. Alternatively, a hypothetical scenario might be defined using historical risk driver and risk relationships and then modified to account for actual developments and connections, thus mitigating the pure backward-looking nature of historical scenarios.

3.2.2 Historical or shock scenarios

While history does not tend to repeat itself, some historical events provide a detailed picture of transmission mechanisms of a singular trigger event onto a whole economy, making it a complete and, by definition, a plausible and realistic scenario. However, the way macroeconomic variables have been affected when the initial shock filtered through was representative for the state of the economy at that time which might have been very different from today's world. A practical example is the oil crisis of the 70's which had significant credit-related effects because of the unexpectedness of the event, whereas today a substantial rise in oil prices would be more of a concern to the economy due to the globalization of trade. The Lehman default and, more recently, the sovereign debt crisis became popular shock scenarios for both credit and market risk. At the same time, the aftermath of the Lehman event demonstrated the shortcoming of a historical scenario: the unprecedented aggregated losses of the financial industry and the related economic downturn exceeded all other historical events by far, meaning that applying pre-Lehman shocks would have substantially underestimated risk from shocks.

3.2.3 Worst-case scenarios

The goal of worst-case scenarios is to provide information on effects which materialize in a most adverse situation, based on expert judgement or quantitative techniques, thereby creating awareness of the magnitude of potential problems. For example, a bank might be interested in how their liquidity would be affected if certain clients – i.e. large corporates or customers in certain sectors or regions like those domiciled in the European periphery – fully draw on their committed credit lines because of concerns of a looming credit crunch. While this assumption may be exaggerated, it nevertheless enables the bank's management to identify the impact of a maximum amount of stress and to set correspondent trigger levels which, once reached, activate counterbalancing measures.

3.2.4 Stress scenario requirements

Stress scenarios, in order to be meaningful and relevant in a strategic context, have to be[12]

- **extreme:** The level of stress should create a meaningful impact which does not underestimate real threats. For example, the economic downturn in 2009 was so severe that barely an economic forecast caught the full magnitude appropriately, thus leaving banks pondering how to plug the holes in their capital resulting from both losses and rapidly rising risk weights of their assets;
- **plausible:** Although extreme, the stress scenario still must be realistic to gain acceptance of a bank's management to serve as a basis for risk-mitigating measures. Ultimately, there is a fine balance between preemptive measures to protect the bank from an unlikely but possible event and the costs attached to it which could put a bank into a competitive disadvantage;
- **consistent:** Consideration of the interconnectedness of stressed variables should be consistent with the model framework but also reflect the economic reality. This allows interpretation of scenario results with intuition gained from experience;
- **specific:** In order to reveal material and sometimes hidden weaknesses of a credit portfolio, the individual portfolio characteristics should be sufficiently recognized. For example, a credit portfolio comprising of loans to private individuals with below-average credit quality might be more severely affected by a significant rise in unemployment as opposed to a financial institution that is primarily engaged in

[12] See also Bonti et al. (2006).

wholesale banking. Thus, a stress scenario needs to adequately incorporate the observed sensitivities of the portfolio and stress those variables which determine the quality of the portfolio.

3.3 Types of stress tests

Stress tests approaches differ in relation to their objectives and frequency. To address the complex nature of interconnected risks,[13] their drivers and relevance for the portfolio of a bank, multiple layers and combinations of stress tests are performed. An overview of (complementary) stress tests is provided by Table 3.1 below.

All approaches should entail qualitative and quantitative elements where larger and more complex organizations focus on the latter as per the principle of proportionality. Common to both larger and smaller institutions is a narrative running through the stress-testing programme that links the risk appetite, business strategy and the impact of the stressed events (internal and external) on the business model as highlighted by the test results.[14]

Table 3.1 Types of stress tests

Type of Stress	Short Description
Sensitivity analysis	Analysis of the impact of a *single stressed factor* on the risk profile of a portfolio
Scenario analysis	Analysis of the impact of a *stressed scenario*, historical or hypothetical, on the risk profile of a portfolio. The scenario addresses all risk drivers relevant to the individual portfolio, as well as interconnectedness and spill-over effects (second and third round effects)
What-if analysis	Analysis of the impact of a specific *hypothesis* related to risk metrics, parameters or developments of the portfolio or parts of the portfolio
Concentration risk analysis	Analysis of the effects of *portfolio concentrations*, by region, industry, single name or asset type, on the portfolio key risk metrics
Reverse stress testing	Simulation of *trigger event* and transmission mechanism causing a predefined significantly adverse outcome

[13] Potential interactions between risks, such as intra- or inter-risk concentrations, have to be explicitly recognized, rather than isolating single risk factors.

[14] See CEBS (2010b).

3.3.1 Sensitivity analysis

A sensitivity analysis is a simplified stress test approach where one factor identified as a key risk driver is stressed to assess the sensitivity of portfolio risk metrics to that factor. It generally starts with the definition of relevant key risk drivers such as macroeconomic, credit risk and financial risk drivers as well as external effects[15] and their changes under stress. Typically, individual risk types, business lines or sub-portfolios are subject to a sensitivity analysis to address questions specifically related to those portfolio segments. If stress tests are performed using a credit portfolio model, a sensitivity analysis considers those macroeconomic variables which are input to the portfolio model. A comparison of credit risk metrics, i.e. PD, EL, EC and RWA, before and after shock reveals how sensitive they are in relation to the stressed variables. Several rounds of tests with a varying degree of severity provide a comprehensive picture of the relationship between stressed factor and outcome on a portfolio. An extension of the sensitivity analysis is the multi-factor approach, which allows assumption of a combination of events. However, unlike a scenario analysis, this type of stress test intentionally ignores the interconnectedness of macroeconomic variables and second or third round effects to determine the relevance of a single factor to the risk profile of a portfolio.

3.3.2 Scenario analysis

A scenario analysis is the most complex type of stress test and should cover all material risks throughout the organization. It is based on forward-looking hypothetical or historical scenarios, although using only historical scenarios proved to be insufficient.[16] Typically, a set of scenarios is defined incorporating various events with an increasing level of severity. Factors that are not directly addressed under the stress scenarios – which usually encompass only a small number of systematic factors – respond to the stress through correlations to the stressed factors. That allows generation of a consistent set of stressed PDs for the total portfolio since the change in PDs depends on the correlation of the individual credit exposure to the stressed factors. A scenario analysis has to

[15] CEBS (2010b) lists interest rates as an example for macroeconomic risk drivers, change in bankruptcy law or shift in PDs for credit risk drivers, increased volatility in financial instrument markets for financial risk drivers and operational risk events, market events, events affecting regional areas or industry sectors for external events.

[16] Shortcomings of historical scenarios relate to the observed magnitude of the shock impact that may be well below effects triggered by an identical event that happens today. Also transmission chains and spillover effects may differ substantially due to the globalized nature of the modern world economy.

consider the *risk types* that are most relevant for the institution, the institution's predominant *risk factors* and the individual, institution-specific vulnerabilities, in particular intra and inter-risk concentrations.[17]

3.3.3 What-if analysis

In some cases a stress scenario is defined by events channelling through special macroeconomic factors which are not encompassed by the credit portfolio model, the specification of which usually recognizes only broader systemic factors. Stress assumptions are then applied directly to certain parameters such as PDs, LGDs or EAD, either on the whole portfolio or portfolio segments to isolate effects on sub-portfolio level which are then focused on as part of the scenario. For example, a multi-factor credit portfolio model may take into account major macroeconomic variables which describe the general state of the economy but only few risk drivers that are relevant for the performance of specific sectors. For instance, the credit portfolio of a typical German bank may be representative of the dominant automotive industry in Germany. As experienced in 2009, the decline in global economic growth severely affected the demand for both new and used cars, leading to significant stress in that particular sector and mitigated only by political initiatives which provided incentives to buy new cars in form of a scrappage bonus. However, in order to isolate the effect of a collapse in the automotive output from that of a global recession, i.e to model the hypothesis of saturated markets or shifts in consumer preferences, risk measures of that portfolio subset are directly adjusted. This can be done by a significant increase in obligor PDs and EAD, reflecting both the deteriorated operating profit as well as the additional refinancing needs of the borrowers concerned. A decrease of the LGD corresponds to lower valuations of assets of automotive producers and their suppliers. A what-if analysis also complements a scenario analysis based stress test where certain portfolio or asset characteristics or discretionary actions are not fully addressed by the portfolio model specification. Examples include the agreement of investors to accept haircuts on their Greek government bond holdings[18] or losses related to mortgages denominated in Swiss franc imposed to banks by the Hungarian government.[19] In those cases, losses can be directly simulated by adjustments of the credit risk measures concerned.

---

[17] See CEBS (2010b). Institution-specific vulnerabilities include regional and sectoral portfolio characteristics as well as specific product or business line exposures or funding policies.

[18] As a result of the Private Sector Initiative (PSI), holders of Greek government bonds issued under Greek domestic law agreed in 2012 to a cut of the bond principal.

[19] In 2011, Hungary allowed its citizens to repay Swiss franc denominated mortgages in a lump sum and an exchange rate which was substantially below the actual rate, with the resulting loss to be taken by the lending banks.

3.3.4 Concentration risk analysis

Risk concentrations in a bank's credit portfolio are a key source of concern and determine the level of credit risk capital. A credit portfolio may exhibit concentrations in countries or regions, industries, single names or credit products or due to high correlation among those factors. Since the Basel II approach does not cover risk concentration in its assessment of regulatory capital based on risk weighting of assets, regulators strongly emphasize the importance of internal or economic capital to the setting of a bank's risk appetite. Stress tests on portfolio concentrations aim at verifying the consistency of the portfolio concentration characteristics under stress to the stated risk tolerance but also at identifying hidden sources of portfolio weaknesses due to material risk concentrations. In a complete setting and because of the interconnectedness of risks, concentration risk stress test should cover risks across the different booking locations and risk types. However, since credit risks are typically the predominant source of risks for most banks, a stress test on credit risk may already provide valuable insights on inherent vulnerabilities and reveal undesired sensitivities of the credit portfolio to a macroeconomic downturn or other sources of stress.

Concentration risks are either stressed by measuring the impact of a stress scenario on key portfolio metrics or by imposing worst-case assumptions directly on selected risk measures with the stressed outcome then observed on a portfolio level. The aggregation of risks and corresponding losses serves as a basis for evaluating specific corrective managerial actions.

3.3.4.1 Single name concentration risk stress test

Single name concentrations arising from a deteriorating risk profile of a portfolio are usually stressed within the scenario analysis. However, the prevailing obligor concentration can become significantly more severe when those clients decide to raise the amount drawn under the committed lines to counter a looming credit crunch or as a general preemptive measure. This assumption can be applied to borrowers domiciled in certain regions which are affected the most, i.e. the European periphery at the time of the sovereign debt crisis or to corporates operating in industries that exhibit structural weaknesses or downturns. A worst-case scenario would entail all large and bulk risk relevant obligors drawing up to the granted amounts. While this could serve as a benchmark measure to put other stress test assumptions and results into perspective, it misses on the condition for stress tests being plausible and realistic. The effect on capital in this particular test is more pronounced for the economic capital as a consequence of the rising level of portfolio

concentration as opposed to the regulatory capital, which is impacted by the increase of RWA only. A rise in amounts drawn under commitments is consistent with deteriorating PDs from a scenario analysis based stress test and reveals a hidden portfolio vulnerability from concentration. To move the stress a little further, the scenario may incorporate the default of one or more of the largest customer groups. In this case, the bank's capital position is affected not only by the amount of additional loan losses, thereby reducing the total capital and capital ratios, it also suffers from a meaningful loss of current and future client revenues which, because of the default of the customers, will no longer materialize as assumed.

3.3.4.2 Sector concentration risk stress test

Although the sensitivity of obligors to systemic risks varies, in general the majority of them are exposed to the economic conditions prevailing in their respective industries or regions. When a stress test on sector concentration is being conducted by applying economic stress on a credit portfolio, stressed economic variables should be representative of or have a direct link to those areas which should be tested, such as countries or industries. A scenario to stress regional or industry concentration risk assumes a severe increase of risk in that particular area. Other factors that are not directly stressed respond via the specified dependence structure of the model. The advantage of this approach compared to a simple aggregation of exposures by sector is that risk concentrations also become visible through the correlation structure.[20]

3.3.5 Reverse stress testing

Reverse stress tests aim at identifying causes and scenarios which ultimately result in a predefined outcome, typically the failure of the firm or, less extreme, a breach of specific triggers such as maximum loan losses or minimum capital ratios. Trigger levels are set to reflect that in case the thresholds are breached, a bank may be no longer in a position to perform its regular operations which may be well in advance of undercutting the regulatory capital minimum requirement. At this point, a combination of risks such as credit, market and liquidity risk may respond simultaneously to the situation, eventually blocking the bank from tapping the capital markets for funds or capital. In general, a range of simulations is performed since various reasons or constellations can ultimately result in the insolvency of a bank or the breach of a predefined trigger level which would impose a significant restriction on the maneuverability of

[20] See Bonti et al. (2006).

the institution. Those events which are sufficiently adverse to the capital of a bank are assessed by their likelyhood to materialize. Risks or flaws within business lines or concentrated sub-portfolios resulting in losses that are inconsistent with the bank's risk tolerance are analyzed in order to identify plausible and *economically relevant* scenarios or shocks that are able to generate those impacts. Reverse stress tests can be either qualitative or quantitative, depending on the aspirations and complexity of the financial institution. However, while regulators point out the importance of reverse stress tests to identify weaknesses in the business operations, they may be used for monitoring and contingency planning purposes but are not expected to be considered in context of capital planning or for capital buffers.[21]

3.4 Stress test information and subsequent mitigation

Stress test results provide managerial value when presented in an understandable format, with a clear description of the scenario, including the rationale for the formulation of the scenario, the impact on the portfolio and its key metrics and finally the conclusion-based actions to be taken. The responsibility of the management for the stress test program of a

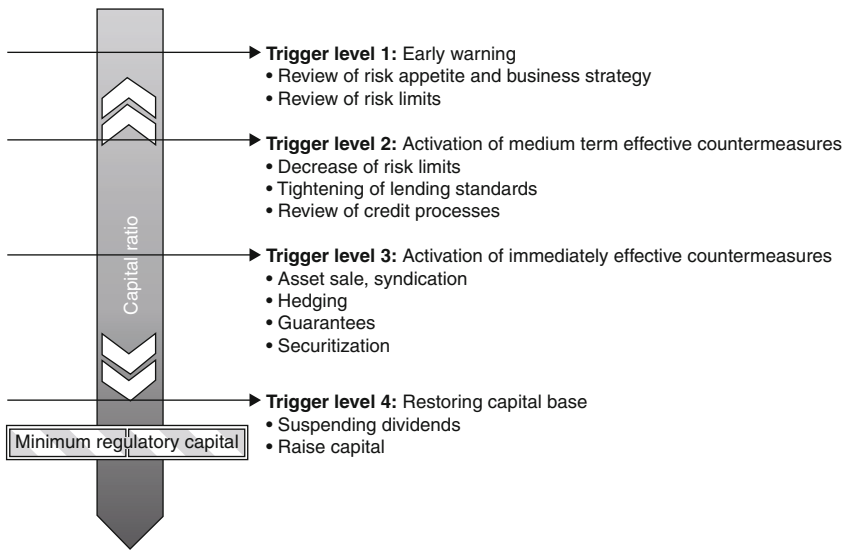


Figure 3.1 Stylized cascading approach of pre-defined trigger levels and corresponding risk-mitigating measures to counter a decline of the capital ratio

[21] See CEBS (2010b).

bank includes the ability to understand the impact of stress events on the bank's firm-wide risk profile and, based on that, to take appropriate actions to assure the ongoing solvency.[22] As required by their supervisors, banks have to demonstrate their ability to maintain sound capital ratios even under adverse circumstances, thus to develop contingency plans in case regular actions prove to be insufficient and to take mitigating actions to ensure the survival of the organization for an extreme but plausible scenario. Contingency plans entail a set of counterbalancing measures, incorporating a description of the type and timing of the actions as well as an assessment of the feasibility of those measures under stress. A waterfall approach cascades considerable mitigations as follows:

- revision of risk appetite, strategy and business plan, closing business lines or regions where necessary
- de-risking actions which take effect medium term, i.e. a review of the credit process, a tightening of lending criteria and adjustments to risk limits
- de-risking actions unfolding their impact immediately such as hedging, selling and securitizing assets
- capital restoring actions, i.e. capital increase or halt in capital outflow, i.e. eliminating dividends.

The stress test framework includes the management's responsibility to agree on intervention and mitigation and to question whether the assumptions underlying the mitigations are realistic.

3.5 Conclusion

Stress tests are a useful and necessary tool in risk and business management. As such, they are embedded in capital adequacy assessment and business and capital planning as well as in the determination of the risk appetite of the institution. Governed by top management and their active involvement, stress tests emerged from a regulatory box-ticking exercise to a business and risk management connecting instrument where views and thoughts on economic outlooks and scenarios are actively shared and controversially discussed. Although details such as modelling assumptions, incorporated correlations, model and infrastructure limitations play a major role for the stress test outcome, the awareness of the management body and senior management is often fully taken by the scenario

[22] See CEBS (2010b).

selection and the outcome itself. Stress test committees are the right place to address those limitations but also the design and implications of the stress-testing program in general. This is of particular importance because when business and strategic decisions take into consideration stress test results, the shortfalls of stress tests must likewise become part of the decision.

Part II

Credit Portfolio Management in Practice

The development of credit portfolio management is largely reflective of the change of the traditional banking to a more active, value-oriented approach, driven by a combination of economic and regulatory forces. Since for most banks credit risk consumes a dominant part of economic and regulatory capital, it comes as no surprise that efforts of both financial institutions and regulators focus on management of credit risky assets. Regulators expect financial institutions to provide evidence of an adequate steering and management of their portfolios of credit risks, which includes a regular and frequently updated overview of portfolio characteristics and dynamics. Emphasis must be placed on the analysis of consistency of portfolio developments with the approved strategy with respect to relevant credit risk parameters. Furthermore, banks are requested to perform an analysis, taking into account stress test results, to define trigger levels which initiate the execution of action and contingency plans that detail conceivable active and organic measures to change the portfolio characteristics and trends, in order to regain a sufficiently sound and sustainable credit portfolio. The focus of regulators is on risk containment, that is, controlling risk and avoiding tenuous losses. Stakeholder interests, in particular those of bondholders, are geared to preserving the value of investments while shareholders additionally expect an optimization of the return on equity. Both require an active approach to portfolio management in order to create value. The board of a financial institution and the senior management have a common interest in effectively managing and communicating the level of credit portfolio risk because of its direct implications on funding costs and equity valuation. Perceived weaknesses in a bank's credit portfolio may ultimately result in higher funding costs, which in turn can make business with better rated clients unfeasible, thereby forcing the bank into investments at the lower end of the rating scale to maintain its market position. Because of the

costs of this vicious circle, a business model may become unsustainable. The objective of active credit portfolio management is therefore to optimize the risk/return balance and economic capital of the bank's credit portfolio and to support the business model that complies with the firm's risk appetite. In this part, we discuss the evolution of active credit portfolio management business models, and outline the objectives which are decisive for its set-up as well as a full credit cycle value proposition. Since portfolio manager activities effectively connect different segments of debt capital markets, a description of convergence of bank debt to other debt securities follows. Loan transfer prices which serve as a market price based loan valuation and profitability measure of a lending relationship are explained. Organizational aspects more often than not contribute to the success of a portfolio management unit. Key considerations are highlighted with emphasis being put on defining the mandate. Valuing loans in line with CDS and bond spreads is also at the core of solutions to solve the accounting asymmetry arising from credit derivatives measured at fair value and loans carried at costs. An in-depth discussion of the alternatives to mitigate the CDS hedging induced volatility in financial results covers Hedge Accounting for Credit Risk, Fair Value Option and Financial Guarantees. Part II concludes with an overview of regulatory capital relief achieved through credit risk transfer which is a primary motivation for financial institutions to engage in hedging.

4

Evolution of Portfolio Management Business Models

Credit portfolio management consists of a variety of activities, many of which are more passive like portfolio risk modelling, measuring, reporting and monitoring. The business models of credit portfolio management can be described according to the activities performed and the level of sophistication and autonomy. The contribution of a **'risk controlle**r' is to provide intelligence on portfolio key risk measures and developments as well as on the usage of limits. Setting portfolio risk limits and developing risk strategies for performing loans are responsibilities of the **'risk protector'.** The focus here is on risk reduction or risk containment rather then risk/return optimization. The **'risk optimizer'** defines a target portfolio and optimizes growth based on risk adjusted returns. Stress tests are performed to confirm the feasibility of developed strategies and to discover hidden vulnerabilities of the portfolio and strategy. Until this point, all portfolio management measures target the new flow of business, which includes asset origination as well as refinancing of existing stock due to repayments, amortizations and prepayments. In contrast, the **'value creator'** or **Active Credit Portfolio Management (ACPM)** can be defined as actively reshaping and changing the risk-return profile of a given portfolio of credit risk to achieve an improvement in key portfolio measures such as Value at Risk (VaR) or Conditional Value at Risk (CVaR) to the level that is consistent with the loss tolerance of the respective financial institution.

The evolution of an active approach to credit portfolio management mirrors the impressive growth of credit markets since the 1980's. It received another boost when tradeable debt products, sophisticated debt packaging and risk transfer techniques emerged. New quantitative models, combined with – until recently – a hugely increased liquidity in credit markets, enabled loan portfolio managers to reshape almost any given portfolio to a target risk profile at minimal transaction costs like an asset manager. For many financial institutions, especially for those with

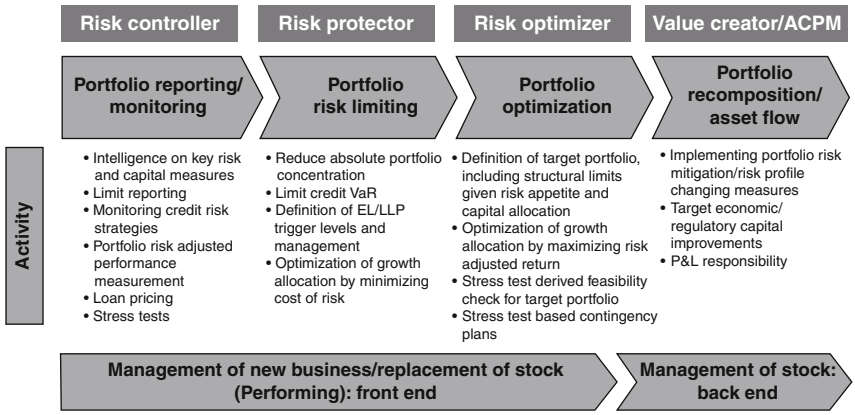


Figure 4.1 Business models of credit portfolio management

investment banking aspirations, the development from a '**buy-and-hold**' model into '**originate-to-distribute**', where assets do not remain on balance sheet or a least the credit risks attached to them get neutralized, is synonymous with the creation of active credit portfolio management. However, since the spectrum of credit assets composes of a diverse range of loan products with different risk and cash flow profiles as well as specific funding requirements and presence of secondary markets, there are numerous approaches and models for managing credit assets, sometimes even within one organization. With secondary market liquidity for loans, bonds, CLOs and credit derivatives as the criteria for segmenting assets into a liquid, less liquid and illiquid category, the dividing line is often blurred. Liquidity of debt capital markets tends to suddenly disappear in times of market volatility, which could unexpectedly limit the flexibility of portfolio managers and thus hamper the portfolio management model of choice. Consequently, a clearly formulated mandate, shared targets and senior management governance proved to be a condition for a successful and stable credit portfolio management operation, especially during the financial crisis. Furthermore, a consistent loan pricing concept prevents internal arbitrage, where assets are directed to those books with the most beneficial pricing scheme from the point of view of the client relationship manager who gets charged with the transfer price.

Besides the selection of the best fitting portfolio management model, the real challenge lies in implementing the corresponding organizational structures, policies and processes and then maintaining the approach through the different phases of the credit cycle. This chapter is organized into four parts. First, it describes the factors to be considered when designing the ACPM model. The model of choice is determined to a

certain extent by the type of assets under management, which will be described in the chapter covering the connectivity of loans, bonds and CDSs. An in-depth analysis of the important role of the transfer price for an enhancement of origination discipline and transparency in profitability follows. The chapter closes with a review of organizational and infrastructure aspects, implementation issues and a case study for an implementation of ACPM at a fictive wholesale bank.

4.1 From credit advisory to active credit portfolio management

It's fair to say that no major financial institution can claim to be well equipped to weather financial storms without having some kind of credit portfolio management in place. At the same time, the overwhelming emphasis observed at the time of advent of ACPM, both at banks and consultant firms, may for some look exaggerated these days. One could argue that neither did ACPM fully prevent their banks from the impact of the downturn nor do today's market conditions for risk distribution allow ACPM to exploit its full value. However, a closer look at the performance of banks reveals that in particular those that managed their assets in a more sophisticated way have been hit less by the crisis. Also, in many cases portfolio management focussed largely on corporate loans for which a meaningful secondary market activity existed. Losses, however, stemmed predominantly from credit assets that were traditionally outside the scope of ACPM. The conclusion is twofold. First, the concept of ACPM has proved to work under extreme conditions. Second, an extension of ACPM to other, less liquid assets can improve the resilience of financial institutions in times of market stress. Given the series of once-in-a-lifetime events which have plagued financial markets since the start of the century, the importance of an active approach to credit risk management – rather then a credit advisory function only – actually may have never been higher.

Nevertheless, the challenging environment in which banks operate calls for fundamental adjustments to the role of ACPM. The scarcity of capital and liquidity, the repricing of credit risk in general, as well as the languishing market for asset securitization necessitate a new way of thinking. The subprime crisis also uncovered the inherent moral hazard aspect of the originate-to-distribute model. Essentially, if originators do not have to be afraid of any repercussions of insufficient credit standards and low quality loan origination, there is no shared goal with the ultimate investor of these assets. To find a balanced approach serving best the individual needs of the institution and its stakeholders, a number of

strategic issues have to be fixed. The appropriate level of risk that a bank should target and respect, the risk appetite, aligned with business objectives and incentive schemes for managers,[1] provides the framework in which portfolio managers can act. The bank's mission and strategy, its risk culture as well as the market environment, are key determinants of success for the credit portfolio management unit, which in turn must be visible and authorized to perform its defined role within the organization. Generally, two categories of credit portfolio management models can be observed: those that aim to be highly effective or those that intend to cover the portfolio to the largest extent possible. Effectiveness comes with a higher degree of specialization, with a focus on fewer assets that are more liquid and marketable, such as multinational and large corporate loans or certain LBO transactions. Here, pricing, market timing and time to market matter the most. In contrast, a holistic approach covering the full range of diverse credit assets on a bank's balance sheets calls for a longer-term-oriented solution and is less driven by secondary market conditions but by appropriate lending standards. The two approaches models usually find their expression in the location of the portfolio management unit within the organization. For about half of 49 international banks, the CPM unit resides within a business line, whereas for the others CPM is part of a finance or risk function.[2] Being part of a business line naturally limits the scope of portfolio management to those assets owned by the respective line. On the other hand, asset ownership and profit and loss responsibility typically make for stronger and more active CPMs, whereas the focus of CPMs at risk or finance is more on risk reduction and capital management rather then risk/return optimization. As a result, there is no one-size-fits- all model which is appropriate to each and any bank, given the individual balance sheet composition and ambitions of financial institutions. What is common to all concepts, however, is the necessity for an intensified and target-oriented, sometimes less technical, communication between senior management, portfolio and risk managers. But also within the credit chain, which involves loan origination, credit analysts, loan officers, portfolio managers, quants, traders and syndication, a common language and understanding of the mission is the key to letting portfolio management become a strategic advantage.

Consequently, the starting point for designing the ideal ACPM is to identify the key objectives, which can be grouped into six areas of value

[1] By incentive schemes, we mean not just monetary compensation and awards but more generally the key performance indicators and motivation of managers, which are determined by high level goals and serve as a key driver for consistent execution and success.

[2] See Stegemann and Jamin (2008).

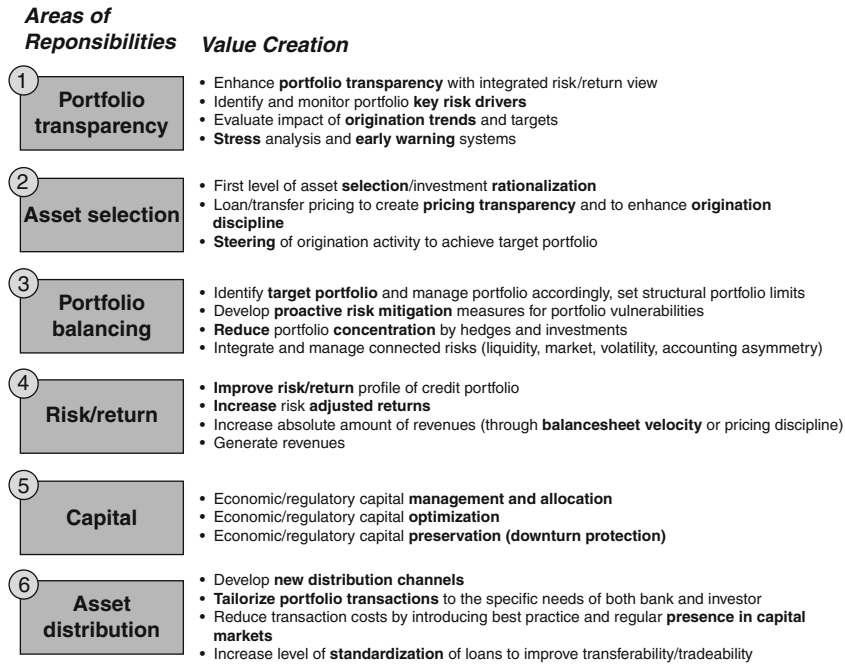


Figure 4.2 Portfolio management value creation levers

creation levers. Enhancement of portfolio transparency on aggregated and granular level for a 'deep dive', close monitoring of origination and portfolio trends as well as stress analysis and early warning systems are base objectives. A necessary improvement in that respect has often been cited as a lesson learnt from the financial crisis.[3] Asset selection based on proper risk assessment, pricing and profitability considerations as well as portfolio aspects is another value creation lever and is often subject to dedicated investment committees. Improving origination discipline to achieve satisfactory loan margins and to identify the gap to internal hurdle rates or risk transfer costs, which must be filled by revenues from ancillary business, requires a methodologically sound and accepted loan pricing scheme. (Re-)balancing of the credit portfolio by setting structural limits (see also Risk Limits: Framing the Credit Risk Strategy), which aims at reduction of economic capital and portfolio vulnerability, is a standard task for most portfolio managers on the risk management side. Hedging operations or other risk mitigating measures to mitigate concentration and counterparty or issuer risks require more advanced

[3] For example, see Schuh (2009).

portfolio management operations and usually reside with the business units. Corresponding to regular and frequent risk transfer, loans must be priced in line with market conditions. Value-adding credit portfolio management targets an improvement in the risk/return characteristics of the credit portfolio via specific front-end and back-end measures. Front end describes the asset selection process, which begins with the client relationship management and ends with the credit approval decision. Client managers and loan officers who apply credit standards to route through or sort out new business are the first line of defence against risks that do not comply with the financing principles or lending standards. Back-end management, however, denotes measures that change the composition of an existing portfolio by way of risk transfer. All these activities have a significant influence on the competitiveness and success of financial institutions. An empirical analysis confirmed that financial institutions that follow a specialized lending strategy combined with back-end portfolio diversification activities can enhance the shareholder value or maximize risk adjusted return on (economic) capital.[4] Disadvantages resulting from a higher level of specialization, i.e. a portfolio exhibiting concentration risks in the form of regional, industry, client or credit products exposure, can be offset when actively managed while preserving the competitive advantages of a price setter or know-how leader – provided sufficient risk distribution capabilities exist to regain a superior portfolio diversification. These efforts also help to protect or optimize the capital position which has been the primary objective when banks suffered from serious losses during the financial crisis. The shortage of capital in the financial industry has been singled out and addressed by the recommendation on the bank recapitalization plan as published by the European Banking Authority (EBA)[5], adding to the prevalent pressure on banks. Capital optimization is seen as one of the most important value propositions of credit portfolio management units as they are in a unique position to offer an integrated view on risk weighted assets and their drivers. Regular and frequent distribution of risks requires access to relevant capital markets, processes and regulations for products concerned, as well as the expertise to cope with tailorized and complex risk transfer transactions. Developing these distribution channels, thereby building on best practice and regular presence in debt capital markets, is another value creation lever for credit portfolio

[4] Gann and Hofmann (2005).

[5] See www.eba.europe.eu. The 2011 EU Capital Exercise performed by EBA recommended to require banks to build up an exceptional and temporary capital buffer to reach a core Tier 1 capital ratio of 9%. Banks were asked to respond to the recommendation by submitting plans for achieving the target capital rations by January 2012 and to meet the requirement by June 2012.

management. These back-end portfolio reshaping and capital releasing activities often make the difference between active and passive management of a credit portfolio in the relevant literature, which promotes consistent and regular risk transfer. However, in this book, the term 'active' is descriptive of any activities which intentionally optimize the risk-return characteristics of a credit portfolio. By definition, this includes front end measures for asset origination, which is complemented by capital market driven risk mitigation.

The main credit portfolio management objectives naturally differ in relation to the business model of the respective financial institution. Investment banks are usually more sensitive to capital consumption from corporate loans and consequently most active in distributing credit assets into the market. The capital, once freed up, is then again available for new business. The repeated usage of capital allows for increasing non-loan revenues and achieving a comparably higher return on equity. The ability to turn over the balance sheet or the velocity of capital is a major determinant of the future profitability of investment banks and wholesale banks alike. Wholesale banks generally use their large balance sheets to achieve a dominant position with the client, thereby gaining fee income and improving the loan to non-loan revenues ratio. Since risk reduction or distribution is mostly seen as unfavourable or even harmful to the client relationship in case a client becomes aware of it, active credit portfolio management has to develop risk mitigation concepts which have no detrimental effect on the clients' perception of the bank. Unfortunately, the credit product of choice to manage credit risks, the credit default swap (CDS), introduces market risks because CDS have to be measured at fair value according to IAS 39. Many financial institutions are less comfortable with taking market risks as opposed to credit risks, which are seen generally as the bread and butter business for commercial banks. Finding appropriate solutions to balance hedging-induced market risks can be a key decision factor for the implementation of an active credit portfolio management unit. Those banks that actively hedge their credit portfolios use CDS spreads as a measure for opportunity costs to enhance loan origination pricing transparency or even as a pricing source for fair valuing loans. The focus on origination discipline is just a natural consequence of hedging as loan margins are often below CDS spreads and other market-based risk prices. Client profitability assessment is generally one of the main activities for CPMs of wholesale banks. For regionally active or specialized lenders, ACPM can help here to reduce the portfolio bias to certain regions or industries. Since bilateral credit is characterized by a low level of standardization, ACPM improves the process efficiency for traditional credit risk mitigations such as sub-participations, guarantees or collateral by standardizing and bundling the loan structuring

and documentation. This is particularly relevant for client-focussed banks, which have a reasonable comparative advantage in mitigating information asymmetries between lender and borrower, given the close relationship to their clients. Specialization benefits, resulting from better client information to overcome the problem of adverse selection, as well as qualified assessment of collateral value, advanced workout processes and timely anticipation of negative credit trends due to superior market insights, are counterbalanced by concentration effects.[6] Thus, preserving the advantages of specialization while mitigating the increase in risks from regional, industry or collateral concentration ultimately enhances the risk-adjusted return of financial institutions.

4.2 A full cycle approach to credit portfolio management

In economic theory, business cycles are defined by the degree of utilization of the production potential of an economy, mostly represented by changes in GDP as the most aggregated output measure. Cycles are characterized by a similar and recurring wave-like pattern, although these vary substantially by length and depth. Financial markets, both stock

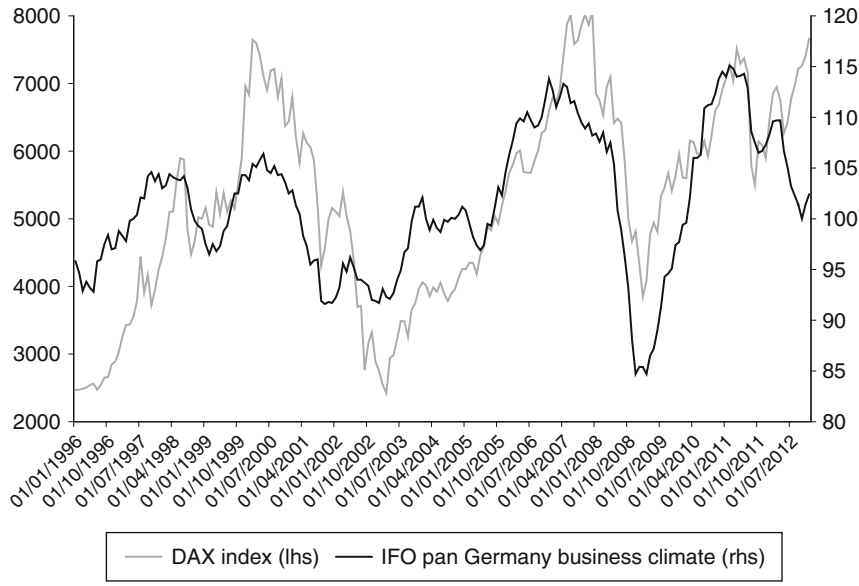


Figure 4.3 Dax index and IFO pan Germany business climate
Data source: Bloomberg.

[6] See Böve, Düllmann and Pfingsten (2010).

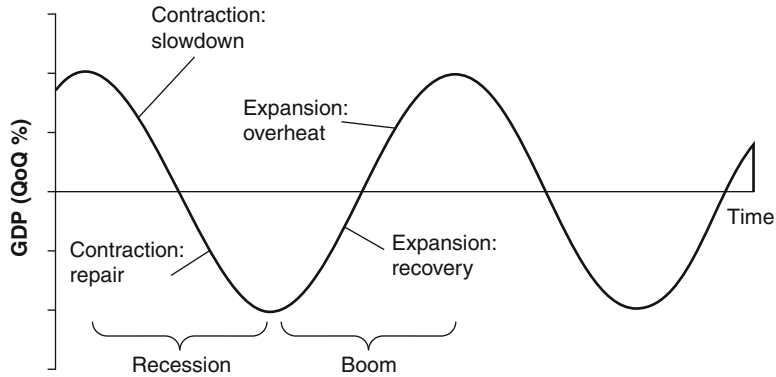


Figure 4.4 The four phases of the business cycle

and debt, respond to the economic cycles and are generally perceived as anticipating the trends rather then following.

Consequently, a well positioned portfolio management needs to be prepared to refocus its activities to the specific credit environment and requirements of these different phases. A stylized graphical representation charts the boom phase as positive GDP growth while a recession indicates negative GDP growth. Two consecutive quarters of real GDP decline is often referred to as the beginning of a recession. Other variables used for assessing economic cycles include gross domestic income, employment, various output measures and consumer spending.

The National Bureau of Economic Research (NBER), which officially reports U.S. business cycles,[7] defines recessions or contractions as starting at the peak of the cycle and ending at the trough. Out of 11 cycles since 1945, NBER identified three business cycles (contraction, peak to trough) for the more recent history: from July 1990 to March 1991, from March 2001 to November 2001 and from December 2007 to June 2009.

Various four-quadrant schemes monitor the developments of economic activity in relation to business and consumer survey based assessments of current economic climate and outlook, among which are the European Business Cycle Clock of Eurostat,[8] the OECD Business Cycle Clock[9] and the German Federal Statistical Office.[10] Because business cycle clocks not

[7] For reference please see: http://www.nber.org/cycles.html.
[8] See http://epp.eurostat.ec.europa.eu/cache/BCC2/group1/xdis_en.html.
[9] See http://stats.oecd.org/mei/bcc/default.html.
[10] See http://www.destatis.de.

only provide an intuitive visualization of recent and historical economic trends but also give some hints to potential future developments, they receive a fair deal of attention from the financial industry. For Germany, a significant correlation between business expectations and climate, displayed by the *Ifo Business Cycle Clock*, and economic activity, described by the *Monitor for Real GDP* by the German Federal Statistical Office has been proved.[11]

The recurring pattern of the economic cycles has led to the invention of simple but useful methodologies for cycle-sensitive asset allocation. Research analysts from Morgan Stanley, Merrill Lynch and Citigroup among others are using investment clocks which suggest portfolio positioning relative to the phases of an economic cycle. Coordinates are either leverage versus GDP growth or corporate profits versus debt.

However, credit markets do not tend to correspond in similar ways to recessions or slowdown in economic activity. Despite the eight months of contraction in 2001, which were caused by the burst of the dot-com bubble, credit spreads were largely stable with the exception of a major widening for a shorter period of time that can be attributed to the 9/11 terrorist attacks. A substantial widening only occurred in 2002 when stocks retreated, reflecting concerns about the brewing Iraq conflict, which also depressed economic growth later. In both cases, markets anticipated the economic slowdown-induced deterioration of average borrower

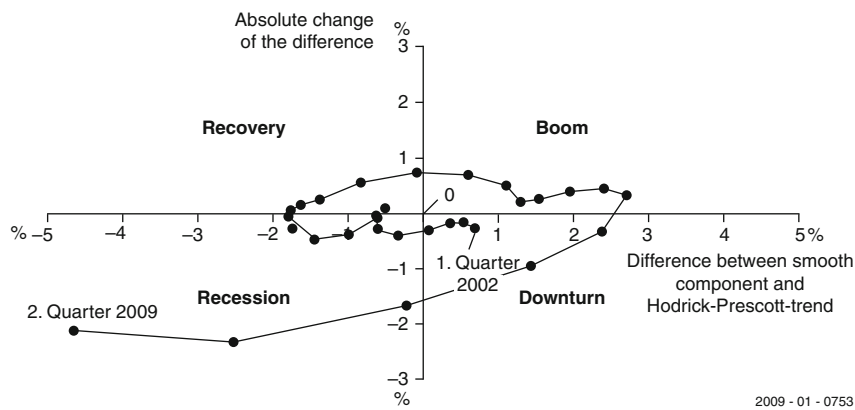


Figure 4.5 Monitor for real gross domestic product, Germany
Source: Oltmanns (2009).[12]

[11] See Abberger and Nierhaus (2010).

[12] (c) Statistisches Bundesamt, Wiesbaden. Dr. Erich Oltmanns: 'Das Bruttoinlandsprodukt im Konjunkturzyklus', in Wirtschaft und Statistik, 61. Jahrgang, Heft 10/2009, page 963 ff., here: page 968.

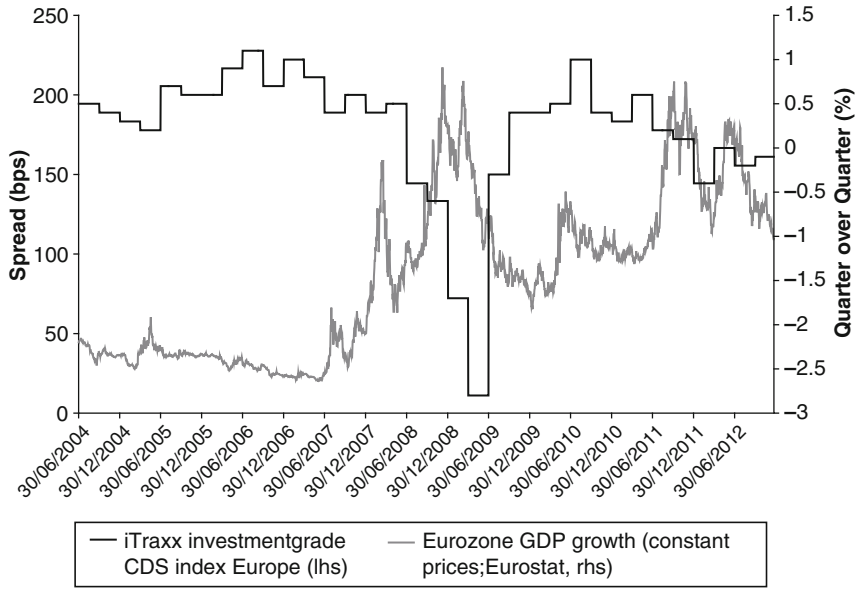


Figure 4.6 Credit spreads versus Eurozone GDP growth
Data source: Bloomberg.

credit quality with an increase in credit risk premium well before the economic downturn, while during the slowdown itself spreads were stable or even tightened. Prior to the most recent 18-month economic slump, which, according to NBER, started in December 2007, spreads widened again from a record tight of around 20 bps for iTraxx to 65 bps which was massive at that time. Spreads reversed the widening in late 2007 but then corporate and bank bonds plunged together with stocks when the housing and subprime bubble collapsed, further accelerated by the default of Lehman and bailout of Bear Stearns, Merrill Lynch and Bank of America. Both in 2001 and 2008 the accumulation of stress, either because of the impact propensity of global interconnectedness or due to idiosyncratic events, underscored the value of tail risk protection.

Certainly, the phases of the cycle cannot be easily forecast nor can the implications for corporate credit quality and credit spreads. Nevertheless, supported by cycle monitoring, proactive credit portfolio management should be able to chart the corresponding activities to the phases of a cycle and determine trigger points for timely portfolio positioning and pre-emptive measures.

A counter cyclical credit portfolio management builds up downside and tail-risk protection already in the **overheat phase** when also fostering

origination discipline is necessary to offset a weakening in lending standards. Rigorous asset pricing, based on risk transfer costs, increases transparency in risk-adjusted profitability of lending. During the **slowdown phase**, portfolio de-risking can be supported by an improved asset standardization to broaden the channel for risk transfer. Consequent capital markets information enhances transparency to build a stable investor base. The **repair phase** often corresponds to a decline in capital ratios, which results in capital relief and optimization initiatives. ACPM contributes here by balance-sheet management and capital optimization efforts. In the **recovery phase**, with an improvement in risk and return, the focus shifts to increasing the velocity of the balance sheet in order to further boost profits to cost of equity.

A full cycle active credit portfolio management concept highlights the advantage of a continuous focus adjustment for ACPM activities and, equally important, consistency within the intention of measures. This is in particular notable as the different objectives exhibit time effects, with some measures lagging others. For example, since credit spreads already regularly anticipate economic downturns and rise during the expansion phase, hedges usually may have become too expensive in relation to expected losses when borrower credit quality deteriorates in the downturn phase. On the other hand, when the business cycle enters into

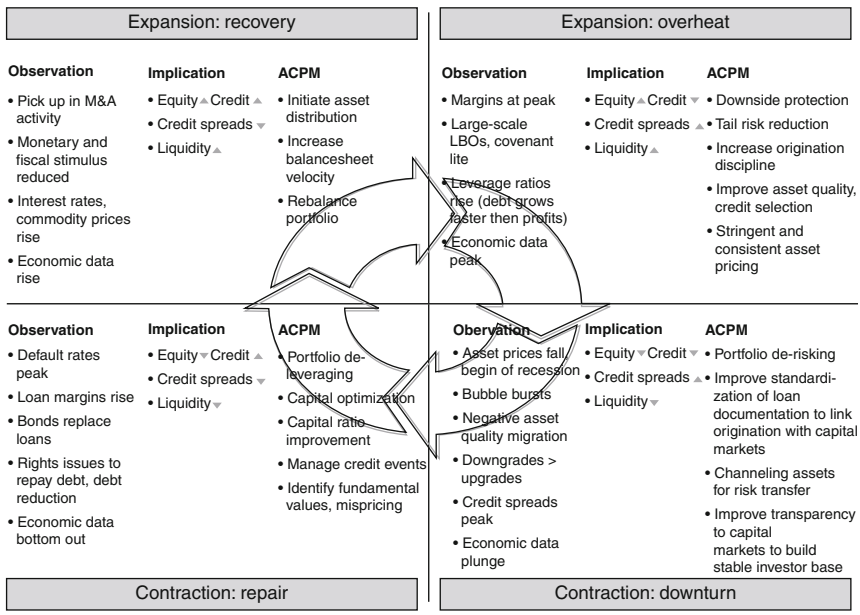


Figure 4.7 Full cycle approach to credit portfolio management

the downturn and repair phase, the related de-leveraging and de-risking initiatives often prevent closing hedges because of their contribution to capital release and loss protection with the ramification of giving up earlier mark-to-market gains from hedges when spreads tighten again. CDS hedges are quite often hugely mark-to-market positive before internal and external ratings start to deteriorate with subsequent loan loss provisioning. The diverging timing of loss compensation due to rising spreads from hedges booked in the trading profit and loss account and potential loan losses from a credit event at the hedged borrower at a later point in time requires continuous review of the hedge strategy. The review needs to be clear about the prime objective of the hedge which could be profit and loss maximization, net credit loss minimization, avoiding loan loss provisions and capital conservation, among others. Profit and loss maximization is different from net credit loss minimization in that at the time of a credit event, buying the cheapest CDS deliverable, delivering it into the CDS and receiving par from the hedge often overcompensates losses from a loan of the same borrower but leaves the bank with the unprotected loan on the balance sheet. While from a pure economic point of view this procedure is optimal, it could foil the strategy of the workout department which might consider CDS hedges as part of their negotiations with other banks or the borrower in a restructuring. Clear guidance on priorities is a prerequisite to achieving the best results, not only from CDS hedges. Since there are alternatives to transfer risk and optimize capital and timing matters for most of them, ACPM should offer advise on potential risk mitigating measures and their correspondent strategy throughout the different phases of the business cycle and the lifetime of the underlying transactions. This includes the purpose and goals of the risk management measures, the development of exit strategies and definition of decision making and procedural roles, i.e. the right to call in new risk mitigants like hedges and the veto rights when it comes to unwinding them.

4.3 Bridging distinct worlds: loans, bonds and credit derivatives

The changing environment in which financial institutions operate has deep implications for traditional, client-relationship-driven banking. The availability of cheap central bank funding, which has become a common worldwide response to economic and financial stress, has tremendously increased the competition among banks on the one hand, but also between banks and markets on the other. Financial disintermediation is gathering pace and will further accelerate the integration of banks and financial markets. In the hunt for yield, third party investors – which

include pension and mutual funds, hedge funds, insurance companies and private investors to name but a few – turn to markets to source assets. These investors depend on loans originated and distributed by banks and debt securities directly issued by the individual borrowers to achieve their target asset allocation. The rapid growth of corporate bond issuance, the emergence of electronic trading platforms where those debt securities are frequently quoted and traded, as well as derivatives used to insure and distribute credit risks, have transformed the once separated markets with observable spillover effects on pricing. For banks, synergies exist due to the complementary nature of lending and capital markets underwriting. When bank loans compete with corporate bond or equity issuance, a bank specializing in investment banking ultimately benefits from additional revenues sourced from client advisory on capital structure, rating and debt issuance. The scarcity of bank capital may actually result in banks *guiding* rather then *losing* borrowers to the market. Active credit portfolio management contributes to the trend of converging loan and bond markets since it amends the lending function, which consists of originating, servicing and managing credit assets, by risk distribution, thereby connecting otherwise distinct markets. Credit risk processing to capital markets increases interdisciplinary price transparency, which allows directly comparison of the costs of different funding alternatives to borrowers.

4.3.1 Asymmetric information in bank loans

Banks are better suited for lending as they can minimize the problem of asymmetric information and moral hazard between borrower and lender. According to the theory of financial intermediation, two types of mistakes arise from lending with imperfect information: declining good borrowers or approving bad borrowers. Because of their closeness to customers, in particular in case of relationship-driven lending, banks are expected to have better information about their clients. Thus, the problem of information asymmetry can be reduced if banks gain access to higher quality and more timely financial data as well as to soft, that is non-quantitative, information. Lower loan losses compensate for the costs of sourcing and screening additional information and subsequent monitoring, the so-called agency costs. Furthermore, higher returns can be generated when banks have superior information as financiers gain a better understanding of the client's needs and thus are able to deliver tailored funding solutions which further tie the client to the bank. Relationship banking contrasts with pure transaction banking, where no such close relationship exists because of intense client or price competition or because of the transactional focus of the customer business. At the other extreme, a bank securing an information monopoly may

improve the loan portfolio performance and generate higher returns, but that comes at the expense of the borrower. Long lasting bank–borrower relationships might allow lenders to extract monopoly rents by charging higher loan margins due to their exclusive position with the client. Consequently, it is common for larger firms to have multiple lending relationships or core banks to reduce the costs of borrowing. This, however, may also motivate lenders to demonstrate their financing expertise and become more client-focussed in order to preserve their customer proximity and to counterbalance the effects of price competition. Banks with close customer relationships may retain a competitive advantage because they are able to take more timely decisions and intervene when the borrower's strategy changes or when credit quality deteriorates. To the contrary, the ongoing internationalization of banking may have a detrimental effect on the quality of originated loans since the distance to the customer increases.[13] From an economic point of view, the concept of a single core bank creates information cost efficiency as for multiple lenders monitoring costs for each occur and add up. For debt securities with a widespread investor base such as corporate bonds, the monitoring of issuers by many lenders could lead to unnecessary costs and free-riding problems.[14] Rating agencies basically coordinate the fragmented investor base by providing a kind of information certificate – a role which is otherwise implicitly performed by banks by providing loans. Based on a theory initially developed by Boot et al. (2006), Bannier and Hirsch (2009) find evidence that rating agencies effectively perform a monitoring function via the credit watch procedure. Ratings for issuers and securities are supplemented by outlooks and reviews or watch lists which express the agency's opinion on short- to medium-term credit rating developments. Market reactions to rating changes did increase after the introduction of watch lists, suggesting that market participants accept the role of the agencies as a central information source.[15] A review for

[13] DeYoung, Glennon and Nigro (2006) show that for small business financing with opaque information, loan performance suffers from extended borrower-lending distance.

[14] See Altunbas et al. (2009).

[15] Although there is no common sense both in literature and among financial market participants that rating agencies are economically relevant and that ratings contain any valuable information, the recent efforts to strictly regulate the agencies strongly suggest that ratings do matter for financial markets' stability in the view of regulators and authorities. For more information please see: **European Commission**, Proposal for a Regulation of the European Parliament and of the Council, amending Regulation (EC) No 1060/2009 on credit rating agencies; Regulation No 1060/2009 and Regulation No 513/2011, www.ec.europa.eu, **Center for European Policy (CEP)**, *Credit Rating Agencies*. cep policy Brief No. 2012–2007, www.cep.eu, **European Banking Federation (EBF)**, Comments on the European Commission's proposal regarding the

downgrade by a rating agency may be seen as a warning shot and thus increases the issuer's discipline to take active measures to defend the rating. Boot et al. (2006) introduced the concept of an *implicit contract* between the issuer and the rating agency where the borrower commits to taking 'recovery efforts' to counteract possible deteriorations of credit quality. If the attempt fails, the rating review ends up in a downgrade. This is similar to the threat of banks to terminate or to not refinance loans if an obligor does not comply with its credit development path as previously agreed with the lender, thereby creating an incentive for the borrower to maintain the credit grade.

4.3.2 Convergence of bank loans and debt capital market instruments

The certification role of both bank loans and credit ratings is credible and also facilitates the access of borrowers to public debt markets by building up the reputation and by 'establishing' the borrower.[16] Hale and Santos (2008) show that costs of external funding decrease because of the extended reputation, visibility and transparency that come with the listing of bonds. To put it another way, the delegated agency costs and reduced information asymmetry, also because of debt issuer coverage initiated by research analysts after a bond IPO, lowers loan margins requested by banks. Those borrowers that tap the bond markets may also consider syndicated loans as the closest substitute to corporate bonds. In particular, larger and more profitable firms that are highly levered prefer syndicated loans, which have emerged as an asset class on their own, over corporate bonds for medium- and long-term funding.[17] Smaller borrowers, however, may find it easier to negotiate with a single bank and are less likely to tap the public debt markets; this is also because of the significant costs and disclosure requirements attached to the listing of debt securities.[18]

regulation of Credit Rating Agencies (CRAs), www.ebf-fbe.eu, **European Securities and Markets Authority (ESMA)**, Annual report on the application of the regulation on credit rating agencies as provided by Article 21(5) and Article 39a of the regulation (EU) No 1060/2009b as amended by Regulation No 1095/2010, www.esma.europa.eu. **Securities and Exchange Commission (SEC)**, *Report on Review of Reliance on Credit Ratings*, www.sec.gov.

[16] For many mutual and pension funds, the requirement of a rating is often regulated by investment guidelines.

[17] See Altunbas et al. (2009).

[18] Although the requirements are less onerous for eurobonds, which are offered exclusively to institutional rather then retail investors, listing of securities at an exchange like the London Stock Exchange requires the provision of comprehensive information about the financial conditions of the issuer such as independently audited annual accounts for past years as well as on an ongoing basis for the duration of the listing.

Bonds from non-frequent issuers typically are more illiquid and trade at comparably higher credit spread levels, reflecting both the limited investor base as well as the greater investment uncertainty arising from the information asymmetry, which is sometimes mitigated by restrictive covenants. The life cycle theory describes a firm that evolves from borrowing in the form of a bilateral loan from a single bank, to a syndicated loan provided by multiple lenders and, as often observed for publicly listed companies, finally issuing bonds. There is extensive literature available on the competitive, complementary or co-existing nature of bank loans, private and public debt capital markets.[19] While debt markets and bank loans appear to have become increasingly integrated and co-dependent,[20] the firm's financing choice is only one determinant of the convergence process. Another driving factor is the emergence of active credit portfolio management which accelerated the process by structuring, standardizing, bundling, transforming and dispersing risks. Since credit portfolio managers engage in

- selling or syndicating loans;
- buying derivative protection for loans;
- investing in CDS and corporate bonds;
- securitizing credit risk as well as
- receiving (sub-)participations and guarantees;

valuations of different credit risk products become directly comparable because of market observable prices and credit spreads.

Credit default swaps (CDSs) are a bridging element to smoothing price discrepancies of loans and bonds and have been publicly acknowledged by some multinational corporates as the benchmark for their loan and bond pricing. Linking loan margins to CDS spreads is more widespread among companies in the United States, but has also been considered by European corporates to overcome difficult funding market conditions.[21] Norden and Wagner (2008) find that CDS spreads are a dominant factor

Private information, which may affect the pricing of the listed security or the ability of the issuer to fulfil its obligations, has to be provided.

[19] Song and Thakor (2010) present a thesis of complement and co-evolving banks and capital markets that contrasts with other views of competition between the two where the growth of one comes at the expense of the other. Due to their specialization, banks and markets each have their merits and comparative advantages which play out when interacting with each other.

[20] See Boot and Thakor (2009).

[21] For example, in 2008 both Nokia and Nestle expressed an interest in linking the margin of their commercial paper backstop facilities to the respective CDS spread while a French state-owned utility company switched the loan base rate from LIBOR to a reference bank rate setting. See www.uk/reuters.com.

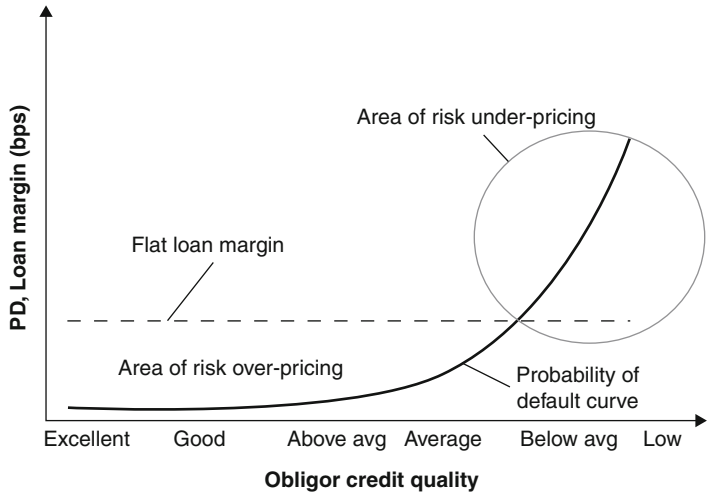


Figure 4.8 Flat loan margin versus increasing probability of default

in determining prices of syndicated loans to U.S. corporates. They conclude that CDS spreads in turn incorporate loan-specific information which should not come as a surprise given that CDSs were invented as an instrument to transfer credit risks from loans. Contrary to just absorbing risks, the credit risk distribution activities of banks allow external investors to diversify their portfolios by investing in assets which would otherwise not be available for them and, at the same time, delegating to a certain extent the monitoring function to the asset originating bank. A higher degree of standardization improves the transferability of assets, thereby increasing pricing transparency. From a socio-economic perspective, the European economy benefits from an accelerated integration of the still fragmented European bank loan market as well as from converging loan and bond interest rates in the non-financial corporate sector due to enhanced competition and innovation.[22] The next chapter explains how loan transfer pricing contributes to a consistent and harmonized approach to credit asset pricing. We will show that using market spreads to price loans is a lynch pin to the regular risk processing, serves the purpose of improving loan origination discipline and is a prerequisite in context of mitigating the accounting mismatch created by hedging loans with CDS.

[22] Wagenvoort et al (2009) found that while there is a complete integration of the primary Euro-denominated bond market, the market for bank loans remains segmented, albeit to various degrees depending on type and size of the loan. In particular, retail lending appears to be a national affair.

4.4 The role of loan transfer pricing

Loan pricing is a key determinant of success of a financial institution. If margins are consistently set too low, thus under-pricing the risk of assets, the result over a longer period of time will be net losses from credit operations as lending income fails to cover losses from materialized risks. If risks are overpriced, an institution will be forced out of the market[23] since eventually a borrower will opt for lenders that offer cheaper conditions. For instance, a combination of over- and under-pricing which will be caused by flat loan margins – that is a constant margin regardless of borrower risks or non risk-adjusted pricing – will have the effect of adverse selection. Pricing will be too high for better rated customers and will keep these clients from borrowing at the bank, while the same loan margins will attract debtors with lower credit quality as spreads are cheap compared to risk-adjusted pricing prevalent at other banks.

Very often, in context of the implementation of a credit portfolio management, an internal market-based credit risk pricing has been established at which an asset is transferred from loan origination to portfolio management – effectively replacing the bank internal risk-adjusted pricing by making reference to market spreads. The transfer price allows isolation of the economic benefit from portfolio management but also better measurement of the profitability of loan origination. But even if the portfolio management is not run as a profit center,[24] usually banks apply for measurement purposes a rule-based transfer pricing which aims at risk-adjusting the price in line with observable market prices for tradeable debt securities. Assets, which are priced too generously compared to these market prices and do not compensate for the risk taken, have to be either subsidized by other incremental income or otherwise strategically justified to avoid being dismissed. On the other hand, if assets are priced so that losses are more than covered, the responsible client relationship manager will be rewarded accordingly. Consequently, transfer pricing of loans helps to create transparency regarding profitability of a credit asset relative to prevailing debt capital market prices. If consistently applied, transfer pricing highlights the cost of relationship-driven lending, including the profitability driver and the total customer profitability over time. A financial institution is free to choose the benchmark for risk adjustments which could be anything from observable market spreads to generic pricing which is defined by net profitability hurdle rates or capital efficiency or just reflects incentives based on strategic decisions for higher and lower growth areas. However, it is critical that the pricing scheme

[23] Assuming the institution is a price taker, not a price setter.

[24] See Practical implementation: organizational and infrastructure challenges.

coincide with the business model in order to set incentives which are the most supportive to achieve the goals laid out.

4.4.1 Risk-adjusted loan pricing

Non-market-based risk-adjusted pricing of loans includes elements which are determined by the credit quality of the loan debtor, i.e. the expected loss[25] and the additional amount of capital to be held for the risk of the loan, as well as costs which are specific to the bank such as the internally assessed cost of equity,[26] funding costs and operating costs. Commercial adjustments are used for strategic purposes, for instance setting a negative value to subsidize business when entering into a new market where established competitors defend their market share. In a market where the bank is already heavily exposed and unwilling to extend the market share or concerns exist about the market's future prospects which are likely to precipitate by rising PDs, the financial institution may decide to raise the bar and add to the commercial adjustment as a precautionary measure.

The basic idea of risk-adjusted prices is to enhance the discipline of client relationship managers to negotiate loan margins which are profitable net of costs. If the client manager cannot meet the hurdle rate, the gap between internal price and loan margin needs to be filled by revenues from ancillary business. In a more sophisticated portfolio management, a sponsor, i.e. the business unit which benefits from cross selling like the debt capital markets area from a bond issue of the borrower, has to advance the shortfall from its own profit and loss. This is clearly superior to a promises register of future revenues. A sponsor will only emerge if the prospects of that future business are convincing; if not, the deal in question has little chance of going through. Besides the absolute level of net revenues, banks also often set rules on the quality of income. The lower the share of lending-based revenues, the higher the return of equity because non-lending revenues such as advisory fees do not consume capital. Defining a maximum ratio of interest to non-interest income creates

---

[25] Since expected loss is comprised of probability of default and loss given default (and in some cases the loss confirmation period), it is of great importance for the financial institution that these parameters are correctly derived to remain competitive with respect to pricing and ultimately remunerate the shareholder's investments.

[26] Cost of equity usually relates to regulatory capital. It should be noted that the capital weights of assets under Basel II, although these rules represent a significant improvement compared to Basel I, are still somewhat simplistic and insufficient for assessing capital adequacy or pricing purposes. By contrast, under Basel I the risk weight for assets has been categorized only into five weights: 0, 10, 20, 50 and 100%. At that time the Basel Committee on Banking Supervision already pointed out that '*…the weightings should not be regarded as a substitute for commercial judgement for purposes of market pricing of the different instruments*.' See BCBS (1988), II. 29.

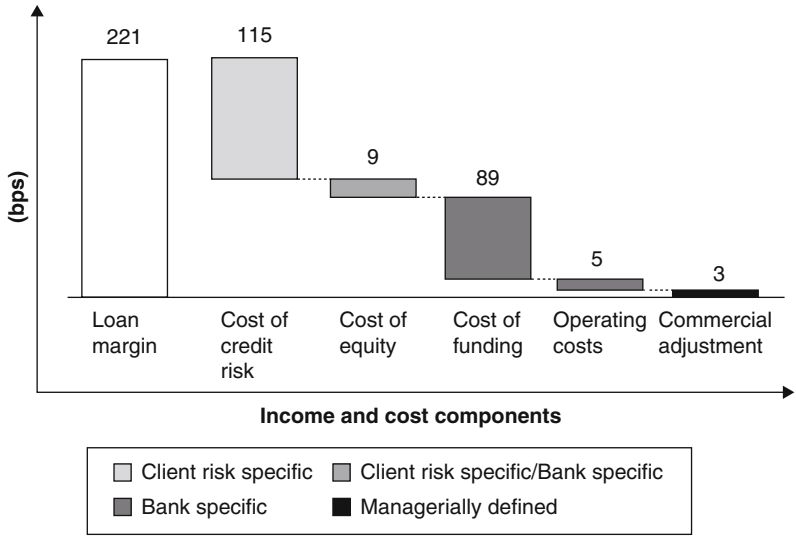


Figure 4.9 Risk adjusted internal pricing

a certain sensitivity to deploying the bank's capital which is naturally a scarce resource. By definition, any kind of benchmarking will face skepticism from client managers who can claim to be autonomous with respect to pricing. On the other hand, risk-adjusted pricing also removes subjectivity and creates reliability when it comes to defending the loan at investment councils or credit approval committees. For those loans which surpass the hurdle rate, provided all other loan features comply with internal rules and requirements as well as the client strategy, credit approval will most likely be easily and consistently obtained.

4.4.2 Loan transfer pricing

The term *transfer pricing* emerged in context of the development of active credit portfolio management being set up as an independent internal asset manager. The transfer of a loan from origination to credit portfolio management takes place at the clearing price which is the price where the asset-taking unit is indifferent to receiving the loan because it can distribute the asset into the market by way of selling or hedging at zero net profit and loss. A cascading approach illustrates the steps for pricing loans, using market prices and spreads.

In a first step, a loan gets priced at the prevailing secondary market price, provided that such a price exists. Furthermore, applying secondary market prices is conditional to the permission from the client manager to

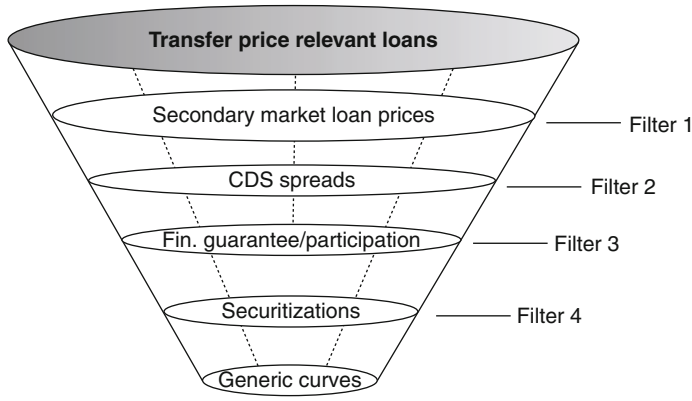


Figure 4.10 Cascading approach for transfer prices

sell down the asset and a loan documentation that does not prevent such a sale. If these conditions are not fulfilled, a transfer price will be derived from the costs of hedging, which could be CDS spreads or the costs at which an investor would take the risk by way of a Financial Guarantee, a sub-participation or the costs of securitization. Since the universe of liquid credit default swaps and bonds is concentrated on large, multinationally operating companies, a generic curve pricing based on market quotes ensures consistency for pricing of loans of smaller corporates. In any case, the introduction of a new concept of loan pricing needs to be transparent, well-communicated and supported by top management to secure the buy-in of involved units. This is even more important when the concept encompasses corporate loans only partially, i.e. when the bank's internal risk-adjusted pricing is chosen for small and medium enterprises, whereas loans for larger corporates are priced using market quotes. Internal arbitrage of pricing approaches by allocating customers among the different categories, depending on the better outcome for the client relationship manager, may be a result of lack of acceptance of transfer pricing. For most banks, the cost of funding is another significant contributor to the transfer price. The funding spread is often provided by an internal funding desk which is in charge of calculating the cost of funding for a specific transaction, given its characteristics. Banks fund themselves from different sources, i.e. deposits, bank bonds, collateralized or covered bonds and central bank funding. The blended funding costs can vary significantly over time and given their share of the total transaction costs, the effect on the profitability of a transaction can be substantial. An alternative is to use the bank's own CDS spread as an indicator for cost of funding. Although this is transparent and consistent, the

real funding costs usually differ from the CDS spread. Thus, profitability of a loan calculated using the bank's CDS spreads can be materially different from the real economic value of a transaction, affecting the ability to take informed decisions when approving a credit request. Because of those implications, the sensitivity of transfer prices and loan approvals to funding costs has to be taken into account.

Transfer pricing plays an important role in the context of fair valuing financial assets to overcome the accounting asymmetry from measuring loans at amortized costs while credit default swaps used for hedging are valued to market for financial reporting. Since changes in values of credit derivatives affect the profit and loss statement, adopting fair value for loans can substantially reduce the mismatch which otherwise leads to unintended volatility from hedging activities. While measuring changes in hedged loans under Hedge Accounting for Credit Risk (HACR) reflects corresponding spread changes from the hedge CDS, loans valued in line with the requirements of the Fair Value Option (FVO) could be measured using market prices for loans, CDSs, other debt instruments or derived from models. If a bank chooses to apply either HACR or FVO, it needs to ensure that the approach is as consistent as possible to the transfer price. Even though the objectives of accounting might differ from the purpose of internal market-based loan pricing, they share the common ambition of creating transparency as to the actual economic substance of those loans that are valued.

4.4.3 Loan transfer pricing based on observable loan market prices

Even though the last few years witnessed a pickup in the secondary loan trading for large corporates, the depth of this market is still seen as insufficient as a pricing source for valuing loans other then the ones trading. However, if a loan price can be observed in the market and the contractual terms of the loan permit for syndication or loan sale, then this price is understood to be a fair price at which an asset can be cleared. Prices are quoted by brokers and dealers and provided through financial information servicers such as Bloomberg or Reuters. Quotes indicate bid and offer and are mostly indicative rather then firm prices which will be updated upon request. Rule-based pricing requires a minimum amount of regular quotes and frequency to allow eliminating distorting outliers. Loans trading in the market are typically Leveraged Buy Out (LBO) loans, syndicated loans, credit lines and distressed debt.

In some cases a loan cannot be sold at par into the market. This means that the cash price implied secondary market spread is different from

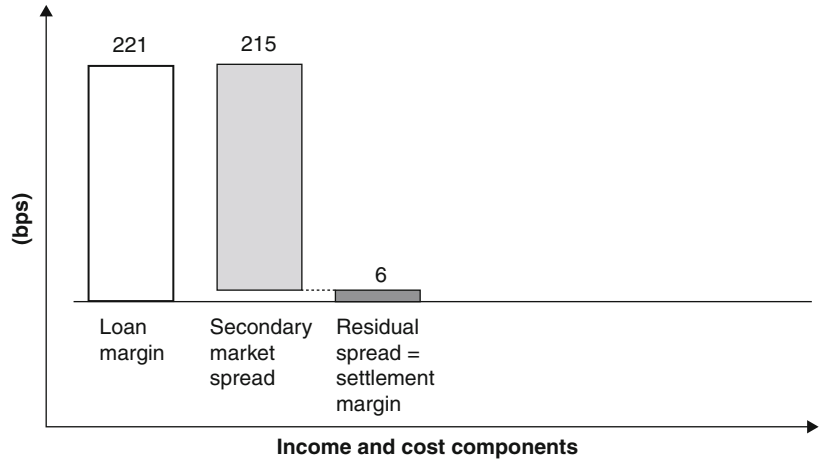


Figure 4.11 Transfer price for loan which can be sold into secondary market

the loan margin, with the difference between the two being the residual spread or settlement margin. The net present value of the residual spread equates to the discount to par at which the loan trades. If a loan can only be sold at a loss, the client manager has to reimburse the portfolio management unit accordingly and vice versa. A loss can be interpreted as the cost of the client relationship which must be compensated by other client income.[27] If a transaction is prevented from being sold because of legally binding contractual features, then a credit portfolio manager's discretion is restricted. This is often the case when a client wants to have the bank's full commitment to the financing or is concerned about a change of the final creditor without explicit prior consent. Because syndicated loans often trade at par at the time of origination, an asset sale goes without immediate profit and loss implications. In contrast, when there are restrictions to selling the loan, a different transfer pricing scheme has to be applied which could result in a significantly more negative transfer price. An alternative to selling a loan is to keep the asset on the books but transfer the credit risk to an investor. This typically takes place in form of a credit default swap hedge, a Financial Guarantee or an open or silent sub-participation, which are in most cases more costly. An origination

[27] This holds true for the pricing gap at the time of loan underwriting and subsequent syndication. If the loan gets sold at a later point in time, the price can deviate substantially from par because of market conditions or because of changes in the credit quality of the borrower. A transfer price, however, is calculated solely at the time of underwriting. If the portfolio management unit is authorized to take the decisions to sell down assets at its own discretion, it is also accountable for the resulting profit and loss resulting from the trades.

unit which is measured by the transfer price is thus incentivized to negotiate with the client terms allowing a loan sale which is also a prerequisite for a originate-to-distribute model. However, outright selling of loans is not always a suitable alternative. A client manager is often wary of potentially negative implications for the customer relationship if the client becomes aware of the sale. Also, most loans do not trade frequently enough or in sufficient size, sometimes due to market conditions, to use these quotes as a reference for transfer price purposes.

4.4.4 Loan transfer pricing based on observable credit spreads

If loan prices cannot be applied, a hedge-cost-based transfer price is the next step in the pricing cascade. In general, using CDS spreads for loan pricing is widely accepted by portfolio managers. Thus, via this transmission mechanism, CDS spreads may influence the cost of refinancing and eventually also the access to funding of loan borrowers. Credit agencies benchmark their fundamental credit assessment with market implied ratings which are derived from spreads of trading credit assets, namely CDS. But also CDS spreads and stock prices become interlinked because of trading strategies which aim to generate low risk but steady returns by arbitraging deviating developments between credit and equity risk, i.e. by selling CDS protection on a listed company and simultaneously hedging the credit exposure by selling the stock. As a consequence, the liquidity of the CDS market and its interconnectedness to other capital market instruments qualify CDS as an objective source for pricing information. When portfolio managers engage in rebalancing a credit portfolio by hedging and reinvesting, the hedge spread also corresponds to the price where portfolio managers can invest in equivalent assets of the same borrower, ensuring consistency of the approach.[28] A market-spread-based transfer price is comparable to an insurance premium and should therefore cover both expected loss (EL) as well as unexpected loss (UL).[29] Market spreads reflect a fair price where market participants agree to trade based on their asset valuations given publicly available information[30] and, by definition, do not take into account the contribution of said asset to the risk profile of an individual portfolio.

---

[28] For comparison, the investment has to be treated the same way from an accounting perspective.

[29] Goebel (2007). This is a fundamental difference from the internal risk assessment, limiting the direct comparability of market spreads to internal PDs.

[30] Assuming efficient markets. That assumption may not always hold true, in particular for less regulated over-the-counter (OTC) markets which is the case in particular for corporate debt and CDS.

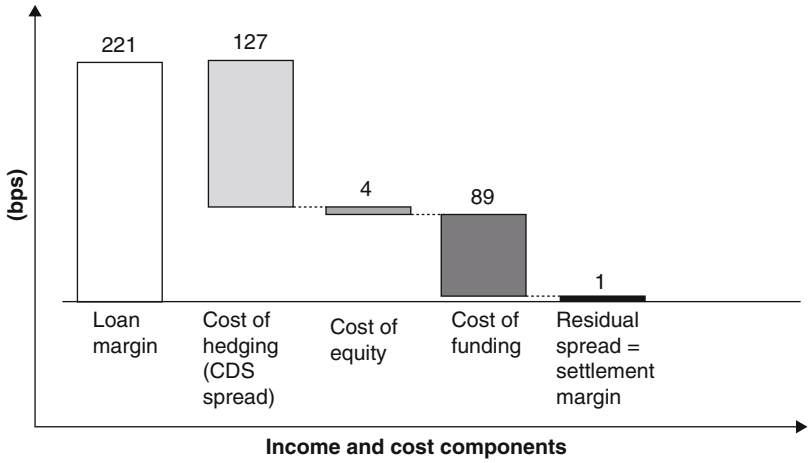


Figure 4.12 Components of hedge spread based transfer price

Spreads of credit default swaps refers to a deliverable asset, bond or loan, of a specified borrower. In many cases, a loan product encompasses a variety of features which have to be considered for pricing. Unlike bonds which have predefined and non-changeable maturity and exposure, for many loans assumptions on both have to be taken since for instance prepayment and extension options alter the maturity and some contract terms give the borrower the right to flexibly draw money under the loan. For non-plain-vanilla loans, a credit conversion factor helps to recognize the loan specifics, usually with respect to expected cash flow profile and maturity features. Exposure of undrawn credit lines, backup facilities, revolver or guarantees, for example, are typically estimated in relation to the borrower credit quality and maturity, determining both the amount of risk to be funded and hedged as well as the potential income from the loan, as interest is usually only paid for the drawn part. The likelihood of committed lines being drawn ranges from 25 per cent for a BBB rated customer to 80 per cent for a B rating. Sensitivity of drawing to maturity increases with decreasing credit quality. If the transfer pricing approach is a net present value of revenues and costs, the default probability has to be considered since it is less likely that future revenues will be realized for lower rated customers. Put another way, timing of default matters. Financial covenants have a risk-mitigating effect and are taken into account when calculating the usage of lines at default and the loss given default. A negative pledge clause, for example, prevents the borrower from providing collateral to another lender, which would put existing creditors into a subordinated position when it comes to the liquidation

of the borrower. Collateral provided by the client has to be subtracted to calculate the net exposure that needs to be hedged. Optionalities of loans include grid pricing, term out and prepayment options, as well as an extension clause.

Prepayments of loans are in particular a concern since for risk, accounting and regulatory reasons the maturity of the loan must be matched by the maturity of a hedge.[31] If a loan gets prepaid, the hedge and the funding continue to exist without the other leg of the pair, the hedged item. Even without considering the market value effects from hedge and funding, which are no longer offset by the corresponding value changes of the loan, also the costs of both are no longer compensated by the loan income. But prepayment risks do not only exist at times of declining market spreads. Borrowers often make use of a better credit environment to lower the average costs of borrowing. Very similarly, debtors tend to refinance their debt on time before maturity when they expect that refinancing could become difficult. In that case, loans are prepaid or terminated early to secure new funding even if interest costs for the new loan are substantially higher. However, once the transfer price has been calculated and agreed to, the risk of deviations from actual to the estimated cash flows remains with the portfolio manager. Therefore, the transfer

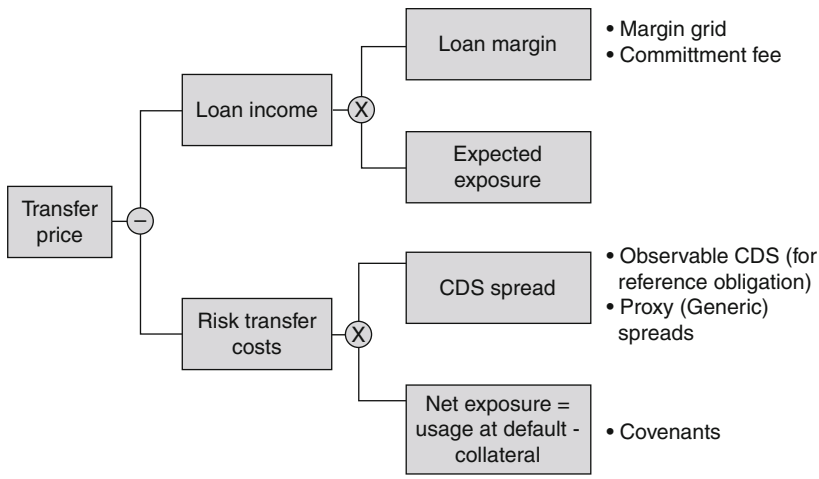


Figure 4.13 Determinants of loan income and risk transfer costs
Source: McKinsey.

[31] For example, to qualify for Hedge Accounting for Credit Risk (HACR), the CDS maturity must not exceed the maturity of the loan. The opposite holds for regulatory requirements regarding capital release via CDS hedges.

price must take into consideration breakage costs so that, at least on the portfolio level, the portfolio manager is compensated for those costs that occur due to options which have been granted to the borrower by the responsible client relationship manager.

4.4.5 Transfer pricing based on generic curves

If no risk transfer takes place, either by intention or because of a lack of investor interest in the particular asset, the loan gets priced against a benchmark to derive the transfer price. Applying market spreads to loans for pricing purposes highlights the sometimes differing views of the bank internal credit analysis and capital markets. But even for borrowers where the credit quality assessment does not differ between a bank and the rating agencies or the markets, as measured by spread implied default probability, loans are often priced below the corresponding credit spreads for tradeable debt securities. In particular the pricing for loans of larger companies and multinationals is mostly relationship-driven and only to a lesser extent reflexive of the cost of risk corresponding to the external and internal ratings. In the absence of cross-selling revenues, a bank would yield a higher income when investing into the client's bonds while taking identical credit risks and capital charges.[32] Consequently, loan transfer pricing based on market spreads is often used by financial institutions as a shadow pricing to quantify the pricing gap between the loan margin and the risk compensation demanded by other investors to foster origination discipline, keeping the gap as narrow as possible. However, market prices can be directly observed for larger, listed corporates and frequent borrowers, while for the others a generic pricing scheme has to be developed. Usually, benchmarks for rating classes and industries can be established and used for generic pricing. Input to these benchmarks are typically CDS spreads, corporate bond spreads and spreads of securitizations. Event though the introduction of TRACE®[33] has improved the trading and pricing transparency in corporate bond markets substantially, CDSs are still referred to as the most liquid element for generic pricing. Since securitizations became quite rare and pricing of structured credit products depends not only on the type and quality of collateral but also

[32] Assuming all else equal (i.e. exposure, maturity, debt ranking, accounting treatment, etc.).

[33] TRACE®: Trade Reporting and Compliance Engine®. The Trade Reporting and Compliance Engine is the FINRA-developed vehicle that facilitates the mandatory reporting of over-the-counter secondary market transactions in eligible fixed income securities. Since 2002, all broker/dealers who are FINRA member firms have an obligation to report transactions in corporate bonds to TRACE under an SEC approved set of rules. Current TRACE reporting time is 15 minutes. See http://www.finra.org.

other important features such as the risk of the originator and servicer etc., using structured credit transactions as a benchmark for pricing loans is less common today. Furthermore, extracting the risk component of the individual asset out of the securitized pool is challenging. Nonetheless, CDS spreads have some pitfalls too. The universe of actively traded CDS is comparably small. Within the CDS universe, index constituents are the most liquid. Because indices are a small sample[34] by definition, the count of spreads for some industries or rating classes may not be sufficient to generate a full rating/maturity curve for each rating classes and data points for at least 1, 2, 3, 5 and 7 years.

A generic pricing for loans using market spreads can be performed as follows. To obtain a large enough number of issuers for which prices can be observed on a daily basis, CDS spreads as well as corporate bond quotes are used. Although basis risk exists for bonds and CDS and can be substantial, i.e. during times of financial stress, the basis risk is not considered here for simplification. U.S. domiciled companies represent the biggest share of corporate bond issuers with some 5,000 – 6,000 bonds frequently quoted. By comparison, around 1,000 quotes can be retrieved for Euro denominated bonds. For comparing bonds to CDS spreads, the equivalent par spread of bonds is taken into account.[35] Bonds from financial institutions are removed. Corporate bonds denominated in different currencies are adjusted by adding the basis swap quote for the respective maturity and currency. Short dated bonds with a maturity of less than one year are excluded from the sample as they tend to be more illiquid, with their prices sometimes not updated frequently. Maturities in excess of 10 years are also discarded as there are only few bonds outstanding. Callable bonds, which are often issued by non-investment-grade corporates, should be included in order to enrich the sample if the embedded call is significantly out of money. Since CDS spreads are considered to be more liquid compared to corporate bonds, bond spreads are replaced by CDS if CDS spreads are available. Mapping of bond issuers to CDS can be done by using the Bloomberg corporate ticker for each issuer. Removing outliers further cleans up the sample. Bonds with negative spreads are excluded as we assume that borrowers cannot fund themselves below

[34] The iTraxx Europe index, for example, consists of 100 industrial and 25 financial names while the high yield index Crossover is comprised of 40 constituents.

[35] Bloomberg, a financial information servicer, provides various bond spreads, among others the par asset swap spreads and z-spreads, to compare bonds to credit default swaps. However, these spreads are prone to a certain bias as they do not incorporate recovery rates or probabilities of default, which prevents a like-for-like comparison of bond and CDS spreads. A methodology developed by JPMorgan, called equivalent par CDS spreads, offers a more accurate and robust comparison between bonds and CDS. See JPMorgan (2003).

LIBOR, indicating that the spread is distorted by an embedded option or the bond has been simply mispriced. To compute a generic curve, the remaining spreads are clustered by rating and maturity. A composite rating scale analogue to the ones used by the rating agencies is taken to construct rating buckets. An example for a bucket would be all spreads for issuers with a rating of AA[36] and maturity of CDS or bond between 4 and 5 years. For each bucket down to BBB, all spreads lower than the 5 per cent quantile and higher than the 90 per cent are excluded. Below BBB, all spreads lower than the 5 per cent quantile and higher than the 80 per cent quantile are discarded. The spreads of some names may not be representative for their rating classes because of pending downgrades or upgrades or simply because of a significantly diverging view of the riskiness of the CDS reference entity by market participants versus rating agencies. To arrive at generic rating/spread curves, a Nelson-Siegel curve is fitted, using the Levenberg-Marquardt algorithm. The Nelson-Siegel parametric approach is widely used and a standard to perform generic curves. For comparison, a more in-depth analysis of pricing using Nelson-Siegel is provided by Oricchio (2011). All curves that are not strictly monotonic increasing with respect to maturity are excluded. Overlapping curves have to be avoided. For example, the generic curve for AA rated industrials over the 1 to 10 year time horizon should never cross the curve of AAA- or A-rated industrials. Missing curves are interpolated using the geometric mean of the two neighbour rating curves. An illiquidity premium, which reflects the illiquid nature of loans, could be added to spreads across the rating spectrum, but should be more pronounced for investment grade. Empirical data suggest that illiquid high grade bonds offer 20–40 per cent higher spreads to compensate for illiquidity. High yield bonds are usually smaller by issue size and trade with a larger bid-offer spread, which makes them more comparable to loans, thus there is less need to add a premium for illiquidity. Borrowers, which are not externally rated, have to be mapped to the corresponding rating category by comparing the internal default probabilities attached to internal ratings to those of the external ratings. Ratings are allocated to default probability ranges rather than to a single PD value. Overlapping default probability ranges between internal and external ratings have to be harmonized. It should be noted though, that on a single obligor level the pricing will be most likely not exactly representative but rather indicative of a theoretical average risk compensation that an investor would demand for those assets. In other words, if an obligor specific market

[36] In case more than one rating exists and they are not corresponding, the lower rating will be used.

spread would exist, it would be very likely different from the generic spread, although the deviation should be insignificant. On a portfolio level, those differences may cancel each other out, meaning the prices on average are fair.

While a generic pricing scheme for loans within different categories (i.e. industry, country, currency) can be established, its application may be limited since the generic curve is highly representative of the composition of the CDS and bond markets. Thus, the pricing might be suitable for some industrial countries (e.g. the U.S., U.K., Germany and France) with a high share of listed corporates[37] but less so for those which are dominated by smaller sized corporates like Italy or Spain. Given the significant country risk premium incorporated in CDS and bond spreads as well as loan margin for corporates domiciled in the European periphery, their low share in the generic pricing may lead to a systematic underpricing of corporates of those countries. Interestingly, for pricing credit risks in non-liquid markets, Oricchio (2011) suggests incorporating a market view into fundamental risk assessment. Additional sources of information are macroeconomic indicators, research from established investment banks, default rate forecasts of rating agencies and credit indices. The main advantage compared to an internal rating model based (IRB) pricing is that the majority of rating systems are point-in-time (PIT) and calibrated using a backward-looking anchor point, thus effectively lagging business cycles. In contrast, rating agencies take a forward looking through-the-cycle (TTC) approach. Blending the different approaches preserves the memory of rating sensitivity to previous credit cycles while anticipating future developments. Although the rationale has its merits, the concept is a compromise between a pure markets- driven pricing and a rating-model-based credit pricing and is therefore well suited for a portfolio management which is front-end oriented but to a lesser extent for an originate-to-distribute model, which is by definition ultimately determined by prevailing market prices. Because of the subjective nature of forward-looking assumptions, the approach misses the objectivity of market spreads as a measure for origination success and leaves transfer prices open to discussions on whether the price is fair. However, since the assumption of efficient capital markets with an indefinite liquidity – which allows distribution of assets to investors at the discretion of the portfolio manager at all times – does not hold, the forward-looking nature of Oricchio's approach provides a clear advantage.

[37] Very often, CDS reference entities and bond issuers are publicly listed companies because issuing securities involves a significant burden and costs of public disclosure which may not be suitable for smaller corporates.

4.4.6 Risk adjusted versus transfer pricing

Contrary to transfer pricing, a buy-and-hold strategy and internal risk cost based loan pricing have to explicitly incorporate the loan portfolio structure. Assets which remain on the bank's balance sheet should be priced so that the loan origination unit benefits from an improvement in the portfolio's value-at-risk from the asset added to the portfolio, whereas a penalty should be imposed on prices for assets which deteriorate the portfolio risk metrics due to their contribution to an increase of portfolio concentration or correlation risks. From that follows that market-based transfer pricing, if it is not used solely for benchmarking or shadow pricing but for profit and loss measurement, is only applicable for assets which are ultimately hedged or sold at these prices. Pricing for all other assets has to be determined by their contribution to the portfolio risk.[38] A market-based credit pricing for a buy-and-hold strategy without any back-end portfolio management, that is risk distribution into the market, will not meet a shareholder value orientation. Even if the margin of a loan may be in line with the hedge spread, it may not compensate for a potential disproportionate rise of cost of equity driven by the increase of the portfolios economic risk and capital given the increase of the portfolio concentration risks from the single asset.[39] It becomes clear that for loan origination units, an originate-to-distribute approach and subsequent market-based loan pricing allows them to originate loans to one or correlated customers at constant prices[40] regardless of the amounts already originated, while the asset may become prohibitively expensive under a buy-and-hold regime once the asset adds too much concentration risk to the portfolio. In practice, this creates problems as a pure originate-to-distribute model where all assets originated will be distributed into the markets by portfolio managers rarely exists. Also, in many cases assets remain for some time on the balance-sheet until they get sold or hedged because of the size of loans which exceeds the liquidity of hedge instruments or because of time consuming negotiation phases for asset sale or participations. In particular, securitizations pose some uncertainty about saleability and conditions of portfolio transactions and require an asset warehousing before a transaction can be executed. During that time, the eligibility of loans for an intended securitization is subject to negotiations with potential investors especially for lower quality assets, so that applying illiquid prices calculated from expected or observed securitization costs bears

[38] See Steinmüller (2007).

[39] See Gann (2008). While the risk weights of Basel II are insensitive to any correlation effects, regulators expect banks to consider correlation risks when assessing the capital adequacy and therefore to hold additional capital to cover those risks.

[40] Assuming all other pricing determinants, i.e. funding and market spreads, remain unchanged.

some uncertainty. To solve the conflict of bank internal risk adjusted versus market-based transfer pricing which has the potential to create intense discussions between the loan origination unit and portfolio management because of the possible distortion of the profit and loss measures of both, portfolio managers must issue an opinion about the intentions to distribute the asset during the origination phase and also lay out the proposed transactions impact on the portfolio. This way, client managers are incentivized to originate loans that remain in the bank's balance sheet and add economic value to the portfolio, even though market spreads might be higher than the loan margin. Therefore, if the asset has a negative impact on the portfolio loss distribution, the internal price correctly reflects the increase of economic risk which the client manager must pass on to the client. For loans which are intended to be distributed to investors, a market-based transfer price and subsequent hedging or selling allows the client manager to proceed with the transaction even though the unfavourable portfolio implications of that transaction or a violation of concentration risk limits would have otherwise led to a refusal of the deal. The latter is in particular relevant for client relationships where a financial institution wants to position itself as a core or house bank to the client because of its strategic relevance or because it wants to protect its home market but cannot afford to keep all assets of said client on the book. A pure market-based pricing where portfolio considerations are out of scope will become more relevant again with the accelerating financial disintermediation or development of shadow banking where the bank's credit value chain ultimately consists of asset origination and brokerage, i.e. for project finance where banks have the expertise to originate but might not want to hold the assets because of an asset/liability term mismatch, while other investors have the funds but not the access to this asset class. Selling assets into the market immediately after origination implies that credit risk effectively becomes underwriting risk.

Market prices are often challenged by the client relationship managers for their relevance to traditional banking, especially if market spread implied default probabilities exceed the ones derived from the internal rating model which are also not updated as frequently as credit markets reprice. As loan markets typically follow credit markets with some time delay, rising credit spreads which indicate an impending deterioration of credit quality are only transformed into higher loan margins with some delay. That leaves the loan originator with an increasing gap between loan interest income and hedging costs, to be filled with revenues from cross selling. On the other hand, in times of tightening credit spreads, loan margins may not be renegotiated as quick as spreads come in. This creates an opportunity to hedge out loans and preserve the residual income after hedging which is then almost risk free and therefore significantly profitable from the return

on equity perspective. Market prices are used for shadow pricing of loans and, in some cases, used to enhance origination discipline. Calculating transfer prices, which are based on market prices, makes the shortfall of loan income transparent and allows origination to assess the amount of additional income from a client relationship. Clearly, transfer pricing is almost always viewed with some suspicion by client relationship managers and loan origination units. Especially, when ACPM is organized as a profit center, the concerns are that portfolio managers will attempt to make profits to the disadvantage of loan origination. The conflict of interest when it comes to loan pricing – that is, pricing transactions away from current markets to create profits at portfolio management while loan origination has to take an equivalent amount of losses – has to be considered appropriately when setting up an active credit portfolio management unit which is responsible for loan pricing. Ensuring full integrity and interest alignment of origination and portfolio management is difficult but a prerequisite to the introduction of any kind of transfer price.

4.5 Practical implementation: organizational and infrastructure challenges

Unlike for other areas in banking, there is no ideal ACPM model or best practice design which serves all financial institutions alike. This should come as no surprise, given the widely differing strategic objectives and individual strength and limitations of the financial institutions. The International Association of Credit Portfolio Managers (IACPM) developed a framework of principles and practices[41] against which an organization can benchmark its own activities and to measure the development of its portfolio management efforts. The paper provides an excellent overview of the various aspects to be considered when designing portfolio management operations. Very often active credit portfolio managers rely on the existence of liquid debt capital markets for risk transfer and risk pricing purposes. However, in today's financial markets environment, the credit portfolio also must be managed rigorously at the front end. That means setting incentives and restrictions sufficient to originate only assets, which contribute to an improvement of the risk/return profile of the credit portfolio. Increasing the risk-adjusted performance of a credit portfolio through the credit cycle requires a long-term view, complemented by short-term measures such as asset distribution and back-end portfolio rebalancing. In the transition towards an active credit portfolio management, creating the correspondent organizational structures and portfolio management processes represents the most significant

[41] See IACPM (2005).

challenges.[42] Specifically, the key determinants for success of active credit portfolio management are

Governance and mandate: Precisely and fully defined objectives and competences, based on senior management understanding and sponsorship; full transparency on governance and principles and buy-in of concerned stakeholders;
Organizational design: The design for ACPM must be chosen carefully based on the specific characteristics, strategic targets, risk culture and limitations of the institution as well as market-imposed constraints;

Performance measurement and communication: Performance measurement must be long term oriented, based on a full credit cycle approach with regular and frequent review and focus adjustment;

Portfolio analytics and IT infrastructure: Guidance on portfolios developments, which are of interest to the different stakeholders. Timely, accurate and complete data must be provided, using a sound IT structure, which allows combining of different data sources.

4.5.1 Governance and mandate

By far the most decisive factor of a successful implementation of any credit portfolio management is top management governance and sponsorship. The hierarchy level where ACPM is located clearly reflects its strategic importance, whereas the reporting line is more determined by organizational aspects. A clearly formulated mandate and scope which must be communicated accordingly to all relevant stakeholders and along the lines of cooperation is another prerequisite for success. While this may sound obvious, the financial crisis laid bar that this is the striking gap for many credit portfolio management activities with potentially severe implications that will prevent the CPM function to exploit its full potential. The latest incidence of a confusing mandate was the admission of JPMorgan Chase to have lost more than $2 bn due to 'errors, sloppiness and bad judgement'. The bank said in a statement on May 11th, 2012, that its chief investment office had the mandate to generate profits, backed by CEO Jamie Dimon, although the primary role of the unit was to protect the credit portfolio. Unclear responsibilities generally result in internal competition, fight for mandates and a lack of conviction for execution. As there are various ways to define, implement and run credit portfolio management, no one is organized like another and all are largely dependent on and must be responsive to the individual goals and characteristics of the respective financial institution. Specifying the mandate includes

[42] See PricewaterhouseCoopers (1999).

Objectives	Improve origination discipline and loan pricing	Enhance portfolio transparency	Optimize portfolio risk/return and capital consumption	
Portfolio under Management	Asset based lending (leveraged, project and commodity finance), commercial real estate, shipping, leasing, factoring	Multinational corporates/ large caps	SME	Private individuals
Involvement in Credit Approval Process	Advisor	Voting right from portfolio perspective	Voting right from portfolio and credit risk perspective	Veto right
Risk sources	Borrower and issuer default risk, migration risk	Counterparty risk	Market risk (price risk)	Liquidity risk
Risk Mitigation	CDS, LCDS, CDS based credit indices (linear and tranched). Options	Syndication	Guarantees, participations	Securitization, portfolio transactions
Investments	Derivatives (CDS, LCDS, CDS based credit indices incl. tranches, Options)	Bonds (corporates, high yield), promissionary notes	Loans	Convertibles
Booking and Risk Limits	Trading books Trading (VaR) limits	Banking books Credit lines, plafonds, RWA	Combination	
Transfer Price and Asset Transfer	Risk insurance: Internally derived insurance premium covering expected loss and cost of capital or CDS quote. No asset transfer, only risk transfer	Pro rata credit risk asset transfer: Transfer price based on net pro rata (i.e. yearly) value of cash flows, expected loss and capital costs, administrative costs. Excluded are funding costs and risks (i.e. prepayment)	PV credit risk asset transfer: Transfer price based on present value of cash flows, expected loss and capital costs, administrative costs. Excluded are funding costs and risks (i.e. prepayment)	Full asset transfer: Transfer price calculated as net present value of all cash flows and costs, with full transfer of asset to ACPM P&L

Figure 4.14 Key ACPM mandate definition criteria

Objective	Focus on risk mitigation with cost limits. Little connectivity to capital markets and no market timing	Focus on risk mitigation and diversification while keeping costs low. Some activity in capital markets. Market trends and timing partially considered	Focus on risk transformation, reshaping portfolio composition with complete allocation of all related P&L effects. Frequent access to capital markets with market timing aspirations and best practice for execution	Focus on risk transformation and revenue generation combining imperfect credit markets with expert knowledge on debt origination and debt capital markets and products. Trading like approach to arbitraging price inefficiencies of derivatives and bonds, market timing. Discretionary trading VaR and P&L limits
Profit and loss	Cost center:	Part profit center with zero P&L:	Full profit center:	Full profit center with budget:
	Costs of risk mitigation (spread costs and valuation changes) and P&L from asset transfer (transfer prices) booked at an segregated account	Costs of risk mitigation should not exceed transfer prices and income from investments. Mark-to-Market from hedging and investments booked at an segregated account. Potentially DV01 neutral strategy for combination of hedges and investments	Costs of risk mitigation, transfer prices, P&L from hedging and investments (carry and mark-to-market)	Costs of risk mitigation, P&L from hedging and transfer prices booked at an segregated account
Market risk from CDS hedging	No mitigation	Offsetting with DV01 neutral investments	Hedge Accounting for Credit Risk	Offsetting by Mark-to-Market valuation for loans

Figure 4.15 Combinations of portfolio management objectives with profit and loss implications and mitigants

the definition of the scope of portfolio management, which could comprise loans (i.e. to multinational corporates, financial institutions, small and medium enterprises (SME) or private individuals), asset based lending such as acquisition and leveraged finance, project and commodity finance, commercial real estate and shipping, but also investments (corporate bonds, promissory notes or CDS). Different approaches to managing credit sub-portfolios can be taken, which clearly raises the need to identify the relevant portfolios and the corresponding portfolio management style. Besides the asset under management, the risks that the portfolio manager is supposed to manage also have to be defined. Risks to be managed could comprise credit risk, migration risk, counterparty risk, market risk and also liquidity risk.

The objectives should be reflected in the competences granted, i.e. if a portfolio manager is authorized to sell or buy assets in the secondary market or execute hedges to rebalance the portfolio, provided necessary credit lines and limits are available and loan documentation does not prevent selling the asset. In some cases the mandate includes investments to recover costs from risk transfer or for portfolio diversification purposes. Here, it is important to define investment guidelines, which detail instruments, strategies and books to be used as well as restrictions.

4.5.2 Organizational design

The contribution of CPM to the credit value chain is a key determinant of its organizational allocation. A portfolio management largely focusing on hedging and enhancing origination discipline by applying transfer prices on loans is better located on the business side. On the other hand, if the scope is mostly on regulatory capital optimization, CPM would be probably better suited within the CFO area, with transactions executed by business specialists. In many cases and in particular for larger financial institutions, the balance sheet is comprised of a variety of loan products and clients. Portfolio management as a risk function offers the advantage of a broader and consistent coverage of credit assets across the board.[43] The organizational allocation in turn determines whether the portfolio management unit is a cost or profit center. The most powerful ACPM units are run as profit centers. This is because profit and loss responsibility is ultimately the most direct measure and constraint to operate with and, at the same time, reduces process related inefficiencies. However, the design of the credit portfolio management unit must explicitly acknowledge the moral hazard

[43] Stegemann and Jamin (2008) conclude that stronger CPMs are typically located in the line of business, whereas weaker mandates can be found in the risk or finance function. They observed that '*the effectiveness of CPM grows with the assigned power…. The optimal model depends on the strategic objective a firm wishes to pursue with CPM*'.

problem when client management becomes completely detached from the profit and loss implications of their origination activity. It is of utmost importance to retain common responsibility and partnership.

Specific policies detail the role of portfolio management and the connectivity to other units, which are part of the credit value chain (e.g. ALM, capital management, loan origination, trading, syndication etc). Cross-divisional and/or shared responsibilities must be underpinned by an agreement on the senior management level and, in case required by legal or formal aspects, also by service level agreements (SLA). Strict compliance rules must be respected. Since borrower credit analysis often contains non-public information, Chinese walls between the private and public side of ACPM must be implemented, accompanied by clear rules and codes of conduct. Penalties for misconduct can be severe and it is often difficult to prove that private information made available has not been incorporated into the decision and/or timing of risk mitigation when using capital market products. To avoid restrictions to the interaction between ACPM and capital markets, any execution or trading desk must be located on the public side. Tax, legal and regulatory aspects play a significant role in the organizational setup of ACPM. Cross-country internal risk transfer between subsidiaries or branches of a bank must follow tax laws and in many instances takes place at fair value rather then book value. Qualification of ACPM personnel must meet the specific requirements of the portfolio management process. Because active credit portfolio management combines elements of traditional banking and debt trading, banks often source the expertise from units which are specialized in those areas, i.e. traders for execution, quantitative risk managers for portfolio analysis and credit analysts for transfer pricing and single name management. However, the flood of new regulations with respect to risk management, capital adequacy and accounting, requires expertise in different disciplines.

Case Study 3: ACPM at a larger, cross-border universal bank with investment banking operations

Let us consider a large, cross-border financial institution with significant corporate and investment banking activities. Typically, the bank's portfolio displays a certain degree of borrower concentration risks due to the strong relationships to multinational corporates but also exposure to some regions are substantial as the bank aims at defending a reasonable market share in its home country. The portfolio diversification benefits from loans to private individuals with low cost of risk. Small and medium enterprises are underrepresented. The board decided to implement an ACPM function to

1. release regulatory capital (which could be reinvested),
2. achieve a reduction in economic capital to a predefined target level,

3. reduce potential loan loss provisions from large corporates,
4. mitigate portfolio sensitivity to certain geographical areas and industries,
5. reduce vulnerability to market downturn related stress, and
6. achieve an improvement in origination discipline, loan pricing and increase in non-loan revenues,

under the condition that risk transfer must be effective, profit and loss volatility induced from hedges must be contained and the portfolio management must be self-financing with a limited amount of revenues from investments. ACPM has been given full responsibility for profit and loss. The portfolio management mandate includes all corporate loans.

Due to the importance of ACPM to the strategic mission of the bank, ACPM has a direct reporting line to the senior management. The decision to provide ACPM with a profit and loss responsibility in combination with the desired improvement in origination discipline suggests that it should reside with the business line. To reduce regulatory capital, diverse risk transfer products are used, e.g. securitization, participations, syndications and CDS. Single name concentration risks are mitigated by CDS with the respective loan as a reference obligation. Since the derivatives should not introduce profit and loss volatility, either Hedge Accounting for Credit Risk (HACR) or Fair Value (FVO) for loans have to implemented to offset value changes. Both approaches are closely connected to a loan transfer pricing methodology, which enhances the origination discipline. An investment committee has been set up, where underpriced loans are discussed. The revenue shortfall due to underpricing is expressed by the difference of fair value to book value at the time of origination and must be covered by additional income from cross selling. Business units benefitting from potential ancillary business have to sponsor the discussed transaction; otherwise loan approval will be rejected. Loan loss provisions are diminished via HACR and FVO, where the increase in hedge CDS value due to rising spreads compensates for decreasing loan fair values. Industry concentration risks are hedged by a combination of linear and tranched CDS. Options on CDS are opportunistically used in context of the credit risk strategy to reduce tail risks. Investments balance the market risk of options and indices, albeit under the condition that the net position must be at least DV01 neutral or negative.[44] A trade execution desk has been set up to maintain hedging on the public side. For calculations of the effects of risk mitigation to economic and regulatory capital, the unit runs a vendor portfolio model, which benchmarks the internal model. Regulatory capital optimization is performed in close cooperation with CFO functions. To ensure consistency with CFO and CRO reporting, a close and regular portfolio analysis has been performed with comprehensive information to senior management for timely guidance. Stress tests are conducted as a joint effort with risk functions.

A stylized organizational chart, which represents the layers of ACPM in this case study, looks as follows:

[44] Introducing a zero DV01 limit means that the net profit and loss from a spread increase of one basis point should be zero. That means the value changes of hedges

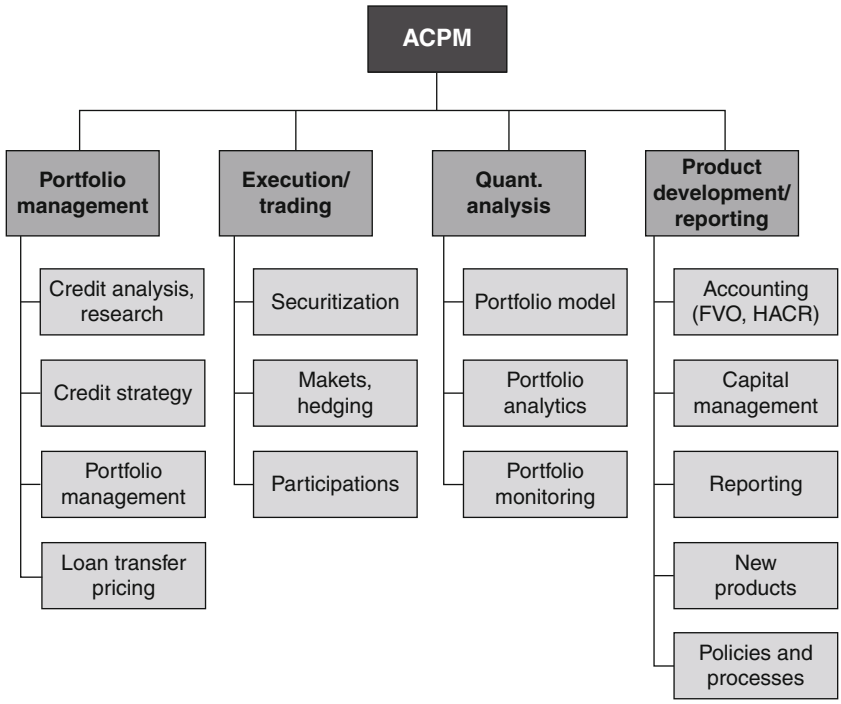


Figure 4.16 Stylized organizational ACPM chart

4.5.3 Performance measurement and communication

Portfolio managers need to bring forward the effects of their activities and communicate effectively. To a certain extent, portfolio reports also help to make the impact of portfolio management visible and support the measurement of the portfolio manager's performance, based on performance indicators that correspond to the mandate. It should be noted, though, that without a precisely framed operating mandate no meaningful performance measurement can be set. In some cases it has been delegated to the CPM units to propose and set targets and measurements used to ultimately determine the level of success. Resulting from interviews held with dedicated bank CPMs, McKinsey[45] concluded that there is a dependency between senior management support and the definition of a clear and measurable vision for CPM. Being asked

must at least amount to those of investments when credit spreads widen. A negative DV01 restriction requires that profit and loss effects from investments should not exceed those from hedges.

[45] See McKinsey and Company (2009).

- if the value contribution of CPM was questioned at the respective institution,
- if CPM was perceived as having a critical positive contribution during the crisis,
- if it is possible to measure a large part of the CPM value contribution in bps form and
- what the value contribution of the measureable part of the CPM activity was in bps

the majority of portfolio managers answered that their achievements during the crisis were valued positively by the institution's management but were not measurable or measured by any performance metrics. Furthermore, there was little evidence of full transparency of the metrics being used to measure CPM performance and define numerical targets. Consequently, it is questionable if the management's view on the role and achievements of CPM coincided with the portfolio managers own view or if it was mainly left to perception rather than facts. However, a lack of appropriate performance measures risks that the value contribution of ACPM may not be fully understood or recognized at the senior management level and throughout the organization. Going forward, financial institutions that are committed to raising the potential of their credit portfolio management will have to set cycle consistent, non-contradictory and intuitive performance measures that fit the business model and consider the long-term time horizon of the effects.

4.5.4 Portfolio analytics and IT infrastructure

A part of organizational considerations is about information and technology. The aim is to provide a timely, complete but comprehensive and correct picture of the portfolio risks to all stakeholders, considering their individual center of attention. Portfolio reporting and management need to take into account the focus point of the various stakeholders which is likely to differ from one to another, with the business side more interested in shorter term metrics, especially revenues and risk-adjusted profitability which includes regulatory capital, whereas risk management concentrates on key risk measures like expected loss and economic capital, which are longer term- and cycle-oriented. Concepts to describe exposure vary, with CFO taking the accounting view for granted loans (on and off balance risks), the business perspective on the maximum risk at stake, i.e. plafonds and granted amounts, while exposure at default serves as the measure of choice at risk management. Time horizons can be different with peak, average and point-in-time exposure, which could have larger effects for clients that are generally doing end-of-period window dressing deals

which is common for financial institutions. Revenues consist of interest income, fees and other income from ancillary business. Usually, a customer relationship is characterized by some parts of the client's business subsidizing others, which is typically accepted as long as the overall revenues from that client satisfy the minimum thresholds defined. However, since larger customers consist of a number of subsidiaries, themselves clients of other divisions and probably regions, a meaningful credit portfolio reporting and analysis always needs to start at the most aggregated level and then break down into a higher granularity. In any case, it should reflect the way client business is organized, i.e. centralized vs decentralized. Using different, sometimes disconnected databases stresses the need for a clearly defined cooperation mode between the units involved, shared responsibility and full transparency on contribution and final product. Hence, to meet the expectations of the CPM sponsors, the set of metrics and particular focus points need to be defined and agreed on in advance with the stakeholders to make the exercise worthwhile. The ability to elaborate on portfolio risks depends on the availability of complete, accurate and timely data, sound IT infrastructure, models and modelling expertise. However, users of model-based portfolio analytics not only have to understand their tools, but they also have to have appropriate incentives to use them in a way consistent with the strategic objectives of their bank. As Bohn and Stein[46] point out, this also depends on the organizational structure and culture in which models are implemented and used. If loans are fair valued or Hedge Accounting for Credit Risk is used to mitigate the volatility in profit and loss arising from the accounting mismatch for hedges, databases and systems for loans must communicate with those for market products. This is in particular challenging since loan products display a wide range of loan-specific features, which are usually not present in capital market products and therefore not recognized in IT systems for trading.

4.5.5 Implementation of an ACPM function

An implementation of a portfolio management function requires a sound plan that considers various issues across the line of credit risk management. Since most banks are advanced in managing their credit portfolios, the focus is probably more on reviewing and optimizing the business model of their portfolio management operations in light of a dramatically changed operating environment, regulatory and accounting rules rather than defining a new setup. To maintain the most suitable model given the bank's specific targets and the nature of their loan business, a

[46] See Bohn and Stein (2011).

continual review and refinement of organizational structures and portfolio management tools is essential. The non-exhaustive list of criteria that support a clear definition of the scope and purpose of credit portfolio management includes an outline of the objectives, identification and agreement on the assets to be managed, the risk mitigation instruments and practices, the type of investments if any, the trading and banking books allocated to the credit portfolio management including respective limits, and finally the determination of the transfer price system to be applied. While these factors are considered to be relevant for the design of the portfolio management activities, an early stage involvement of those business and risk management units that are concerned by the introduction of a portfolio management unit is likely to reveal other important aspects to be taken into account.

5
Accounting Complexity and Implications

Accounting standards and in particular their contribution to the financial crisis have been an intensively debated topic for quite some time. A central aspect of accounting relates to the valuation of financial instruments. International Financial Reporting Standards (IFRS) rules that financial instruments are either carried at amortized costs or have to be valued mark-to-market (fair value). Both approaches have their merits and their drawbacks. Fair value of assets enhances transparency on the worthiness of assets but has also been blamed for having intensified the downward spiral when the crisis broke. Significantly depreciating the value of assets has led to banks facing a capital shortage. Banks then sold assets to ensure that their capital position met the regulatory minimum requirements. Forced selling induced additional pressure on market prices. As a result, asset valuations had to be reduced again with pronounced detrimental effects on capital. These events led in October 2009 to an amendment to IAS 39 and IFRS 7 which did permit reclassification of some assets out of the fair value through profit and loss category into new cost or amortized cost. The procyclicality of fair value is a major concern of politicians who requested changes to the accounting rules. Under IAS 39, which deals with the recognition and measurement of financial instruments, financial assets are classified into four categories:

- Held for Trading, measured at *fair value* through profit and loss,
- Loans and receivables, measured at *amortized costs* through profit and loss,
- Held to Maturity, measured at *amortized costs* through profit and loss and
- Available for Sale, measured at *fair value* through equity.

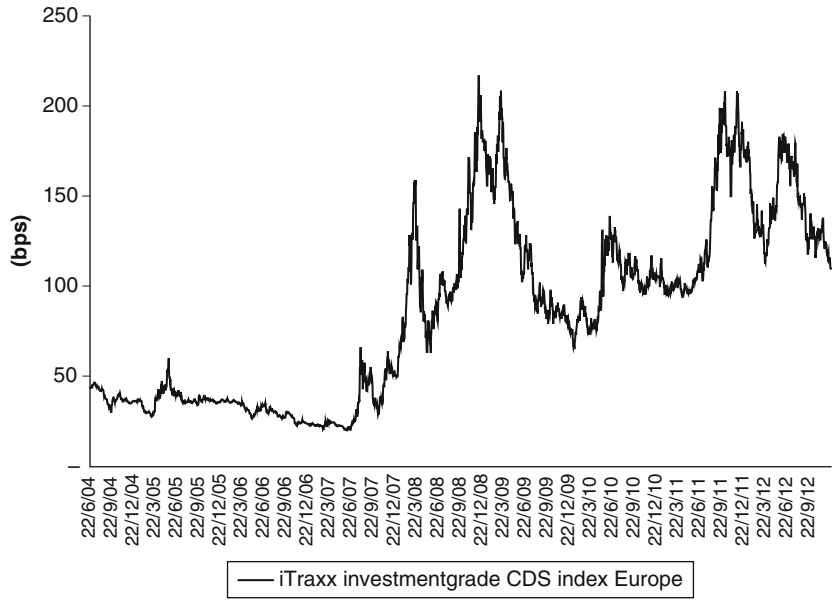


Figure 5.1 Markit iTraxx Europe spreads
Data source: Bloomberg.

IAS 39 will be replaced by IFRS 9: *Financial Instruments* which covers classification and measurement of financial assets. The new accounting rule becomes effective on January, 1st 2015; earlier adoption is permitted. Under IFRS 9, there will be only two measurement categories, *fair value* and *amortized costs*. Albeit IFRS 9 explicitly recognizes the business model of a bank to determine the valuation approach for on balance sheet items, the mixed model problem of IAS 39 remains. Unlike traded securities, loans are usually booked into banking books and accounted for at *amortized costs* – the so called *accrual accounting*. On the other hand, credit default swaps, which are derivatives by design, have to be carried at *fair value*. The profit and loss from value changes of CDS are recognized in the income statement. While economically little risk[1] remains from a perfect name specific credit risk hedge, the effects from asymmetric accounting treatment of value changes of the loan and CDS pair creates headaches for risk managers. In a volatile capital market environment, those effects can be and have been very substantial.

[1] Residual risks arising from CDS hedging are explained in chapter 7.

Case Study 4: CDS Hedge Induced Profit and Loss Volatility and Mitigation

The chart above shows the generic spread[2] for the Markit iTraxx Europe index, comprised of 125 equally weighted credit default swaps on investment grade European corporate entities. (For details, refer to Chapter 7.) In the wake of the financial crisis, the index spread widened from a record low of 20 bps in 2007 to more than 200 bps at the end of 2008. It softened again in 2010 but did not reach levels as low as before the crisis. The sovereign debt crisis did again contribute to rising corporate spreads in 2011. Financial institutions which run a meaningful CDS hedge portfolio to protect loans are exposed to substantial volatility from changes in CDS spreads. While some banks decided to take this risk unmitigated, others were more conservative and took appropriate measures.

Example 1: Société Générale

It appears that Société Générale's portfolio management opted to take the volatility from its CDS hedging activities unmitigated. The bank reported on February, 18th 2010 '*… accounting effects related to the revaluation of debts linked specifically to the credit risk and credit derivative instruments used to hedge the loans and receivables portfolios…. These items, which reached an exceptional level on account of the crisis, made a contribution of EUR -2,324 million to gross operating income in 2009 (vs. EUR +2,489 million in 2008).*'[3]

Example 2: JPMorgan Chase & Co

The bank's portfolio management unit, which was awarded the credit portfolio manager of the year 2012 by *Risk*,[4] takes an active stance towards managing wholesale credit risk, including hedging but also diversifying the portfolio by ways of investments and portfolio transactions. For 2010, JPMorgan outlined in its annual report:[5]

'Management of the Firm's wholesale exposure is accomplished through a number of means including loan syndication and participations, loan sales, securitizations, credit derivatives, use of master netting agreements, and collateral and other risk-reduction techniques. The Firm also manages its wholesale credit exposure by purchasing protection through single-name and portfolio credit derivatives to manage the credit risk associated with loans, lending-related commitments and derivative receivables. Changes in credit risk on the credit derivatives are expected to offset changes in credit risk on the loans, lending-related commitments or derivative receivables. This activity does not reduce the reported level of assets on the balance sheet or the level of reported off-balance sheet commitments, although it does provide the Firm with credit risk protection. The Firm also diversifies its exposures by selling

[2] The time series shows spreads of the at the time on-the-run iTraxx series, spread adjusted for the rollover.

[3] See www.societegenerale.com, Press release 2009 Activities and Results.

[4] See www.risk.net.

[5] See www.jpmorgan.com, 2010 Annual Report.

credit protection, which increases exposure to industries or clients where the Firm has little or no client-related exposure; however, this activity is not material to the Firm's overall credit exposure.

The credit derivatives used by JPMorgan Chase for credit portfolio management activities do not qualify for hedge accounting under U.S. GAAP; these derivatives are reported at fair value, with gains and losses recognized in principal transactions revenue. In contrast, the loans and lending-related commitments being risk-managed are accounted for on an accrual basis. This asymmetry in accounting treatment, between loans and lending-related commitments and the credit derivatives used in credit portfolio management activities, causes earnings volatility that is not representative, in the Firm's view, of the true changes in value of the Firm's overall credit exposure. The MTM value related to the Firm's credit derivatives used for managing credit exposure, as well as the MTM value related to the CVA (which reflects the credit quality of derivatives counterparty exposure) are included in the gains and losses realized on credit derivatives disclosed in the table below. These results can vary from period to period due to market conditions that affect specific positions in the portfolio.'

Example 3: Deutsche Bank

The German bank is well known for its proactive, disciplined and comprehensive approach to managing credit risks from loans. Running a substantial hedge book, Deutsche Bank decided to make use of the Fair Value Option for loans and commitments under IAS 39. In its annual review 2010, titled 'Delivering in the Face of Uncertainty', Deutsche Bank wrote[6]

'*Our Loan Exposure Management Group (LEMG) helps mitigate our corporate credit exposures…. As of year-end 2010, LEMG held credit derivatives with an underlying notional amount of € 34.6 billion. The position totaled € 32.7 billion as of December 31, 2009. The credit derivatives used for our portfolio management activities are accounted for at fair value…. LEMG has elected to use the fair value option under IAS 39 to report loans and commitments at fair value, provided the criteria for this option are met. The notional amount of LEMG loans and commitments reported at fair value increased during the year to € 54.1 billion as of December 31, 2010, from € 48.9 billion as of December 31, 2009. By reporting loans and commitments at fair value, LEMG has significantly reduced profit and loss volatility that resulted from the accounting mismatch that existed when all loans and commitments were reported at historical cost while derivative hedges were reported at fair value.*'

Example 4: Hypovereinsbank

Hypovereinsbank successfully developed and implemented a new concept, Hedge Accounting for Credit Risks, to mitigate the volatile effects from CDS hedging onto the profit and loss. Since 2009, the bank applied a micro fair value hedge to reduce the volatility in its income statement, thus correcting

[6] See www.deutsche-bank.de. Annual Report 2010 – entire.

existing inconsistencies of CDS and loan valuations. In its 2010 annual report, Hypovereinsbank describes the approach as follows:[7]

'As part of hedge accounting for credit risks, in accordance with IAS 39.86 (a) the credit-induced changes in the fair value of selected hedged items such as loans and receivables with customers and irrevocable credit commitments (off-balance-sheet fixed commitments) and the full-induced changes in the fair value of the hedging instrument (credit default swap, CDS) are offset. Remaining-term effects need to be adjusted in this context.

These remaining-term effects lead to a change in the credit-induced fair value over time without the current market credit spread changing. Among other things, this includes a difference between the nominal amount and the credit-induced fair value at the inception of the hedge. Excluding the possibility of an impairment, the credit-induced fair value on the settlement date will correspond to the nominal amount of the hedged item. Any difference between the credit-risk-induced fair value and the nominal amount existing when the hedge is designated amortises over the remaining time (pull-to-par effect). Differences like this can arise when hedged items are designated at a later date rather than when originated, for instance, since the contractually agreed credit spread does not generally match the normal market credit spread at the inception of the hedge in such cases.

The change in the credit-induced fair value determined in this way (after adjustment for remaining-term effects) is taken to the income statement under effects arising from hedge accounting in net trading income. Where the hedged items are assets recognised in the balance sheet, the carrying amount is adjusted for the changes in the credit-induced fair value. Irrevocable credit commitments (fixed commitments not shown in the balance sheet), on the other hand, are not recognised in the balance sheet. The credit-related changes in the fair value relating to these are carried under other assets in the balance sheet.

We show the associated hedging instruments (CDSs) at their fair value as hedging derivatives; the changes in the fair value are similarly taken to the income statement as effects arising from hedge accounting in net trading income.'

Concerning the approach towards managing credit risks from loans, Hypovereinsbank stated that

'Default risk is managed on the basis of defined policies, approval authority structures and risk-assessment processes. The introduction of fair value hedge accounting for credit risk did not result in any changes in the management of default risk.'

Unintended volatility in the income statement is not the only problem active portfolio managers face when hedging loans with CDS. Another important aspect of the accounting asymmetry is that, because CDSs are generally classified as derivatives under IAS 39, they do not represent a collateral in connection with the evaluation of loan loss provisions. Gains from hedges, which compensate economically for losses from the

[7] See www.hypovereinsbank.de. HVB Group Annual Report 2010.

hedged item, are already reflected in the income statement and cannot be 'reserved' for loan losses. The absolute level of loan loss provisions is a key indicator for the success of risk management. CDS as a risk mitigation tool stands a much better chance of being taken seriously if these drawbacks are resolved. Accounting rules in their current form do not coincide with business practices and also decrease the transparency of financial reporting. The risk is that banks may decide not to engage in hedging and rather leave risks unprotected.

As seen in the cases shown above, active credit portfolio managers make regular use of financial products to manage the risk profile of their credit portfolios. Different approaches are taken to mitigate the accounting effects from risk management. The following part of the book contemplates solutions which are tested in practice, closing with a confrontation of the advantages and challenges associated with each approach.

5.1 Hedge accounting and other solutions for accounting asymmetry

Since accrual accounting for credit derivatives does not seem to be an option for the accounting standard setter, other alternatives to mitigate profit and loss volatility from CDS hedges have to be investigated. Potential solutions should encompass

- consistency with the business model and portfolio management approach;
- accounting intuition, meaning consistent results of financial accounting and economic performance; and
- technical simplicity.

Firstly, business decisions should not be driven or restricted by the accounting regime. Ideally, accounting rules follow business practices. Accounting intuition suggests that no excessive explanation in the financial statements is needed to describe the economic situation behind the numbers. The purpose of and effects from active portfolio management activities, using financial products to mitigate risks, should easily become clear from financial reporting. Appropriate solutions also imply that back office, monitoring and IT related efforts are operationally feasible.

Currently, there are four alternatives to address the diverging accounting value changes for loans and CDS:

Financial Guarantee: If a derivative contract can be restructured in a way to meet the definition of a Financial Guarantee (FG) of IAS 39, then the contract is allowed to be carried at cost with no volatility effects for the

profit or loss statement. A FG is no derivative; therefore it qualifies as collateral and thus protects against loan loss provisions. However, it should be noted that a borrower credit quality deterioration driven impairment does not necessarily coincide timing-wise with a failure to pay which is the only credit event that triggers a compensation payment under a FG. The accounting requirements for a Financial Guarantee are strict and difficult to meet, hence making a FG a fairly illiquid hedge transaction that is in general expected to be kept together with the hedged item until maturity.

Fair Value Option: Applying the Fair Value Option allows measuring each instrument at fair value. The full fair value incorporates changes in credit spreads, interest rate and/or liquidity, while the credit derivative only offsets the credit risk. Volatility in the profit or loss statement is reduced only to the extent of offsetting effects from the CDS hedge, except for other risk sources being hedged in addition. Credit hedge induced volatility in profit and loss is substantially decreased by the Fair Value Option. However, the cash basis, where changes of the value of loans as funded assets deviates from value changes of unfunded derivatives, can become an issue. Effectively, impairments are implicitly determined by the fair value of the loan, thus replacing specific loan loss provisions. Accounting under the Fair Value Option requirements significantly limits the flexibility of a portfolio manager.

Hedge Accounting for Credit Risk: Under certain circumstances, the hedged loan valuation can be adjusted by the corresponding value changes in the hedge instrument. No other factors that determine the full fair value of loan are considered; hence no cash basis risk arises as under the FVO. If applicable, Hedge Accounting for Credit Risk serves the purpose of volatility reduction in the profit and loss statement very well. It also counters the problem that loan loss provisions have to be built for hedged loans due to hedge gains being already reported in the profit and loss. However, the approach is challenging to implement and critically assessed by the IASB with IFRS 9 promoting the application of a flexible FVO (phase 3).

No Mitigation/Combination of Hedges and Investments: Volatility in the profit or loss statement could be accepted. Offsetting investments, measured at fair value, can reduce the overall volatility induced by hedges but create new credit and market (basis) risk. These risks are introduced by cash investments versus derivative hedges or derivative investments with other reference entities than that of the hedge. Because of their favourable secondary market liquidity and low transaction costs, derivative indices like the iTraxx index are often used to counterbalance hedge profit and loss volatility which exposes the investor to the credit risks of the index

constituents. Depending on the purpose of hedges, i.e. for portfolio diversification versus outright risk reduction, this approach may be a suitable alternative but does not fit all portfolio management models. In contrast to the profit and loss volatility mitigating effect, the capital relief from hedges booked in the banking book and derivative investments in trading book is significantly reduced under the new Basel 2.5 rules.

In practice, all approaches are present, often used in combination by active credit portfolio managers. In the U.S. risk managers seem to prefer the Fair Value Option since U.S. GAAP does not consider Hedge Accounting for Credit Risk, which is not widespread yet. Practitioners such as the IACPM members debated the issue intensively. Some banks expressed their interest and consider an implementation of hedge accounting. However, none of the listed solutions are without compromise or limitations. And even if CDS would be measured at cost, which intuitively appears to be the best way, it would have some disadvantages. In many cases, portfolio managers do actively manage their hedge portfolio to adjust for fluctuations in exposure amounts, i.e. due to drawing of revolving credit facilities or early prepayments, or changes in the maturity profile of the client exposure. Buying and selling CDS hedges take place at market spreads, no matter if that is consistent with internal valuation. If, for example, the spread tightens for a hedge position that is carried at cost, then the resulting losses would not be visible in the profit and loss until the position is closed. However, when the portfolio manager unwinds the hedge and the losses materialize, they cannot be offset because the other leg of the loan/hedge pair remains valued at cost (or, in case of a prepayment, disappears). Tightening CDS spreads are indicative of an increase in the credit quality of the reference borrower. Proactive risk managers may want to reduce the overall level of credit protection in times of improving credit conditions and increase protection if things get worse. Unrealized losses from spread tightening of hedges have the potential to severely hamper an active approach to risk management. Ideally, valuations of hedge and hedged item change in full synchronicity to align economic performance with accounting treatment. If accounting becomes equivalent to the hedge strategy, then the performance measurement and external reporting provides an adequate picture of the risk management activity and success. Hedge Accounting for Credit Risk and Fair Value Option for loans are closest to achieving this objective.

5.1.1 Hedge Accounting for Credit Risk

Hedge accounting is well known to banks from its application to interest rates. Although Hedge Accounting for Credit Risk (HACR) is less

widespread and more complex to implement, the two concepts share some commonalities. The advantage of hedge accounting is clearly that it aligns the strategic purpose and economic effects from hedging with its accounting representation. Hedge accounting offsets the effects on profit or loss of changes in the values of the hedging instrument (derivative) by changes in fair value of the hedged item (risk-bearing asset). The fair value change of the hedged item results from value changes of the hedged risk only, hence is isolated from any other valuation relevant parameters. The objective is to achieve a high level of negative correlation or offsetting effect.

5.1.1.1 Types of hedge accounting and requirements

The IFRS Standard distinguishes three types of hedging relationships which may be applied to micro and portfolio hedges:

Fair Value Hedge: denotes the hedge of changes in fair value of an asset or a portion of the asset. Fair value changes must result from a specific risk which is termed '*hedged risk*' in IAS39, i.e. credit risk, interest rate risk or FX risk. Revaluation of the hedge remains recognized in profit and loss; the carrying amount of the hedged item is adjusted for the change in valuation due to hedged risk with the value change reported in profit and loss.

Cash Flow Hedge is a hedge of the exposure to protect from variability in cash flows resulting from a particular risk. The hedged item will be carried at cost while the hedge is split into an effective and ineffective portion of the gain or loss, recognized in other contingent income (OCI) respective profit and loss.

Hedge of Net Investment in a Foreign Operation describes a hedge of a portion of net investments of a foreign operation, i.e. loans in foreign currency, currency options or other derivatives. This is a special form of a cash flow hedge.

Micro hedge refers to hedged single financial assets. For credit risk, a micro hedge in the form of a fair value hedge comes into consideration. There are two important aspects to it. First, under a fair value hedge, the value change of both hedge and hedged item are accounted for at the profit and loss statement. Thus, the netted amount is the residual gain or loss which ultimately determines the profit and loss volatility. Second, when the credit spread of a hedge rises, it results in gains. The loan amount is then reduced by an equivalent amount. Assuming efficient markets, any potential losses from a default of the reference borrower together with its probability will be reflected in the spread of a

CDS. The carrying amount of the hedged loan will therefore be adjusted, very much like a write down, which effectively replaces loan loss provisions unless the bank sees the need for additional reserves.[8] In this way, the economic objective of hedging – which is mitigating losses from credit risk – is mirrored in the accounting representation. However, some requirements have to be fulfilled in order to qualify for hedge accounting under IAS 39:

- Formal designation of hedge and hedge item at inception of the hedge (retrospective designation is not permitted). The hedging relationship has to be documented, including the hedge, the hedged item and the hedged risk, as well as the hedge objective and strategy. Also the method which will be used to assess the effectiveness of the hedge relationship has to be stated. Once the prospective and retrospective hedge effectiveness tests have been performed, the results have to be attached to the documentation.
- The hedged risk must be *separately identifiable* and *reliably measurable*. Since the hedged risk is credit risk, CDS spreads are an appropriate indicator to derive a discount curve (benchmark curve) in order to measure fair value changes of a loan by applying the discounted cash flow model (DCF). However, only liquid CDS[9] referring to the loan borrower as the reference entity with a coincident level of seniority ensure that credit risk of the hedged item can be reliably measured. Furthermore, to meet the requirement of 'reliably measurable and separately identifiable', the hedged item has to be a deliverable obligation into the CDS to ensure that the default of the borrower is a CDS trigger event. In this way, the loan can be physically delivered into the CDS, in line with corresponding Basel II rules. Designation of hedging relationship has to cover the lifetime of the hedging instrument. However, partial term hedging allows designation of a hedged item for only a portion of time. The hedge relationship must be highly effective throughout all financial reporting periods for which the hedge was designated. A hedge is highly effective if the changes in fair value (or cash flow) of the hedge compared to the change in value of the hedged item are within a range of 80–125 per cent. Effectiveness has to be measured, both prospective and retro-

[8] Specific loan loss provisions might occur as a result of timing differences between impairment and credit trigger event.

[9] A condition of a liquid CDS is that the CDS is a standardized contract under ISDA (International Swaps and Derivative Association) and regularly and frequently quoted in active markets.

spective. If the effectiveness criteria are not fulfilled, the hedge pair must be de-designated; that is, applying Hedge Accounting for Credit Risk cannot be continued.

5.1.1.2 Assessing fair value changes and measuring hedge effectiveness

Fair value changes of the hedged item (a loan or bond) are determined by the contractual cashflows (C_{ext}) which are discounted on an adjusted swap curve fixed at designation date $(Swap_{t_0})$ – adjusted for the actual credit spread (CS_t) and residual margin (Mar_{t_0}). Since both swap curve and the loan margin remain constant over the lifetime of the hedge, only the hedged credit risk will affect changes in the fair value of the hedged item:[10]

$$\text{Hedged Fair Value} = \sum_t \frac{c_{ext}}{\left(1 + Swap_{t_0} + CS_t + Mar_{t_0}\right)^t}$$

The IFRS does not prescribe a single method for measuring hedge effectiveness but the method used must be in accordance with the risk management strategy of entity. Assessment of the effectiveness has to be performed on monthly or quarterly basis. The following methods are applicable:

Dollar Offset Method – A hedge is highly effective if changes in fair value of hedged item divided by changes in fair value of the hedge fall within the 80–125 per cent range. The dollar offset method is comprised of period by period dollar offset and the cumulative dollar offset method. The advantage is the comparably simpler application but in case of small changes in the fair values of hedge and hedged item, high effectiveness may not be achieved.

Regression Analysis – A statistical method that measures the strength of the statistical relationship between the changes in hedge fair values of the hedged item and the changes in fair values of the hedging instrument or vice versa. Effectiveness is measured by the slope of the regression line which must be between -0.8 and -1.25. Furthermore, a t-Test should verify if the results for slope of the regression analysis are statistically significant to prevent from hedges being wrongly classified as effective.

Shift Scenario (Sensitivity analysis) – A quantitative method to analyse the effect of a shift in main risk factors onto the fair value of hedge and hedged item which are then compared. For credit risk, the method

[10] See Schubert (2009).

should incorporate absolute shifts of a credit spread curve and changes in the structure of the credit spread curve to take into account all relevant aspects of the risk factor. The shift scenario is applicable for the prospective test.

Historical Simulation – An estimation of changes in fair values of hedge and hedged item based on historical changes of the risk factors, applicable for the prospective test.

Matching Critical Terms – A simple prospective test which compares principal terms, i.e., borrower entity, notional amount, currency, maturity etc.

The effectiveness tests have to be performed both prospectively and retrospectively. For the retrospective test, the dollar-offset or regression analysis using historical data have to be applied. Going forward, the IFRS 9 will relax the requirements for the effectiveness test. As per the current version, the retrospective test has to be performed solely for assessing the ineffectiveness of the hedge relationship for reporting purposes. To determine if a hedge pair qualifies for Hedge Accounting for Credit Risk, only the prospective test is of relevance. The fixed range of 80–125 per cent, which verifies the effectiveness of the hedge, has been dropped. The focus is now on the ratio of hedge to hedged instrument to minimize expected ineffectiveness. For a clear case of 1:1 hedge ratio, the critical term match test which is qualitative only could be accepted. In case a hedge relationship proves to be ineffective prospectively, the hedge strategy could be rebalanced rather than de-designating the hedge as under IAS 39. Instead, a de-designation could result from a change in the hedge objective or hedge strategy.

5.1.1.3 Hedge accounting eligible assets and strategy

Assets which could be considered for Hedge Accounting for Credit Risk (HACR) must bear significant credit risk. Eligible assets for a fair value hedge are assets on balance sheet, i.e. bonds, floating rate notes, term loans or loan commitments or off-balance-sheet items, (firm) loan commitments – in general any financial instrument that is economically hedged with respect to credit risk if the requirements in connection with the economic risk transfer are met. Since a major prerequisite for applying HACR is that the CDS has to be liquid, the scope is effectively limited to credit risks of large multinationals. Loans are often restricted by non-transferability clauses which prevent a portfolio manager from selling the asset but also from physical delivery when it comes to the CDS trigger event restructuring. If no hedge accounting would have been

applied, the portfolio manager would buy the cheapest-to-deliver asset in the market, deliver it into the CDS and receive par. The difference of the purchase price to par is thus the loss compensation for losses from the asset of the defaulted borrower that the portfolio manager owns. Since the value change under hedge accounting has been imposed directly onto the asset on the book, this approach is not feasible. Beside the transferability clause, loans usually exhibit features which could have a negative effect on effectiveness of hedge accounting:

- **Undrawn Lines**: The right to draw a credit line by a borrower up to the granted amount at any time. *Problem*: Many portfolio managers take a notional-based approach when hedging credit risk. If the drawn amount of a credit line is significantly lower than the committed amount, the credit risk induced value change of the loan may differ from the changes in value of the hedge. *Solution*: Statistics show that corporates usually almost fully draw the lines available before default to ensure a maximum of flexibility until to the last moment this company exists. Assuming that exposure at default is close to granted amount for lower rated customers is conservative and did hold in most of the corporate defaults of the current decade.
- **Term Out Option**: The right of the borrower to extend the maturity of the loan to a predefined date without the consent of the loan granting bank. *Problem*: A change in the final maturity may decrease the effectiveness of the hedge pair as the maturity of the hedge does not match the maturity of the protected instrument. However, assumptions that companies in trouble will exercise this right in order to secure more time to breathe, in contrast to corporates with easy access to liquidity and improved refinancing rates, did not hold. To the contrary, some borrowers that faced a deterioration in their credit quality were more keen to restructure their liabilities on time to avoid a liquidity crunch at (even extended) loan maturity. Nevertheless, as the extension does not need the bank's consent, the said financial institution is effectively short an option and has to be conservative in assuming the option will be exercised. *Solution*: Any term out has to be taken as the final maturity date of the loan.
- **Prepayment Option**: The loan is repaid in part or in whole prior to maturity. *Problem*: This leads to either a reduction of the notional amount or the whole loan disappears. *Solution*: Pricing the option or building a model reserve.
- **Multiple Borrowers**: Under the terms of the loan contract, various borrowers are entitled to borrow from that loan. *Problem*: The most critical issue of a hedged position is that a hedge will not hold.

This would be the case if a credit event takes place at the borrower of a loan which does not trigger the CDS because of a different reference entity. The result would be losses from loans, due to the credit event, that are not offset by gains from the CDS. *Solution*: To avoid such problems, any of the multiple borrowers entitled to borrow under the scheme have to be linked to the reference entity of the CDS. In some cases, this creates problems even for larger, multinational corporates which tap the capital markets via a dedicated financing subsidiary that is not contractually bound to the holding company.

- **Multiple Currency**: Under the terms of a loan, the borrower can tap the loan in various currencies. *Problem*: This could impose inconsistencies of hedged versus borrowed amounts in the case of large scale currency moves since CDSs are usually denominated in USD or EUR. *Solution*: While these effects can be material, so far in itself it has not been a criteria for ruling out hedge accounting effectiveness. Nevertheless, in combination with other optionalities, it could become an obstacle and should be handled with care.
- **Grid Pricing**: Like a coupon step up for corporate bonds, some loan contracts exhibit margin grids for a range of default probabilities or ratings where margins increase if certain thresholds of credit quality are not met. *Problem*: While the CDS spread is fixed at purchase of default protection, the loan margin can vary over the lifetime of a loan and thus create ineffectiveness. *Solution*: Pricing the option or building a model reserve.
- **Fixed Rate Coupons**: While margins of most loans are floating, e.g. a certain risk premium above Libor, some borrowers prefer fixed coupons like those for corporate bonds.[11] *Problem*: Value changes for fixed coupon loans are determined by changes in credit and interest rate risk. *Solution*: Hedge Accounting for Credit Risk generally targets exclusively the credit risk component of a loan. A combination of interest rate swap and CDS should be able to mirror the cash flows of a floating rate loan. Without the interest rate swap, valuing loans based on interest rate curves and CDS will almost certainly create ineffectiveness at one point in time.

Even though loans are often very complex and individual products which contrast sharply with the standardized nature of CDS, most active credit portfolio managers make regular use of the derivatives to manage credit portfolios and single name credit risk in particular. If applied at inception, which means hedging a loan at the time of signing the loan transaction,

[11] Although many frequent issuers also have some floating rate notes (FRNs) outstanding, the vast majority of corporate bonds have been issued with a fixed coupon.

Hedge Accounting for Credit Risk perfectly supports a static strategy of risk protection. The profit and loss volatility induced by mark-to-market for CDS hedges has been substantially reduced. The residual profit and loss, the hedge ineffectiveness, arises from value changes of the CDS which are not completely offset by value changes in the hedged loan. Considering that loans for larger corporates, for which CDSs are available, are usually looked at as relationship-driven products, it is fair to assume that loans margins will almost never match CDS spreads. However, the difference may be small enough to ensure sufficient hedge effectiveness at origination even though some residual profit and loss effects will be still observable. Nevertheless, Hedge Accounting for Credit Risk also leaves room for portfolio management discretion regarding timing of hedging and subsequent application, provided the hedge relationship is effective. Here, timing is of the essence since a major gap between loan margin and CDS spread can restrict the application of hedge accounting because of ineffectiveness. This is typically the case when hedging takes place quite late, that is, when signs of credit problems are already visible through elevated CDS spreads while the loan margin remains unchanged and low. A proportion hedge, where only parts of the loans are hedged and hedge accounting applied, is permitted. This is in particular useful as management of concentration risk demands that only the exposure amount that breaches the limits has to be mitigated but not the full exposure amount of the borrower. It was clearly stated by the IASB that the objective of IFRS 9 is to align more closely hedge accounting to risk management activities to achieve a proper reflection in the financial statements. Unfortunately, for HACR a credit risk mitigation technique acknowledged by Basel II does not find its expression under IFRS 9, which contradicts this 'mission statement' of the IASB. Hedge Accounting for Credit Risk may not be suitable for some very active strategies which involve frequent hedge adjustments and imperfect hedges, curve and relative value positioning. These strategies aim at maximizing profit and loss from market dislocations, in addition to managing the underlying credit risk. Since the purpose of Hedge Accounting for Credit Risk is to reduce profit and loss volatility rather than profit maximization, those are conflicting objectives by definition.

5.1.1.4 Conclusion

Hedge Accounting for Credit Risk is a straight forward accounting concept and has successfully passed the practice test. However, the approach is complex and difficult to implement. Technical and methodological challenges, i.e. new procedures to change values of loans in loan data system, are significant. Extensive monitoring, back office and reporting

processes have to be set up and come at a cost. The effectiveness tests have to be performed regularly, representing an administrative burden. Related effects on workout and impairment, although positive, have to be considered and discussed with the units involved. Also, hedge accounting has some limits and drawbacks, mostly imposed by various loan features. A major concern of the standard setter is that credit risk of a loan may not be separately identifiable and reliably measureable. Provided sufficient liquidity in derivative markets, CDS allow to take a position on a very credit specific, isolated view. Therefore, those concerns are not admissible. Hedge Accounting for Credit Risk is a major step to value loans in line with market conditions which creates transparency about the true economic substance of the credit portfolio and also increases managerial flexibility to manage credit risk.

5.1.2 Fair valuing loans

Under IAS 39, any financial asset[12] or financial liability may be designated at initial recognition as a financial asset or financial liability, reported at fair value with changes in fair value included in the profit or loss statement. The option to fair value financial assets or liabilities is permitted only if (a) using it eliminates or significantly reduces an accounting mismatch that arises from measuring assets or liabilities or recognizing the gains and losses on them on different bases; or (b) it is used for a group of assets or liabilities that is managed and whose performance is evaluated on a fair value basis, in accordance with a documented risk management or investment strategy.[13] In principal, FASB follows the IFRS standard which makes the FVO a first choice for banks reporting under U.S. GAAP. The Fair Value Option under IAS 39 or FAS 115 aims to alleviate the problem of accounting asymmetry for related financial instruments, i.e. a loan or bond reported at amortized costs while a corresponding hedge is measured at market value. In this way, like for hedge accounting, the effectiveness of a hedge to mitigate interest rate or credit risk can be assessed. Based on that, hedging strategies can be revised at the full discretion of the portfolio manager if the economic objective has not been achieved. It also serves the purpose of reflecting the actual economic value of assets which in turn creates transparency for loan pricing and origination discipline. However, the FVO implicitly assumes that markets for credit risks are infinitely liquid

[12] IAS 39 does not permit election of the FVO for investments in equity instruments that do not have a quoted market price in an active market, and whose fair value cannot be reliably measured.

[13] Tschirhart, O'Brian, Moise and Yang (2007). The paper provides a good high level overview of the FVO and related issues at commercial banks.

which might not hold true in all circumstances, thereby questioning the accuracy of the derived fair value. In addition, if market prices for loans are observed, they have to be applied, giving rise to potentially significant basis risk resulting from differences between loan price and CDS implied valuation. On the positive side, deteriorating loan values are recognized in a more timely way compared to the concept of provisioning and can also send early warning signals to take proactive measures to mitigate the risk. Provided markets for those loans or related derivatives exist, measures could include forced selling or forced hedging once the value of the loan has fallen below a critical level. Often, market-based pricing anticipates burgeoning credit problems earlier than internal credit analysts or external rating provider but also tends to send incorrect signals sometimes. Consistent pricing of credit risk across the books (i.e. trading and banking books) and instruments (i.e. loans, bonds and derivatives) helps to provide a comprehensive view of the overall risks taken and to take educated decisions to actively manage those risks. Fair value of loans is deeply connected to loan transfer pricing. Effectively, fair valuing loans replaces the bank's internal assessment of the loans' risk by those of the markets. However, based on the valuation, an immediate conclusion can be taken as to the fairness of the loan price. To enhance origination discipline, a minimum fair value (in % of notional) can be set as a threshold to be met. If not observed, the loan would either face internal dismissal, approval conditional to selling the loan or the client manager would have to cover the shortfall with other (non lending) revenues from the customer.

5.1.2.1 FVO-eligible assets and pricing

Under the FVO where a more flexible approach has been discussed by the IASB, almost all financial assets or liabilities, including loans and commitments, can be elected to be measured at fair value in the financial statement. Determining the fair value of a loan includes changes in credit risk but also interest rates and liquidity spreads. With respect to credit risk, a stepped approach, similar to the one outlined for transfer pricing, can be taken. Essentially, the approach follows the idea that credit assets are valued according to observable market prices for those or comparable assets. Hence, secondary market loan prices have to be directly applied to value a loan. If the loan does not trade, other sources of valuations such as bond or CDS spreads can be applied. In that case, the residual profit and loss volatility from changes in the credit risk of the borrower will be largely determined by the basis between loan and bond or CDS which is driven by

- **Funding**: Loans are funded while CDSs are unfunded instruments. Therefore, a basis between loan prices and corresponding CDS spreads

will arise since the basis reflects the different funding levels of market participants;

- **Supply and Demand**: While CDS and loan markets are loosely connected, they often exhibit varying supply and demand trends due to their specific market and product characteristics which clearly impacts the pricing relative to each other;
- **Definition of Default**: The definition of default for loan and CDS may differ since the loan often carries specific provisions whereas the documentation for CDS is standardized and includes credit events definitions different from the concept of incurred losses;
- **CDS Deliverable Obligation**: A CDS contract defines the obligations which are deliverable into the auction after a credit event. The loan may or may not be eligible as a deliverable, which has a significant impact on the loan price. The liquidation proceeds, not the auction-determined recovery rate, determine the value of the loan if the loan cannot be physically delivered to the CDS protection seller;
- **Loan Optionalities**: Unlike CDS or bonds, loan documentations more often than not include various optionalities which are partly sensitive to interest rates. Embedded options have to be priced consistently, which may prove to be challenging and may result in meaningful differences to CDS and bond spreads.

Most loans do not trade regularly in the market. Instead, valuing loans of a particular borrower can be derived from market prices for related tradeable securities of the same reference entity, i.e. CDS or bonds. The basis risk described above gives rise to a potentially considerable profit and loss amplitude, especially when hedging larger loan amounts. This can be irritating at times and in particular when the credit risk of a loan is thought to be perfectly hedged. When no secondary market prices or spreads are available for a particular borrower, generic curves can be used for pricing illiquid loans. Banks can estimate the fair value of a loan using a discounted cash flows (DCF) model. In a very simplified way, the fair value of a fully drawn transaction, e.g. a term loan or a bond, for a performing obligor can be computed as follows. Expected payments from the customer minus costs are multiplied by the survivorship probability (that is, 1- probability of default) per each payment date t, resulting in the 'net risky payments'. Payments from the obligor include margin on the exposure outstanding, principal payment at maturity and fees. Costs of the transaction are (among others) credit spread, funding costs, operating costs and cost of equity. The probability of default rises over time so that the value of expected payments in the distant future is lower than the value of same amount expected payments near term. Net risky payments

at each period t are then discounted according to the spot curve. The fair value of the financial transaction is then determined by the present value of the net future expected payments.

5.1.2.2 Regulatory requirements for application of FVO

It becomes clear that the FVO is very sensitive to price assumptions and pricing models. The Basel Committee on Banking Supervision (BCBS) expressed concerns about the ability of banks to determine reliable fair values for instruments without market prices observable from active markets. According to the BCBS, the lack of reliable fair measures may permit companies to manage earnings by using self-service models in ways that would not easily be detected by financial statement users.[14] In its guidance released in June 2006,[15] BCBS laid out a number of supervisory expectations to users of the FVO. Specifically, banks are expected not to apply the Fair Value Option to instruments for which they are unable to reliably estimate fair values. In April 2009,[16] BCBS issued principles which aimed at promoting a strong governance process around valuations, given the significance of fair value measurements for regulatory capital adequacy and internal bank risk management. Rigorous validation of models should be systematically applied, including evaluations of the model soundness, appropriateness of model assumptions and benchmarking of model results with observed market prices.

5.1.2.3 Conclusion

Application of the FVO is an appropriate way to solve the accounting mismatch of hedged loans and CDS hedges. Compared to Hedge Accounting for Credit Risk (HACR), FVO is less complex but also effective, provided functioning and liquid credit markets which is a condition for deriving reasonable fair values. Although the profit and loss volatility is substantially reduced under the FVO, potentially significant residual effects arising from the cash basis may remain. In contrast to HACR, imperfect, macro or portfolio hedges can be considered to manage credit risk as there is no requirement of a one-to-one hedge relationship or hedge ratio between a particular loan and hedge. However, valuation models are

---

[14] Basel Committee of Banking Supervision, Letter to Sir David Tweedie, Chairman of IASB, regarding comments on the IAS 30 Fair Value Option proposal, July 30, 2004. See www.bis.org.

[15] Basel Committee of Banking Supervision, *Supervisory Guidance on the Use of the Fair Value Option for Financial Instruments by Banks*, June 2006. See www.bis.org. The guidance referred specifically to IAS 39 but assumed that the principles are generally applicable to similar Fair Value Option regimes in other jurisdictions.

[16] Basel Committee of Banking Supervision, *Supervisory Guidance for Assessing Banks' Financial Instrument Fair Value Practices,* April 2009. See www.bis.org.

under regulatory scrutiny, which may restrict the eligibility of illiquid assets. Application of the FVO may be suitable for those obligors where a sufficiently liquid CDS or at least bond publicly trades. Product-wise, the focus is on term loans, credit lines and revolving credit facilities with little complexity from embedded options. Nonetheless, the FVO constraints have been so onerous that few banks have chosen to apply this option. Three key limitations have prevented from a more widespread use of the FVO but have been addressed by the IASB to increase the flexibility of the FVO:

- The ability to elect fair value only at the time of inception;
- The irreversibility of the decision to apply the FVO over the lifetime of a transaction;
- The inability to fair value only a portion of the hedged facility rather than the full amount.

Portfolio managers may prefer to use HACR where possible if those restrictions are not acceptable to them. Provided the hedge pair is effective, those limitations do not apply under HACR.

5.1.3 Financial Guarantee

One common feature of most loans is their illiquidity. Trading in bilateral loans almost never takes place while larger syndicated loans trade mostly at the time of origination and rarely later on. Complex credit products are tailored to the specific needs of clients and are largely reflexive of the banks expertise to satisfy these needs. This comes with a lower level of standardization of the loan documentation which, on the other hand, prevents regular trading of those assets. In contrast, credit default swaps are the most liquid debt instrument which is exactly because of their high degree of standardization, regulated by the International Swaps and Derivatives Association (ISDA). Portfolio managers make active use of CDS to protect the bank against credit related losses. However, the accounting implications of CDS hedging is for many banks a constraint which prevents a more active and rigorous risk management. An alternative solution to avoid the unintended volatility in profit and loss induced by CDS hedging is a Financial Guarantee. The objective of this instrument is to protect against a loan loss due to obligor default similar to CDS while matching the accounting treatment of loans. For reasons of efficiency, CDS documentation is often used as a reference to design a Financial Guarantee. Nevertheless, a simple carbon copy of the CDS documentation will likely lead to a dismissal of the contract as a Financial Guarantee

as evidenced in case of the Austrian bank Erste Group. In October 2011, the firm had to issue a profit warning related to an abrupt change in the accounting treatment of their credit derivatives which amounted to €410 mn charge. It appears that Erste Group had to switch from accrual accounting to fair value accounting, claiming beforehand that the transactions were Financial Guarantees, although using the standard CDS documentation.

5.1.3.1 Accounting rules for Financial Guarantees

Under IAS 39, a Financial Guarantee contract is defined as '*a contract that requires the issuer to make specified payments to reimburse the holder for a loss it incurs because a specified debtor fails to make payment when due in accordance with the original or modified terms of a debt instrument*.' The rules for designing Financial Guarantees according to IAS 39.9 are strict and focus in principal on potential losses from credit risk while other risks such as market risk are excluded from the definition.[17] A Financial Guarantee requires a contractual agreement between protection buyer and protection seller. The contract must refer to defined payments of the debt instrument. The payments must be quantifiable and the protection buyer must be exposed to the risk of non-payment Also, the debt instrument cannot be disposed of by the bank that wants to enter into a Financial Guarantee for hedging purposes. Schubert (2011a) rules out the notion that the debt instrument can be sold to a third party with the holder of the Financial Guarantee claiming compensation from the guarantee provider for subsequent losses due to obligor default. As a precondition for loss compensation payment, the holder of the contract must have incurred a loss because of the failure of a debtor to make payments when due. The important point here is that the definition is loss driven and not event driven. For example, a loss occurring from a decline in market value due to a deterioration of the borrower credit quality is not covered by a Financial Guarantee under the definition of IAS 39. Furthermore, compensation payments under the Financial Guarantee must not exceed the loss incurred from the specified hedged instrument. Also for that reason, the standard CDS documentation cannot be applied. CDS can be settled either by cash or physical delivery of the defaulted asset. In case of cash settlement, the CDS protection buyer receives the compensation payment once the recovery is determined. Then the CDS contract terminates. One reason for protection buyers to prefer cash settlement is if the loss compensation from the CDS is expected to exceed the loss incurred from the asset they own. The physical settlement option of the CDS

[17] See Schubert (2011a).

standard[18] permits the protection buyer to opportunistically purchase a deliverable defaulted asset (deliverable obligation of the reference entity) that is then settled into the CDS rather than the initially hedged asset. If the purchase cost for the deliverable asset is below the value of the hedged debt instrument, the protection holder is actually overcompensated for incurred losses. Like insurance, the Financial Guarantee however does only cover losses associated with the insured item and insured event.[19] Any possibility of a loss compensation which does not match the amount of loss incurred – which cannot be excluded if, in case of cash settlement, the protection buyer retains the defaulted asset and the future cash flows associated with it – contradicts the definition of a Financial Guarantee. Thus, the restrictive accounting framework requires certain adjustments to the CDS documentation in order to qualify for a Financial Guarantee, i.e. exclusion of cash settlement. Under physical delivery, the hedged debt instrument must be the reference obligation, which the protection holder is expected to keep on his books for the lifetime of the protection. A similar situation occurs with respect to the credit event definition of the Financial Guarantee. Common credit events according to market usance and ISDA credit derivative definitions include bankruptcy, failure to pay and restructuring of which only failure to pay meets the definition of a Financial Guarantee. This is because ISDA provides with event specifications that would determine a credit event even though no loss to the holder of the reference obligation has actually occurred, thereby violating the insurance intention of a Financial Guarantee. With respect to credit events, the Financial Guarantee documentation has to ensure that the triggering event directly refers to the payments under the debt instrument and that no compensation in excess of the incurred losses is possible. Like for Hedge Accounting for Credit Risk, the settlement date of the hedge contract must not be later than the maturity of the hedged item.

5.1.3.2 Conclusion

Financial Guarantees are best suitable for an insurance approach: the credit asset is insured against exactly the amount of losses that arises from a default. A Financial Guarantee qualifies as collateral under IAS39. The specific features of the loan asset can be recognized in the documentation since Financial Guarantees are tailorized hedge products – a kind of

[18] Assuming that the contract specifies 'borrowed money' rather than 'reference obligations only'. Under 'borrowed money' all outstanding obligations of the reference entity qualify for physical delivery.

[19] See Schubert (2010). The article provides a well-written and in-depth assessment of how to restructure a standard CDS into a Financial Guarantee.

'restructured' CDS designed to not conform with CDS standards, which otherwise would imply mark-to-market accounting recognition. This in turn results in illiquidity of the hedge, which may not be appropriate for actively managed credit portfolios. Traders would take a basis risk by hedging Financial Guarantees with standardized CDS, which very few are willing to do and which comes at a significant premium. An early unwind of a Financial Guarantee when a loan gets prepaid is fully dependent on the willingness of the counterpart, with no perfectly offsetting (netting) CDS investment possible due to the different transactional specifications. Hence, a contract design which fully complies with the accounting standards unduly restricts the flexibility of the portfolio manager. In addition, the protection buyer may be still exposed to risks that would result in loan loss provisioning since the only credit event recognized by an FG is 'failure to pay'. Table 5.1 (see below) compares a CDS hedge booked into banking book with a CDS hedge where Hedge Accounting for Credit Risk (HACR) has been applied as well as a Financial Guarantee. A decision about the most appropriate solution is largely dependent on the priorities and targets which have to be achieved. In some cases, certain restrictions can lead to dismissal of the product for hedging purposes. For instance, since a Financial Guarantee encompasses the credit event 'failure to pay' only, it is seen as incomplete by many risk managers and therefore ruled out, even though from an accounting perspective it might have been the optimal solution.

5.1.4 Combination of hedge and reinvestment portfolio

Some portfolio managers use a combination of hedges and investments to manage the CDS- induced profit and loss volatility. That concept is mostly applied for diversification strategies. Value changes from hedges, which aim at compensating for loan losses, are balanced by those from investments. On a net basis, the overall risk in terms of exposure or expected loss of a portfolio does not decrease significantly under this approach; it may even increase. However, it is possible to reduce the economic capital consumption of a portfolio by hedging large bulk risks at comparably lower hedge costs.[20] Nevertheless, combining hedges with investments

[20] The reduction in economic capital consumption is driven by the improvement in the portfolio diversification. Since Basel II capital weights do not recognize correlation effects, there is no immediate equivalent reduction in regulatory capital from the strategies outlined here. However, since banks are requested to hold additional capital for concentration risks, there is ultimately a positive effect from the hedge/investment combination when assessing the capital adequacy of the firm. It should be noted though that Basel 2.5 penalizes investments booked into the trading book by charging higher risk weights.

Table 5.1 Schematic comparison of CDS hedge, CDS hedge with Hedge Accounting for Credit Risk applied and Financial Guarantee

	CDS	**CDS with HACR**	**Financial Guarantee**
Impact on RWA	Reduction on RWA can be achieved. The RWA reduction effect depends on the risk weight of the protection seller		Partial/no capital relief due to exclusion of Restructuring and Bankruptcy credit events
Impact on Accounting Treatment	Full Mark-to-Market (MtM)	MtM of the CDS significantly offset by fair value adjustment on the loan (hedge result). Reduction depends on effectiveness of hedge pair	At cost treatment (book value)
Mark-to-Market Risk	Full Mark-to-Market	Residual Mark-to-Market risk from hedge ineffectiveness	In case of early termination of the hedge instrument Mark-to-Market compensation to the counterpart basis risk if a contact cannot be closed out and an offsetting transaction is put in place
Impact on Specific Loan Loss Provisions (SLLP)	No effect	SLLP represented by fair value adjustments. Timing effects to be considered when impairment occurs before credit event, depending on the estimate of liquidation proceeds	In general on SLLP necessary but timing effects to be considered when impairment occurs before 'failure to pay' credit event
Impact on Standard Risk Costs (SRC)	SRC only on counterpart risk (according to the regulatory view)		
Economic Loss	Fully covered	Fully covered	Only losses from failure to pay credit event
Possible Credit Events	Failure to pay Bankruptcy Restructuring (not for the U.S.)	Failure to pay Bankruptcy Restructuring (not for the U.S.)	Failure to pay
Loss Compensation in Case of Credit Event	Full compensation of loss, determined by auction	Full compensation of loss, determined by auction	Full compensation of loss, as determined by internal work-out

Failure to Pay	Recovery for all deliverables determined by credit derivatives auction	Recovery for all deliverables determined by credit derivatives auction	Realized loss of the hedged underlying after work out
Bankruptcy	Recovery for all deliverables determined by credit derivatives auction; no differentiation for maturity buckets	Recovery for all deliverables determined by credit derivatives auction; no differentiation for maturity buckets	Not applicable
Restructuring	Separate auctions for different maturity buckets may result in different recoveries	Separate auctions for different maturity buckets may result in different recoveries	Not applicable
Profit and Loss effects due to timing differences	P&L effects (SLLP, Mark-Market, Recovery) will likely occur in different accounting periods	Efficient hedge relationships largely smoothen the time effect	Timing effects might occur when impairment takes place before failure to pay credit event. The actual loss after work out is applied against the compensation payment of the hedge
Qualifying underlying for protection instrument Product liquidity	Reference obligation High for standard maturities	Reference obligation High for standard maturities	Reference obligation only specific debt instrument on the book of the protection buyer during the lifetime of the FG Illiquid
Impact of early termination of the hedge instrument	Accounted for at market value, no impact	If loan still exists, FV adjustments is amortized over the remaining lifetime of the loan; If loan is repaid, FV adjustment is reversed immediately through P&L	In case of early termination of the hedge instrument MtM compensation to the counterpart. Protection buyer however is not allowed to receive any payments from protection seller in case of early termination

Continued

Table 5.1 Continued

	CDS	CDS with HACR	Financial Guarantee
Consequence of prepayment of underlying	CDS can either be unwound, or reassigned to another asset (also in work-out situation)	CDS can either be unwound, or reassigned to another asset (also in work-out situation); however former hedge pair terminates and therefore goes out of HACR; FV adjustments are reversed immediately through P&L	If loan terminates early the FG has to be terminated as well. (No MtM compensation payment will be triggered – neither from protection seller nor protection buyer side)
Costs	Carry costs. Mark-to-Market value changes	Carry costs. Residual Mark-to-Market from hedge ineffectiveness. Pull to zero effect of FV adjustments. In case of dedesignation: amortization or immediately reflected in P&L (as described above under 'early termination')	Carry costs. Mark-to-Market compensation payment in case of early termination
Physical or cash settlement	Both, contractual agreement	Both, contractual agreement	Physical settlement only
Qualifying underlying for physical settlement	Any underlying which is determined as deliverable obligation by Credit Derivatives Determinations Committee (can be cheapest to deliver)	Any underlying which is determined as deliverable obligation by Credit Derivatives Determinations Committee (can be cheapest to deliver)	Reference obligation only. Specified debt instrument on the book of the protecting buyer during the lifetime of the FG

exposes the portfolio manager to substantial mark-to-market risks. The strategy works best for highly correlated hedges and investments, which is also the major drawback since a diversification strategy aims at reducing the correlation between portfolio constituents. There are four main applications for a combination of hedges and investments:

1. DV01 neutral
2. Beta neutral
3. Notional neutral
4. Cost (Cash Flow) neutral.

Let us assume that a portfolio manager wants to hedge €100 mn of a 5-year senior unsecured, fully drawn loan of the Italian corporate Enel, using a corresponding CDS of equal duration. To counterbalance the profit and loss volatility which arises from changes in the spread of the CDS hedge, the portfolio manager considers a maturity matching investment in the similarly rated German utility company E.ON. In order to test the four approaches and to compare the results, we use the CDS spreads

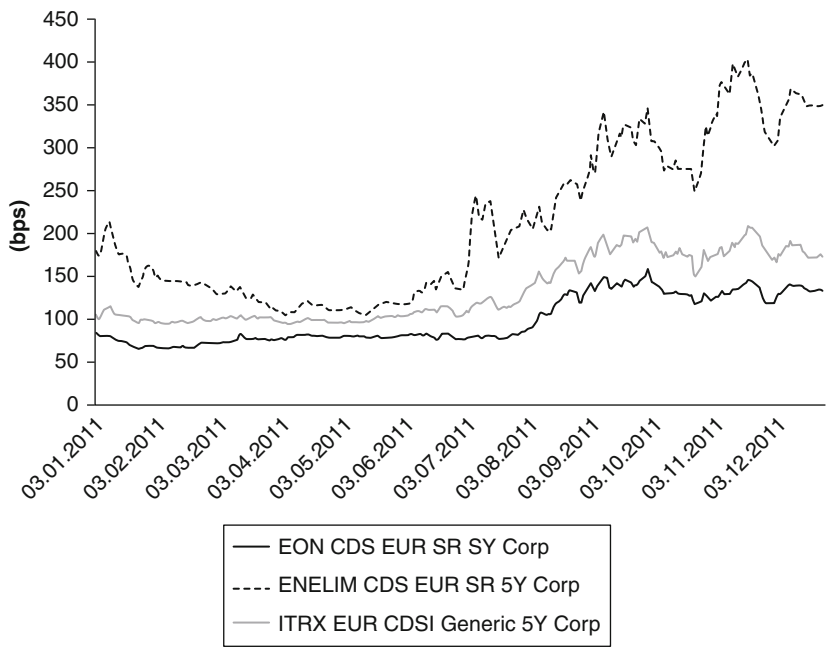


Figure 5.2 ENEL, E.ON and iTraxx 5-Year CDS spreads
Data source: Bloomberg.

Table 5.2 Profit and loss effects from combined hedge and reinvestment strategies

	Hedge	**Investment**	**Combined**
Company	ENEL	EON	
Rating	A3/A-	A3/A	
Ticker	CENEL1E5	CEON1E5	
Duration	5Y	5Y	
Seniority	Sen Unsec	Sen Unsec	
DV01 (€)*	42.453	47.918	
Coupon (bps)	100	100	
Spread at January 3, 2011 (bps)	179	83	
Spread at December 30, 2011 (bps)	350	134	
Δ Spread (mn €)	172	50	
Beta		0,28	
Notional Amount (mn €)			
DV01 neutral	100	–89	11,41
Beta neutral	100	–355	–255,17
Notional neutral	100	–100	0,00
Cost neutral	100	–214	–114,30
Carry Amount (mn €)			
DV01 neutral	–1,79	0,74	–1,05
Beta neutral	–1,79	2,96	1,17
Notional neutral	–1,79	0,83	–0.95
Cost neutral	–1,79	1,79	0,00
P&L from Δ Spread (mn €)			
DV01 neutral	7,29	–2,14	5,15
Beta neutral	7,29	–8,56	–1,28
Notional neutral	7,29	–2,41	4,87
Cost neutral	7,29	–5,17	2,12
Total P&L (mn €)			
DV01 neutral	5,50	–1,40	4,10
Beta neutral	5,50	–5,60	–0,10
Notional neutral	5,50	–1,58	3,92
Cost neutral	5,50	–3,38	2,12
P&L Volatility (mn €)	**Max**	**Min**	
DV01 neutral	2,13	–1,17	
Beta neutral	2,13	–1,24	
Notional neutral	2,13	–1,17	
Cost neutral	2,13	–1,20	
Cumulative P&L (mn €)	**Max**	**Min**	
DV01 neutral	6,19	–3,39	
Beta neutral	4,07	–4,78	
Notional neutral	4,04	–3,34	
Cost neutral	4,04	–2,83	

*DV01 per € 100mn Notional.

of 5-year CDS of Enel and E.ON for a full year, starting from January, 2nd 2011 to December, 31st 2011. A combination of hedge and investment for one year will be put in place on January, 1st 2011. However, even though the two corporates belong to the same industry and share almost the same probability of default as assessed by external rating agencies, their spread moves differed significantly.

Table 4 exemplifies the corresponding amounts to be invested in E.ON 5-Year senior unsecured CDS. The DV01 denotes the change in value of the respective CDS for a 1 basis point change in the spread of the CDS. Profit and loss effects arising under the different approaches are detailed by the contribution from cost of carry and value changes. Maximum and minimum values are shown for daily and cumulative profit and loss. The objective of any of hedge/investment strategy is to reduce both daily value changes and the cumulative profit and loss from the combined position as much as possible. The following examples illustrate the key concepts but may not be representative for other hedge and investment combinations.

5.1.4.1 DV01 neutral hedge and reinvestment strategy

The basic concept of the DV01 neutral strategy aims at a balanced development of the hedge/investment pair based on their sensitivity to changes in spreads. The relevant DV01 measure for the CDS contract is the change

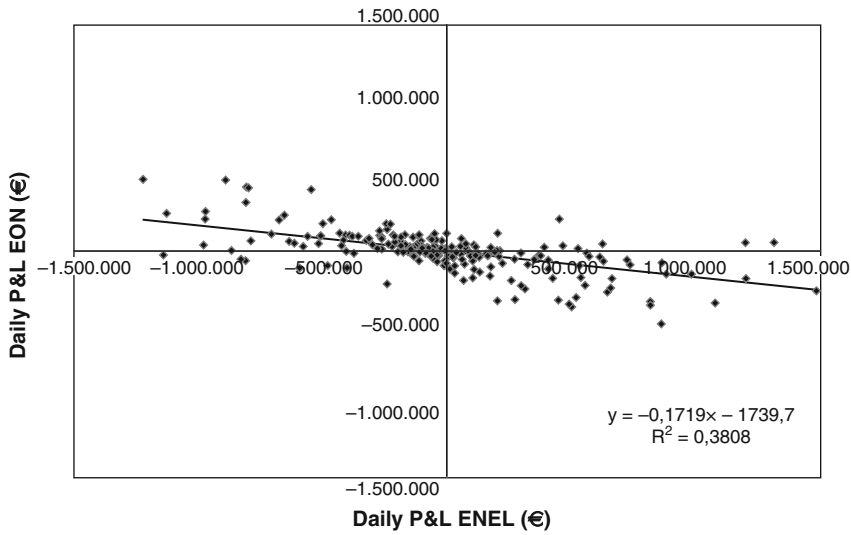


Figure 5.3 Correlation of daily P&L changes from hedge and investment under the DV01 neutral approach

Data source: Bloomberg.

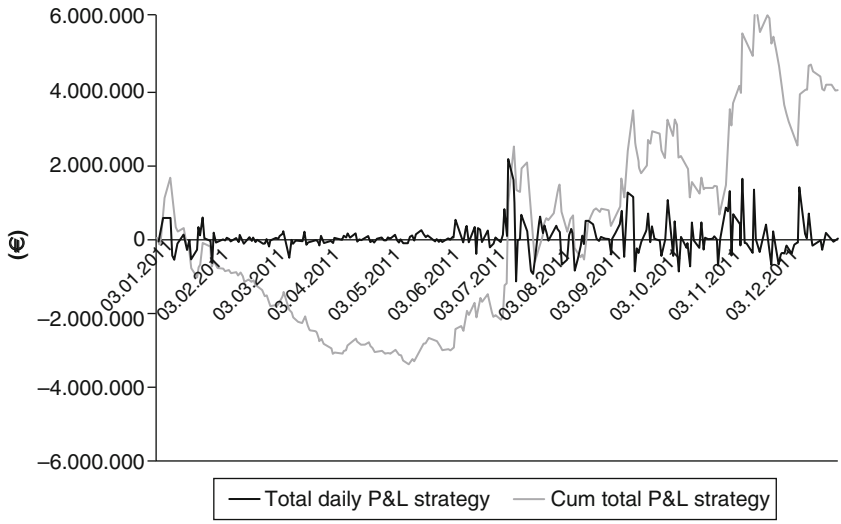


Figure 5.4 Daily and cumulative P&L of the DV01 neutral hedge and reinvestment strategy

Data source: Bloomberg.

in value of the CDS contract when the CDS quoted spread increases by one basis point. Since the DV01 for ENEL is lower compared to E.ON, an investment of €89 mn in E.ON CDS would be DV01 neutral for €100 mn ENEL hedge.[21] That means, that if E.ON and ENEL spreads move in perfect synchronicity, the residual profit and loss (P&L) from spread changes would be zero.

However, during the tested period of 2011, losses from spread widening for E.ON have been more then compensated by gains from spread widening of the hedge. Figure 5.1 shows that daily profit and loss moves are dispersed to larger moves, positive and negative, for the ENEL hedge which are not counterbalanced by similar changes from the investment. Although the carry to protect for a default of ENEL largely exceeds the income from selling protection on E.ON, the total profit and loss for the combined position for the full year would have been a gain of €4.10 mn. Over the course of the year, the cumulative profit and loss from the pair

[21] The example shown here assumes that the ratio remains static over the lifetime of the trade, i.e. no delta hedging or any dynamic or curve adjustment will be made. Although this restriction contrasts with the strategy conducted by market makers or other traders, the intention here is to recognize the different objective of a portfolio manager, aiming at a longer term stable hedge/investment relationship that does not inflict notable corrections of the positions which create transaction costs and consume resources.

ranges from €-3.39 mn to €6.19 mn. The chart below depicts the daily value changes from spread moves and carry costs for the hedge and the investment as well as the cumulative profit and loss.

A DV01 neutral strategy in theory has to be rebalanced frequently as the DV01 sensitivities change, ideally on a daily basis. In our example, no such dynamic adjustment has been considered since a) the purpose of the outline is to illustrate the basic concept and b) the transaction costs and operating inefficiencies resulting from a regular rebalancing have to be weighed against the incremental benefit from the permanently adjusted hedge ratio.

5.1.4.2 Beta neutral hedge and reinvestment strategy

Higher risk names typically exhibit a larger volatility compared to safer companies. A beta neutral strategy explicitly takes the correlation of both names to an index or to each other into account in order to balance the profit and loss from market moves. The investment amount of €355 mn is equal to the hedge amount divided by the correlation weighting factor which is 0.28[22] in this case. Unfortunately, the correlation is mostly unstable over time. So even in a beta neutral strategy, the residual profit

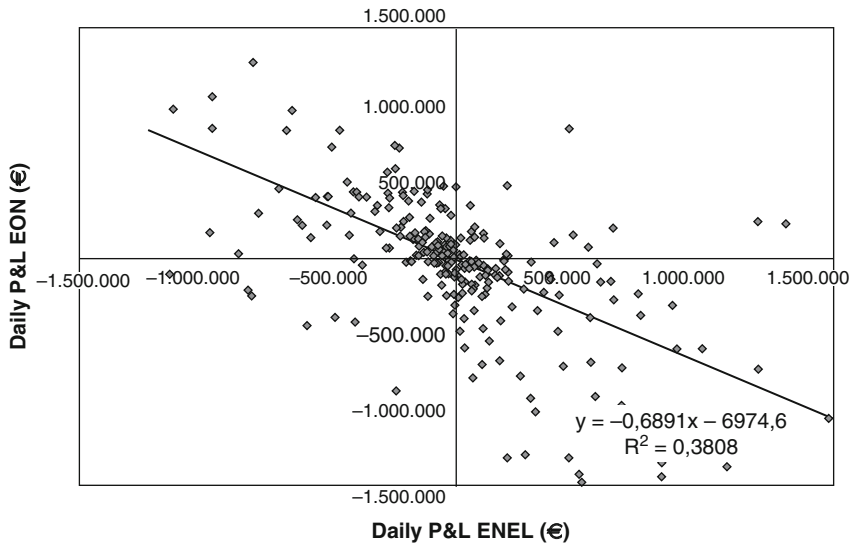


Figure 5.5 Correlation of daily P&L changes from hedge and investment under the Beta neutral approach

Data source: Bloomberg.

[22] For simplification, the regression has been performed on the time horizon of 1 year (2011 data).

and loss from spread moves will be uncertain and deviating from zero, which is a form of basis risk. For the chosen hedge and investment pair, this is demonstrated in Figure 5.4, where the daily profit and loss changes are widely spread. During the lifetime of the hedge/investment pair, significant profit and loss spikes can arise although they should be lower than a DV01 or notional approach that does not consider the correlation between hedge and investment.

A dynamic hedging approach, where the offsetting investment position is continuously adjusted to a trailing weighting factor, which incorporates the most recent moves in correlation, can be considered but results in meaningful turnover from adjusting the offsetting investment position. The total profit and loss from this strategy amounts to €-0.1 mn which is the lowest absolute value of the four strategies discussed herein, driven by offsetting effects from both value changes and carry costs. However, from the chart below, one can see that while for most of the year the cumulative profit and loss oscillated in a range of €-2 mn to €2 mn, it dropped from €4 mn to €-5mn in a short period of time.

5.1.4.3 Notional neutral hedge and reinvestment strategy

Portfolio managers often apply a notional or exposure outstanding approach when hedging loans. The structure of this combination is determined by a notional amount of hedge CDS equal to the notional

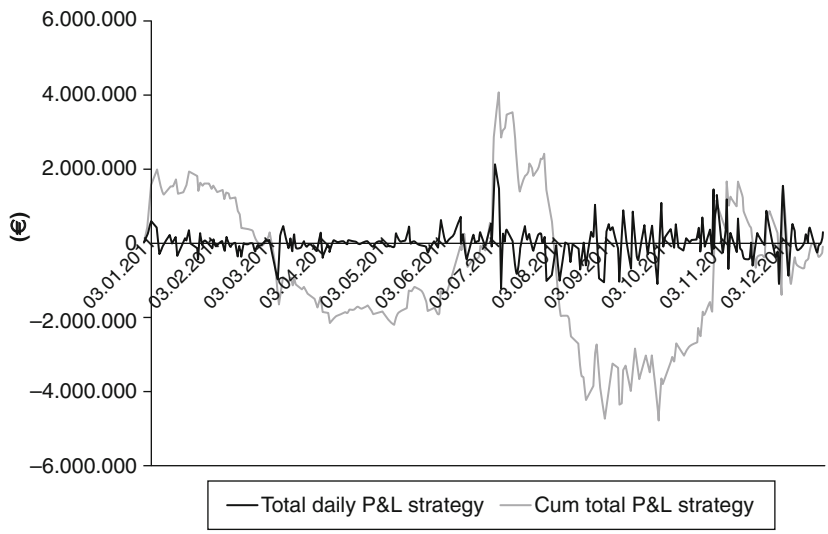


Figure 5.6 Daily and cumulative P&L of the Beta neutral hedge and reinvestment strategy

Data source: Bloomberg.

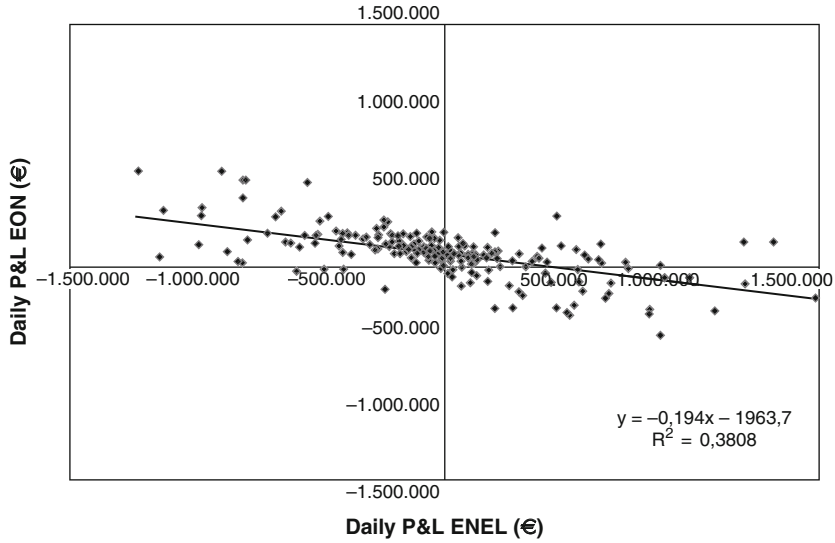


Figure 5.7 Correlation of daily P&L changes from hedge and investment under the notional neutral approach

Data source: Bloomberg.

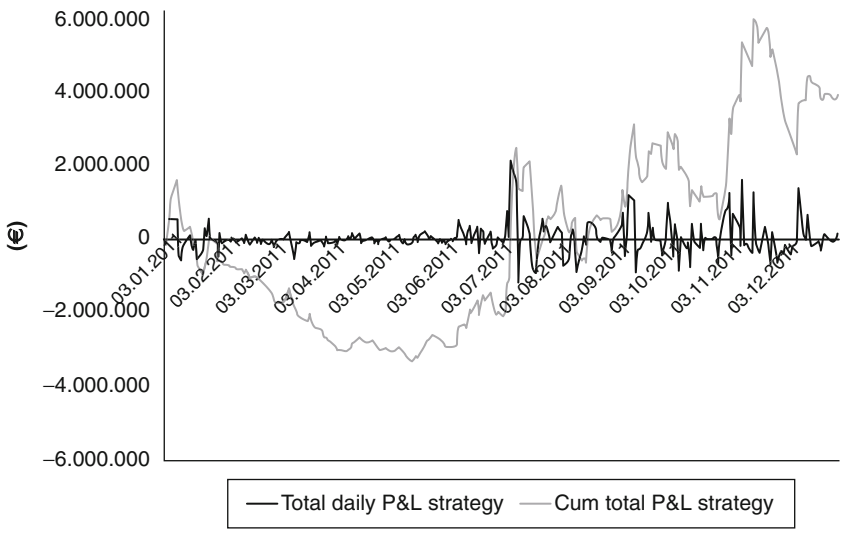


Figure 5.8 Daily and cumulative P&L of the notional neutral hedge and reinvestment strategy

Data source: Bloomberg.

amount of CDS investment. In an extreme case, where both hedge and investment obligor default, the resulting profit and loss will be determined only by the difference of the recovery of each name.[23] Similar to the DV01 neutral approach, daily profit and loss moves are dispersed due to the higher volatility of the hedge compared to the investment as shown in Figure 5.7.

The total profit and loss is €3.92 mn because of the positive spread-widening effect from insurance bought on ENEL, which outweighs both the losses from the investment in E.ON and the higher protection costs for ENEL. It becomes clear from the chart below that this strategy is less effective for counterbalancing profit and loss volatility.

As evidenced by the example shown above, the structure of this trade exposes the bank to mark-to-market gains and losses from spread moves of the hedge and investment since neither the DV01 of the two strategies are equal nor do the spread changes perfectly offset each other.

5.1.4.4 Cost (cash flow) neutral hedge and reinvestment strategy

If a portfolio manager has been allocated a budget for hedges which cannot be exceeded, a strategy that keeps carry costs from hedges as low

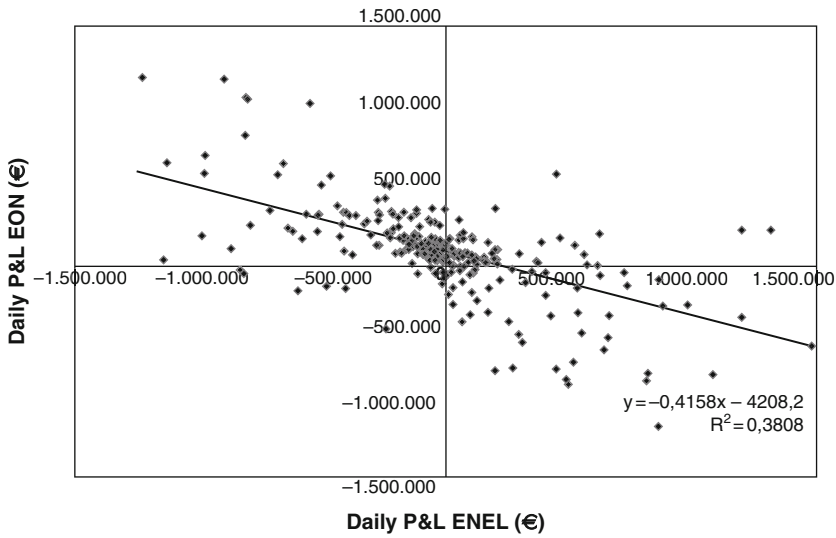


Figure 5.9 Correlation of daily P&L changes from hedge and investment under the cost neutral approach

Data source: Bloomberg.

[23] Assuming the two defaults take place simultaneously and ignoring the time value of the recovery.

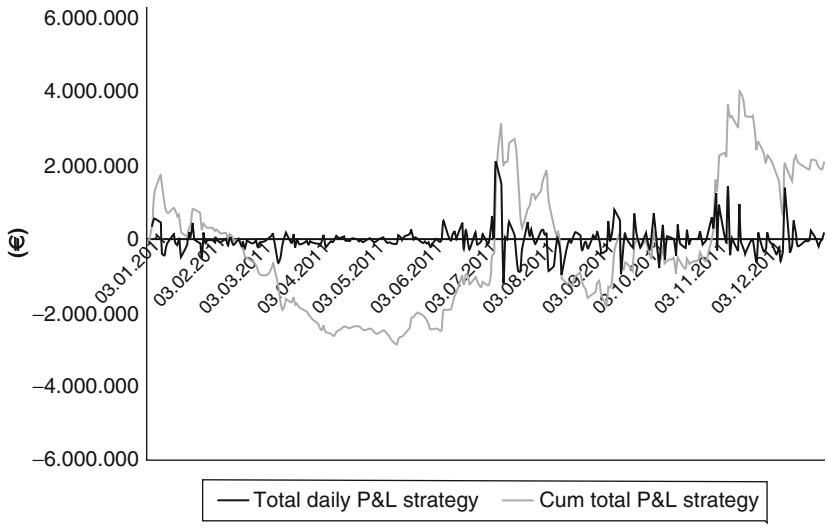


Figure 5.10 Daily and cumulative P&L of the cost neutral hedge and investment strategy

Data source: Bloomberg.

as possible may be appropriate. In the example of ENEL and E.ON, the costs to protect for a default of ENEL are 2.14 times higher then those for E.ON at the trade date. Thus, the portfolio manager would sell €214 mn protection of E.ON to match the costs of buying €100 mn protection for ENEL. The cumulative profit and loss from this strategy is then solely determined by value changes because of spread moves of hedge and investment, and no longer by different costs of carry. As evidenced in Figure 5.9, this strategy exhibits less daily profit and loss volatility and direction compared to the DV01 neutral and notional neutral strategy since the ratio of hedge and investment is determined by the ratio of their spreads, which already reflects the different degree of idiosyncratic risk. In this case, the strategy would also be superior to the beta neutral strategy. In general, while the structure of the trade offsets all running cash flow from the hedge by those of the investments, the cash flow from an exit other then termination at maturity may be non-zero.

Nevertheless, even in this case where the slope of the linear regression of the daily profit and loss moves from hedge and investment is –42°, thus close to the ideal –45°, there are significant dispersions around this line. Also the cumulative profit and loss over the course of the hedge period exhibits significant distortions, ranging from €–2.83 mn to €4.04 mn, although these are the lowest minimum and maximum values of the four tested strategies.

5.1.4.5 Conclusion

Combining hedges with investments helps to reduce profit and loss volatility arising from value changes in hedges. However, because of diverging spread moves of hedge and investment, both the remaining daily profit and loss swings as well as the cumulative profit and loss can be material. The new Basel 2.5 rules have a detrimental effect on the capital efficiency of these strategies since the capital relief from hedges in the banking book is offset by capital charges on investments in either the banking or trading book. All four strategies are best suited for bulk risk reduction for investment-grade companies where the hedge can be counterbalanced by liquid investments, e.g. the iTraxx index, provided the basis risk of diverging spread moves of hedge and index is acceptable to the portfolio manager. Credit indices, however, expose the investor to credit, sector and country risks of index constituents that may be unwanted. Product-specific basis risk, i.e. from CDS hedges offset by investments in corporate bonds, can become a concern. The higher the share of idiosyncratic risk of a CDS, the less appropriate is a hedge/investment strategy. Here, an outright risk reduction should be considered rather than a risk substitution. As a regular portfolio management tool for managing single names, combinations of hedges and investments will play only a minor role. On a portfolio level, especially when using the Fair Value Option for loans, investments can contribute to improve the relevant risk metrics through diversification benefits, as well as mitigate effects from the accounting mismatch.

6
Regulatory Capital Management under Basel II

Under the Basel II international capital framework,[1] banks must maintain a minimum level of capital for the risks taken to ensure capital adequacy. Beside the economic risk transferred by hedging loans or bonds with CDS, a key and sometimes primary motivation of banks to engage in such risk mitigation is the resulting capital relief, since the Basel capital framework explicitly recognizes credit risk mitigation (CRM) techniques as an effective risk-management tool which can significantly reduce credit risk.[2] Basel II revised the approach to credit risk mitigation, allowing a wider range of credit risk mitigants that achieve regulatory capital relief compared to Basel I. The tight capital situation of banks has been in particular a concern in the aftermath of the Lehman crisis but was also highlighted by the EBA stress tests, followed by corresponding requests to banks to close the gap between their actual capital base and the requested threshold. To solve this issue, capital management has become a high priority exercise for most banks. Advanced financial institutions view capital management as a holistic, firm-wide function which encourages both regulatory and economic capital discipline and consistency rather than a post-business care where costly and cumbersome capital optimization initiatives seek to restore the capital base. A centralized approach ensures that capital is coherently allocated throughout all business divisions within a common strategical and tactical framework. An improved awareness of the amount of capital deployed, the capital intensity and the costs attached to it are key to capital efficient business operations, not just for the risk-weighted

[1] See BCBS (2006). The framework is adopted by European law via the Capital Requirements Directive (CRD).

[2] See BCBS (2011b). The BCBS noted that certain credit protection transactions exhibit the potential for regulatory capital arbitrage, and thus will be closely scrutinized by the bank's supervisors. While those concerns relate primarily to high cost credit protection under the securitization framework, it becomes clear that regulators will keep a close eye as to how banks optimize their capital in general.

asset-intense units. Increasing the capital flexibility warrants in-depth insights as to how quickly capital can be reallocated across business functions or redeployed within a unit where capital relief has been achieved. Correct anticipation of related effects from an active capital management on liquidity, revenues and profit and loss is critical to allow senior management to take informed decisions. Even though profitability hurdle rates which explicitly acknowledge capital efficiency – either regulatory or economic or a combination of both – are introduced at most major banks, the development of the capital base may not always conform to the path set out in the risk and business strategy due to a different than expected operating environment. As a consequence, micro level or single name specific adjustments up to high level portfolio or whole business line transactions using risk transfer instruments provide effective tools to maximize the risk–return profile of a portfolio while making optimal use of the capital base.

6.1 Capital optimization – key considerations

A bank has two alternatives to improve its capital ratio: either to increase the numerator which is the core capital or to reduce the denominator which is the risk-weighted assets. Core capital consists, inter alia, of total equity such as common stock, retained earnings and other paid-in capital, less goodwill. Although a number of banks raised their capital by issuing new stocks during the recent years, most look first at optimizing the asset load to avoid dilutive effects from the capital increase to the existing shareholder base, both in terms of share of ownership and share of operating profit. Assuming that the risk weight of assets has been – from the perspective of a regulator – correctly assessed, hence leaving no room for further capital relief from optimization, the balance sheet may be further right sized by transferring risks that are inefficient from a capital perspective while retaining those that are efficient. Figure 6.1 (see below) provides (non exhaustive) key considerations to any RWA optimizing transactions which may also serve as a cooking recipe.

In any case, a bank that wants to reduce the capital consumption from its assets has to weigh the costs attached to it to alternative measures and eventually also to the cost of capital. The return on equity (ROE) will keep constant or improve only if the return on assets selected for reduction is below the weighted average cost of capital (WACC). The efficiency of capital optimization, measured in terms of costs relative to the amount of capital relief achieved, is therefore a key criterion for determining the most appropriate solution. However, even if a transaction for capital relief purposes does not stand out as overly efficient, it may still

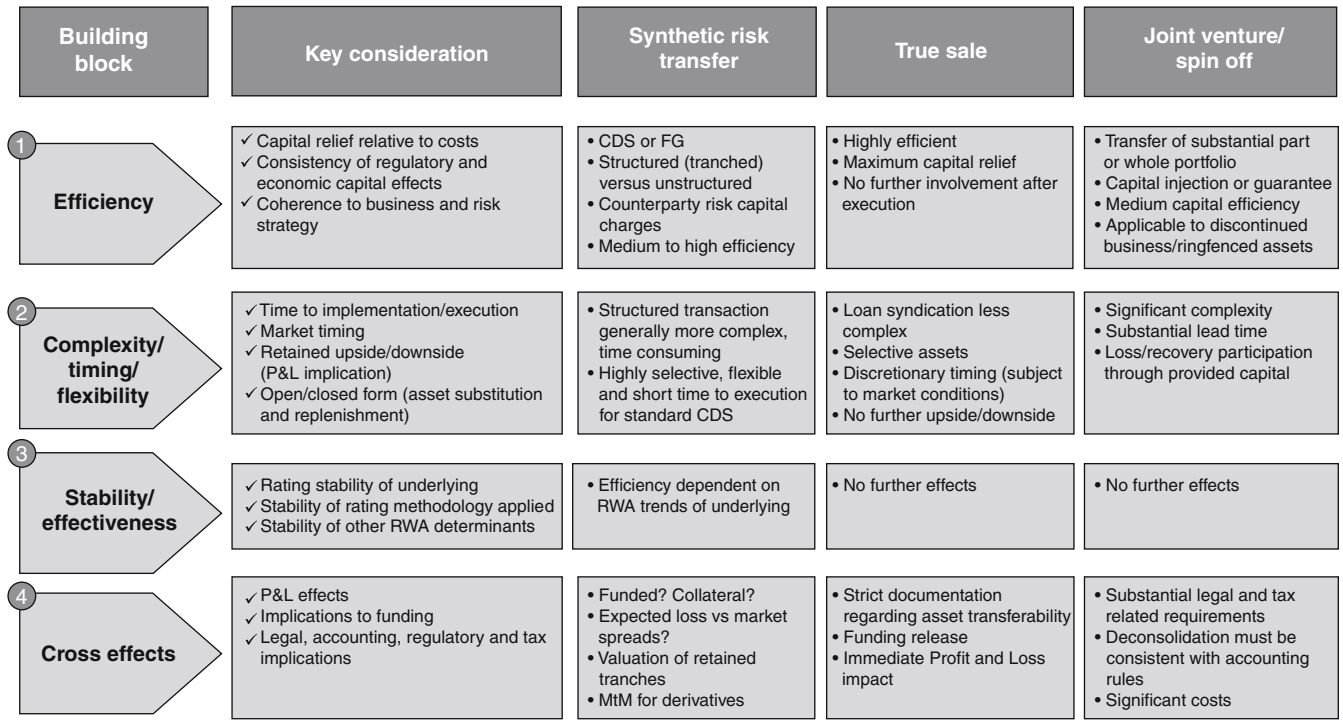


Figure 6.1 Building blocks of capital optimization

offer features that make it more favourably compared to other instruments. For instance, synthetic risk transfer is in most cases less efficient in terms of the costs relative to the amount of capital released compared to true sale transaction where the assets exit the balance sheet since residual capital charges for remaining risks such as counterparty risk apply. Hence, synthetic risk mitigation never fully neutralizes the capital consumption. Nonetheless, the in-principle higher level of standardization which results in a short time to market and discretionary timing of implementation combined with a lower level of administrative burdens, speak for synthetic risk transfer as the most flexible solution for tailorized and asset specific capital reduction. Other effects – such as the stability of the capital release efficiency which is subject to the risk weight of the underlying and therefore varies with its rating, as well as profit and loss related implications – have to be considered for an overall assessment of the suitability of the measures in discussion. An in-depth comparison of alternatives to manage bank capital is of particular interest to active credit portfolio management but is outside the scope of this book. In the following part, we will concentrate on the aspects of regulatory capital relief achieved by using CDS for hedging purposes, which has been a major focus point up to now.

6.2 Regulatory capital relief through CDS and guarantees

Credit derivative protection bought[3] with the purpose of mitigating credit risk and booked into the banking book reduces, under certain conditions, the capital requirement of the banking book asset hedged. The level of capital relief from CDS hedging depends on various conditions which are summarized in the following part. However, in any case the use of CRM techniques should not result in higher capital requirements than if no such techniques were applied.[4] If supervisors are satisfied that banks meet certain minimum operational requirements regarding the risk-management process and where credit derivatives are direct, explicit, irrevocable and unconditional, banks are permitted to consider the credit risk protection from these instruments when calculating the capital requirements.[5] More specifically, banks must demonstrate that they have robust procedures,

[3] Credit derivatives qualifying as credit risk mitigants under Basel II are CDS, guarantees and, under certain conditions, 1st and 2nd to default baskets and total return swaps (TRS).

[4] See BCBS (2006a), paragraph 113.

[5] See BCBS (2006a), paragraph 140 and BCBS (2011 b). Paragraph 189 specifies that a guarantee or credit derivative must represent a *direct* claim to the protection provider. *Explicit* means that the protection must reference specific exposure or pool of exposures. Both conditions ensure that the protection is clearly defined and

Table 6.1 Hedge eligibility criteria under Basel II

Criteria	Description and condition
Contract Type	CDS, TRS,[a] CLN[b] and 1st or 2nd to default baskets[c]
Credit Events	Credit events covered by the CDS contract have to include at least • failure to pay • bankruptcy, insolvency or inability of the obligor to pay its debt when due • restructuring, including forgiveness or postponement of principal, interest or fees resulting in a credit loss event[d]
Credit Event Determination	The parties responsible for determining whether a credit event has occurred must be specified and must not be solely the protection provider. The protection receiver must have the right to notify the responsible parties of the occurrence of a credit event.
Reference Obligation	The underlying obligation must be specified as the reference obligation under the credit derivative. An asset mismatch is permitted if the reference obligation ranks pari passu with or is junior to the protected asset, provided that both hedged asset and reference obligation are obligations of the same obligor and are legally enforceable due to cross-default or cross-acceleration clauses.
Maturity	The maturity of the credit derivative must match the maturity of the underlying asset including any grace period and term out or extension option
Settlement	Cash settlement: a robust valuation method must be in place for a reliable estimation of the credit losses, including a clearly defined period when the post-credit-event valuations of the underlying obligation will be obtained. Physical settlement: if physical settlement has been agreed, any required consent of the delivery of the hedged asset to the protection seller must not be unreasonably withheld by the protection provider.

Note:

a For a TRS where the net payments received are recorded as net income but as not offsetting the corresponding decline in the value of the asset protected, no recognition of the credit protection is permitted.

b Only cash-funded CLN issued by the bank and protecting assets in the banking book will be recognized but treated as cash collateralized transactions.

c A first to default basket hedge is defined as a basket of names for which the bank receives credit protection and where the first default of the referenced names triggers the credit event and contract termination. The protection buying bank may receive regulatory capital relief only for the asset of the basket with the lowest risk-weighted amount and only if the notional amount of the protection is at least equal to the exposure of the protected asset. The calculation of the risk weight follows the treatment of securitization tranches in case an external rating for the basket has been obtained. For baskets with no external rating, which has to be assumed as the standard case, the risk weight is calculated as the aggregated risk weights of the assets included in the basket (capped at 1.250%), multiplied by the notional amount of the basket. For second-to-default baskets, the bank will only receive capital relief if it also owns the first-to-default protection of the basket. A second-to-default basket where a credit event has occurred effectively becomes a first-to-default basket. The capital relief for a second-to-default basket follows the treatment of the first-to-default basket with the exception that, when aggregating the risk weights, the asset with the lowest risk weight can be excluded. See BCBS (2006 a), paragraph 207–210. Since baskets in general are less frequently used for capital relief by credit portfolio managers due to their lower level of standardization and complexity, the following text will focus on plain vanilla CDS.

d If 'restructuring' as a credit event is excluded from the CDS contract but all other conditions outlined in Table 1 are met, a partial recognition of up to 60% of the hedge is permitted. This is in particular relevant as the Standard North American Contract (SNAC) excludes 'restructuring' from the list of credit events. However, in the U.S. most restructurings fall under chapter 11 of the U.S. Bankruptcy Code which automatically triggers the Bankruptcy Credit Event.

processes and a strategy in place to control residual risks[6] which may arise from CRM techniques, namely legal, operational, liquidity and market risks. Another concern of regulators relates to concentration risk resulting from the bank's CRM activities, a concern which seems to be well-founded given the fact that the market for CDS is largely dominated by a few global players. This is confirmed by a report of the ECB[7] showing that – based on a survey conducted by Fitch, DTCC and BIS data – JP Morgan, Goldman Sachs, Citigroup, Morgan Stanley, Bank of America and Barclays account for a substantial share of the global CDS market. Given that other major dealers like Bear Stearns, Merrill Lynch[8] and Lehman Brothers but also natural sellers of protection such as hedge funds, CDOs, SIVs, bank conduits and monoliners discontinued or reduced their involvement in CDS trading and investing with no new actors taking their places, it is quite likely that the level of concentration of this market has increased in recent years. Concentration risks from CRM techniques must be assessed in their interaction with the bank's overall risk profile. If a supervisor views the robustness, suitability or application of a bank's CRM management policies and procedures as inappropriate as to the capital relieved by those CRM measures, the bank may be asked, among other possibilities, to take immediate remedial action or hold additional capital against residual risks.[9]

The Basel II capital framework specifies the operational requirements for guarantees and credit derivatives to account for capital reduction.[10] Beside the preconditions described above, credit derivatives are recognized for the assessment of capital based on the following criteria:

Guarantees must be an explicitly documented obligation assumed by the guarantor, covering all payments the debtor is obliged to make under the transaction contract, including principal, margins, fees etc.[11] They

incontrovertible. *Irrevocable* excludes contract clauses that allow the protection provider to unilaterally cancel the contract or clauses which would result in increasing costs due to a deterioration of the credit quality of the hedged asset. The protection provider must not be prevented by any contract clause from being obliged to timely pay out in case of a non-payment by the original counterparty in order to make the protection *unconditional*.

[6] See BCBS (2006a), paragraph 115 and 767–768. Legal risks are further outlined in paragraph 117–118, stressing that contracts must be legally binding and enforceable, thus strictly avoiding the pitfalls of ineffectiveness because of untested documentation.

[7] See ECB (2009). According to a survey conducted by Fitch at the end of the 1st quarter of 2009, the counterparties to 96% of the credit derivative exposure of the U.S. firms surveyed were only five bulge bracket investment banks.

[8] Both Bear Stearns and Merrill Lynch have been taken over in 2008, so they disappeared as an independent market maker for CDS.

[9] See BCBS (2006a), paragraph 769.

[10] See BCBS (2006a), paragraph 189–197, 488–489.

[11] See BCBS (2006a), paragraph 190. In case only the principal is covered by the guarantee, a bank may proceed with the capital reduction but only for principal amount.

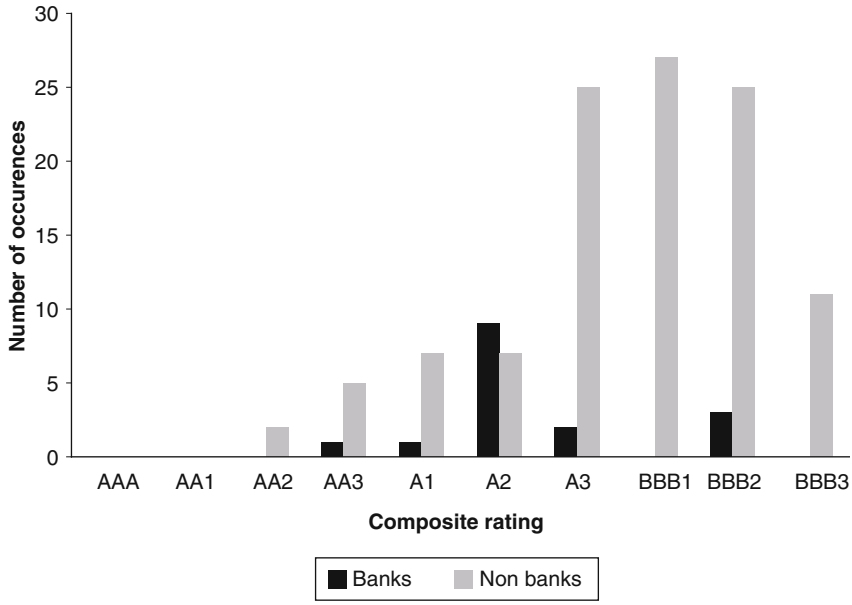


Figure 6.2 Rating distribution of 125 iTraxx constituents (banks and non banks) as of December 2012

Data source: Bloomberg.

are recognized if the bank receives full compensation for the amount outstanding on a timely basis after a qualifying default or non-payment of the obligor without having to take any legal action to enforce the payment from the guarantee provider. The compensation can take place in the form of a lump sum. Alternatively, the guarantor can assume all future payment obligations from the obligor. This rule clearly violates the requirements of IAS for eligibility of Financial Guarantee accounting which limit any compensation payment to actual losses incurred by the owner of the guaranteed debt asset. Partial or proportional cover of credit risk by credit derivatives or guarantees where the loan amount exceeds the hedged amount will result in capital relief for the protected part while the unprotected share will be treated as unsecured.[12]

6.2.1 Determination of capital relief amount

The amount of capital required for an exposure hedged by CDS or guarantees is determined according to the standardized approach or the internal ratings-based approach (IRB) which is then further split into the foundation

[12] See BCBS (2006a), paragraph 198.

approach for those banks which are using supervisory values of LGD and the advanced approach for banks using their own internal LGD estimates.

Substitution approach: Within the standardized approach under Basel II, the adjusted risk weight of the hedged asset will be reduced to the level comparable to a direct exposure to the hedge provider which is unchanged to the 1988 Accord. This is called the *substitution approach*. Thus a capital reduction through hedging will only be achieved if the protection provider carries a lower risk weight than the underlying obligor.[13] If this condition is not met, banks may decide not to recognize the credit protection for capital relief purposes. Eligible protection providers include sovereign entities, public sector entities (PSE), securities firms with a lower risk weight than the counterparty and other companies rated at least A-. Even though banks experienced significant pressure on their ratings in the aftermath of the financial crisis, their average single A rating still supports capital relief when serving as a counterpart for hedging corporates rated at the lower end of the investment -grade rating spectrum or below. Economically, corporates weigh the leverage-driven increase return on equity (ROE) against the cost of capital which disproportionally rises with deteriorating credit quality. For European corporates, the equilibrium is found in the low BBB area, whereas in the U.S. investors tolerate a more pronounced gearing in exchange for a higher ROE. Nonetheless, an increase in leverage leaves less room for error, meaning that a cyclical downturn will exhibit stronger adverse effects for those firms which accept higher leverage and lower debt coverage ratios.

Banks, on the other hand, have to maintain a higher rating as implicitly required by regulators through the minimum capital ratio. In addition, a BBB rating for financial institutions in general is inconsistent with many business segments, in particular where banks serve as counterparts or receive deposits for funding purposes. Unfortunately, the current distribution of spreads does not conform to the prevailing rating. These days, the credit markets inherently price in a higher probability of default for banks compared to corporates even within the same rating category.

As a result, the capital relief from hedging using CDS may prove to be comparably expensive. In general, a business model where the funding costs of financial institutions stay above those of their corporate clients for a prolonged period of time may prove to be unsustainable. A looming credit crunch, induced by banks that become reluctant to lend because of their elevated funding costs, will ultimately hit those firms which are characterized by a weaker credit profile. Any restricted access to capital for corporates with immediate funding requirements poses a

[13] See BCBS (2006a), paragraph 141.

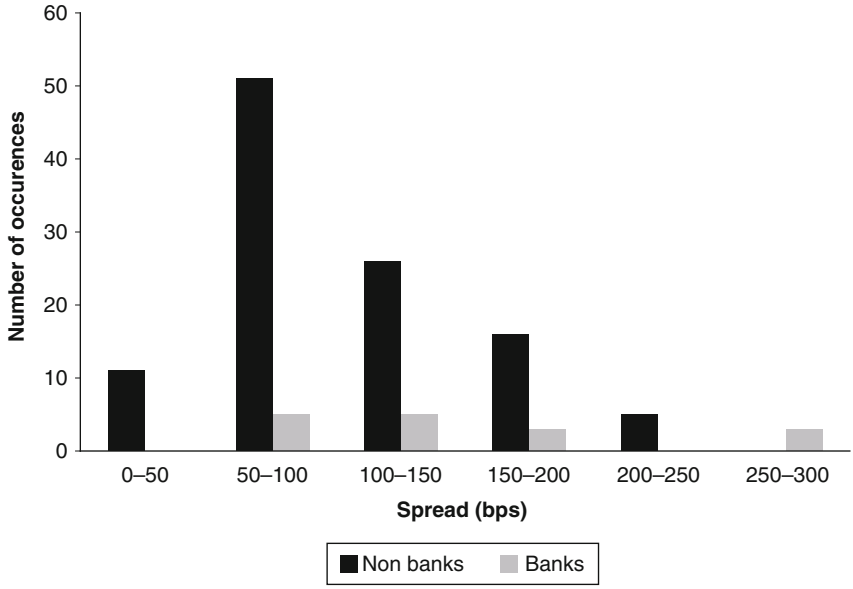


Figure 6.3 Credit spread distribution of 125 iTraxx constituents (banks and non banks) as of December 2012

Data source Bloomberg.

risk of an accelerated liquidity drain up to insolvency. Consequently, even when costs of capital freed up by hedging are considerably high, the risk-mitigating effect may be worthwhile from a forward-looking perspective.

The **foundation approach** follows closely the standard approach. In addition to the eligible guarantors under the substitution approach, credit risk protection providers that are internally rated equivalent to A- or better also qualify under the foundation approach, while under the advanced approach there are no restrictions to the qualifying protection provider. For banks qualifying under the foundation or advanced IRB approach, the risk weight of the protected share of the transaction is derived by

- the risk weight function of the guarantee provider;
- the internally assessed PD of the guarantor;
- the LGD of the guarantee.

Here, the regulatory treatment differs substantially from the economic risk of such a hedged loan. While the substitution approach reflects the fact that the credit risk of the obligor is eventually replaced by the

counterparty risk of the hedge or guarantee provider in case of a default of the obligor,[14] the two risks cannot be seen in isolation. Hence, under the IRB approach, hedges and guarantees are treated in a more sophisticated way.[15]

Double default approach: Banks qualifying under the foundation or advanced IRB approach have the option to use the double default approach when calculating the capital consumption for a credit risk protected asset, which is in addition to the requirements described above conditional to (non-exclusive)

- the protection instrument is either CDS, guarantees, first or nth-to default baskets where also the (n-1)th default protection has been obtained;
- the risk weight of the hedged exposure does not already incorporate the risk protection;
- the hedge provider is a regulated bank, investment firm or insurance company, regularly active as a protection provider and rated internally at least equivalent to A- at the time of hedge trade inception or at least investment-grade at all other times;
- an hedged obligation that is a corporate (with the exception of specialized lending), PSE or small business exposure;
- a underlying obligor that is not a financial firm as described as a hedge provider, nor associated with the protection seller;
- the full compensation of credit losses from the hedged asset resulting from a credit event specified in the hedge contract;
- the protection provider and the obligor must not exhibit 'excessive' correlation, meaning that they must not be connected beyond the systemic risk drivers.

6.2.2 Adjustments in capital reduction for CRM

Basel II defines hair cuts to the degree of capital relief in case the loan specifics are not fully matched by the hedge, which creates a form of basis risk or incomplete risk transfer. Examples provided here are a maturity and currency denomination mismatch.

Maturity mismatch: A maturity mismatch occurs when the hedge expires before the underlying credit exposure matures. For an assessment of the expiration date of the loan, extension options have to be taken into account plus a conservative estimate of a grace period. For the hedge,

[14] Simplistically, the hedge seller or guarantee provider assumes the obligations of the defaulted borrower, and therefore takes the place of the original obligor.

[15] See BCBS (2006a), paragraph 300–304.

the shortest effective maturity is assumed, which should consider certain embedded options such as a right of the protection seller to call the hedge. Because of a maturity mismatch between hedge and underlying, the level of capital relief can be significantly reduced. In some cases, the hedge will not be recognized at all. A maturity mismatch as defined by Basel II is less of a concern for credit portfolio managers from a pure risk mitigation point of view because loans are typically short to medium term and rarely match the standard and most liquid five year maturity of CDS, meaning that the standardized five year tenor of the CDS almost always exceeds the loan maturity. However, a maturity mismatch exposes the bank to the profit and loss of the remaining leg of the hedged pair once either a loan or the hedge matures, which can be significant. Consequently, any maturity mismatch between loan and related hedge contrasts sharply with the requirements of IAS ruling that Hedge Accounting for Credit Risk (HACR) can be applied only if the maturity of the hedge does not exceed the maturity of the hedged asset.[16] For the opposite case where the hedge expires before the loan, the maturity mismatch will have a detrimental effect on the hedge effectiveness of the pair, which is a condition for applying HACR. Even though the Fair Value Option (FVO) is less restrictive in that respect and tolerates maturity mismatches, the residual profit

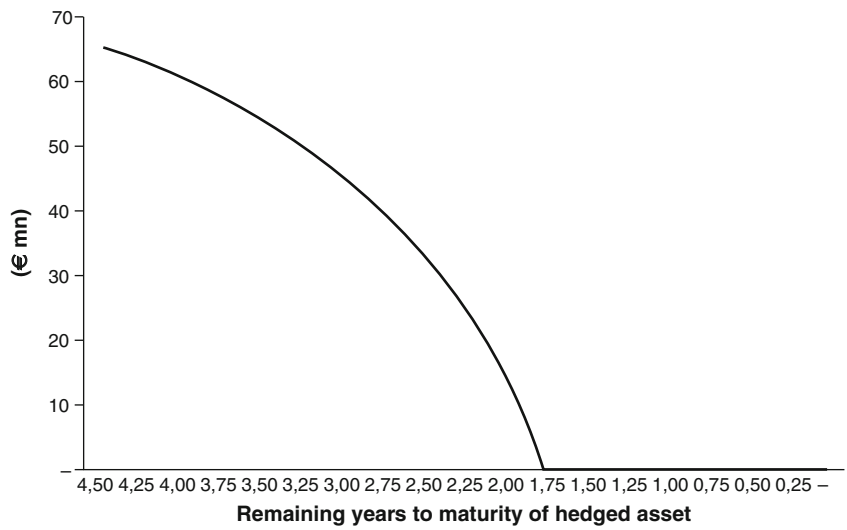


Figure 6.4 Maturity mismatch adjusted credit protection value

[16] Hedges expiring on the next standard maturity date (the 20th of March, June, September and December) following the maturity of the loan are compliant with IAS rules, thus eligible for HACR.

and loss volatility from value changes of the hedged item which are only partially offset by those of the hedge may be a source of concern. While hedging a loan with a CDS of corresponding tenor is advisable from a risk transfer, an economic (profit and loss) and accounting perspective, shorter CDS maturities are usually less liquid or even illiquid. As a consequence, small offer sizes result in a significant ramp up period to accumulate the CDS to cover the full loan amount that needs to be hedged and in higher transaction costs from wider bid-offer spreads which are also characteristically for lower liquidity. In some cases and particularly for non frequent issuers, only standard maturities are offered by CDS dealers.

a. **No capital relief:** In case of a maturity mismatch, a hedge will not be recognized for capital relief if the *original* maturity of the CDS is *less than a year.* The same applies for hedges with a *residual* maturity of *less then three months* and maturing before the underlying credit.
b. **Reduced recognition of capital relief:** According to Basel II, the value of credit protection adjusted for maturity mismatch equals[17]

$$Pa = P \times \frac{t - 0.25}{T - 0.25}$$

where:
Pa = maturity mismatch adjusted credit protection value,
P = CDS amount (adjusted for any haircuts),
t = min (T, residual maturity of the CDS), in years,
T = min (5, residual maturity of hedged asset), in years.

Example: Let's assume that a bank wants to fully protect the credit risk of a €100 mn loan exposure, original maturity of 4.5 years with a CDS hedge. A dealer offers 3- and 5-year maturities for the obligor. Since a standard 5-year CDS maturity would not qualify under Hedge Accounting for Credit Risk, the bank decides to buy €100 mn of protection on the client with a maturity of 3 years after a prospective test proved the effectiveness of hedged pair. From the Basel II formula, the following maturity mismatch adjusted credit protection amount can be recognized for the capital relief calculation:

Figure 6.4 above shows that even though the maturity mismatch is constant at 1.5 years, the value of the recognized credit protection decreases overproportionally when the hedge approaches the expiration date. At the time the remaining lifetime of the hedge comes down to 3 months,

[17] See BCBS (2006 a), paragraph 204–205.

the hedge is no longer considered consistent with the rule that hedges with a residual maturity of three months or less are not accounted for.

While a maturity mismatch does not give any concern in case of a bankruptcy or failure to pay credit event, it can have some ramifications in case of a restructuring which may prevent the loan or bond from a physical delivery into the auction. (For more details please refer to 15.2 Restructuring Credit Event).

FX mismatch: If the CDS contract is denominated in a different currency than the hedged risk, a haircut based on a 10-business day holding period to the hedged amount will be applied. The supervisory haircut equals 8 per cent.[18] While CDSs are usually available in all major currencies such as the G-8 and beyond, some loans feature optionalities such as multicurrency options which allow the borrower to decide in which currency it draws under an existing loan documentation. Thus a currency mismatch will occur if the CDS is denominated in a different currency than the one drawn by the obligor, unless the CDS is dynamically adjusted in full or partial amounts corresponding to the drawing under the loan contract, which may be difficult and costly.

6.3 Conclusion

In principle, the Basel II rules for capital relief achieved through hedging of credit risk by CDS or other instruments are broadly accepted by portfolio managers. Regulatory capital arbitrage, introduced by Basel I capital weightings, has become significantly less attractive under the new rules and attracts close scrutiny by the bank's supervisors. However, the financial industry continues to encourage accounting standard setters and global regulators to improve the consistency of the two regimes, which still creates obstacles for an economically sound credit portfolio management. More specifically, the portfolio manager's objective concerning the accounting view of hedges in most cases is to avoid the accounting mismatch, i.e. accrual accounting for loans in the banking book while CDS hedges are valued mark-to-market. Regarding the regulatory view, the purpose of hedges is to achieve a maximum reduction of the capital charges from the hedged loan. Under current rules, as discussed in previous chapters, the two views do not fully coincide. A third view relates to the economic risk of the credit assets which is measured in internal, risk or economic capital. Since economic capital explicitly recognizes the correlation structure of credit assets and the portfolio, again significant

[18] See BCBS (2006 a), paragraph 200. The scaling up of the haircut according to the square root of time formula is further detailed in paragraph 168.

differences may emerge as to the selection of the optimal hedge strategy and asset. Since the Basel rules are evolving on a continuous basis, the economic and regulatory perspectives are likely to converge at some time in the future. Nevertheless, under certain circumstances, single name hedging efficient for regulatory capital relief purposes may turn out to be significantly less efficient in terms of economic capital, for instance when the portfolio post hedging exhibits a higher concentration as a result of hedging only more granular or less correlated assets. Hence, prudent credit portfolio risk-management principles will have to consciously recognize prevailing shortfalls of the regulatory framework. In any case, consistency between tools applied for risk-management purposes, accounting and regulatory requirements and market practices is a key prerequisite to provide banks with the flexibility to adapt to a rapidly changing operating environment. In light of the banking industry wide need for restoring or improving the capital base, capital optimization efforts have become an important and common objective for credit portfolio managers.

Part III
Hedging Techniques and Toolkits

Credit derivatives represent the financial innovation success story of the last two decades, underpinned by an impressive market growth and ever new applications and related products. While in relation to the much larger market for interest rate swaps being considerably small by size, the notional amount of credit default swaps (CDS) outstanding nonetheless exhibits an unparalleled growth since its invention in the early 1990s. Accelerated by the introduction of the first CDS-based, broader credit index iTraxx in 2004, the market expanded more than tenfold during the following three years until 2007, when it surpassed the $50 trn mark for the first time.[1]

However, during the past years, credit derivatives have been intensively discussed in public, with those discussions questioning the role those financial instruments played in the context of the demise of once venerable Wall Street giants such as Lehman Brothers. Worse, CDS were

[1] One should note that a pure comparison of the notional amount as depicted here refers to the nominal amount of protection sold rather then the market value of the CDS. The rapid fall in notional amounts since the first half of 2007 is attributable to both the decreasing number of new trades but also largely due to the 'termination cycle' during which trades outstanding have been compressed to reduce the overall number of trades and notional outstanding. However, the representation of the market size by notional outstanding has often been criticized as a major reason for misunderstanding. From a risk perspective, the notional amount would only equal the net risk, which a CDS seller owes to the buyer, if the recovery value of the protected debt instruments would be zero. A more appropriate measure for the CDS market size is the replacement value which describes the current net present value of the CDS contracts. Although this measure is currently not available as a long term time series for the global CDS market, survey results indicate that the replacement value is only a fraction of the notional amount of existing CDS. Anyway, the development of the trend shown in Figure 38 was confirmed by a report of the BIS. Interestingly, the report notes that while in 2009 notional amounts of CDS between financial institutions continued to decline, the outstanding contracts with non-financial customers more than doubled. See Avdjiev et al. (2009).

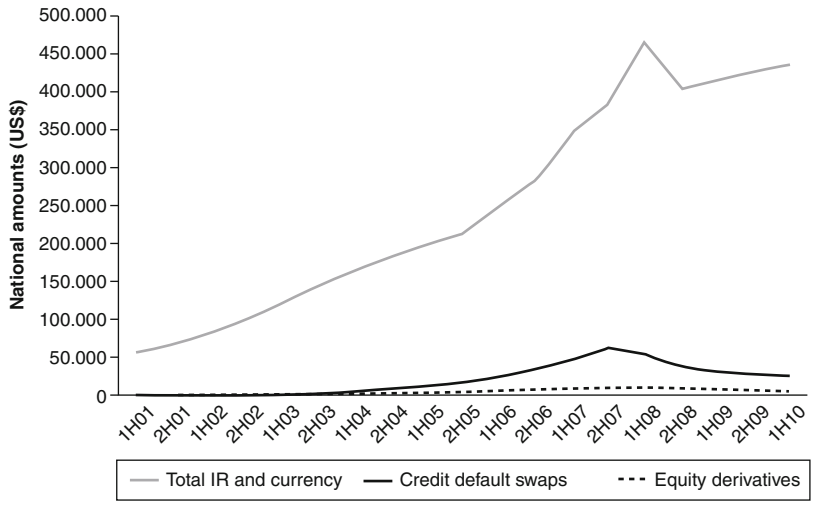


Figure III.1 **Size of IRS, CDS and equity derivative markets**

Source: ISDA[2].
Reprinted with permission of International Swaps and Derivatives Association, Inc. © 1987–2010 International Swaps and Derivatives Association, Inc.

suspected of being abused for purely speculative purposes with the unethical objective of profiting from forced corporate and sovereign borrower defaults. In his annual letter to shareholders, the CEO of Berkshire Hathaway and 'sage of Ohama', Warren Buffet, quite outspokenly called derivatives 'financial weapons of mass destruction' which could harm not only the involved parties to such highly complex transactions but the economy as a whole.[3] Clearly, the opaqueness of individual over-the-counter (OTC) trades combined with the perceived overall precarious low level of transparency of the CDS market as a whole, including its size and importance for financial markets, contributes to the mistrust of credit derivatives. At the same time, the financial industry, which appears to be in general overhaul, does not ignore the calls for higher transparency. In 2008, the Depository Trust and Clearing Corporation (DTCC) issued a statement which clarified that the lack of a central registry for over-the-counter (OTC) credit derivatives was as much a misconception as blaming CDS for being a driver of the U.S. mortgage crisis.[4]

[2] See ISDA, www.isda.org.

[3] See www.berkshirehathaway.com, annual letter to shareholders 2002. Ironically, Berkshire Hathaway ranked 8th in the list of top ten non-sovereign CDS reference entities on the basis of net protection amounts as of July 2009. See ECB (2009).

[4] The DTCC made clear that its automated Trade Information Warehouse has been established in 2006 as an electronic central registry for CDS, registering the vast

Nonetheless, the perceived motivation of a few market participants such as hedge funds or proprietary traders that are seen by some as solely short term profit oriented but uninterested in any broader economic repercussions of their activities have added to the publicly voiced reservations against credit derivatives. The vicious circle of rising CDS spreads, indicative of a deterioration of the credit quality of the underlying obligor, and constrained access to capital markets as observed in the Greek sovereign debt tragedy has been a prevalent source of unease for government representatives and regulators alike. Although neither the IMF[5] nor the European Commission did find compelling evidence that naked[6] CDS led to an increase in systemic risk and credit defaults, their concern is that this could become the case in times of distress, thereby destabilizing government bond markets. Polleit and Mariano (2011) argue instead, that '*…sound economic analysis reveals that CDS are fully compatible with the principles of the free market, and that CDS are not to blame for the disintegration of credit markets…. CDS provide investors with an efficient and effective instrument for exposing economically unsound and unsustainable fiat money regimes and the economic production structure it creates – which, in turn, provokes a (n intellectual) counterattack from government officials (and their "court intellectuals"), who argue for regulating or even banning CDS.*' The ban on naked sovereign CDS and short selling of government bonds proposed by the European Commission follows an attempt to distinguish the use of CDS for (respected) hedging purposes as opposed to (not tolerated) pure speculative trading.[7] While the consequences of the ban are not fully clear yet, market professionals showed concern that the rules may distort a proper market functioning. However, hedging of positions that a bank owns and which were highly correlated in the past to the price of a particular CDS is exempted from the regulation as are

majority of CDS trades. Moreover, the DTCC clarified that less than 1% of the registered CDS related to residential mortgage-backed securities. See DTCC public press release '*DTCC Addresses Misconceptions About the Credit Default Swap Market*', October 2011, www.dtcc.com.

[5] See IMF (2010).

[6] A naked CDS position refers to buying CDS protection on a reference entity without owning a deliverable obligation.

[7] See Regulation (EU) No 236/2012 of the European Parliament and the Council of March 14, 2012 on short selling and certain aspects of credit default swaps (OJ L 86/1), www.ec.europa.eu. Isolating and limiting hedge fund activities which are at the core of the regulation may fail since a) hedge funds in general are reportedly only minor players in the sovereign CDS market measured by notional amount of CDS positions b) the regulation directly affects only European-based investors c) the relatively lower importance of the CDS market compared to the larger sovereign bond market. The recent drop in sovereign CDS market liquidity, however, suggests that traders and hedge funds may stay sidelined in order to not get dragged into regulatory contention.

market making activities, both of which should limit the market liquidity dampening effect. Nevertheless, the use of sovereign CDS for hedging derivatives counterparty risk or CVA risk – which has been stipulated by Basel III by offering regulatory capital relief for those hedges – already receives close scrutiny by banks. Any longer term imbalances of supply and demand will eventually dry up markets and distort prices, hence motivating CVA desks which account for a larger part of the sovereign protection demand to seek for alternatives to sovereign CDS for hedging purposes. In stark contrast to the fears that CDS may contribute to an acceleration of financial crises, there have been marked doubts on the effectiveness of CDS as a risk transfer instrument, however. The stated intention of political leaders to avoid at all costs a CDS relevant credit event in Greece in order to protect the global economy and European sovereigns in particular from the fallout of a hitherto unthinkable but factual failure of a EU member state has sparked a lively debate even among experienced market participants as to whether CDS will hold or drop dead. The long-running drama of Greece came finally to end when the ISDA announced the credit event on March, 9th 2012. The subsequent payout – as little as $2.89 bn, or 78.5% of the remaining $3.68 bn outstanding CDS – turned out to have no impact on markets. Although, with the benefit of hindsight, concerns of a derailed global economy caused by a Greek accident appear to have been vastly exaggerated, the sovereign debt crisis by no means has been called off. The risk of financial contagion motivated politicians and regulators alike to step up their efforts to get a better handle on the market for credit derivatives. Central clearing, counterparty risk management and margin standards as well as the adjustments to Basel II with respect to the trading book, dubbed Basel 2.5, set the stage for wide ranging improvements. But also the CDS product itself underwent some significant changes. The so called 'Small Bang' and 'Big Bang' protocol introduced by ISDA in 2009 serves to facilitate the liquidity of the CDS market by increasing its standardization. With all these initiatives, it is quite likely that CDS will reemerge as a cleaner and more straightforward instrument with a growing acceptance among market participants, regulators as well as politicians. The recent events surrounding CDS confirm that the product passed the test of time but also laid bar persistent criticism. All that helps to educate market professionals as well as decision makers to gain a better knowledge of micro- and macro-economic benefits from a standardized risk transfer instruments. After all, spreading risk and diversifying risk are two sides of the same coin and one cannot go without the other.

A central aspect of portfolio management focuses around active and frequent use of techniques to transfer risk: loan syndication,

sub- participations, guarantees and securitization are as much considerable as are CDS. However, given their high level of standardization and outstanding liquidity, CDS provide for portfolio managers the ultimate tool which allows them to micromanage the portfolio on a single name basis. The derivative nature of CDS which requires the holder to account for them on a mark-to-market basis makes CDS a suitable instrument to hedge both spread risk which arises from changes in the valuation of the hedged item as well as default risk that denotes the risk of an obligor failing to make payments when due. But even though the CDS is regarded as the instrument of choice for risk transfer, the experience of the last years with an ample number of defaults of CDS reference borrowers clearly shows that CDS users should obtain an in-depth knowledge of the key features of credit derivatives to engage in profound and solution-oriented hedging strategies and to avoid unpleasant surprises. The same holds true for CDS-based instruments such as indices, tranches or options. This part of the book, therefore, aims to provide a detailed description of CDS as a hedging tool for credit portfolio managers. While most literature on credit derivatives offers a wealth of information on pricing related topics, there is little reading available on important aspects of CDS hedging such as the definition and outcome of credit events or the mechanics of the auction process, which can be quite complex and cumbersome as in case of the restructuring credit event. Although sometimes a bit technical by nature, the mechanics of CDS are deemed to be relevant if not critical for actively managing a portfolio of credit risk, thus representing a specific point of interest for loan and bond portfolio managers. Other hedge instruments such as loan CDS and sub-participations are introduced, explaining the key features to be considered when engaging in these products. The following chapter continues with credit derivative indices which are often used as a portfolio proxy hedge, benefitting from low transaction costs. Finally, correlation and volatility sensitive products such as nth-default baskets and swaptions which represent a leveraged form of credit portfolios protection are explained. The chapter concludes with a brief discussion on imperfect or macro hedges which may become relevant as substitutes for CDS due to regulatory or market-releated restrictions.

7
CDS: Hedging of Issuer and Counterparty Risks

Credit derivatives have found a broad range of applications throughout the capital markets, within portfolio managers, traders and investors alike. The favourably liquid nature of these products, which translates into low transaction costs for market participants, contributes to the broad acceptance of these instruments. CDSs are used for hedging credit risk, management of economic and regulatory capital, speculative or proprietary trading, synthetic (or unfunded) investments, pricing credit risk assets, capital structure arbitrage and as a gauge for credit risk through market implied ratings (MIR) or early warning systems (EWS). The single name credit default swap is a widespread form of transferring credit risk from the protection buyer to the protection seller and is often compared to an insurance contract. Like insurance, a premium has to be paid for compensation of potential future losses from a specified event occurring to the insured item. While there are certain similarities between CDS and insurance contracts, there are substantial differences, too. One of the arguments against CDS as insurance points to the fact that any payout under insurance is conditional to the holder owning the insured object or at least experiencing losses caused by the insured event, neither of which holds for a CDS. Thus, a CDS contract designed as a Financial Guarantee may actually be a closer match to an insurance contract since it a) indemnifies the protection buyer only for losses incurred and b) is subject to accrual accounting, thus no value changes appear over its lifetime. Another view compares CDS to options where the protection buyer owns a put option on the credit risk of the reference entity. According to this theory, a CDS is in the money if a credit event occurs for the reference borrower, but otherwise the cash outflow of the CDS protection bought is limited to the coupons to be paid to the seller of the CDS. However, this representation holds only for one point in time, namely at the CDS expiration date, whereas both seller and buyer of CDS are exposed on

a daily basis to gains or losses from mark-to-market valuations, which may exceed coupon payments by far. CDSs are popular with credit portfolio managers and client-relationship managers because they protect the credit risk of a borrower, but – unlike a loan syndication – do not require the consent of bank's customer.[1] Even better, the risk transfer takes place without involvement or notification of the client, thus giving the bank the largest degree of flexibility and discretion when managing credit risk. In portfolio context, credit derivatives allow banks to[2]

- isolate the credit risk component of assets and manage it separately from other risk types such as interest rate risk;
- optimize the risk–return profile of a credit portfolio by replacing risks that exhibit a suboptimal contribution with other assets that allow moving the portfolio closer to the efficient frontier;
- apply a dynamic hedge approach;
- smooth peak exposure, which arises from seasonal patterns of drawings under committed lines, to a target average exposure;
- manage counterparty risk, which arises from market value changes of derivative transactions;
- reduce portfolio concentrations in the form of regional, industry, single name, collateral or product clusters;
- increase the level of portfolio diversification by way of substituting assets with others that have a significantly lower correlation with the existing risk concentrations;
- balance loan pricing risk, which arises from changing market conditions during the period between final negotiation of loan terms to contract subscription, which at times can take weeks;[3]
- hedge the risk of significant price changes for loans in the syndication phase until the asset has been successfully syndicated or sold into the primary or secondary market. The same applies to underwriting risk from bonds which a bank takes on its book until the securities are fully placed in the market.[4]

---

[1] Although the borrower's consent to transfer the obligation must be ensured for physical delivery under a CDS in some cases.

[2] See also Banks et al. (2007).

[3] Even though the bank is not legally bound to any agreement on terms and conditions of a loan including the loan margin until the loan document is signed by both parties (the borrower and the bank), it may feel morally bound and stick to the negotiated contract. In practice, the bank weighs between the pricing risk and the reputational risk which can be severe in case it decides to walk away from a deal due to an adverse change in market conditions.

[4] Assuming that the transaction is fully underwritten in contrast to an agreement to place the assets on a best efforts basis where the risk that a lower-than-targeted amount of proceeds will be raised ultimately remains with the client.

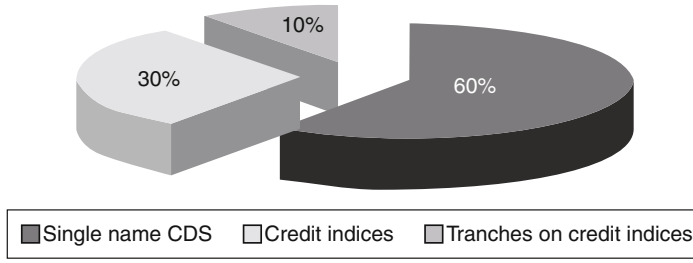


Figure 7.1 Breakdown of credit derivatives by type (as of April 2012)
Source: DTCC.

The tremendous growth of the CDS market – the CDS was originally designed as an individual, bilateral contracts for hedging credit exposures of a bank's balance sheet – has been supported by an ever-increasing range of applications coupled with improved standardization and liquidity provided by market makers and electronic trading platforms.

The growing acceptance of credit derivatives and involvement of diverse market participants and specialists has led to the invention of a variety of CDS-based products, with CDS index families and options the most well known; but tranched CDS indices, baskets, CSOs and recovery swaps have also been created to meet the demand of more sophisticated market participants. Assets referenced by CDS are unsecured bonds and loans from investment grade, high yield and emerging market corporates, senior and subordinated bank debt, developed and emerging market sovereign securities, municipal debt, and commercial and residential mortgages. Additionally, LCDS have been developed for syndicated secured loans. The 'sweet spot' of trading activity centers around 5-year transactions for high grade single name corporates and indices with sizes of $10 to $50 mn per trade whereas high yield typically trades in $2 to $5 mn lots.

This chapter on CDS is structured in the following way: first, an introduction to CDS and product-specific conventions is provided. Recent initiatives to increase the standardization of credit derivatives such as the Small and Big Bang are highlighted. Key elements of a CDS trade that drives both prices and recoveries, i.e. deliverable obligations and credit events, are discussed. The standard procedure at which the final price of defaulted debt is determined, the auction process, is described, elaborating on relevant decisions to be taken from the standpoint of a hedger in that specific context. Since loan credit default swaps (LCDS) grew up from their infancy and have become a regular tool to manage secured loans, the essentials of the instrument are outlined. Case studies illustrate real life examples of the functioning of CDS. The information contained herein is

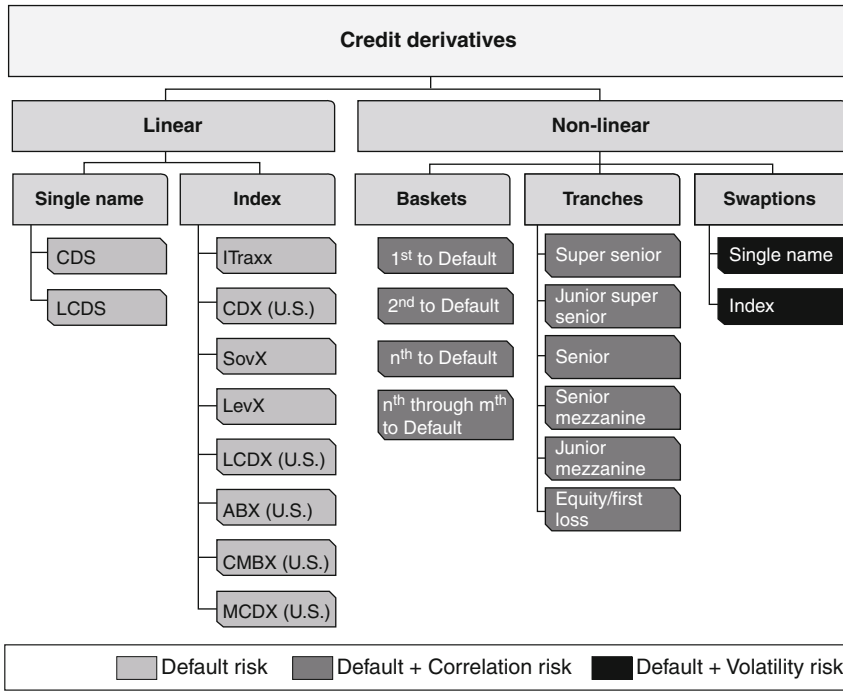


Figure 7.2 Overview of credit derivative products

neither exhaustive nor does it represent legal advice or is it intended to be a substitute for reading the original ISDA definitions and supplements.

7.1 Mechanism and conventions of CDS

All standard CDSs are governed by a set of definitions and provisions, for instance the 2003 ISDA Credit Derivatives Definitions and Master Agreement (the '*2003 Definitions*') which, for instance, detail the relevant credit events which lead to a payout from CDS. The 'Small Bang' and 'Big Bang', introduced by ISDA in April and July 2009 respectively, corrected shortfalls of the CDS which were identified as a lesson learned during the crisis years and aimed to facilitate the liquidity and stability of the CDS market. The 'Big Bang' protocol or 2009 ISDA Credit Derivatives Determinations Committees and Auction Settlement Supplement (the '*March 2009 Supplement*') deals with changes related primarily to the determination of a credit event and the subsequent CDS settlement. The protocol became binding for all new CDS transactions with immediate effect. Market participants were free to choose whether to apply the

2009 Supplement to existing CDS trades for a short period. Following the 'Big Bang', ISDA published the 2009 ISDA Credit Determinations Committees, Auction Settlement and Restructuring Supplement (the '*July 2009 Supplement*'). The purpose of this 'Small Bang' protocol was to implement a standard auction process for a restructuring credit event with relevance in particular for the European CDS market. Other efforts to improve contractual standardization, such as the introduction of fixed coupons and upfront payments in the Standard North American Contract (SNAC) or Standard European Contract (STEC), found widespread acceptance. Unlike interest rate swaps, the bilateral nature of CDS has led to enormous and inflated growth of gross exposure in the past, which exaggerated the 'real' economic risk after netting or offsetting transactions. The introduction of a central clearing substantially reduced counterparty risk. Additionally, portfolio compression aims to reduce notional size and number of contracts without changing the net risk position of the portfolio by replacing existing trades with new trades exhibiting a risk profile and cash flows similar to the original portfolio.[5]

7.1.1 Transaction terms and conditions

A credit default swap (CDS) is a financial contract which provides loss protection to the buyer in exchange for periodic risk protection payments to the protection seller. A CDS sell position refers to selling protection on the credit risk which is economically equivalent to a long position in the underlying obligation and vice versa. CDS, like other credit risk instruments such as corporate bonds, are predominantly characterized by the underlying credit risk. However, the derivative nature of CDS requires additional contractual features. The key elements of a CDS trade confirmation are outlined in Figure 7.3 (see below).

The following text provides a more detailed description of those CDS components and elaborates on the pitfalls which warrant attention.

7.1.2 Quotation conventions

Standardizing conventions has significantly contributed to smooth functioning of the market for CDS and related credit derivatives products, in particular in volatile times. The introduction of *fixed coupons* proved to be an efficient way to reduce the jump-to-default risk which

[5] According to ISDA, approximately USD 74.6 tn in CDS notional in single name, index and tranche contracts, covering the U.S. Europe, Japan and Emerging Markets, have been eliminated in 2010, mostly through TriOptima but Creditex and Markit are also providers of portfolio compression services. See www.isdacdsmarketplace.com.

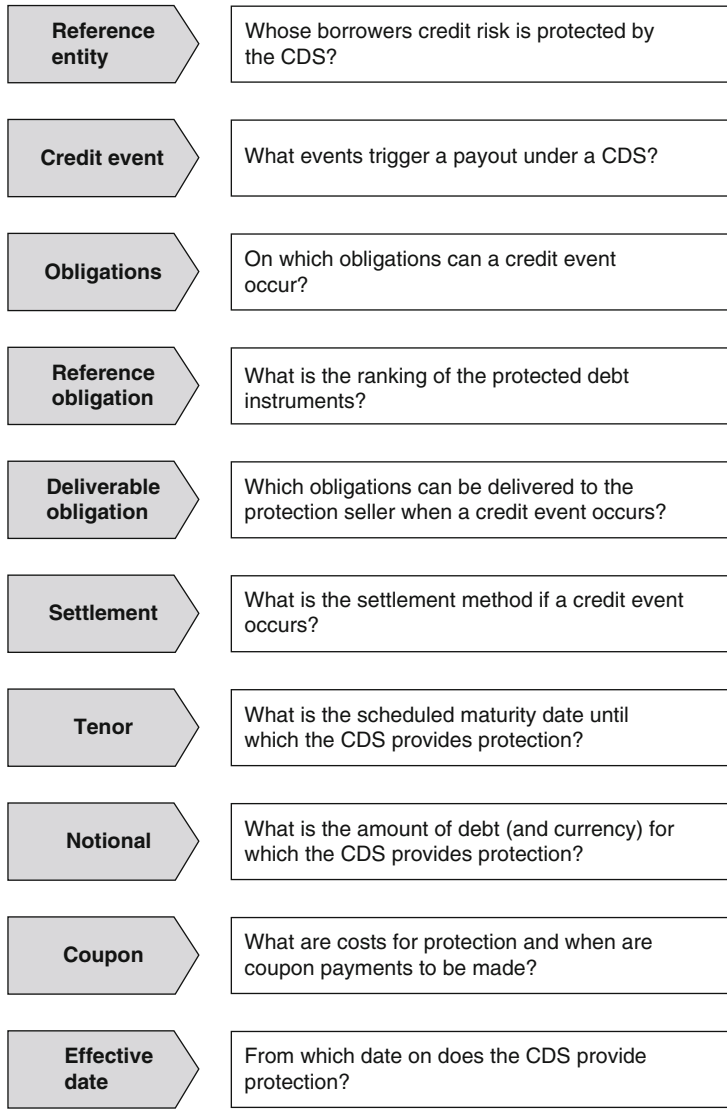


Figure 7.3 Key elements of a CDS trade confirmation

arose from CDS that were deep in the money and offset by a counterposition with a substantially different coupon that has been set according to the prevailing traded spreads. *Standard maturity dates* further improved the efficiency of CDS but also matter for regulatory capital relief through CDS hedging as well as in the context of accounting rules.

Fixed coupon (bps)	European corporates	Western European sovereign	North American corporates, sovereign	Japan corporates, sovereign**	Emerging markets*
25	Yes	Yes	No	Yes	No
100	Yes	Yes	Yes	Yes	Yes
500	Yes	No	Yes	Yes	Yes
1000	Yes	No	No	No	No

*: Latin America, Asia corporates and sovereign, Eastern Europe, Middle East and Africa sovereign.
**: Likewise for Australia and New Zealand corporates and sovereign.

Figure 7.4 CDS fixed coupon standards

7.1.2.1 Spread, fixed coupons and upfront payments

Until 2009, most CDS traded on par with no initial upfront payment. That means that CDS were quoted as a running spread which was then fixed as the coupon for a trade, thus resulting in zero net present value at trade inception. When the spread moved, so did the coupon for the next trade. In June 2009, fixed coupons were introduced to achieve a higher level of standardization. Since then, CDSs are quoted with the following fixed coupons:

Most common are coupons of 100 and 500 basis points (bps) while 25 bps are also used for sovereigns and European corporates, although to a lesser extent. From 2010 on, North American LCDS trade with a fixed coupon of 250 bps which is an exception, but also 100bps and 500bps may be available in selected cases. As a general rule, the coupon will be determined by current and historical spreads and existing trades. Since the fair spread of a CDS transaction rarely matches the fixed coupon, the equivalent of the net present value of the difference between actual spread and coupon is paid upfront.

Example: A trader wants to buy €10 mn protection on BMW, 5-year senior unsecured, at a fair spread of 145 bps. The coupon for a BMW standard contract is 100 bps. To compensate for the 45 bps lower coupon paid during the 5 years of the contract, the CDS is priced at 97.864 per cent, meaning that the CDS buyer pays the protection seller an upfront amount of 2.14 per cent or € 213,619.[6] Let's assume the coupon for 5-year BMW is 500 bps. Then the upfront payment is equal to the net present value of five years of 365 bps difference between coupon and fair spread, payable by the protection seller. In this case, the upfront payment amounts to 16.85 per cent or € 1,685,217.

[6] Source: Bloomberg, using the CDSW function, which is based on the ISDA Standard model v1.

The fixed coupon convention also solved an issue which hedgers faced when the asset underlying a CDS hedge became distressed and they wanted to close out the hedge position to monetize the valuation gain. In order to close the CDS buy position and realize the profit, the trade had been balanced by selling CDS with identical contract specifications, i.e. obligor, tenor, currency. The only difference related to the coupon since the CDS was initially bought when the issuer spread was tight, whereas the spread for the CDS sell position was significantly higher due to the subsequent deterioration of the issuer credit quality. The two transactions perfectly eliminate the credit risk of the borrower and pay a quarterly income stream from the coupon payments received from the CDS selling leg, net of the coupon payments to be paid for the CDS buy leg. However, when a trade has been closed where the coupon was far out of the money, a new type of risk emerged. Jump-to-default risk arises because the positive difference between the spreads of the two legs is paid for the remaining lifetime of the contracts *only* if no default of the CDS reference entity occurs until maturity. Otherwise, all payments are terminated and the CDSs are settled. Although for the combined CDS buy and sell position, the default risk of the borrower is neutralized, the future cash flows related to coupon payments from the two offsetting legs still leave the hedger exposed to the credit risk of the reference entity. Unfortunately, for borrowers that trade at elevated spread levels, the probability of default is considerably high, implying that it is less likely to receive many coupons from the CDS selling leg. Equally probable, not all coupons for the CDS protection buy leg will have to be paid. Because the coupons from the CDS buy position are lower than the coupons received under the CDS protection sell leg, a notable amount of future income is uncertain from the transaction that was considered to be closed. Alternatively, the portfolio manager may decide to unwind the transaction with the hedge counterparty rather than offsetting the original hedge with a sell protection position. In that case the jump-to-default risk attached to the CDS coupons is effectively transferred to the dealer but still not eliminated. The dealer may then hedge that jump-to-default risk by buying additional short dated protection on the name which is in most cases very expensive as high default risk borrowers tend to trade with a higher short end risk premium compared to medium- or long-term spreads in what is known as an inverted curve. Moreover, funding the higher coupons of the sell protection leg generates additional costs for which the dealer will seek compensation. The dealer will charge the portfolio manager with the costs from hedging jump-to-default risk and funding, which will diminish the amount of gains from widened spreads on the hedge position that should compensate the portfolio manager for potential losses from a default of the

hedged entity. Fixed coupons offer a solution as the original trade and the offsetting transaction will have identical coupons while the difference in valuations is paid upfront.[7]

Two kinds of quotations became usance in CDS markets: *spread quotation* and *upfront or price quotation*. Spread quotation applies to CDS whose reference borrowers are rated investment grade, both for single name CDS and indices such as iTraxx Europe (Bloomberg: ITRXEBE) or CDX IG North America (Bloomberg: IBOXUMAE). Additionally, indices for European Crossover names (XOVER, Bloomberg: ITRXEXE) and sovereigns (i.e. SovX, Bloomberg: ITXSWE) and the index for municipal issuers (MCDX, Bloomberg: MCDNAA5) are quoted in spreads. By contrast, CDS of North American High Yield issuers are quoted in price terms for both single name CDS and the High Yield CDS index (CDX HY, Bloomberg: IBOXHYSE). The same applies for the North American index for loan- only CDS on Syndicated Secured 1st lien loans LCDX (Bloomberg: LCDXGE) and its European pendant LevX (Bloomberg: ITRXLX5).

7.1.2.2 Termination and coupon payment dates

Maturity dates are set to one of four *roll dates*, which are the 20th of March, June, September and December. For trade days in between the roll dates, the maturity is rounded to the next roll date. For example, a CDS contract traded on the 15th of August will have a maturity of the 20th of September. This specification is relevant for Hedge Accounting of Credit Risk (HACR), since under IAS 39 the maturity of the hedge must not exceed the maturity of the hedged item. The maturity convention implicitly caps the number of days that a standard CDS hedge may exceed the maturity of any underlying to a maximum of 90 days.[8] Since this rule appears to be acceptable under IAS 39, the condition for HACR is respected. Every three months, the standard maturity rolls forward three months. If the maturity falls on a non-business day, then the contract matures on the following business day. Coupons of CDS transactions are paid quarterly, calculated on an actual/360 days basis with a full first coupon. Payment dates coincide with the standardized maturity dates. The first full coupon equates the three month period between the standard roll dates in which the CDS traded, with the protection seller paying

[7] Upfront payments are calculated assuming a flat curve. When using pricing models based on non-flat curves derived from observable CDS quotes, i.e. either upward sloping or inverted, the trade spread given upfront payment and fixed coupon will differ from the convention. That effect is more pronounced, as described in the example above, for higher coupons and inverted curves where the protection seller is exposed to jump-to-default risk for the remaining coupons.

[8] After 90 days, a new roll date would be available, with the difference in days between maturity of underlying and hedge starting again from zero.

to the buyer accrued interest for the days between the previous maturity date and the trade date. This is similar to accrued payments for corporate bonds.

Example: An investor buys protection on the 15th of August. The first full coupon is paid by the investor to the protection seller for the time between the 20th of June to the 20th of September. The protection seller pays to the buyer accrued interest for 55 days between the 20th of June to the 15th of August.

It should be noted, though, that CDS coupons stop accruing at the date a credit event is determined. This leaves the protection buyer with a mismatch since coupons of the underlying likely will be unpaid for the period from after the last coupon payment to the date of the credit event.

7.1.3 Reference entity

The *Reference Entity* defines the obligor whose credit risk is being transferred by the CDS protection, either a corporate or a sovereign. While the selection of the reference borrower seems obvious when a hedge strategy has been developed to protect the credit risk of a particular name, it warrants close attention as sometimes different entities within a corporate conglomerate exhibit varying default risks and are disconnected from each other in case of a default of one. Moreover, recoveries within a corporate group can vary, too. Two examples illustrate the importance of being clear and correct on the reference entity. First, in December 2000, the U.S. company Armstrong World Industries filed for reorganization under chapter 11 because of asbestos injury claims which exceeded the value of the company. While the action triggered a credit event for Armstrong World Industries, the parent company Armstrong Holdings remained unaffected. A similar situation occurred in October 2002, when TXU Europe Ltd. defaulted after a subsidiary failed to make an interest payment on two bonds outstanding. The U.S. based firm TXU, however, was only impacted on a $500 mn working capital facility which featured a cross default provision, triggered by a default of TXU Europe. Beside the reference entity, the reference obligation also contributes to an exact definition of the credit risk hedged by a CDS.

7.1.4 Reference and deliverable obligations

A critical aspect of CDS for hedging (and other) purposes concerns the debt which is deliverable in case of a credit event: the *deliverable obligation*. While most of the obligations outstanding of a reference entity are relevant for the determination of a credit event, only a subset will be eligible for a delivery from the protection buyer to the protection seller

following a credit event. Hence the deliverable obligations will be essential for determining the recovery at the Auction process. In general, a CDS covers obligations that are issued or unconditionally guaranteed by the reference entity. Contract specifications determine the debt instruments relevant for the settlement of a CDS contract by defining

- the **obligation category** or the type of debt, which could be bonds, loans (or bonds or loans) or borrowed money – in principal any obligation which the borrower has to repay sometime in the future – or the reference obligation only;
- the **obligation characteristics**, for instance the maximum maturity, the ranking (i.e. seniority or subordination),[9] the currency, the governing law and the market of issuance.[10]

The type of debt is important as there are meaningful differences to be considered when hedging credit risk. Off-balance-sheet credit risk such as committed lines or revolving credit facilities which have not been drawn at the time of the credit event are excluded from the range of deliverables – although undrawn lines consume regulatory capital which can be released by buying CDS protection. Partially drawn revolver can be delivered but the CDS covers the drawn part only with no protection for any future drawing under the revolver as the protection buyer must indemnify the protection seller from any future liability that arises from drawing post the credit event. It should be noted that equity-like instruments such as preference shares are not eligible as deliverable obligations, while perpetuals may or may not be, depending on the conditions of repayment. Beside the obligations that are directly issued by the borrower, guarantees in which the reference entity agrees to assume all payments due from an obligation of another obligor may also be eligible as long as they are irrevocable, transferable and non-dischargeable other than by payment. Since banks often provide loans to subsidiaries of clients, under certain circumstances hedging can take place at the parent or subsidiary level of a corporate, depending on whether downstream and/or upstream guarantees are in place that qualify under the ISDA rules. For instance, if a parent company guarantees the debt of a subsidiary, hedging the credit risk of the subsidiary is possible with CDS on both parent and subsidiary as a reference entity. This is because if the

[9] In some cases, subordinated debt is excluded as a deliverable obligation.

[10] For some countries such as those in emerging Europe or Latin America, only non-domestic debt, issued under non-domestic law in a non-domestic currency, qualifies as a deliverable. Nevertheless, cross default clauses have to be observed as they can effectively bridge the gap between domestic and non-domestic debt.

subsidiary experiences a credit event, it is obvious that the subsidiary's debt is deliverable into the CDS of the subsidiary, provided it qualifies as a deliverable obligation. However, if the parent that guarantees the debt of the subsidiary does not satisfy the claims of the holders of the subsidiary's debt as promised in the guarantee, a credit event on the parent occurs and the subsidiary's obligations become deliverable into the parent's CDS too. The same holds if a credit event takes place at the parent; even without a corresponding credit event at the subsidiary, the subsidiary's debt become immediately deliverable into the parent's CDS because of the parent's guarantee. From the outside perspective of market participants not involved in direct lending through loans, the undisclosed interconnectedness of affiliates by way of guarantees provides a challenge to anticipating the pool of qualifying deliverable obligations for the auction after a credit event, which is ultimately a key driver of the CDS determined auction recovery value. Moreover, certain restrictions apply to the obligations of a reference entity in order to become deliverable to the CDS auction. The main deliverable obligation characteristics for standard CDS contracts are

- **Not Subordinated:** The obligation must rank at least pari passu with the most senior reference obligation in priority of payment, or if no reference obligation is specified, the borrowed money obligations of the reference entity that is senior;
- **Specified Currency:** The currency or currencies in which an obligation or deliverable obligation must be payable. Standard contracts include CAD, JPY, CHF, GBP, USD and EUR;
- **Maximum Maturity:** 30 years;
- **Not Contingent:** Any obligation whose repayment of principal exclusively depends on the borrower;
- **Assignable Loan:** A loan that can be assigned or novated without the consent of the obligor;
- **Consent Required Loan:** A loan that can be assigned or novated with the consent of the obligor;
- **Transferable:** Loans must be able to be assigned or novated on the delivery date without anyone's consent;
- **Not Bearer:** The obligation must not be an unregistered security that is payable to its bearer or the person who possesses it.

Even when an obligation does not fulfil the criteria for a deliverable obligation, it might still trigger a credit event although it is not deliverable to the auction following the credit event. The protection buyer is entitled to deliver any acceptable delivery obligation to the protection

seller after a credit event to settle the CDS contract. Hence the recovery value will be determined by the value of these deliverable obligations at the auction. From the perspective of the CDS seller, the list of deliverable obligations is a kind of blind pool of which any asset might be delivered in case of a physical settlement, including and very likely the cheapest asset which conforms to the criteria of the deliverable obligations. This is called the cheapest-to-deliver option a CDS buyer owns and describes that the protection buyer may source a cheaper deliverable obligation in the secondary market and subsequently deliver the asset to the auction while the asset initially hedged can be sold at a higher price. Since for both assets the recovery value will be the same for all credit events except restructuring, a CDS buyer may make a windfall profit by exchanging any deliverable obligation into the cheapest-to-deliver obligation.

7.2 Credit events

One of the key questions a portfolio manager may ask when hedging credit risk is *what am I protected for*? The answer to that question, however, is not as straightforward as for *credit losses incurred* which would meet the definition of a Financial Guarantee but not that of a CDS. To provide a precise answer, we split the question into two parts: **1) when** is a payment to be made from a CDS and **2) how much** will be paid and how does it relate to credit losses from the hedged instrument? For the first part, we will find the answer in the *Credit Events* defined in the 2003 ISDA Credit Derivative Definitions that trigger a payment under a CDS from the protection seller to the protection buyer. These events are much more broadly defined than just payments due but not made under the obligation and will be explained hereafter. The second part of the question deals with the settlement procedure after a credit event and the way the payment amount or recovery is determined. Detailed information on this subject is provided in 7.3. Settlement after a credit event. Let's come back to the question of when a payment under a CDS will be made. As said, a payment from a CDS will be triggered by a credit event. The following six actions constitute a credit event when they occur:

1. Failure to Pay;
2. Bankruptcy;
3. Restructuring;
4. Repudiation or Moratorium;
5. Obligation Acceleration; and
6. Obligation Default.

Table 7.1 Overview of CDS credit events

Credit Event	Definition	Corporate CDS	Sovereign CDS	Municipal CDS
Failure to Pay	Failure of payment by the Reference Entity on one or more obligations when due, after expiration of grace period. Since this Credit Event results in exactly quantifiable losses (the amount unpaid), it is the only trigger which meets the definition of a Financial Guarantee	Yes[11]	Yes[12]	Yes
Bankruptcy	Insolvency, liquidation, administration. Status of borrower that cannot meet its obligations under the debt owed to creditors. The only Credit Event related to the borrower, not the obligation. CDS may be triggered under this Credit Event well in advance of any losses occurring	Yes	No	No
Restructuring	Change in agreement between Reference Entity and obligation holders due to a deterioration in credit quality or financial condition of the Reference Entity	Yes[13]	Yes	Yes
Repudiation/ moratorium	Authorized officer or governmental authority declares or imposes the moratorium or repudiation and a Failure to Pay occurs within 60 days (or the next payment date for the relevant obligation)	No[14]	Yes	No
Obligation acceleration	Situation (other than a Failure to Pay) where one or more obligations become due and payable as a result of a default but before the time it would have been without the default.	No[15]	No[16]	No
Obligation default	Situation (other than a Failure to Pay) where one or more obligations become capable of being declared due and payable as a result of a default but before the time it would have been without the default.	No	Yes	No

[11] Not applicable to Emerging Market or Latin American corporates.
[12] Not applicable to Emerging Market or Latin American sovereigns.
[13] Not applicable to North American Corporates, though older contracts may feature the Old R or Mod R.
[14] Applicable to Emerging Market or Latin American corporates.
[15] Applicable to Emerging Market or Latin American corporates.
[16] Applicable to Emerging Market or Latin American sovereigns.

The table below provides a brief definition of the credit events and indicates the type of the CDS reference entity to which each may apply. By design, credit events are one of the key determinants for the CDS valuation and specified in the CDS trade confirmation.

As part of the ISDA Auction Supplement Protocol or 'Big Bang' Protocol, introduced in April 2009, a *Determinations Committee* (DC) has been established to formalize the determination and settlement of credit events. Any counterparty to a CDS or eligible market participant can request the DC to determine the occurrence of a credit event, either in its own name or anonymously as a general interest question. In order to be recognized, a credit event must have occurred no earlier than within the past 60 calendar days, a date which is known as the *Credit Event Backstop Date*. The backward-looking nature has important implications if a credit event has occurred but CDS and related debt still trade, as in the case of Greece. Since a CDS that is initiated after the credit event but within the 60 day period can be immediately triggered, the Greek sovereign CDS market effectively came to a stand still after the settlement following the credit event. The DC determines whether or not a credit event or succession event has taken place, and if so, the corresponding date and type of the event. Once a credit event has been determined, interest stops accruing at the *event determination date* which is the date at which publicly available information on the potential credit event has been provided to the DC. The DC approves and specifies the deliverable obligations eligible to the auction process. The DC is comprised of 15 voting members, of which eight are global dealers, two are regional dealers and five are non-dealers. In addition, four non-voting members comprised of two dealer and non-dealer investors respectively attend the committee, while the ISDA serves as the secretary and coordinator. Five different DCs cover the geographical regions: Europe (EMEA), the Americas, Japan, Asia (ex Japan) and Australia–New Zealand. All relevant information about requests to the DC and related decisions are available from the ISDA website.

7.2.1 Hard credit events

All of the credit events listed above are so called hard credit events with the only exception of restructuring. Hence bankruptcy, failure to pay, repudiation/moratorium, obligation acceleration and obligation default automatically trigger the CDS contract once they are determined to have occurred, with the subsequent settlement of the CDS between buyer and seller. By contrast, a restructuring credit event is considered to be a soft event because protection buyer and protection seller have the right but not the obligation to trigger the CDS. A trigger by one party to the CDS

is sufficient for settlement. However, if no one decides to trigger, the CDS remains in place until another credit event takes place or the CDS matures.

A **Failure to Pay** is quite straightforward to determine, namely whenever a reference entity fails to make a payment on one or more obligations when due. Further conditions, if applicable, are that the amount unpaid must exceed the payment requirement threshold and a grace period has passed. **Bankruptcy** is a bit trickier, though. Intuitively one would expect legal proceedings arising from insolvency to be a clear-cut case for bankruptcy but other actions prior to or leading to an insolvency can equally trigger a CDS under this credit event. While section 4.2 of the ISDA framework specifies the bankruptcy provision in great detail – which is worth a read as the wording matters – the key actions constituting a bankruptcy event are if a reference entity[17]

- Is dissolved (other than through a merger, consolidation, etc.);
- Becomes insolvent or unable to pay its debts;
- Makes a general assignment, arrangement or composition with or for its creditors;
- Faces insolvency or bankruptcy proceedings;
- Is wound up or liquidated;
- Becomes subject to the appointment of an administrator, liquidator, conservator, receiver, trustee, custodian or similar for all/majority of its assets;
- Has a secured party take possession of all/substantially all of its assets;
- Causes or is subject to an event which is analogous to any of the above under the applicable laws of any jurisdiction.

The broader definition provided by ISDA conflicts with the more stringent approach taken by Moodys in what the rating agency considers to be a default, which is[18]

- Any missed or delayed disbursement of interest and/or principal;
- Bankruptcy or receivership; and
- Distressed exchange where (i) the borrower offers debtholders a new security or package of securities that amount to a diminished financial obligation (such as preferred or common stock, or debt with a lower coupon or par amount), or (ii) the exchange has the apparent purpose of helping the borrower avoid default.

[17] See Haworth (2011). This report provides a clear and insightful overview of credit events.

[18] See Tolk (2001).

Case Study 5: Fannie Mae and Freddie Mac Bankruptcy Credit Event

The diverging approach of Moody's and ISDA can have far-reaching implications, as observed in the case of Fannie Mae and Freddie Mac. These are so-called government-sponsored enterprises (GSE) and play a key role in the U.S. housing market where they are engaged in granting and guaranteeing loans to other banks and mortgage lenders. During the decade until 2007, the combined portfolios of the two firms exhibited strong growth in the region of a tenfold increase in terms of volume.[19] As GSEs, the firms had a mission to facilitate the origination of home mortgages and provide liquidity to the U.S. residential mortgage market, thereby making housing affordable. Unsurprisingly, given that Fannie and Freddie were integral to the housing market, the financial turmoil which started with defaults of low quality or subprime mortgages and ended with house prices slipping across the board did hit them hard.[20] After Fannie Mae booked $58 bn of losses and Freddie Mac $50 bn just days before the Lehman demise, they were placed into conservatorship on September, 7th 2008 by the Federal Housing Finance Agency. That action met the ISDA definition of bankruptcy. Consequently, CDS on both names were triggered because of a bankruptcy event. However, Moody's affirmed the AAA senior and Aa2 subordinated debt rating of the two companies with a stable outlook since '*the conservatorship of both firms does not limit in any way their ability to service their senior or subordinated debt obligations*'.[21] The support of the U.S. Treasury for the obligations did not extend to the preferred stock as the conservator suspended the dividend payments for those securities at both companies. As a result, Moody's downgraded the rating of the preferred stock to Ca and the bank financial strength rating to E+. Shortly afterwards, on October, 6th 2008, ISDA published the auction results for Fannie Mae senior and subordinated debt which was determined at 91.51 per cent and 99.9 per cent respectively. For Freddie Mac, the recovery has been fixed at 94 per cent for senior debt and 98 per cent for subordinated. The debt of the firms later traded at par, indicating that the ongoing bailout by the U.S. Treasury was credible to market participants. Hence the credit event was not necessarily in favour of the protection buyer. Today, Fannie Mae and Freddie Mac, together with Ginnie Mae, guarantee most of the single-family mortgage issues in the U.S.[22] and still receive taxpayers money to stay afloat, in total $117.1 bn for Fannie Mae alone while under government control.

---

[19] See Felsenheimer and Gisdakis (2008).

[20] A very well-written and interesting comment on the course and inherent reasons of the Fannie Mae and Freddie Mac collapse is provided by Banks (2011).

[21] See Moody's Investor Service, Rating Action: Moody's affirms Aaa senior and Aa2 subordinated debt of Fannie Mae and Freddie Mac. Global Credit Research, September 7, 2008.

[22] Until the fourth quarter of 2011, Fannie Mae, Freddie Mac and Ginnie Mae accounted for 90% of the single-family mortgage issuance. See Standard and Poor's, *Fannie Mae*, January 24, 2012 on Global Credit Portal.

From the above, it also becomes clear that bankruptcy as defined by ISDA includes events which could take place well in advance of any losses occurred. This violates the requirements of IAS for a Financial Guarantee and therefore leaves failure to pay as the only undisputed credit event applicable if a portfolio manager wants to avoid mark-to-market accounting for the hedge.

Repudiation or **Moratorium** replaces bankruptcy for sovereigns and some emerging markets corporates and is not applicable to North American and European corporates. The credit event occurs if

- an authorized officer of the reference entity or a governmental authority either repudiates (disclaims, rejects, challenges) the validity of or imposes a moratorium (standstill, roll-over, deferral) on one or more obligations, which is called a *Potential Repudiation/ Moratorium*, **and**
- a *failure to pay* or *restructuring* subsequently takes place.

It should be noted that the repudiation/moratorium credit event triggers a CDS only if both conditions are satisfied. If the failure to pay or restructuring only occurs after the scheduled termination date while the potential repudiation/moratorium happened before, the CDS covers the event even though it took place after the CDS maturity, provided that the contract is extended by a Repudiation/Moratorium Extension Notice by one CDS counterparty to the other.

7.2.2 Restructuring credit event

The restructuring credit event has become a focal point for market professionals, not only in context of bank and sovereign restructurings but also for the corporate sector. While often met with some reservation because of its vagueness, the restructuring event has played a significant role in the recent past. Well known names that experienced a restructuring credit event include Anglo Irish Bank, Allied Irish, Irish Life and Permanent, Xerox, Thomson and Aiful as well as Ecuador and Greece. Since restructuring differs in many aspects from more common credit events such as bankruptcy and failure to pay, a closer look at its implications for the buyer of CDS and the seller of protection appears to be worthwhile. In a first step, we examine the actions which constitute a restructuring credit event and highlight the different provisions which emerged in Europe compared to the U.S. and other countries, driven by local bankruptcy law and regulatory requirements. Moreover, we analyse the implications from a risk and capital management perspective. Finally, a case study sheds some light on the mechanics of the restructuring credit event and related aspects.

The main reason for a CDS restructuring credit event[23] is a change in the documentation in the debt contract (loan or bond) of the reference entity. Contractual changes include

- *reduction* in interest rate, interest amount due or principal;
- *postponement* of interest or principal payments or *extension* of repayment instalments;
- a change in priority ranking, causing contractual *subordination* of the obligation;
- a re-denomination of the currency or composition of interest or principal into any other than a *permitted currency* (G7 or country that is a member of the OECD and rated AAA for its long term local currency debt by Standard and Poors, Moody's or Fitch)[24]

and must be binding to all holders to one or more obligations which is a key requirement. A restructuring event is further conditional to

- changes in documentation of the reference obligation that must not have been introduced at the later of the issuance of the obligation[25] and the credit event backstop date;[26]
- the restructured debt amounting to at least $10 mn or equivalent in the currency in which the CDS is denominated (default requirement), unless otherwise specified in the CDS confirmation;
- changes in documentation of the reference obligation directly or indirectly arising from a decline in the credit quality or financial condition of the borrower;
- the multiple holder obligation (unless specified as non applicable in the trade confirmation) which is satisfied if more than three holders hold the obligation that triggers the restructuring credit event and where at least two-thirds of the holders agree to the event.[27]

---

[23] See ISDA 2003 credit derivatives definition, Doctor et al. (2011), Bruyere et al. (2006), Haworth (2011).

[24] A currency re-denomination becomes relevant as a restructuring credit event for EMU countries which carry a rating below AAA and re-denominate their debt into a local currency when leaving the EMU. See Mahadevan et al. (2012).

[25] Bruyere et al. provide an example of step up coupons of corporate bonds which do not trigger a restructuring credit event given their inclusion in the bond documentation at issuance.

[26] Credit event backstop date: 60 calendar days before the date on which a request has been raised to the ISDA Determination Committee to determine whether or not a credit event has occurred (credit event resolution request date).

[27] If the obligation in effect is a corporate bond, the two-thirds requirement is automatically fulfilled provided that the bond is held by more than three holders. See Haworth (2011).

The restructuring must be coercive; that is, it must be imposed directly by the borrower or government by way of announcement or decree, or result from an agreement between the borrower or a government authority and a number of obligation holders sufficient to become binding to all the holders. There is a fine line of a voluntary debt restructuring which triggers the event and those which do not. If more than the required threshold but not all holders consent to a voluntary restructuring which is then binding for all holders, i.e. due to a collective action clause (CAC), then the CDSs are triggered. This happened to Urugay in 2003 and Greece in 2012. The majority decision under the CAC bound all holders, including those which did not agree to the debt restructuring – which also calls into question the voluntary nature of the restructuring.

CDS trade with different restructuring conventions, namely

- No Restructuring (**No R**),
- Old Restructuring (**Old R**) or Full Restructuring (Full R),
- Modified Restructuring (**Mod-R** or MR) and
- Modified Modified Restructuring (**Mod-Mod-R** or MMR).

The modified restructuring was published in May 2001 as the Restructuring Supplement and has been applied to CDS trade confirmations for U.S., Australian and New Zealand reference entities. However, it was not adopted as a market standard for Europe, Japan or Asia. The modified modified restructuring was introduced by the 2003 ISDA Credit Derivatives Definitions, which has become the market standard for European reference entities since. The background of the modified restructuring is related to the impact of interest rates on long dated bonds which can result in deep discount prices of those bonds. Without any maturity limitations as for the original old restructuring style, a CDS buyer may deliver these bonds rather than the higher valued loans or bonds for which the hedge was originally intended. This effectively creates a cheapest-to-deliver option for the protection buyer with an implied sensitivity to interest rates. Examples of such a situation where long dated deep discount bonds were delivered to the protection seller after a credit event are the U.S. insurance company Conseco, which triggered the restructuring credit event in 2000, and Xerox in 2002. The Mod-R and Mod-Mod-R provisions restrict the maturity of the deliverable obligations to prevent the buyer from delivering those discount obligations, thereby substituting more valuable and expensive (restructured) debt. However, valuing the Mod-R or Mod-Mod-R provision is generally difficult and subject to the specific case as the restructuring can affect the range of corporate liabilities quite differently. Unlike hard credit events

such as failure to pay or bankruptcy where there should be no differences in the valuation of the concerned obligations of the same borrower and ranking regardless of their maturity and asset type, in a restructuring credit event substantial price discrepancies between loans and bonds of different maturities, margins or coupons, currencies and governing laws can occur.[28] The different style of provisions has been subject to heated debates between market practitioners, resulting in bifurcated markets as the users of CDS were unable to agree on a single standard. Nonetheless, names trading with different restructuring conventions are rare because within the respective countries the conventions are consistently applied. Since 2009, when the Standard North American Contract (SNAC) and Standard European Contract (STEC) were established, single name CDS for U.S. corporates trade No R, in line with the CDX indices which are comprised of U.S. firms. Anyhow, in the U.S. most restructurings fall under chapter 11 of the U.S. Bankruptcy Code which automatically constitutes a bankruptcy credit event. Therefore, it provides little added value to incorporate the restructuring credit event into the contract for corporates domiciled in the U.S. By contrast, Basel II explicitly reduces the capital relief through CDS hedges if the restructuring event is excluded, which will likely continue to be the key driver for maintaining the Mod-Mod-R convention for European corporate CDS. In general, the Mod-Mod-R is less restrictive than the Mod-R, which is favour of the protection buyer. In detail, the restructuring conventions are listed in table 7.2 (see below).

Another important aspect of the restructuring credit event concerns the transferability of the loan. Loan documentations typically carry a clause which gives the bank the right to terminate the loan if the borrower does not meet its obligations under the loan contract. Hence in case of the

[28] In the case of Greece, the market correctly anticipated that bonds issued under international law will likely fare better compared to those bonds governed by domestic law which were already settled after an auction. Back in 2004 Jersey et al. (2007) reported a spread difference of 10 bps for Shaw Communications quoted as Mod R and No R, whereas in general they observed that Mod R contracts tended to trade approximately 5% wider than No R contracts. They concluded that the spread differences reflected the expectation of market participants regarding the probability of a restructuring event. Since the different conventions also differ in relation to the credit grade of the CDS Reference Entity with High Yield in the U.S. generally trading No R, a situation where more than one convention is applied to the CDS of a particular corporate may occur for names which cross the line, i.e. fallen angels which were originally investment grade but have been downgraded or rising stars which were born high yield and made their way up to investment grade. Spread differentials for those names may be reflective of the valuation impact of the different restructuring provisions but also of the specific composition of the markets regarding the type of investor for high yield versus investment grade debt.

Table 7.2 Overview of restructuring credit event conventions

Convention	Details	Corporate CDS[29]	Sovereign CDS[30]
No R	Restructuring is excluded as a Credit Event	North America	
Old R	Restructuring included as a Credit Event with settlement like for Bankruptcy or Failure to Pay. Any Deliverable Obligations with a maturity of less then 30 years are deliverable.	Subordinated Europe Insurance Emerging Europe Japan Asia Latin America	Western European Emerging Europe and Middle Eastern Japan Asia Latin America
Mod-R or MR	Restructuring included as a Credit Event. Additionally, the following limitations apply for contracts triggered by the CDS buyer: **Maturity limitation:**[31] CDS buyer is prevented from delivering a Deliverable Obligation with a final maturity later than the earlier of • 30 months following the date of the restructuring • the latest final maturity of the longest restructured bond or loan[32] **Transferability:**[33]the Deliverable Obligation must be transferable on the Delivery Date without the necessity to obtain any consent.	Australia New Zealand	Australia New Zealand

Mod-Mod-R or MMR	Restructuring included as a Credit Event. Additionally, the following limitations apply for contracts triggered by the CDS buyer: **Maturity limitation:**[34] CDS buyer is prevented from delivering a Deliverable Obligation with a final maturity later than • 60 months following the date of the restructuring for restructured bonds or loans • 30 months following the date of the restructuring for all other Deliverable Obligations the scheduled termination date **Transferability:**[35] the Deliverable Obligation must be transferable on the Delivery Date without the necessity to obtain any consent.	Europe

[29] See Haworth (2011).
[30] See Haworth (2011).
[31] Restructuring Maturity Limitation provision. No limitation date applies if the CDS seller triggers the contract except the general restriction of the maximum of 30 year maturity of the deliverable obligation.
[32] Exception is that debt that matures before the scheduled maturity of the CDS can be delivered even if the maturity is beyond the maximum 30 months time horizon.
[33] Fully Transferable Obligation provision. Loans must be able to be assigned or novated on the delivery date without anyone's consent.
[34] Modified Restructuring Maturity Limitation provision. No limitation date applies if the CDS seller triggers the contract except the general restriction of the maximum of 30 year maturity of the deliverable obligation.
[35] Conditionally Transferable Obligation provision. Loans must be able to be assigned or novated on the delivery date without anyone's consent or where the consent is required, it may not be unreasonably withheld or delayed to fulfil this requirement.

hard credit events, failure to pay and bankruptcy, any non-transferability clause becomes ineffective since the bank is factually released from having to obtain the borrower's consent when delivering the loan to the seller of the CDS. However, a restructuring of certain debt does not necessarily mean that the obligor fails in his or her duty on all debt outstanding which in turn requires the explicit borrower consent to deliver the loan after the credit event. Some loan documentations permit the bank to sell or transfer the loan without notification of the borrower, but in many cases the bank's clients want to ensure that their ultimate creditor is known and acceptable to them. Therefore it has to be ensured that the loan is transferable – if necessary by means of a separate agreement with the borrower.

This is in particular relevant for loans hedges within the scope of Hedge Accounting for Credit Risk (HCAR). Loans selected as hedged items must be deliverable when it comes to a physical settlement. Although the definition of a Financial Guarantee specifically requires the transferability of the defaulted asset, restructuring is excluded from the applicable credit events. The reason for this is related to the 'soft' nature of the restructuring – even though a restructuring credit event is determined by the Determination Committee, it may not directly result in losses for the debt holders of the firm in question. For instance, in case of the Paris, France, based company Thomson a payment deferral triggered the restructuring credit event while at the deferred date, no failure to pay occurred. To meet the definition of a Financial Guarantee, however, the protection buyer is only compensated for losses incurred. Consequently, it is possible if not likely that loan loss provisions have to be build for those events described as a restructuring, even though the credit risk is mitigated through a Financial Guarantee.

According to the 'Big Bang' protocol, the Determination Committee (DC) determines whether or not a restructuring event has occurred. Once a restructuring credit event has been confirmed, both the protection buyers and sellers have the right (but not the obligation) to trigger their CDS contracts. A major difference of the 'soft' restructuring credit event to other 'hard' credit events such as bankruptcy or failure to pay, which trigger the CDS automatically, is that the credit event trigger is optional for both buyer and seller of protection. This means that neither party is required to trigger the CDS. When the final list of deliverable obligations is published by ISDA, the protection seller has two business days and the buyer has five business days to trigger the CDS. There are two considerations to be taken into account when deciding whether or not to trigger a transaction. First, the auction process for restructuring differs from the approach for hard credit events, leaving the protection buyer and

seller potentially exposed to significantly diverging prices depending on a) the maturity of the CDS contract and b) whether CDS buyer or seller triggers the contract. Given that the maturity of the contract determines which obligations are deliverable into a particular contract following a restructuring event, there could be as many auctions required to be held as there are CDS maturities in the market. Second, the decision to trigger a CDS will be based on an assessment of the contract value at the auction, compared to the expected value of the CDS post the auction. Therefore, some assumptions regarding the outcome of the auction process under the restructuring credit event have to be taken – which requires a sound knowledge of the auction process as well as a view on CDS notional outstanding and debt that could serve as a deliverable, by amount, type, currency and maturity, in order to anticipate certain supply and demand imbalances which drive the recovery rate at the Auction. The valuation of the CDS post-auction is by and large determined by the probability of a hard credit event at a later stage. The survival of the restructured firm clearly depends on a variety of factors, but the most striking one for the nearer term future is whether the proposed restructuring is sufficient to keep the company afloat.

Case Study 6: Thomson Restructuring Credit Event

Thomson, today known as Technicolor, was seen as the test case of the Mod-Mod-R convention shortly after the implementation of the 'Small Bang' protocol since it was a member of a various (linear and tranched) iTraxx, HiVol and Crossover index series, as well as a reference entity to a range of CDS, CDS options and CDOs. Because of that, the notional amount outstanding in Thomson credit derivatives was comparably large and by far exceeded the company's debt. Additionally, the widespread consideration meant that various market participants were active in that name, from asset managers, hedge funds, bank portfolio managers and insurance companies to traders and correlation desks – all of which were following different strategies and motivations.
On July 24, 2009, the French media components manufacturer Thomson announced that it had signed a restructuring agreement with a majority of its senior creditors.[36] A statement released by the firm on August 9, 2009, indicated that Thomson had deferred principal payments under a private placement due in June, 2009, with the agreement of 'a sufficient number of holders to bind all holders.'[37] The wording of the statement met the definition of a restructuring credit event which was determined accordingly by the ISDA Determination

[36] See www.technicolor.com

[37] See Haworth (2011). Thomson agreed on a waiver and forebearance on the 6.5% notes due on June 17th, 2009.

Committee.[38] On October 6, 2009, ISDA published a list of deliverables for the Thomson auction which consisted of private placements and revolving credit facilities (RCF), split into three separate tranches. Sellers of CDS had two days until October 8, 2009, and CDS buyers five days until October 13, 2009, to trigger their CDS. Before the auction took place on October 22, 2009, CDS holders had to assess the economic implications of triggering the CDS since it was difficult to anticipate how many buy and sell orders would have been submitted into the auction. ISDA excluded bonds and loans which were subject to the restructuring agreement as deliverable obligations. As a result of the statement of Thomson that the restructuring was agreed to by a *majority* of holders, only a small amount of the debt outstanding was expected to be delivered into the auction. Three auctions were held, namely for the 0–2.5 year, the 2.5–5 year and the 5–7.5 year bucket. Contracts with maturities matching the scheduled termination dates were allocated to the respective buckets. Since the deliverable obligations for the short dated auctions were also deliverable into the other, longer-dated buckets, market participants and research analysts anticipated that the recovery value of the shortest bucket was likely to be the lowest. This assumption turned out to be correct. A strategic positioning of protection buyers, conscious of this consideration, presumably accelerated this effect. The outcome of the three auctions was as follows[39]:

Table 7.3 Recovery values from restructuring credit event Thomson

Bucket	**0–2.5 Years**	**2.5–5 Years**	**5–7.5 Years**
Recovery Value	96.25%	65.125%	63.25%

Only a few months after the restructuring credit event, Thomson experienced a bankruptcy credit event. The recovery value of 77.75 per cent determined by the auction on December 10, 2009, closely matched the prices of private placements trading in the secondary market at that time. By contrast, the company offered 5 per cent of face value for perpetual notes to the noteholders, more in line with their nature as substitutes of equity. When Thomson released in October 2009 the details of the draft plan for the 'procédure de sauvegarde' which aimed at the going concern of the firm, holders of the perpetual notes who did not accept the offer were threatened to lose any future coupon payments even if the company opted to distribute cash to shareholders by means of dividends or any other means.

The Thomson case uniquely displays the various options CDS buyers and seller have in the context of a restructuring credit event, but also the decisions which have to be taken under uncertainty. Moreover, it exhibits the necessity that a company in distress must take into consideration the implications that CDS hedges (and investments) can have to the strategic positioning of their

[38] Thomson August 12, 2009, restructuring credit event.
[39] Source: Markit.

creditors. Essentially, a loan portfolio manager has to decide to either agree to a restructuring as proposed by the borrower and not to trigger the CDS contract or to trigger the CDS and participate in the auction following the credit event. All else being equal, the decision hinges very much on the soundness of the restructuring plan but also on the expected outcome of the recovery determined at the auction. However, if and only if the credit asset is perfectly hedged in terms of notional and maturity and further presents a deliverable obligation, then the hedger is indifferent as to whether to trigger or not. In all other cases, for instance when the hedge matures before the hedged item or the debt hedged does not qualify as a deliverable, the outcome of the alternatives can vary substantially. In general, CDS contracts that include the restructuring credit event provision offer a potential earlier exit option, which nonetheless is complex to value.

7.3 Settlement after a credit event

The previous chapter described credit events that trigger CDS and ultimately result in compensation payments from the CDS seller to the CDS buyer for credit losses of the hedged obligation. Now, the next step is to look at how the recovery amount and the time of payments are determined. A holder of default protection basically has two options. The first option is to transfer the defaulted asset to the seller of protection which makes any further considerations regarding appropriate loss compensation redundant for the hedger. In some cases and for reasons to be explained later in this text, protection buyers continue to own the asset that is in trouble and therefore opt for recoveries paid in cash. In order to better understand the development of the settlement process following a credit event, it is helpful to start with the origins of the physical delivery of the assets before explaining the auction-derived cash settlement.

7.3.1 Physical settlement

Under the 2003 ISDA definitions, CDS contracts were settled physically after a credit event, meaning the CDS protection buyer transferred the defaulted debt to the protection seller for a payment of the notional value of the debt. If the buyer did not own any deliverable obligation, it had to be bought in the secondary market to avoid a termination of the contract without any payment. Naturally, no uncertainty about recovery existed for the protection buyer as the protection seller had to fully reimburse the holder of the hedged asset for the notional amount of the bond or loan granted. In a first step, either buyer or seller of the CDS delivered a credit event notice to the CDS counterparty, together with the notice of publicly

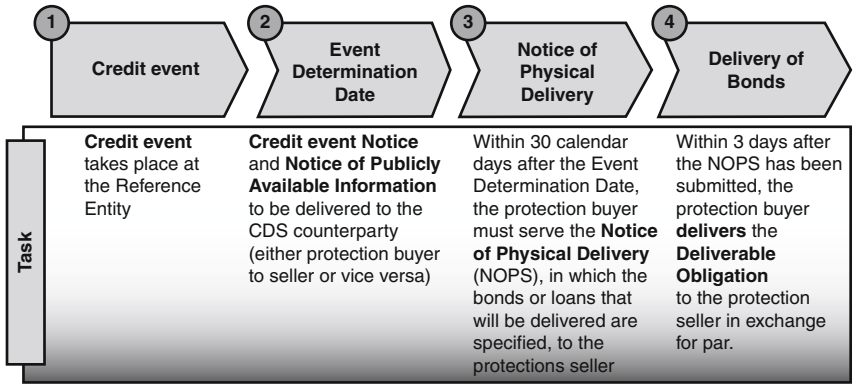


Figure 7.5 Four steps of physical settlement after a credit event under the 2003 ISDA credit definitions

available information, in which the occurrence of the credit event was documented based on information from trusted sources such as international media news, information provider such as Bloomberg, Dow Jones or Reuters or company announcements. The delivery of the credit event notice and the notice of publicly available information constituted the event determination date. The physical delivery of the deliverable obligation had to take place within 30 business days after the event determination date. In order to deliver credit assets to the protection seller, the CDS buyer had to serve the notice of physical settlement (NOPS) within 30 calendar days after the credit event notice. In the NOPS, the protection buyer specified the bonds or loans to be delivered to the protection seller. Finally, the protection buyer delivered the bonds or loans which qualified as deliverable obligations to the protection seller within three days after the NOPS submission in exchange for par or the physical settlement amount. If the principal amount of the delivered debt instruments was less than the CDS notional amount, the buyer received less cash accordingly. Accrued but unpaid interest was excluded from the loss compensation.

However, to resolve operational inefficiencies arising from physical settlement, a new procedure allowing for cash settlement was introduced by ISDA in 2005. The physical delivery as described above represents a substantial amount of work as each contract has to be managed and settled individually. Moreover, the notional amount of CDS contracts outstanding in many cases significantly exceeds the amount of debt of the reference entity which serves as a deliverable to a CDS. As a result, prices of the eligible deliverables can be heavily distorted by a 'run' on relevant debt securities following the credit event in what is known as

a short squeeze.[40] This poses a problem in particular for portfolio managers when hedging loans which did not satisfy the criteria for deliverable obligations, for instance loans denominated in a currency other than the standard currencies. Even though the hedged credit risk may be fully correlated with the deliverable obligations, meaning subject to the same probability of default, credit event and capital structure ranking, the difference between secondary market prices paid for securities eligible as a deliverable and those which are not can quite substantially deviate – if non deliverables trade at all. Hence, using CDS as a proxy hedge carried a significant basis risk. The cash settlement, known as the CDS protocol, provides a solution for this issue while it also allows for physical delivery, like under the old procedure, in case the protection buyer may want to transfer the defaulted asset. This point deserves some attention since a pure cash compensation leaves the protection buyer with some uncertainty as to the final outcome of the workout of the defaulted borrower. In addition, proceeds from a liquidation arrive with considerable time delay and involve significant resources in terms of work time of dedicated specialists, which may be expensive. On the other hand, a credit event does not indicate the necessity of a liquidation. In some cases, a restructuring and going concern may prove to be a better alternative compared to a gone concern in which the borrower will be dissolved. If a bank opts to preserve the client relationship after a credit event, it is mandatory to continue to hold the respective debt or even to buy out other lenders to become the driver of the restructuring. Under these circumstances, a cash settlement is in the best interest of the CDS buyer – as long as it yields *in principal* a result which comes close to the losses from the restructuring or the loss given default in a liquidation scenario.

7.3.2 Cash settlement and auction mechanics

Cash settlement was introduced by the ISDA in 2005. The development of a standardized settlement process for all credit derivatives including indices and tranches on indices in 2005 has significantly contributed to eliminating the basis risk of diverging recoveries between different debt products. The Determinations Committee decides on the occurrence of the credit event, the eligible deliverable obligations and whether an auction settlement is required[41] and, in case it is, the terms of the auction.

[40] When Delphi experienced a credit event in 2005, $2 bn of deliverable obligations were confronted with about $20 bn of CDS notional amount outstanding. See Jersey et al. (2007).

[41] If the amount of CDS notional outstanding is insignificant, the DC may decide to not conduct an auction.

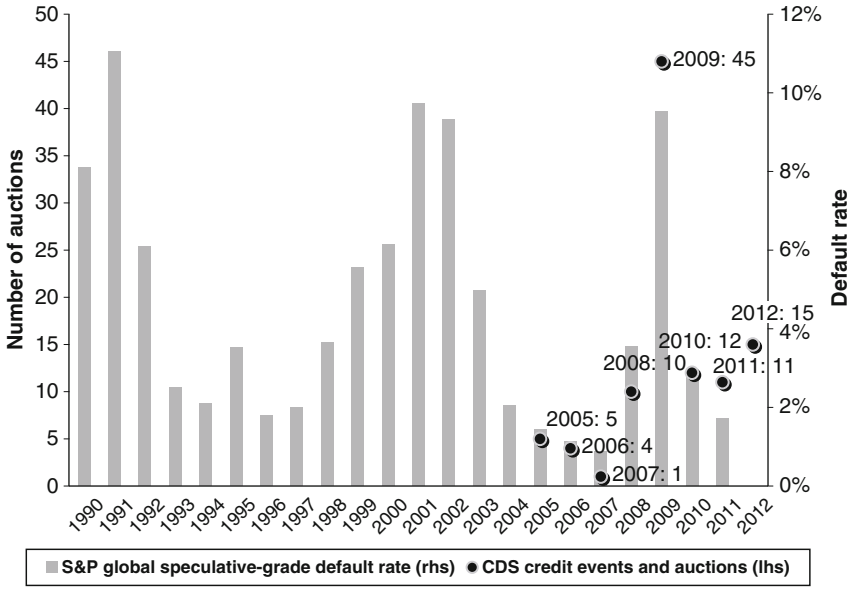


Figure 7.6 Standard and Poor's Global Speculative-grade default rate versus CDS Credit events and auctions

Source: Own, Markit, Standard and Poor's (2010 Annual Global Corporate Default Study and Rating Transitions, March 30, 2011).

ISDA subsequently publishes the list of deliverable obligations. In case of a hard credit event, meaning all but a restructuring credit event, all CDSs are automatically triggered. A single auction determines one fixed recovery at which all single name CDS but also indices, tranches, option and others are settled. The settlement process for a restructuring credit event is somewhat more complex and will be described later. Through the implementation of the 'Big Bang' and 'Small Bang' protocol in 2009, the cash settlement procedure became hard-wired into the CDS contracts, meaning the hitherto optional application of the protocol has been replaced by the auction as the new standard. This is binding for all contracts which now enter into the auction process following a credit event with the only exception of the restructuring credit event where both protection buyer and protection seller have the option to trigger the CDS contract. CDS protocols for defaulted firms and sovereigns are published by ISDA, while auctions are administered by MarkIt and CreditEx.[42] As one would intuitively assume, the number of auctions held in recent years has been fairly

[42] See www.isda.org for CDS protocols and www.creditfixings.com for auction results.

significant – reflecting the spike in default rates to record levels in the U.S. and Europe. In total, more than 100 auctions have been conducted since the introduction of the CDS auction procedure in 2005, with a peak of 45 credit events in 2009.

The auction process is comprised of two steps to derive the final cash settlement or recovery. In the first stage an indicative recovery rate, called *Inside Market Midpoint* (IMM), is determined, together with the outstanding notional of bonds and loans to be settled physically. The IMM is a kind of preliminary recovery rate. In order to derive the IMM, participating dealers establish indicative two-way markets (bid and offer at which they would be prepared to buy and sell) for the deliverable obligations in a pre-defined size and pre-defined bid-offer spread. These are known as the *initial market quotation amount* and *maximum initial market bid-offer spread,* respectively. Depending on the liquidity and range of defaulted assets eligible as deliverables, the size restriction is usually set between $2 and $5 mn for senior and up to $2 mn for subordinated debt, while the bid-offer are submitted at a spread of 2 to 3 points, both varying by credit. Additionally, dealers send in physical settlement requests which express their aggregated interest to buy or sell defaulted assets through the auction on behalf of their clients and their own. Note that for senior CDS, only senior debt is deliverable whereas for subordinated CDS both senior and subordinated debt are eligible. Bids and offers which can be crossed, meaning that the bid is higher than the offer or vice versa, are matched and eliminated by the auction administrator. The remaining quotes are ranked in descending order for the bids and ascending order for the offers. The inside bid is then the average of the best 50 per cent of the remaining bids whereas the inside offer is the average of the best 50 per cent of the remaining offers. The inside market midpoint is simply the average of these two, rounded to the nearest 1/8. Dealers who quote offside the market have to pay a penalty. Once stage 1 is finalized, dealers get 2–3 hours to evaluate the amount and direction of the *net open interest*, which arises when the protection buyers want to settle physically whereas the protection seller does not, or vice versa. If the net open interest is zero, then the IMM becomes the final price and the auction ends.[43] In stage 2, the participants submit limit orders to buy or sell bonds through participating bidders in order to close the open interest of the first round (Dutch auction). The auction administrator will match market orders until the

[43] Alternatively, if the net open interest is selling bonds or loans but limits bids are insufficient to fill the net open interest, the final price is set at zero. In the opposite direction, if the net open interest is to buy bonds or loans but limit offers do not fill the net open interest, the final price is par. In any case the final price cannot go above par for obvious reasons.

open interest is cleared. The final price or recovery rate is then the price of the last limit order that is used to fill the open interest. This final recovery rate is then applied to all bonds, loans and CDS that were entered into the auction. Now that the recovery is determined through the auction, the protection seller pays the notional amount of the CDS contract minus the recovery to the protection buyer. If the protection buyer did submit the physical delivery notice to the protection buyer, the deliverable will be sold at the recovery rate, independent of type or maturity of the asset. Hence, the CDS buyer will always receive in total the notional amount of the CDS, no matter the auction-determined final price.

The design of the auction preserves the economics of the physical settlement which included the inherent cheapest-to-deliver option that the CDS buyer owns. However, the process has been criticized to produce systematically biased results with price distortions in the opposite direction to the open interest, that is CDS auctions tend to overprice bonds or loans when the net open interest shows an oversupply of bonds or loans and vice versa.[44] For instance, protection seller have an interest to reduce the payout as much as possible and therefore aggressively bid for an overhang of bonds in stage 2 of the auction process to drive up the price and the final recovery which minimizes the cash settlement amount. Protection buyers are not in a position to counteract since they are excluded from submitting sell orders when the net open interest is to sell bonds. The same holds true for the other way around, i.e. protection buyers submit offers as low as possible when there is open demand to buy assets in the auction. The rationale but manipulative behaviour of auction participants provoked by the auction scheme does not appear to be eliminated by the price cap and price floors which aim to prevent results from being distorted by large limit orders submitted off-market in particular when there is only a small net open interest. Even though the current approach may not be optimal, there is a common sense that the auction-derived final prices appropriately reflect the market view on the value of defaulted assets. If no auction is held, i.e. due to a limited number of CDS, or the auction does not yield a final price, then the fallback settlement method as specified in the CDS trade confirmation applies. This is usually physical settlement but cash settlement is also possible.

For the restructuring credit event, the restructuring supplement became effective through the 'Small Bang' protocol. To address the issue of difference in the value of deliverable obligations due to their different durations, maturity buckets have been introduced for which an auction will be conducted. Except for old restructuring (Old R) which does not contain

[44] See Du and Zhu (2011).

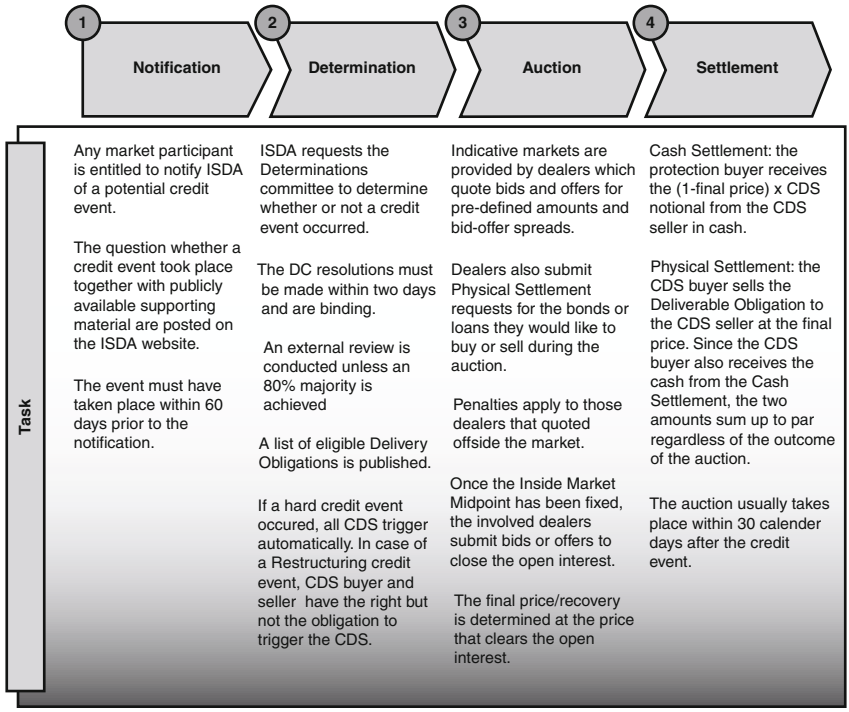


Figure 7.7 CDS auction process after a Credit event

any maturity limitation, a single auction for all maturity buckets will be held. Auction maturity buckets are 2.5, 5, 7.5, 10, 12.5, 15 and 20 years. Deliverable obligations and CDSs are then allocated to these buckets. In general, an obligation is assigned to those maturity buckets whose date is after the maturity date of the obligation. The DC publishes per each bucket a list of deliverable obligations. Once the final list arrives, a CDS buyer has two business days and a CDS seller five business days to trigger the CDS. Those CDS that are triggered by the protection buyer are allocated to the maturity buckets in a way that ensures that there is at least one deliverable obligation that matures before the CDS contract expires. Otherwise, CDS assigned to a bucket with only longer-dated deliverables fall into the next earlier bucket in what is known as the rounding down convention. An exception to the rule is the 2.5 year bucket since there is no earlier bucket. If the CDS seller triggers the contract, the CDS is allocated to the longest maturity bucket which enables the protection buyer to deliver any deliverable obligation. This may turn out to be a risk for those investors who have offset a CDS short position by a CDS long position with equal notional and maturity since the CDS may be allocated

to different buckets. Furthermore, the auction per each maturity bucket is likely to yield different results, a basis risk may be created. If both CDS buyer and seller trigger, the rule for the protection seller triggered CDS applies. Unlike for hard credit events where the transactions are automatically triggered, the information about the trigger has to be provided to the DTCC by the CDS seller or buyer. If there is an insufficient number of triggered CDS for a maturity bucket, the DC may decide not to hold an auction. In this case, the movement option allows CDS buyer and CDS seller to move the CDS within three days to a bucket for which an auction is conducted. Again, there is a difference whether protection buyer or protection seller move the CDS. If the latter moves, the CDS will be allocated to the latest bucket for which an auction takes place. If the protection buyer or both exercise the movement option, the CDS falls to the next earlier bucket with an auction. Although the auction process for a restructuring credit event looks complicated, the overarching aim that the procedure should respect and reflect the peculiarities of the restructuring itself seems to be achieved. This comes at the expense of a significantly more involved process as several additional steps have to be taken into account and each auction bucket is kind of a settlement on its own, separate for senior and subordinated CDS.

Case Study 7: Greece Restructuring Credit Event

The European Sovereign Crisis made visible like no other debt restructuring the diverging and sometimes conflicting objects and constraints of stakeholders, investors, regulators, politicians and, in this particular case, also the central banks, some of which played more than just one role. The ECB exerted pressure to avoid a restructuring or rescheduling in the interest of financial system stability but also held a significant amount of Greek government bonds where both a rescheduling by way of duration extension and restructuring in the form of a significant debt haircut would have led to meaningful losses if not exempted. Politicians at the same time had to consider the knock-on effects of any action to other European countries plagued by unsustainable debt loads, namely Ireland, Portugal, but more worryingly also Spain and Italy, given their huge amounts of bonds which have to be refinanced over the coming years. Capital markets therefore had to weigh the most likely outcome of the numerous options and the effects on investments. However, unlike corporate debt, a large amount of Greek debt does not feature cross default or negative pledge clauses which in turn gave room to a number of restructuring alternatives which had to be taken into account when assessing the probability of a CDS trigger event. Since Greek sovereign bonds issued under Greek law had no collective action clauses, to avoid triggering a default would have required 100 per cent of investor consent to any voluntary restructuring proposal. In contrast, Greek government bond debt issued under English law has collective action clauses

which would need either 66 per cent or 75 per cent of bondholder consent[45] for binding modification of terms and conditions of the respective bonds. In principle, any unilateral or mandatory changes to the terms of bonds, including haircuts and maturity extension, meet the definition of a restructuring credit event and therefore trigger a CDS credit event. With most of the Greek government bonds requiring consent of all bondholders, a voluntary debt exchange for all debt was highly unlikely. However, a voluntary acceptance of a write-down does not constitute a credit event, meaning no credit event will be declared by the Determinations Committee and consequently CDS will not indemnify the protection holders for the loss. The announcement of the Greek government on February 21st, 2012, regarding the key terms of the proposed private sector involvement (PSI) as part of its economic reform program did in itself not constitute a credit event which further heated up the public discussion concerning the effectiveness of CDS as a hedging tool.

After a period of significant uncertainty about the possibility that a payout on Greek CDS will be circumvented, on March, 9th 2012 the ISDA Credit Derivatives Determinations Committee unanimously decided that a restructuring credit event on the Hellenic Republic resulted from the successful Greek debt restructuring. The press release issued by the Greek finance ministry contained a phrase that legally bound those investors who did oppose the proposed amendments to the bond documentations, thereby exactly matching the ISDA definition of actions which led to a restructuring event.[46] Most market participants took this as an encouraging sign that governments ultimately move beyond the point of criticizing and blaming CDS as a source of financial repression to an acceptance and collaboration with financial markets. According to the statement, Greece secured an 85.8 per cent participation rate in the PSI and completed an exchange of €177 bn of domestic law bonds into a series of 20 new bonds which started trading soon afterwards. The Greek event represented the largest sovereign restructuring in the history of CDS and the first for a Western European country. Since most market participants adhere to the 'Big Bang' and 'Small Bang' protocols, they were bound to the auction settlement and the final price derived at the auction. Ultimately, the payout from Greek auction which was conducted on March 19th, 2012, matched the losses from equivalent bond positions. The final payout from CDS and Index positions amounted to $2.89 bn or 78.5 per cent of $3.68 bn net notional outstanding,[47] indicating that the

[45] 66% of bondholder consent is required for bonds issued before 2004 with 75% thereafter.

[46] See www.minfin.gr, press release PSI of March 9, 2012 for further details. ISDA announced that the exercise of 'collective action clauses to amend the terms of Greek law governed bond issues by The Hellenic Republic such that the right of all holders of the Affected Bonds to receive payments has been reduced' conformed to the definition of a restructuring credit event as set out under section 4.7(a) of the ISDA 2003 Credit Derivatives Definitions, amended by the July 2009 Supplement. See www2.isda.org.

[47] The gross notional of CDS on Greek amounted to approximately $69 bn as of March 2, 2012. Source: www.dtcc.com.

vast majority of all Greek CDS have been triggered. Since the credit event was restructuring, triggering the CDS was optional. In order to facilitate an orderly settlement of the transaction concerned, ISDA published a uniform settlement agreement following the credit event. CDS holders signing the agreement confirmed the decision to trigger all its contracts. The recovery of 21.5 was very close to the prices at which the Greek CDS and domestic law bonds were trading prior to **and** post of the restructuring. Other assets which were eligible as a deliverable obligation, for instance Greek international bonds, state guaranteed debt or bonds of state owned institutions such as Hellenic Railway and short dated T-bills, were trading at comparably higher levels since their owners were holding out for better terms than those offered for the restructuring of the domestic bonds. Hence, the PSI bonds were the cheapest-to-deliver obligation and consequently driving the final price. The IMM, which resulted from the first stage of the auction process in which 15 dealers bid on the approved Greek deliverable obligations, was derived at 21.75. A smaller then expected net open interest of €291.6 mn to sell marginally lowered the IMM to the final price of 21.5. However, this outcome was achieved more by chance rather than by design. Unlike in the case of Thomson, the use of the collective action clause (CAC) by the Greek government triggered the CDS and resulted in an immediate haircut on the old bonds so that ISDA was not able to conduct the auction **before** the bonds were restructured. If the new debt would have traded significantly higher, the payout of the CDS would have been correspondingly lower, hence leaving losses partially uncovered on initially perfectly hedged assets that were deliverable into the CDS. In particular, basis investors[48] with long credit positions in Greek domestic law bonds were exposed to this kind of recovery risk, which arose from the potential difference between the economic recovery of the bonds and the CDS final price. It should be noted that the market did not perfectly anticipate this issue since it was possible to unwind a basis package near par prior to the credit event. To complicate the matter further, holders of Greek domestic law bonds that were restructured through the PSI received $31.5 for each $100 of unrestructured bonds which effectively created an imbalance between the initial CDS hedge position of par equivalent and the bonds, assuming a full hedge. Thus CDS buyers that agreed to the restructuring were short bonds going into the Auction and had either to buy additional bonds to cover the short, unwind CDS amounts exceeding the new bond notionals or accept the cash settlement which could have been significantly different from the losses from the bond haircut.

[48] A basis investor buys a package consisting of a) CDS protection on a reference obligation with a lower spread and b) the higher yielding reference obligation in identical notional amounts and maturity to receive periodic income from the yield difference of the two (the basis) or to benefit from a decrease of the yield difference. In the latter case, a basis package shows a positive mark-to-market since the gains on one leg exceed the losses on the other.

The Greek credit event also highlighted the importance of considering the difference of bonds issued under domestic or foreign law. For instance, it is quite likely that holders of Greek foreign law bonds will realize lower losses compared to PSI debt swap offer which imposed an effective haircut of 75 per cent to the net present value of bonds issued under domestic law. A prominent case is the European Central Bank which announced that its €4.27 bn holding of the €14.4 bn non-PSI eligible bond issue that matured end of March 2012 has been fully repaid. Moreover, on May 16th the Greek government decided to repay of €435 mn bonds due on the day before to avoid a hard credit default event which would have triggered cross default clauses on other bonds which remained outstanding after the restructuring in March 2012. Approximately €3.3 bn out of €6 bn outstanding debt appears to have such cross default clauses. The decision of Greece will make it very difficult to achieve an agreement similar to the PSI in future restructurings. The two tiered approach for international versus domestic bonds weighed heavily on the new bonds which were offered as part of the restructuring with 10 year notes trading down to below €0.14 after the announcement to redeem the debt maturing in May in full. This price compared to the value of €0.2878 for those bonds the day after the Auction has been conducted in March, implying a more than 50 per cent loss for investors who stuck to the exchanged debt. It is clear that the decline in prices of the new securities reflected the concerns that Greece will have to leave the Eurozone eventually with unpredictable consequences for the country. Nevertheless, the various stages of the Greek drama highlights the important aspects and strategic choices for both the debtor and the lender in context of sovereign restructurings.

The outcome of the Greek credit event is taken by market experts as a call to the ISDA Credit Steering Committee to revise the concept of sovereign CDS to maintain its status as a suitable risk management product. Concerns are well founded that future restructuring credit events which could become more common for sovereigns could leave the holders of credit protection with severe losses. Ensuring that the payout under a CDS matches the losses or haircuts on the hedged asset therefore is key to the survival of sovereign CDS. The problems which arose from the 60-day look back period that is a standard clause in CDS contracts equally warrants attention. Dealers were confronted with a completely closed market for the 60 days following the credit event determination date since CDS buyers and seller of new CDS were entitled to trigger immediately after trade inception during this period. The lack of CDS trading has been blamed in part for dislocations at the long end of the new Greek sovereign bond curve but also at shorter maturities during that time. This issue was also new to the market since trading in a name typically does not pick up this soon after a credit event emerged. By contrast, the debate about whether the concept of CDS is waterproof if all debt owners would consent to an unfavourable amendment to a loan or bond documentation appears to be missing the point. No derivative in whatever design will alter the decision of its owner to deliberately forego any loss compensation.

The case studies provided in this chapter emphasize the well thought through design of the CDS as an instrument but also the pitfalls which are likely to be addressed near term in order to reflect market practice and preserve the relevance of the product. Within the current process, there are several activities and corresponding decisions to be taken by a portfolio manager who hedged an obligation on whose borrower a credit event occurred. While the figure below is a simplified illustration of the steps in the process, the point here is that the hedger has various options until the final price or recovery is determined by the auction. First, the CDS can be unwound prior to the auction if there is an expectation that the gains on the CDS plus the recovery on the hedged asset at a later point in time add up to more than par. In other words, the actual mark-to-market profit of the hedge overcompensates for potential losses from liquidation. Unwinding the CDS would be a superior strategy if the final price derived at the auction is expected to be lower than current gains and the hedger is prepared to keep the asset on the book. Alternatively, the CDS buyer can submit the hedged obligation to ISDA to ensure that physical delivery is an option. Once the list of deliverable obligations has been published, a decision has to be taken as to whether

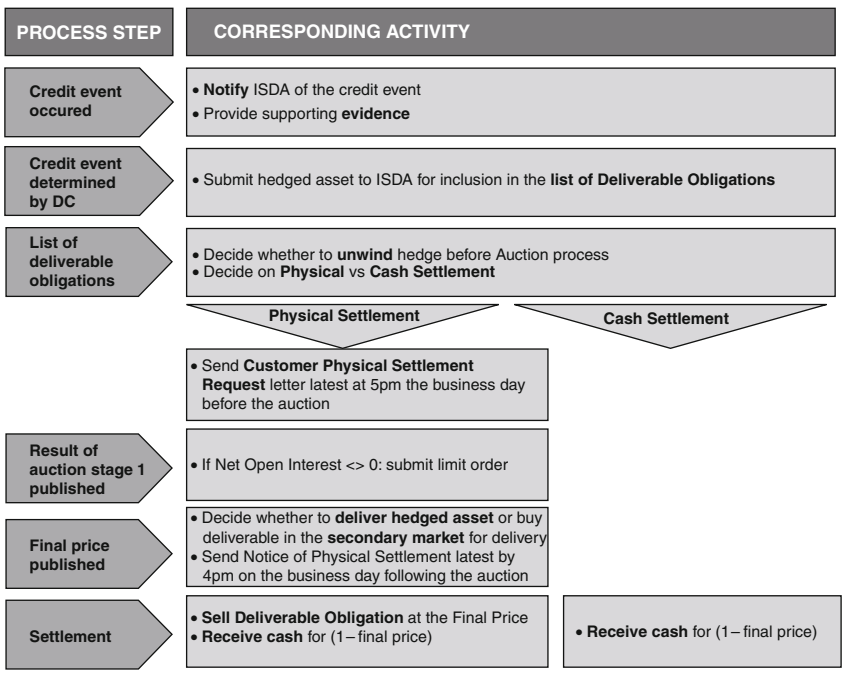


Figure 7.8 Activities and decisions to be taken after a Credit event happened

a physical delivery is preferred. At this stage, no decision has to be made on the deliverable itself; it may be the hedged asset or a cheaper asset that is bought in the secondary market. If it is clear that the asset should remain on the books because of other client-driven considerations, the protection buyer likely will opt for a cash settlement. If physical delivery has been chosen, another important measure is the submission of a limit order after the IMM has been determined, provided that the net open interest does not equal zero. Here, the auction result can be influenced to achieve a higher recovery, which may be valuable if the hedger did decide to deliver an asset bought in the market in exchange for the originally hedged asset. It does not make a difference if no other than the originally hedged asset will be delivered though – the compensation payment will be the notional amount of the CDS in any case independent of the final price. Since CDS offer these alternatives, the protection buyer is well advised to develop a strategic plan as soon as the credit event becomes public to be prepared to react to the different outcomes of each stage of the process.

7.3.3 Final price versus loss given default

While the auction resolves the question how much will be paid in case a credit event occurs, a portfolio manager may still wonder if the protection provided by the CDS compensates for credit risk related losses on the defaulted or restructured asset – in terms of the amount paid and the timing of the compensation payment. This is particularly important when the aim is to offset loan loss provisions by gains from hedges while keeping the asset on the books. A comparison of final recoveries and auction final prices reveals that the average CDS recovery at 20.6 per cent is significantly below the average final recovery after the workout process which is around 24.6 per cent.[49] Although the numbers are based on a small sample point in time observation and thus should serve as a rough guide only, it is nevertheless noticeable that in almost all cases the CDS recovery yields below the workout recovery. This is consistent with the expectation that the additional costs arising from legal advice, involvement of specialists and the later arrival of liquidation proceeds should be discounted in the CDS final auction price, provided efficient markets that correctly anticipate the workout results. Another way to look at the different recoveries is that the value added by the workout department equals the net present value of the extra amount of proceeds from liquidation that exceeds the CDS auction recovery. If no reputational risks or client specific strategy

[49] See Musfeldt et al. (2012).

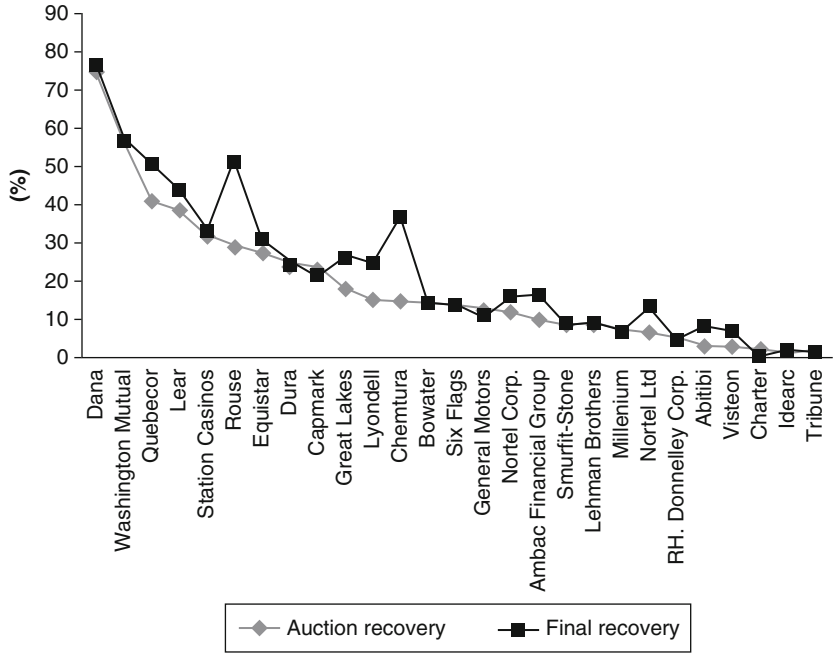


Figure 7.9 Auction recoveries vs. final recoveries for sample set of senior unsecured bonds

Source: Morgan Stanley Research, Musfeldt et al. (2012).

has to be taken into account, a bank maximizes the rate of return on defaulted assets via cash settlement if the costs of workout are anticipated to be below 4 per cent, whereas it would likely opt for physical settlement if the costs are higher. Since the average recovery statistically inversely correlates to default rates, meaning that a rise in default rates implies a higher loss given default (LGD), the uncertainty regarding the time value of money from the liquidation proceeds must be considered.

For CDS pricing purposes, the assumptions on recovery rates or final prices resulting from the auction appear to have a minor impact on CDS spreads.[50] It should be noted that pricing models provided by ISDA or Bloomberg usually assume deterministic recovery rates, i.e. 40 per cent for senior unsecured debt, 20 per cent for subordinated debt and 70 per cent for CDS on first lien leveraged finance loans. On the other hand, existing literature on CDS pricing often mistakes recovery rates as a stochastic quantity and equivalent to recoveries from workout which is clearly not the case.

[50] See Schmidt (2007).

7.4 Succession events

An important aspect of CDS and other debt instruments deals with corporate events in which one entity assumes the obligations of another entity, for instance mergers, takeovers, leveraged buyouts (LBOs), amalgamation, consolidation, transfer of assets or liabilities, divestitures, demerger, spin offs or similar. The Determinations Committee decides whether a succession event has occurred. In general, CDSs are tied to the debt of a company; thus a succession event will likely change the CDS reference entity. Even a split of the CDS is possible, in which case the CDS will reference more than one entity, depending on the outcome of the corporate event. Unlike loans and bonds, where the decision of a company to relocate or buy back the debt is subject to the approval of the holders of the debt, a CDS will be mechanically allocated to the original or succeeding corporate or both, according to the waterfall decision structure as outlined in Figure 7.10. In a succession event, the new reference entity is determined as follows:

In order to determine the successors of corporates, the relevant obligations have to be identified. Those are defined as bonds or loans of the reference entity that are outstanding prior to the effective date of the succession event, excluding intra-company loans. The scope of loans qualifying as relevant obligations needs some interpretations as to whether leasing, factoring and other financing specialties as well as undrawn commitments are excluded. Introduced through the 'Big Bang' protocol, market participants raise the resolution request directly to ISDA Determinations Committee which in turn decides whether an action constituted a succession event, and if so, the date it occurred and the successors. The Determinations Committee will do so by using *best available information* to take an informed decision. Information must be made available within 14 calendar days after the effective date of the succession event; otherwise it will be dismissed. To be considered, a succession event must have occurred within 90 calendar days before the succession event resolution request date (succession event backstop date), the date at which the Determinations Committee is requested to determine whether or not a succession event occurred. Determining a succession event can be a tricky business, since not all corporate actions are fully outlined or even in the preliminary phase of planning when announced. Missing details which are relevant for the decision making often include the distribution of debt after the action, information about the drawn and undrawn parts of the debt, the amount of guaranteed obligations or the timing of the changes and the information about the changes.

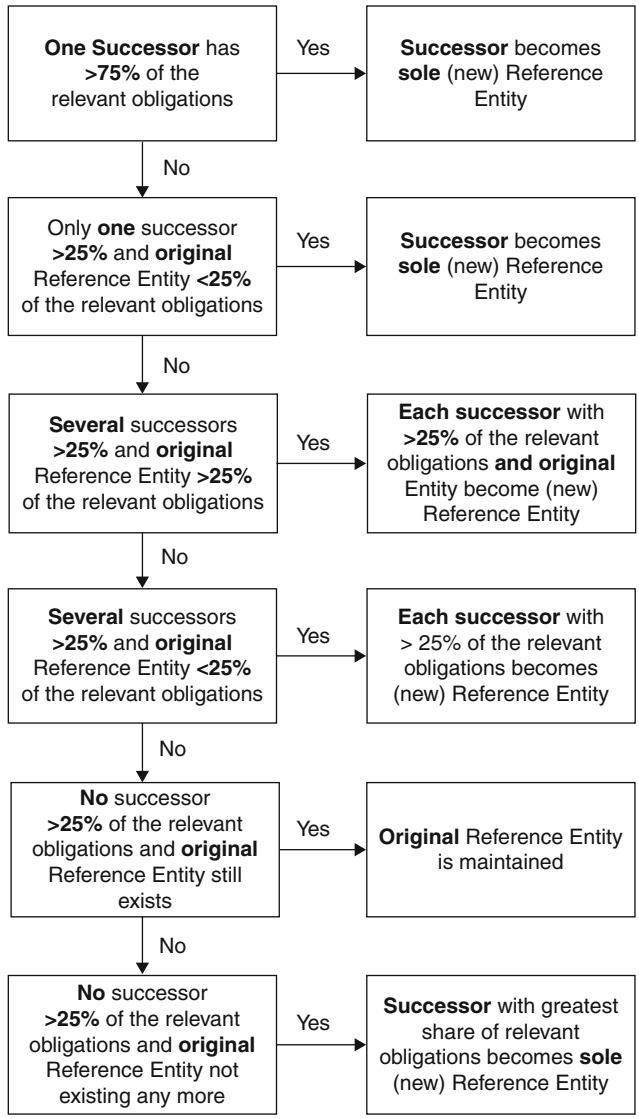


Figure 7.10 Cascading approach to determine a CDS successor
Source: Credit Suisse, Fixed Income Research, Schwarz et al. (2010).

The number of succession events is driven by the global M&A activity of larger, multinationally operating and listed companies, which in turn is reflective of the availability and cost of funds, stock market conditions and global economic growth.

8

Loan Credit Derivatives, Sub-Participations and Credit Indices

While CDS represent the standard for micro-level hedging, a new CDS sub-family emerged to reference senior secured loans. These loans typically feature prepayment options and specify ranking and collateral in their documentation. Even though LCDS never caught up with standard CDS as regards tradable sizes, they nonetheless provide an important hedging instrument for leveraged finance assets which are characterized by higher default risk and lower loss given default due to their asset-based nature. We highlight the main product specifications and the rationale behind the distinct developments of LCDS in Europe and the U.S. Since CDSs are mostly available for large, listed firms only, bank portfolio managers are increasingly assessing alternatives such as sub-participations to protect the risk of illiquid assets. This chapter continues with a discussion of the important aspects arising from an investor being remote to the borrower when taking the default risk and the correspondent implications for the hedger. The last part of this chapter deals with credit indices which are commonly used as highly liquid proxies for credit portfolio hedges. Although they do not cover obligor non-payment risks as specific as do CDS, LCDS or sub-participations, credit indices allow management of spread risks of portfolios in decent size.

8.1 Loan only credit derivatives – LCDS

Loan Credit Default Swaps or LCDSs are an innovation derived from vanilla CDSs where the underlying is a specific syndicated secured loan. Thus no other obligation category, i.e. senior unsecured loan or bond obligations qualifies as a deliverable (for more details, please see 7.1.3 Reference and Deliverable Obligations). LCDSs allow market participants to pursue strategies similar to those where standard CDSs are used, namely hedging, trading and synthetically investing. Investment managers appreciate

LCDS as a liquid, transaction cost efficient and transparent alternative to funded cash positions such as the referenced loans themselves. At the same time, the LCDS structure includes features which, although they are derived from the syndicated loan characteristics, may create significant differences compared to the underlying cash instrument. Those differences relate in particular to cash flows, return and pricing. Differences also emerged within the LCDS contract specifications that are used in the U.S. and Europe. In Europe those banks which are traditionally active in loan syndication apply LCDS to achieve regulatory capital relief from hedging, hence prefer a risk transfer instrument which is tied as closely as possible to the hedged underlying. By contrast, the contract standard developed in the U.S. mirrors the demand of institutional investors, which are the dominant users of LCDS and for this reason put an emphasis on tradeability in order to facilitate market liquidity. The rapid growth of the syndicated loan market, in part driven by a surge in M&A activity and met by an equally strong demand from a new investor base such as hedge funds and CLO managers, contributed to accelerated efforts in 2006 to establish a new LCDS standard documentation. Corresponding indices were launched, for instance the iTraxx LevX index (launched in 2006) which today trades as a Senior Index referencing to 75 first lien loans and a Subordinated Index comprised of 45 second and third lien

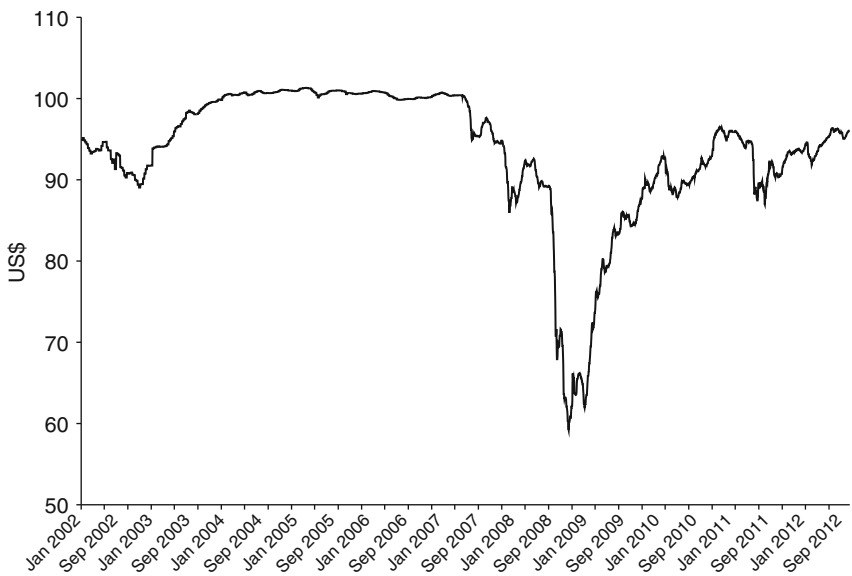


Figure 8.1 S&P/LSTA U.S. Leveraged Loan 100 Index
Data Source: Bloomberg.

loans, and, the LCDX in the U.S. (launched in 2007) which contains 100 names. However, the brewing financial crisis and other LCDS-specific issues, such as the early termination feature, prevented the product from exploiting its full potential. Consequently, ISDA published a new documentation for credit default swap contracts referencing North American loans, the 'Bullet LCDS', on April 5, 2010. While the documentation supersedes the *Syndicated Secured Loan Credit Default Swap Standard Terms Supplement* issued on May 22nd, 2007, the new contract does not constitute an industry-wide protocol that modifies existing contracts as for the 'Small Bang' and the 'Big Bang' of 2009. The changes follow the feedback of market participants and aim to increase the product liquidity and to tap new investors. Although existing single contracts will be supported, which is particularly in the interest of portfolio managers hedging loans, it is expected that liquidity in contracts that do not conform to the new supplement will eventually diminish.

8.1.1 LCDS deliverables

One major difference of an LCDS compared to a CDS concerns the reference and deliverable obligation. Since generally LBO transactions are referenced by LCDS, the peculiarities of those debt instruments are recognized. LCDS eligible obligations typically include term loans, multi-currency loans or revolvers, but no bonds. For European LCDS the reference obligation refers to all tranches or facilities of a syndicated loan of the reference entity if not otherwise stated in the trade confirmation. A credit facility which is partially or fully undrawn qualifies as a deliverable as long as it is not permanently reduced to the part drawn or cancelled and not excluded by 'Delivery of Undrawn Commitments' in the supplement. The total commitment consisting of funded and unfunded parts must be specified in the notice of physical delivery (NOPS). The LCDS contract specifies the seniority of liens, i.e. first or second lien loans. First lien refers to its seniority over other parts of a firm's capital structure and is usually collateralized or secured. Still high in the capital structure but subordinated in the priority of claims and collateralization to first lien loans are second or third liens which are called junior or mezzanine. While LBOs – already indicated by the 'Leveraged' in LBO – exhibit a higher credit risk, the debt benefits from collateralization with a comparably lower loss given default in the event of a failure. Hence, deliverable obligations are obligations that rank at least equal to the reference obligation and are secured by the same assets as the reference obligation. The protection buyer may deliver loans which rank higher than the reference obligation, even though this may not be the cheapest-to-deliver obligation. For U.S. LCDSs, deliverables

include loans on the secured list, or syndicated loans of equal or higher priority. (Sub-)participations or assignments of participations are eligible as deliverables, provided the protection buyer is in a position to grant the protection seller contractual payment rights.

8.1.2 Information advantage

As a general rule, CDS protection sellers suffer from a comparably more restrictive access to debtor information. A loan portfolio manager who owns the loan and seeks to hedge the credit risk for capital relief or other reasons usually enjoys very detailed and timely borrower information. Banks perform at least a yearly credit review on latest available data provided by the client or other sources. In some cases, non-public information contributes to a superior assessment of the borrower's credit quality, provided the rating tools in place to distill the default probability out of the firms data are sufficiently capable. While CDS typically refers to larger, often multinational and stock-exchange-listed corporates that operate worldwide and routinely deal with a global investor base, information on borrowers of syndicated loans underlying LCDSs are more difficult to source and are most of the time private with access given to the syndicate members and other direct holders of the debt. Since investors in LCDS will have limited or no access to that information, they are at an information disadvantage. This is mitigated by the disclosure requirements of listed debt which becomes relevant when a firm chooses to issue high yield debt as a complementary part of the capital structure, which is quite common.

8.1.3 Early termination

Unlike the standard CDS which continues to exist even if there is no deliverable obligation outstanding, orphaned LCDS contracts are cancelled automatically when all the reference loans are called and not replaced within 30 days. Callable loans are loans where the obligor is entitled to repay, prepay, redeem or otherwise discharge a loan prior to the final maturity in accordance with the terms under the loan documentation. Since those loans relevant for LCDS generally and in Europe specifically contain certain optionalities such as the prepayment option, the upside potential of LCDS for investors assuming risk is limited by comparison and should be priced in – in particular for those names where there are only few loans or short term loans outstanding with a low probability of renewal. While the callability or cancelability feature of LCDS is economically sensible given the nature of the underlying credit product, it creates a problem for many market participants which hindered the

LCDS product to close the lines with its bigger sister, the standard single name CDS. The optionality makes it difficult for investors and hedgers alike to value the risky future coupon payments, especially for those contracts with higher par spreads. The probability of early repayment is an additional factor to be considered when valuing the risky annuities since present value and DV01 of a LCDS are both affected by the expectation regarding prepayments. Simplistically, the cancellation of the LCDS due to loan repayment is comparable to a default-driven contract termination but with a recovery of par; both are early contract terminations prior to maturity. Some traders assume that default and cancellation are highly negatively correlated. The rationale is that an improvement of the borrower credit quality decreases the probability of default but increases the ability of the obligor to renegotiate or repay the debt ahead of schedule, hence capping the upside potential for the LCDS investor who will no longer receive coupon payments under the contract once it is cancelled. Additionally, an upgrade to investment grade sometimes releases an obligor from posting collateral since higher-rated loans are usually unsecured. As a consequence, the LCDS referenced loans would no longer satisfy the ISDA definition of a syndicated secured loan, which would result in an early termination of the LCDS contract as in the case of Allegheny Energy Supply Company in 2009. While this relationship between borrower credit quality and prepayment probability appears to be unstable and largely dependent on various, not strictly coordinated criteria such as the refinancing conditions and strategy of the firm, the opposite is more likely to hold: a borrower in financial stress will almost certainly not repay debt early to avoid insolvency. However, for LCDS where the spread indicates a moderate probability of default of the underlying borrower, the assumptions about cancelation can be quite subjective. In general, market participants will derive a view that by definition will be consistent with their positioning but may turn out be quite different from that of a trade counterparty. If a loan documentation includes several prepayment dates, the valuation difference can become significant. Foux and Roy (2008) estimate that, using a Bloomberg function to value LCDS under different assumptions regarding prepayment options and default versus prepayment correlation, the impact of probability of cancellation to the LCDS present value amounts to 10–15 per cent. For those borrowers where both LCDS and standard CDS exist, the implied probabilities of the embedded options can be estimated, although assumptions have to be made regarding the recovery value of loans versus bonds which are expected to be the respective cheapest to deliver obligations. As a rule of thumb, loan recoveries are usually set at 70 per cent, whereas for bonds the standard recovery is 40 per cent. In principle, the spread for an LCDS

should trade at tighter levels compared to the CDS to reflect the higher recovery in the event of a default. However, for those names with lower credit spreads, in particular in times of improving credit and economic conditions, the value of the prepayment option will lead to wider LCDS spreads relative to CDS. As a consequence of the differing assumptions taken for valuation purposes, an investment or hedge strategy which correctly anticipated the development of the credit quality of the loan borrower may turn out to be ineffective if the position cannot be unwound because of a disagreement regarding the valuation with the counterpart. Although the standardization of LCDS confirmation documents in 2006 has contributed to a renewed expression of interest in this market, the looming illiquidity of deep-in-the-money contracts has dampened the market participants' euphorics in the first place.

8.1.4 The new North American Bullet LCDS

To address this problem, the new documentation for the North American LCDS removes the cancelability of the LCDS contracts under which the transactions were automatically accelerated if the reference entity no longer had loans outstanding which matched the reference obligation criteria. The new Bullet LCDS documentation will have the LCDS contract remain outstanding until maturity (or until a credit event occurs) even if the reference obligation ceases to exist. On the other hand, in this case the LCDS will be orphaned which may come the way of the protection seller but may not necessarily meet the interest of a loan hedger. While the phenomena of an orphaned LCDS is consistent with the plain vanilla CDS, changes to the continuity procedures and definitions aim at minimizing that risk. In order to develop the new Bullet LCDS contract, a fit for purpose *refinancing event* was introduced, which in a certain way extends the existing definition of the succession and refinancing events, thereby responding to typical situations around loan refinancings and successions.

8.1.4.1 Refinancing event

Under the 'Continuity Procedures for Bullet LCDS' as published by ISDA, succession provisions have been developed for the first time by defining a refinancing event as one the following actions:

Repayment through New Loans or Bonds: a situation where all or parts of the relevant obligations[1] are repaid by proceeds of new bonds or loans of at least one obligor that is not the Reference Entity;

[1] *Relevant obligation* denoted an obligation of the reference entity that meets the syndicated secured loan characteristics.

Repayment and Asset Acquisition: a situation where all or parts of the relevant obligations are repaid **and** all or parts of the assets securing the relevant obligations have been acquired by proceeds of new bonds or loans of at least one obligor that is not the reference entity;

Repayment and Assets Securing New Loans: a situation where all or parts of the relevant obligations are repaid **and** all or parts of the assets securing the relevant obligations subsequently secure new bonds or loans of at least one obligor that is not the reference entity;

Amendment or Restructuring: a situation where, in connection with an amendment or a restructuring event, all or parts of the relevant obligations cease to be obligations of the original reference entity, and another entity becomes a borrower;

Other Event: A situation where another event has substantially a similar effect to those described above.

For categorizing an action as a succession or refinancing event, a designated law firm rather than the Determinations Committee will be responsible and, in case, identify any successors. Similar to the changes in the standard CDS contract in 2009, the backstop date of 60 days until which a credit event must have been recognized was incorporated into the new framework. Additionally, a backstop date of 90 days for a succession or refinancing event has been implemented.

8.1.4.2 Convention changes

Bringing the North American LCDS into line with other single name CDSs, the new Bullet LCDS will trade with fixed coupons and upfront payments. The 250 bps fixed coupon continues to serve as the standard coupon with quotes expressed both in conventional spreads and points upfront, whereas the 100 bps fixed coupon will be quoted in spreads and the 500 bps fixed coupon quoted in points upfront. In addition, a 'zero coupon' has been introduced to meet the preference of some market participants to trade in points upfront without any coupon. Regarding the conversion of conventional spreads into points upfront, the ISDA CDS Standard Model,[2] assuming a standard recovery rate of 70 per cent, will be used. Because the terms of the 'March 2009 Supplement' have been incorporated into the new Bullet LCDS, other convention changes of standard CDS apply too. In particular, the Determinations Committee deciding on a credit event, the auction process following a credit event and the payment of a full first quarterly coupon should be noted.

[2] The converter is available on www.markit.com and on the ISDA website http://www.cdsmodel.com/cdsmodel/.

8.1.5 Settlement after a credit event

LCDSs, similar to standard CDS contracts, are likely to cash settle following a credit event, although for European LCDS, only the protection seller can elect cash settlement. If no firm quotes are available for the deliverable obligations subject to the cash settlement, physical settlement will serve as a fallback method. In any case, a protection buyer will not have to make a payment to the protection seller if the loan trades above par following a credit event, thus adhering to the intention of credit protection. However compared to corporate bonds, the physical delivery for loans is a bit more involved as loans are governed by documentations which most often require the borrower's consent for a transfer. In general, the physical settlement takes place via assignment or silent (sub-)participation. When a borrower provides the protection buyer with the consent to assign a loan, the protection seller replaces the hitherto creditor as a direct signatory to the loan. If the borrower consent is missing, a silent (sub-)participation may be an alternative. Under a participation, the original lender keeps the loan on its books and maintains the loan servicing to the client but transfers the credit risk in exchange for the periodic income from the underlying loan. Participations are less preferable since the participant does not become a direct creditor of the borrower, thereby exposed not only to the credit risk of the underlying credit but also to the credit risk of the lead bank. Additionally, a silent, i.e. undisclosed, transfer of the credit risk of the loan must respect relevant legal restrictions of the loan documentation.

8.2 Sub-participations

A participation or sub-participation refers to an agreement under which a lender sub-contracts a granted loan in parts or as a whole to another financial investor. The sub-participation, either openly disclosed to the borrower of the loan or silent, is a traditional and frequently used measure to distribute credit risks among banks and other non-bank investors. Participations exist in a funded or unfunded format. Funded sub-participations are loans from the participant to the grantor with the loan repayment being conditional on the ability of the borrower of the loan underlying the participation to perform its obligation. The participant will provide the loan grantor with the funds to allow the grantor to meet its duties under the terms of the underlying loan, in particular regarding drawdowns. Unfunded participations are similar to Financial Guarantees but lack on the contract standardization which the guarantees derived from credit default swaps. In both cases, funded and unfunded, the original lender of the loan will pass on the income

received under the loan to the participant as per the agreement. Loan income transferred from the grantor to the participation buyer includes periodic interest payments, one time fees and other items the bank charges to the borrower. In return, the participant will reimburse the grantor for all amounts unpaid by the borrower in violation of the loan agreement by paying the full amount due to the grantor while receiving the proportionate share of recovery under the loan from the grantor. The participant has no direct contractual relationship with the borrower and becomes a creditor of the grantor, but not of the borrower, although she or he assumes credit risks related both to the borrower and the grantor.

8.2.1 Participations from the perspective of the grantor and the investor

A participation provides a credit portfolio manager with a highly individual and tailored instrument that in general is applicable to all credit products, including bilateral loans and revolving or undrawn facilities. Like CDSs or guarantees, participations allow transfer of the credit risk of the borrower without disclosure to the obligor or the necessity to obtain the borrower's consent, hence preserving the client relationship. While the flexibility of this risk transfer tool is favourable, it comes at the expense of complexity and effort intensity due to the lower level of standardization. From the investor's perspective, participations offer access to credit risks in loan format which would otherwise be difficult to acquire when no relationship to the borrower exists. Moreover, loan documentations often include contractual restrictions concerning eligible lenders and distribution of the loan via loan syndication. Direct lending is generally reserved for regulated and authorized financial institutions, thus excluding non financial investors from granting loans to borrowers. Other reasons why market participants may prefer participations over a loan assignment are related to tax inefficiencies arising from an unfavourable tax treatment for the interest income of the risk assumed by an investor or simply the lack of willingness of the selling bank to take losses from a loan sale below par.

However, in the wake of the financial crisis with a series of notable bank failures, buyers of participations are in the process of reassessing their positions towards the providers of participations. Sellers and buyers of participations should take into consideration some product-specific features which are specific to participations when they enter into this instrument for risk mitigation purposes.

8.2.1.1 Loan administration

The seller of a participation is exclusively responsible for the management and administration of the loan. While a grantor has to perform

its obligations to administer a loan compliant with sound and prudent standards, any amendments or changes to the loan documentation are solely in the hand of the original lender and usually do not require the consent of the participant. Unfortunately, in case of a disagreement a participant does not acquire any rights to take direct legal actions against the borrower as it does not stand in a direct lender– borrower relationship, hence has to fully rely on the lead bank to represent its interest. Nevertheless, the lead bank is obliged to notify the participant of any changes in the status of the financial condition of the borrower or the ranking or collateralization of the loan.

8.2.1.2 Alignment of interest and recourse to grantor

Participants should not take it for granted that their interests are shared by the loan originator. This is in particular noteworthy since intercreditor disputes often arise when the borrower of a loan subject to a participation experiences financial stress. Actions that the original lender undertakes to prevent write downs or to minimize losses from a default are a result of a strategic decision which takes into account many facets with a view on the whole client relationship and exposure, not just economic reasons related to the loan or share of the loan subject to the participation. Additionally, loss provisions are determined by regulatory and political directives and guidance. Other factors to be considered include the ability of a bank to withstand further loan losses, the operating environment and the comfort the bank takes in communicating additional provisions to its shareholder base, tax reasons, etc. Notwithstanding a different view that a participating bank may take on the appropriateness of actions taken to secure the loan by the lead bank, it is bound to those decisions. As long as the grantor pursues a collection approach that is consistent with its normal procedures, no recourse of the participant to the lead bank arises under which the participant can make any claims if it does not agree to the approach taken. Consequently, it remains with the grantor to decide if a workout, forbearance agreements, liquidation or another alternative is most suitable, and is irrelevant as to whether this is acceptable for the participant. Although the original lender is not legally obliged to obtain the participant's consent to any measures taken to recover losses, it may seek an agreement in advance to satisfy its fiduciary duties.

8.2.1.3 Grantor credit risk and insolvency

Moreover, the investor becomes exposed to the credit risk of the participation seller. Even if the loan borrower continues to make scheduled payments to the grantor, an insolvency of the grantor would let those payments become part of the assets of the grantor which will be used

by an administrator or liquidator to satisfy the claims of all creditors but not the specific claim of the participant. Sub-participants who are concerned about the grantor's ability or willingness to meet its obligation may request an elevation of its interest in the loan and enter into a direct relationship with the borrower. Alternatively, under pre-defined circumstances, the grantor may assign all rights and obligations under the loan to a third party or trust so that the participant enters into a new participation with the third party. As a general rule, the sub-participation contract with the insolvent grantor will terminate on the day the participation is elevated to either the participant or a third party that becomes the new lender.

8.2.2 Default event

From the perspective of the original lender, a participation is a useful instrument since it retains all discretionary managerial decision-making ability. In contrast to the CDS, where credit events are described in great detail and the decision of whether or not a credit event took place at the borrower of a loan is taken by a neutral instance, the Determinations Committee, there is no such standard for participations. That means that the contractual arrangements for loss compensation are subject to an agreement between grantor and participant. Moreover, since the participant is not in a position to observe the occurrence of the pre-defined event, it has to fully rely on the original lender to receive correct, complete and timely information as to when losses have occurred and by when and how much of the losses will be recovered through actions taken by the lead bank. As much as for the CDS, the lender becomes implicitly exposed to counterparty risk when entering into a participation. If a borrower whose loan has been transferred by way of participation defaults and at the same time the participant defaults too, then the lender has a claim against the participant ranking pari passu with other unsecured creditors. Additional costs may arise from replacing the participations with a new risk transfer transaction that is more expensive. Collateralization is another way to mitigate the inherent counterparty risk – for both sides.

8.2.3 Comparison of sub-participations to standardized CDS

Like a guarantee, a sub-participation is a direct instrument to transfer credit risk from the originator of a loan to another lender. While participations also share certain features with the CDS, there are significant differences which make the instrument comparably appealing, for instance the largely tailored nature which in principle allows transference of the risk of almost any credit product of all borrowers to other investors. At the

Table 8.1 Comparison of sub-participations and CDSs

Feature	Sub-participation	CDS
Standardization	+ High degree of individualization + Terms and conditions subject to agreement between grantor and participant, no industry standard – Complex transaction, time and resource intense, longer time to market	+ Terms and conditions standardized (ISDA framework) + High degree of efficiency + Short time to market, immediate execution
Eligible assets	+ In principle, all assets eligible (syndication clause to be observed)	– Only liquid names trading – Restrictions for Deliverable Obl. apply (although most assets are eligible)
Counterparts	+ In principle, all counterparts eligible – Confidentiality agreement to be signed by both counterparties	– Active dealers only
Liquidity	– No early termination or unwind	+ Ongoing active markets
Accounting	+ Collateral, at cost	– Mark-to-market
Loss coverage	– Losses up to amount realized, when occurred	+ Par minus final price, immediately after auction, independent from losses incurred
Capital relief	+ Risk participation: double default/ substitution approach + Funded participation: full recognition	+ Double default/ substitution approach
Settlement	– No physical delivery, cash compensation	+ Physical delivery or cash settlement

same time, the lower level of standardization results in operative burdens and, to a certain extent, legal risks as outlined above.

8.2.4 Conclusion

If a bank wants to make participations a regular tool for managing credit risk, it must take into consideration these legitimate interests of the participants. A clear description of default events and conditions that trigger

any payments under the agreement from the participant to the grantor can be derived to a certain extent from CDS contracts, thereby diminishing legal uncertainties around the instrument. The necessity to obtain the participant's consent to changes and amendments to the loan documentation such as payment date reschedulings, change in interest rates, waiver to covenants, release or pledge of collateral etc. should be expressly addressed, notwithstanding the fiduciary and agency responsibility of the participation seller. In any case, even though the original lender serves as the loan administrator which makes participations a convenient instrument to acquire credit risks from the investor's perspective, an in-depth and comprehensive independent credit due diligence is a must before entering into a sub-participation. As a general rule, investors in participations should perform a credit review equal to those performed when engaging into direct lending, and thus receive from the originating bank all documents and credit assessment relevant information necessary to perform the review. In order to do so, confidentiality agreements between loan originator and investor have to be put in place.

8.3 Linear credit indices

Credit indices go back to the year 2004 when CDX in North America and iTraxx in Europe and Asia were introduced. Since then, indices have become the most liquid instrument within the world of credit derivatives and are traded actively across the globe, accounting for a dominant share of the global CDS turnover.

8.3.1 Index family and composition

The family of indices offered by Markit is widespread, allowing portfolio managers to synthetically acquire or hedge credit exposure for a broad range of underlyings, maturities and currencies with comparably small transaction costs.

Additionally, indices for sovereign debt are available, including Western Europe; Central and Eastern Europe; Middle East; Africa (CEEMEA); Asia Pacific; Latin America; G7, Brazil/ Russia/India/China (BRIC) and a sovereign index comprising of the most liquid high-grade entities. The sovereign indices trade with a five-year and ten-year maturity. All indices are rolled over every six months into new series to keep constant the standard maturity of the current or on-the-run series and to offset the roll down effect which arises from an index that continuously gets closer to expiration in combination with lower credit spreads for shorter maturities. When a new index is launched, the index composition may change. Index members that become ineligible due to default, downgrade, corporate

Region	Indices	Sub-index	Underlying	Member	Years
Europe	iTraxx	Main	Top 125 high grade CDS	125	3,5,7,10
		Non-financial	High-grade industrials	100	5,10
		Sub-financial	Fin. institutions, sen. rank	25	5,10
		Sub-financial	Fin. institutions, sub. rank	25	5,10
		Crossover/XO	Sub-investment grade	50	3,5,7,10
		High volatility	Highest spread CDS of main	30	3,5,7,10
	LevX	Senior	1st lien syndicated loans	75	5
		Subordinated	2nd/3rd lien syn. loans	45	5
North America	CDX	IG	Top 125 high grade CDS	125	3,5,7,10
		HY	High-yield industrials	100	5,10
		XO	Crossover CDS	35	5,10
		EM	Emerging market sovereigns	varying	5,10
		EM Div	EM Sov. + corporates	40	3,5,7,10
	LCDX	LCDX	NA 1st lien sen sec. loans	100	3,5,7,10
	MCDX	MCDX	U.S. Municipal bonds	50	3,5,7,10

Figure 8.2 Overview of European and North American CDS indices

action, sector change or illiquidity are replaced by new names depending on the rules for the respective indices. For instance, new names to be included are determined through a liquidity poll for iTraxx and a dealer poll for CDX, LCDX and MCDX. The procedure aims at identifying the single name CDS with the highest turnover or importance in the CDS market in order to support the trading liquidity of the new index series. The on-the-run five-year series is the standard maturity traded in the CDS space, thus the center spot of the market activity. Unlike the single name CDS underlying the CDS indices, the effective date of indices is the index roll date rather than the 60 calendar days prior to the actual date.

The individual composition of the indices by country, industry, rating and spread provides the credit portfolio manager with a choice of hedge and investment instruments representative of the credit market. The indices are composed of liquid names which are mostly multinational and globally active corporates, therefore serve only to a lesser extent as a proxy for smaller and domesticially oriented corporates that are highly sensitive to the credit and operating environment in the region where they are domiciled. Nonetheless, the indices are used as a gauge for credit risk priced by financial markets, hence revealing the risk-aversion sentiment of market participants and as such have direct and indirect effects on pricing of other credit and equity products. Although the correlation between a credit portfolio that an investor manages and a corresponding credit derivative index should be carefully assessed

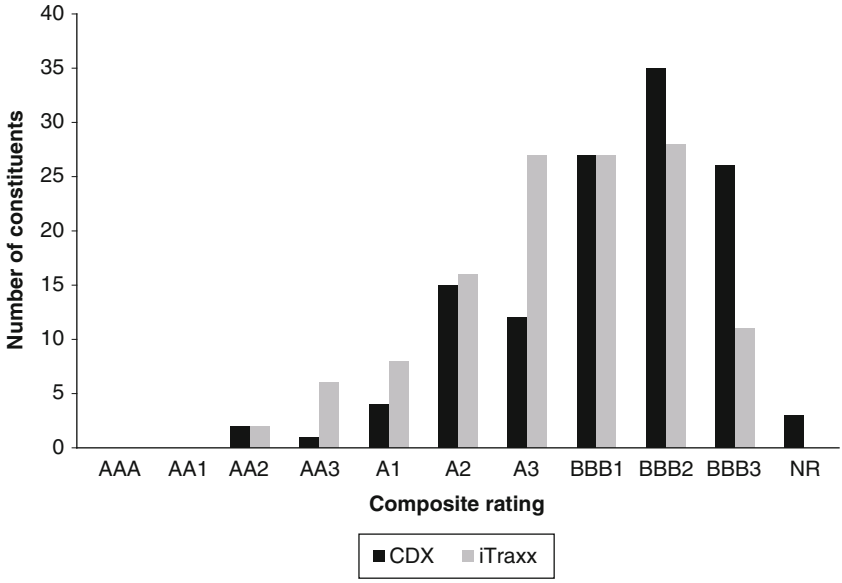


Figure 8.3 Rating distribution of iTraxx Investmentgrade CDS Index (Europe) and CDX Investmentgrade CDS Index (North America) as of December 2012

Data source: Bloomberg.

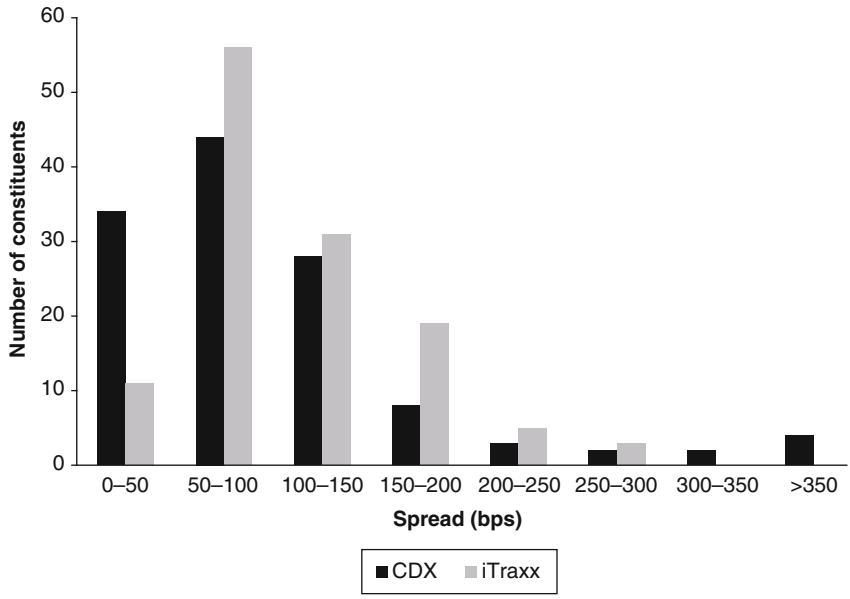


Figure 8.4 Spread distribution of iTraxx Investmentgrade CDS Index (Europe) and CDX Investmentgrade CDS Index (North America) as of December 2012

Data source: Bloomberg.

before entering into any index-based hedge strategy, the indices are not at least because of their outstanding liquidity a popular instrument for credit default and even more so for credit spread risk management. In general, the rating distribution for North American high grade names is, compared to Europe, skewed to the lower end of the investment grade rating scale.

In contrast to the rating distribution, the European index appears to be more risky as measured in terms of spreads which is presumably reflective of the prevailing European sovereign debt concerns, which adds to corporate spreads.

8.3.2 Credit events for CDS indices

When a hard credit event takes place at an credit derivative index constituent, the name affected is removed from the index and settled at the auction. Once the settlement is finalized, a new version, usually named v2 of the index without the defaulted name, starts to trade. The new index consequently consists of n-1 index members compared to the n index constituents for the original series. The index protection buyer receives 1 – recovery for the notional of the index multiplied with share of the defaulted name of the index:

$$P = N \cdot \frac{1}{C} \cdot (1 - R) = \frac{N}{C} \cdot (1 - R) \cdot$$

where

P = Compensation Payment
N = Trade Notional
C = Number of Index Constituents
R = Auction determined Recovery

Example 1: The buyer of $100 mn protection on CDX.NA.HY.17[3] consisting of 100 members, including Eastman Kodak, received a compensation payment for the default of Eastman Kodak[4] of $100mn/100*(1–0.23875)=$761,250.

Once the defaulted name has been removed from the new index version, the notional of that index is corrected by 1/n and trades accordingly as

$$N_{New} = N_{old} \cdot \frac{n-1}{n}.$$

[3] CDX North American High Yield Index Series 17.

[4] The final price of Eastman Kodak derived at the auction dated February 22, 2012, was 23.875. Source: www.creditfixings.com.

Example 2: The CDX.NA.HY.17 index originally comprised of 100 names of which three index members, namely Dynegy, Eastman Kodak and The PMI Group defaulted. Hence the factor for the index is 0.97 derived from (100–3)/100 or $9.7 mn for a $10 mn ticket.

However, if a restructuring credit event occurs, then the affected index will be split into two parts: one without the restructured name or (n-1)/n of the index and the restructured name itself or 1/n of the index. The different treatment, which lets the restructured name become a single name CDS on its own relates to unique nature of the restructuring credit event. In contrast to the automatic triggering in case of a hard credit event, a restructuring requires the CDS buyer and seller to take a decision whether or not to trigger the contract. Assuming the contract has been triggered, the standard settlement procedure for restructuring applies. If untriggered, the CDS will continue to trade until it terminates at the maturity date or another credit event happens. Hence, while the choice of investors may differ with respect to the triggering, there will be only one index trading: the one adjusted for the restructured name.

9

Hedge Strategies for Baskets, Swaptions and Macro Hedges

Managing a credit portfolio through an economic cycle necessitates a view on credit-related developments and related consequences for the specific portfolio. Most of the time, a portfolio manager faces considerable uncertainty when forecasting risk drivers and macroeconomic factors but even more important, potential interventions by policy makers which have become a rule rather than an exception these days. In light of the prevailing fall out from the financial crisis which is still in the process of filtering through the various layers of the monetary transmission mechanism, governments are engaged in far-reaching crisis mitigation measures that are difficult to predict but rapidly change the tune in financial markets, thereby having the potential to make any forecasts redundant. Hence, to be in a position to respond to different and often fast changing conditions in credit markets, a portfolio manager needs to be equipped with a range of hedging tools which provide suitable and effective solutions to shield the credit portfolio from any adverse impact. A complete toolbox comprises of instruments which address:

- **Asset coverage:** financial markets, although most efficient because of the high level of standardization, provide instruments for the largest corporates and plain vanilla credit products such as term loans and bonds. However, a typical credit portfolio of a universal bank is comprised of small businesses, medium enterprises and a broad spectrum of loan products from current accounts to trade finance and guarantees which call for bespoke rather than capital market standard solutions;
- **Short time to market portfolio protection:** fast changing market conditions pose the necessity to respond quickly by entering into hedges that are quick and easy to execute with sufficient liquidity in terms of tradable size and acceptable transaction costs. Ideally, such a hedge is applied on a portfolio level rather than on multiple single names;

- **Portfolio correlation:** In times of financial stress, the dependency structure of credit risks within a portfolio tends to intensify. A rising correlation, both for credit migration and default risk, increases the probability of large scale losses or tail risks due to portfolio concentrations which have been identified as the major reason for failures of financial institutions;
- **Volatility risk:** More often than not, a rise in asset correlation is accompanied by an increase in volatility. Although the risk profile of the credit portfolio stock may not be directly impacted by volatility, it has some implications for the credit value chain and an active management of the portfolio;
- **Hedging restrictions:** Sometimes a perfect hedge which references to the single credit asset that a portfolio manager wants to protect is not at hand, for instance due to the illiquid nature of the asset or because of regulatory restrictions. Consequently, imperfect or macro-hedges with an acceptable hedge error or basis risk have to be developed.

This chapter deals with hedge instruments which allow creation of a cash-flow profile to counterbalance the scenario anticipated by the portfolio manager, while corresponding to all the requirements listed above. The focus is again, as it is throughout the book, on hedging strategies as opposed to trading. While we acknowledge that there is often not a clear distinction between value preservation and value generation or profit making, the objective of any portfolio management activity must be fully transparent from the beginning and should not become confused subsequently. The following part of the book explains risk mitigation approaches using CDS product variations, such as nth-to-default baskets which address asset correlation and portfolio concentration. The chapter continues with a discussion of swaptions which are short-term dated and allow to take a view on volatility. The text outlines how specific strategies can be employed to achieve a full cycle active credit portfolio management. The chapter concludes with a discussion on cross-asset hedging strategies that become increasingly more important in the context of regulatory restrictions, such as the ban on sovereign CDS by the EU commission.

9.1 Nth-to-default baskets: combining default risk with correlation

Nth-to-default baskets on CDS have been introduced at the early days of the credit derivatives and can be seen as a kind of 'CSO light', since nth-to-default baskets have much in common with their larger sister but

are less complex by nature and closer to the single name CDS. Both instruments share the sensitivity to correlation risk which arises from a cash flow or default hierarchy. In principle any kind of basket can be constructed, although there are some standard applications which benefit from a better market liquidity. Most common are 1st-to-default (FtD) baskets on five to a maximum of ten names with a five year term. 2nd-to-default or 2nd-to-last-to-default baskets have become popular, too. As the name suggests, a portfolio of CDS arranged as an nth-to-Default basket exhibits a default hierarchy. For instance, the buyer of an nth-to-default basket receives the coupon payments on the basket notional from the seller until the nth default occurs among the constituents; then the contract terminates. The default hierarchy means that an element of leverage is introduced which is comparable to the structure of the balance sheet of a firm which is composed of equity and debt. All losses are absorbed in the first place by the equity while the debt starts to suffer only if losses exceed the amount of equity. An FtD basket where the first credit event will terminate the instrument is therefore the equivalent of equity in a capital structure. A 2nd-to-default basket is more default and loss remote in that it will become a FtD basket only after the first credit event at one of the names included in the basket occurred and terminates only once the second credit event takes place. Generally speaking, the structure of a basket is comparable to synthetic CDOs (CSOs) and to tranches on credit indices:

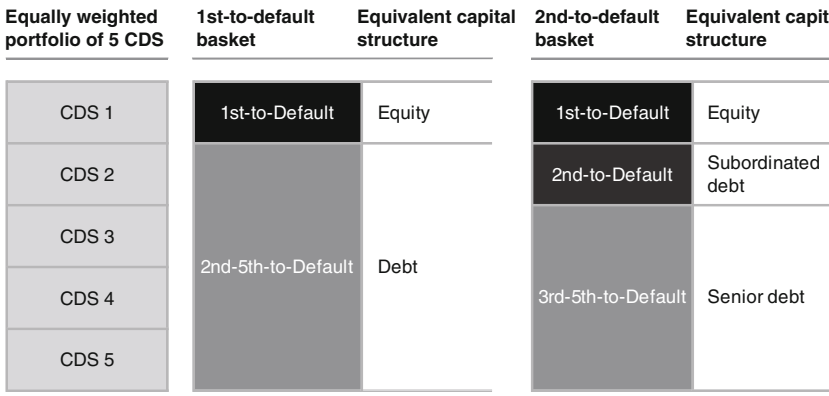


Figure 9.1 Portfolio of equally weighted CDS versus nth-to-default basket structure

Even though there are similarities, there are differences too. For example, unlike CSOs and tranches of credit indices, which continue to exist even after the equity tranche has been wiped out, the first name out of an FtD experiencing a credit event settles through the ISDA auction process and leaves the protection seller with a loss amounting to

$$L = N \cdot (1 - R)$$

where

L = Loss

N = Notional of the basket

R = Auction-determined recovery of the first name of the basket experiencing a credit event.

The leverage of nth-to-default baskets becomes apparent by the fact that the seller of an FtD is exposed to the default risk of all basket constituents, with each of them having the potential to create losses up to the full investment notional amount, assuming a zero recovery – in contrast to a portfolio of identical notional and comprised of the same but equally weighted names where a loss would cost the investor no more than the share of the portfolio notional allocated to the defaulted name.

9.1.1 Pricing the correlation factor

Obviously, the pricing of a basket must reflect its different risk profile. Intuitively, one would expect to the seller of an FtD to be compensated for the default risk of all its underlying CDSs; thus, the premium would be the sum of the spreads of CDS one to n. However, a clever investor would then choose to sell an FtD basket consisting of names with an almost identical risk behaviour, meaning they either all default at the same time for the same reason or none of them defaults. Let's assume the individual CDSs trade at exactly the same spread, which seems logical given that they fully share the same risk profile. The seller of the basket would then receive n times the spread of the underlying while he could buy CDS protection of one of the basket constituents with a notional equal to the basket in order to be perfectly hedged, thus paying only 1/n the coupon. Hence, the trade would give the seller of an FtD n-1 coupons for free. On the other hand, if all the names in an FtD are fully uncorrelated, a seller of an FtD would have to buy protection on each name to hedge the default risk, thus spending n coupons on a notional of n times the basket notional. Neither case, 0 per cent and 100 per cent correlation, is likely but it becomes clear that correlation matters. The way correlation impacts pricing is the coupon which is determined through the percentage of the sum of spreads. In general, FtD pay between 70 per cent and 85 per cent of the sum of spreads for a well diversified portfolio. From that it follows that a 2nd-to-nth-to-default basket enjoys a coupon of 100 per cent of the sum of spreads minus the coupon of the FtD which offers cheap protection provided the hedger can stand a default of one of

the basket constituents since the protection becomes 'activated' only after the first default. Of course, pricing nth-to-default baskets is a lot more complex since CDS spreads are dynamic and the valuation of correlation products incorporates the impact that a default of one of the n CDSs has on the remaining names which is unstable over time. Hence a model must recognize not only the interdependence or the correlation between the names within the basket which is observable at one point in time but must elaborate on a richer correlation structure. Pricing is then simulated using a copula distribution and a Monte-Carlo simulation.[1]

9.1.2 Hedging strategies using nth-to-default baskets

Hedging credit portfolios using CDS baskets is particularly helpful where a portfolio manager explicitly considers correlation aspects. As a general rule, the buyer of FtD protection is short the correlation between the names included in the basket while the seller of protection goes long correlation. Because the pricing of nth-to-default baskets unveils implied correlation of the basket constituents, it also allows cross-checking of the correlation assumptions taken when developing a scenario against which a hedger wants to protect the credit portfolio. Moreover, an FtD hedge releases regulatory capital of the asset out of the basket that carries the lowest risk weighting.

9.1.3 Hedging concentration risk

A 2nd-to-nth-to-default baskets is an effective way to buy cheap protection on a portfolio of concentrated names. Assuming the underlying names are perfectly correlated, and thus would default altogether, the hedger pays a fraction of the premiums he would have to pay for hedging each name separately in exchange for receiving the same protection except for the losses arising from the first name defaulting that remains unprotected. In many cases, portfolio managers are concerned about the correlation of credit risks within the portfolio, stemming from common risk drivers for the borrowers. Thus an unfavourable development of those risk drivers would have massive consequences to the portfolio risk profile since a range of debtors would be affected. While a portfolio manager would be prepared to accept some defaults, a series of correlated defaults would probably exceed the risk appetite and the capacity to absorb losses.

---

[1] See Schmidt (2007) and Zhiyong and Glasserman (2006).

9.1.4 Hedging tail risks

Tail risk hedging has become a core element of any meaningful portfolio protection in the face of repeated significantly negative events which resulted in large scale losses for financial institutions. Persistent uncertainties regarding the quality of sovereign debt in Europe and the future of the euro has measurable repercussions to the funding costs of industrials and financial institutions domiciled in peripheral countries that are perceived to be comparably weak, given their huge indebtedness and rather bleak economic prospects. The knock on effects from the sovereign debt crisis has the potential of a large scale derailing of the financial system and finally also the global economy – a description that meets the definition of a tail risk. Being at the heart of any stress test, tail risks are defined as an unlikely but severe event. Fundamental concerns related to the economy as a whole or idiosyncratic events with extreme consequences such as a sudden collapse of a major systemically relevant financial institution as witnessed in the case of Lehman are likely to translate into intense pressure on valuations across the spectrum of asset classes, partly attributable to an increase of correlation of these assets. Moreover, knock-on effects or second- and third-round effects become hedgeable using the 2nd-to-nth-to-default basket construction. For instance, in the aftermath of 2011 Japanese earthquake which led to the explosion of the Fukushima nuclear reactor, the global automotive and electronic equipment industry was hit by a shortage of certain electronic components where Japan has a dominant share of the worldwide production. Although these two industries exhibit a moderate correlation which is based on their common risk driver of consumer demand, they have been simultaneously affected by this shock event.

9.1.5 Hedging idiosyncratic risk in a benign credit environment

While corporate defaults are rare in a benign economic environment, they nevertheless occur. This is partly due to time lag effects where a firm struggled from adverse operating conditions in the past but managed to stay afloat for some time before throwing in the towel or due to event risk such as litigation, fraud, M&A, etc. In order to fully protect for that risk, a portfolio manager would need to buy protection on each and every name, which is clearly unfeasible. However, an FtD basket would hedge exactly this scenario where only one name experiences a default while all other borrowers within the credit portfolio remain unaffected. The hedge strategy comes at a considerably lower cost, although the costs are still significant and hence sustainable for selected names only. Hence, hedging event

risk with FtD baskets is quite popular with portfolio managers. However, because the upside of an FtD basket is limited to the compensation of the loss from a default of one out of the n names of the basket, the instrument is less suitable to hedge systemic risks which denotes correlated effects. For sellers of protection, an FtD basket offers a less capital-intense way to collect coupons of a multiple of names, hence leveraging the amount disposable for an investment.

9.2 Swaptions: adding a volatility risk component to default protection

Beside the correlation factor that affects the loss distribution of a credit portfolio, another concern relates to volatility in valuation of financial assets. For instance, a recurring pattern in global stock markets is a sudden risk aversion of investors which results in a sharp decline of stock prices coupled with a significant increase of credit spreads. Generally, tail risk hedges should not only protect against large losses in an extreme event but also offset the effects of a rise in volatility of risky assets, which is typically observed in times of stress. The massive and market-dislocating impact of probable shock events makes options a suitable tool to counterbalance corresponding portfolio effects. CDS options or default swaptions complement CDSs and CDS-based indices in that swaptions offer cheap protection for credit market risk while linear products are more expensive or appropriate for hedging default and migration risk. Unless credit assets are booked into a banking book where no market valuations apply, volatility of financial markets may be a concern for the investor. But even in a world where banks continue to maintain accrual accounting on loans or bonds, there are reasons to balance larger moves of credit spreads although they may not become immediately visible in the daily profit and loss. For instance, derivative hedges that are measured at fair value introduce credit volatility to credit portfolios. The timing component of loan origination,

Table 9.1 Expressing credit views with swaptions

	Payer		Receiver	
	Buy/ Long	**Sell/ Short**	**Buy/ Long**	**Sell/ Short**
Credit risk position	Short	Long	Long	Short
CDS pendant	Buy protection	Sell protection	Sell protection	Buy protection
Expected spread move	Bearish	Neutral/ Bullish	Bullish	Neutral/ Bearish

Table 9.2 Overview of default swaption characteristics

Component	Description
Underlying	CDS indices (i.e. on-the-run iTraxx or CDX IG series) and, to a lesser extent, single name CDS.
Strike	Predefined spread level at which the holder can exercise the option, typically ATM +/- 20 per cent.
Exercise	All credit options are European style and can be exercised only at the expiration date, from 9 a.m. to 4 p.m LDN and 9 a.m. to 11 a.m. EST. Options which are not exercised terminate at expiration date.
Expiration Date	Expiration dates are usually set to the third Wednesday of the expiration month or the standard roll dates of CDS and indices (20th of March, June, September or December of each year) for single name CDS options. Most liquid durations are 1–6 months for index options and 1–12 months for single name CDS options.
Settlement	To monetize the value changes of option during the lifetime, an option can be assigned or unwound. At expiration date, options physically settle into the underlying, albeit cash settlement is a possibility.
Credit Event	For options on indices, the option notional reduces in line with the underlying. Any loss is compensated analogous to CDS indices. Single name CDS options terminate in case of a credit event occurs within the underlying (knock out).
Premium/ Quotation	The option premium is the costs of the option and paid upfront. The quotation convention for options is to express the premium in bps.[2] Furthermore, swaptions trade with delta which denotes the simultaneous offsetting of the option with a delta equivalent position in the underlying at the reference price that corresponds to the option quote.

where the margin is negotiated for long time before the loan is finally signed by the bank and its client, exposes the bank to the risk of a significant widening in credit spreads which could make a hedge for the newly originated loan uneconomic. The same applies to debt capital markets underwriting where the bank takes the risk to place certain debt securities at a pre-agreed price, independent of market conditions which prevail at the time of syndication. At the same time, many loans carry prepayment or early amortization provisions which generally become a concern for

[2] An exception to the rule is the CDX High Yield index for which swaptions are quoted in price terms rather than in spread premiums, in line with the usance for the index itself. The terminology for those swaptions also differ from the others in that options are referred to as call and puts as opposed to receiver and payer.

loan portfolio managers when credit conditions improve. Hedging loan portfolio convexity is the objective for another swaption strategy. Other trading strategies, in particular those that are non-directional regarding credit market risk but express a view on volatility, extend the scope of portfolio applications for swaptions. It is important to consider that option strategies generally target mark-to-market gains as opposed to CDS hedging strategies, which, from a credit portfolio manager's perspective, are intended to counterbalance default risk and ideally do not show any mark-to-market volatility otherwise.

Swaptions are offered on single name CDS and credit indices, although options on CDS indices are the most liquid. They were introduced in 2003, when CDS indices on U.S. corporates started to trade. After the financial crisis in 2008, the trading activity in swaptions largely increased and continues to do so. CDS options provide credit portfolio managers with a low cost alternative hedging against tail risks or unexpected market developments, for instance large spread moves. On the other hand, investors such as hedge funds or asset managers make regular use of default swaption to enhance the returns on their portfolios. Other market participants like correlation desks manage convexity or gamma exposure through options. In general, swaptions are by and large similar to other OTC options but feature some unique characteristics which we describe in some more detail hereafter. While we provide a sample of applicable hedging strategies for credit portfolio managers, the focus is on downside protection rather than on trading or income generation.

9.2.1 Conventions

Default swaptions are referred to as **receivers** and **payers**, derived from the usances for interest rate derivatives.

A receiver is the equivalent of selling CDS protection/buy risk, and thus receives the CDS coupon when exercised. Accordingly, a payer has the right to buy CDS protection, therefore has to pay coupons. Buying receivers expresses a bullish view on credit spreads whereas buying payers conforms to a bearish stance. Table 9.2 details above the features of CDS options.

The spot level for the index indicated in a trader run is usually close to actual index levels at the market opening and serves as the level where the delta exchange takes place. A delta exchange denotes the corresponding amount of index to be traded simultaneously to the option trade to neutralize market moves of that index. As for many OTC options, swaptions usually trade with delta to ensure a smooth trading even in a volatile

environment. In order to trade swaptions without delta, an investor may trade with delta and subsequently offset the delta by selling or buying an equal amount of the index opposite to the delta. Unlike for CDS where the quotes have to be refreshed on an ongoing basis to indicate tradeable spreads, the swaption spreads are relative to a reference level of the underlying index so that moves in the index are mirrored by an equivalent move in the swaption quote. The forward DV01 of the underlying is the DV01 or mark-to-market valuation for a 1 bps change in the theoretical index underlying used in pricing models to evaluate payoff calculations. The forward does not trade; it is the spread of the index at the option expiry date. The strike, quoted in spread terms for all indices except the CDX HY, is the predefined level at which an option buyer can buy (payer) or sell (receiver) the index protection at expiration. Options trade at-the-money (ATM), meaning that the strike is set close to actual index spread levels, out-of-the-money (OTM) where the option exhibits time value only and in-the-money (ITM) when the index trades above or below the option strike for a long payer and long receiver, respectively. Trader quotes, called runs, detail the price, delta and volatility for a range of strikes of payers and receivers:

Underlying: iTraxx Main S17. Expiration: Sep12. Forward at 169.152. Delta at 157

Strike	Receiver	Delta	Vol	Strike	Payer	Delta	Vol
90	0.8–5.8	2.5%	58.5%	140	–	–	–
100	4–9	4.9%	58.5%	150	155.3–160.3	–68.8%	64.3%
110	10–15	8.5%	59.3%	160	135.7–140.7	–62.9%	65.7%
120	18.9–23.9	13.2%	60.1%	170	119.2–124.2	–57.3%	67.1%
130	32–37	18.9%	60.5%	180	105.4–110.4	–52.1%	68.5%
140	48.7–53.7	25.0%	62.9%	190	91.8–96.8	–47.4%	69.3%
150	69–74	31.1%	64.3%	200	81.1–86.1	–43.0%	70.1%
160	–	–	–	210	70.8–75.8	–39.0%	70.5%
170	–	–	–	220	62.4–67.4	–35.4%	70.9%
180	–	–	–	230	55.3–60.3	–32.1%	71.3%
190	–	–	–	240	49.1–54.1	–29.2%	71.7%

Figure 9.2 Quotes for iTraxx Main S17 3 months CDS options

For example, an investor would buy an iTraxx Series 17 Receiver swaption with a strike of 150 at an offer of 74, meaning that the option costs a premium of 0.74 per cent of the notional or €740,000 for €100 mn notional. The delta of 31.1 per cent for this swaption indicates that the sensitivity of buying €100 mn of the receiver option equates to buying €31.1 mn of the underlying iTraxx index, quoted at 157 bps for reference. Markit provides standard confirmations for swaptions on its website. The swaption confirmation references a Standard Terms Supplement in addition to the single name CDS documentation framework.

9.2.2 Default event

Fortunately, a credit event for swaptions on indices is fairly straightforward. As described in section 8.3.2 'Credit events for CDS indices', a new index version is created when a credit event takes place for one of the index constituents. In case of a hard credit event, the swaption automatically refers to the new index version without the defaulted name and the buyer of an exercised payer swaption receives par minus recovery for the defaulted name as determined by the Auction process – provided that the Auction takes place prior to the option expiry. If the Auction is held after the swaption expiration date, the option has to be exercised first and then the trade becomes an index trade going through the auction mechanics. From the perspective of the payer option buyer, the decision to exercise will be taken on the option strike versus the spread of the old index as the option underlying which is equivalent to the spread of the adjusted index version 2 without the defaulted name plus the compensation payment from the defaulted name. For buyers of receiver options, the approach is similar.

A restructuring credit event, as usual, is a bit more complex. To retain the decision of the index protection seller and buyer to decide whether to trigger the contract or not, the underlying index will be split into a new index with n-1 constituents and a CDS referencing to the restructured single name. However, to be in a position to trigger the contract at the Auction, an index option must expire before the auction since CDS options are European style, meaning they can only be exercised at expiration date. If the expiration date is post the restructuring credit event auction, the single name CDS that is split from the index remains untriggered as the window of opportunity for triggering the contract has passed.

9.2.3 CDS option strategies

The similarities between CDS index options and the much larger market for options on equity indices allow for conclusions to be drawn from the diverse literature on stock options. In particular, more complex strategies – for instance risk reversals, ladders, calendar spreads, butterflies etc. – are standard in other option markets but in credit markets by and large actively pursued only by market professionals specializing in those instruments. A detailed and complete discussion of sophisticated trading strategies which express outright or relative value views and volatility positioning are beyond the hedging intention and exceed the scope of this book. Although CDS options have a lot in common with stock options, there are some significant differences, too. First of all, stock options do not have to deal with defaults; this risk is unique to credit.

Hence, standard option pricing models have to be modified to account for defaults. Nevertheless, the short dated nature of CDS index options mitigates this risk to a certain extent, although not to a full extent. Since the impact of a default on an index, and therefore on an index option, can be significant, investors in CDS options should bear this risk in mind. Additionally, the pull-to-par price effect of bonds for which the full principle will be paid back at maturity unless a default happened – regardless of the price at which the bond trades prior to maturity – makes options on bonds difficult to compare to options on stocks. The pull-to-par effect of bonds translates into a push-to-zero spread effect for the corresponding CDS. By definition, if no credit event happens, any CDS spread will decrease to zero at the termination date. Stock prices, in contrast, tend to exhibit trends but not any of those effects described above, which are particular to credit instruments. Although credit spreads react to both the trend and the volatility of stocks, a direct comparison of stock and credit options price moves may be misleading.

CDS options mainly settle physically. If the option is exercised at expiry date, the holder will enter into a contract in the underlying index at the strike with the option seller as the counterpart. In order to monetize any gains from the option, the option holder can then unwind the index position at current market spreads. Assuming no default occurred within the option underlying, the value of an option at expiration date is simplistically represented by[3]

Table 9.3 Stylized value at expiration and risk positioning of CDS swaptions

Option Type	Option Value at Expiration	Credit Risk Position	Credit View
Buy Payer	$Max\big(0,(S-K)\big)\cdot DV01_{Fwd}\cdot N-P$	Short	Bearish
Sell Payer	$-1\cdot Max\big(0,(s-k)\big)\cdot DV01_{Fwd}\cdot N+P$	Long	Moderate bullish
Buy Receiver	$Max\big(0,(K-S)\big)\cdot DV01_{Fwd}\cdot N-P$	Long	Bullish
Sell Receiver	$-1\cdot Max\big(0,(K-S)\big)\cdot DV01_{Fwd}\cdot N+P$	Short	Moderate bearish

[3] The representation in Table 11 above serves as a 'rule of thumb' approximation only and does work better for ATM options while less so the more spot-at-expiration and strike diverge from the forward. The valuation of CDS swaptions is more complex and is formally described in Brigo and El-Bachir (2010) or Rutkowski and Armstrong (2009).

where:

S = Spot of the option underlying at expiry date of the option
K = Strike of the option
$DV01_{Fwd}$ = Forward DV01 of the underlying
N = Notional
P = Premium.

For **buyers** of payer and receiver options the maximum loss is limited to the premium paid, while the maximum gain is only constrained by the spread widening/tightening potential. By contrast, the net payoff at expiration date is the opposite for **sellers** of payer and receiver and can be significantly negative, whereas profits are capped at maximum to the premium payments received as shown in the figure below.

Value changes of options are sensitive to price volatility of the underlying, although to a varying degree, depending on the remaining time to expiry and spot to strike level. A higher volatility in general increases the chance that an OTM option may end up ITM at expiration. As a result, an increase in volatility will lead to rising option premium and vice versa. Since option pricing models allow isolation of the

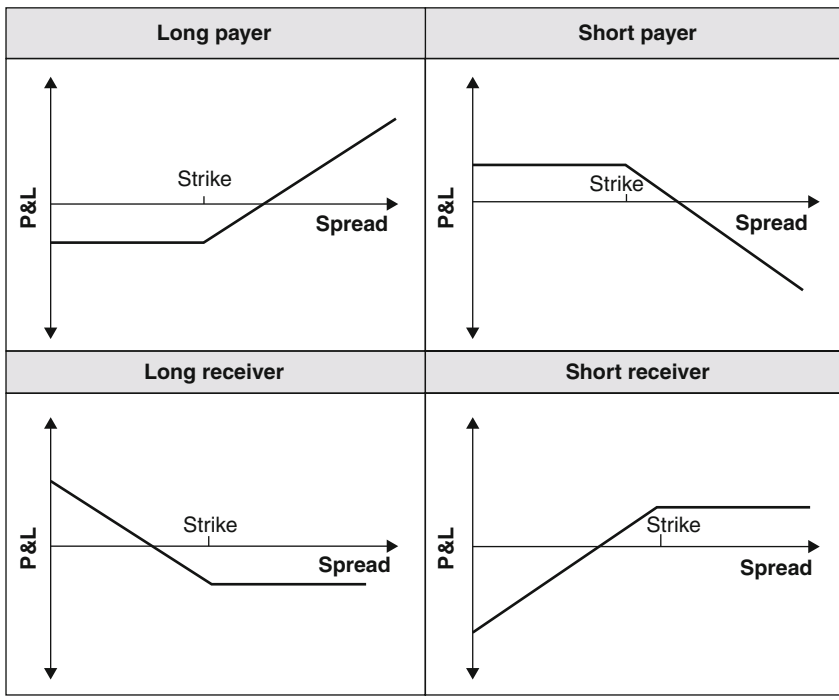


Figure 9.3 Payoffs at expiration date for payer and receiver swaptions

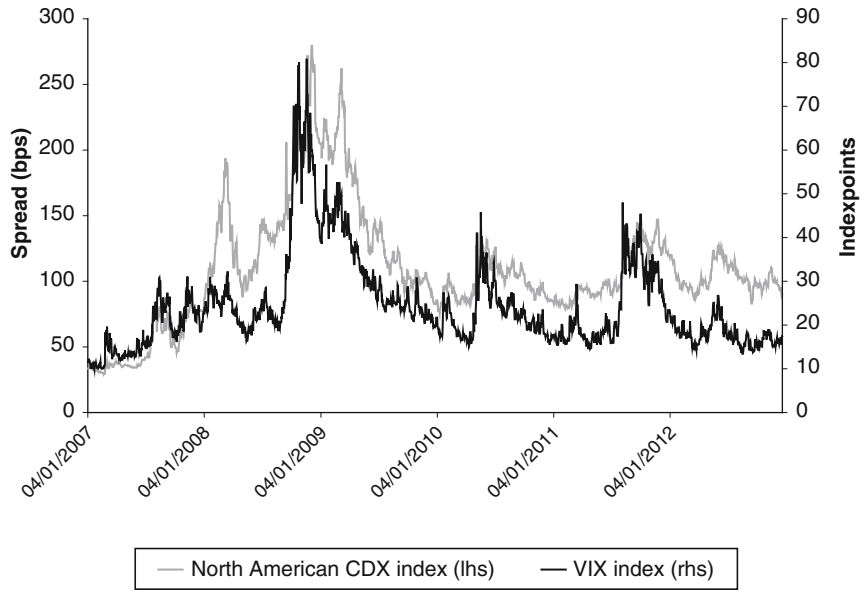


Figure 9.4 VIX Index versus CDX Investmentgrade CDS Index (North America) as of December 2012

Data source: Bloomberg.

contribution of volatility to the value of an option, option prices reveal an implied volatility which, for most of the time, differs from realized volatility of the underlying. The difference reflects supply and demand imbalances as well as expectations regarding volatility trends for which option traders may be prepared to pay a premium. For swaptions, there is an overlapping effect since the spreads of CDS indices that serve as the underlying for those options exhibit a notable sensitivity to changes in stock prices **and** to the amplitude of those changes. A measure mostly used for observation of U.S. stock volatility is the VIX or CBOE Volatility index that reflects the market estimate of future volatility, based on the weighted average of the implied volatilities for a wide range of option strikes.

9.2.3.1 Development of a hedge strategy using swaptions

Developing a hedge strategy using CDS options follows five steps:

1. **Describing the scenario** for which an investor seeks protection, including the probability of the event(s) to materialize;
2. Translating the scenario into a **potential impact** in relevant measures such as profit and loss;

3. **Determining the hedge strategy** which is most suitable in counterbalancing the scenario because of a payoff profile that most closely neutralizes the loss distribution
4. **Defining the hedge budget** in terms of hedge costs and a maximum loss acceptable resulting from the hedge
5. Subsequent **timely monitoring** of the hedge strategy, in particular regarding the effectiveness or the hedge error which arises from residual unprotected risk (basis risk).

When describing a view of potential trends or events in credit markets, the historical distribution of spread changes serves as a reference for the scenario. Isolating a period of market dislocations helps to identify realistic frequency distributions as a basis for determining potential stress outcomes. For example, the frequency distribution of daily spread changes for the European investment-grade CDS index iTraxx is divided into two periods: prior to the Lehman failure[4] where spreads mostly moved between +5 bps and –5 bps a day and post Lehman default with significantly more pronounced volatility.

Developing a hedge strategy using swaptions requires a scenario-derived impact on the distribution of spread changes and spread trends. For instance, widening spreads combined with a rise in volatility can be formulated in terms of impact on profit and loss on the credit portfolio to be hedged. Based on that loss profile, it is possible to identify the option strategy that responds to the scenario in a way which matches as closely

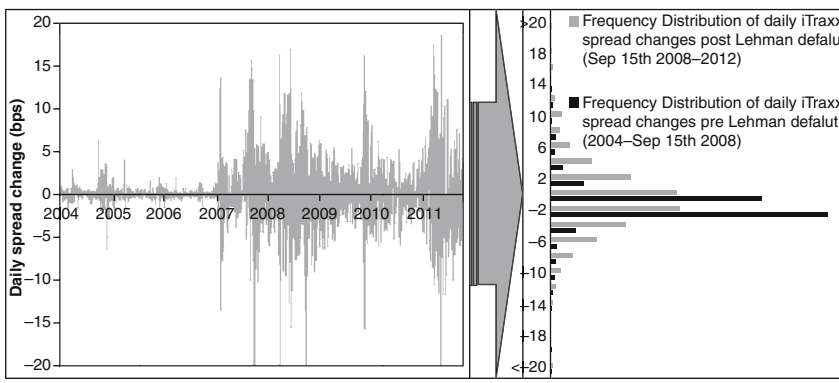


Figure 9.5 Daily spread changes of European iTraxx and frequency distribution
Data source: Bloomberg.

[4] Lehman Brothers collapsed on September 15, 2008. It became the largest bankruptcy filing in the U.S. history.

as possible the loss distribution of the hedged portfolio. It should be noted that the most suitable hedging strategy is determined by a variety of factors, i.e. volatility and skew and the term structure of the underlying index. Skew denotes the difference in implied volatility exhibited by options with the same underlying and expiry but different strikes. Especially OTM options trade with higher implied volatilities since investors prefer OTM payers over ATM options to hedge tail risks, hence increasing the relative expensiveness of those options compared to ATM options. Consequently, the skew is inherently a measure of risk aversion of financial market participants.

9.2.3.2 Long payer option

The predominant option strategy to hedge credit portfolios or counterparty risk is to buy OTM payers or puts.

Example: An investor expects a spread move in European high-grade assets from currently 150 bps to 200 bps due to a deterioration of the economic environment within the next two months. In that case, losses in the investor's credit portfolio of €100 mn notional with an average maturity of five years will amount to approximately €2.5 mn.[5] To compensate for the potential losses, the investor engages in a delta equivalent of an at the money long payer option with a strike of 150 bps and an expiration

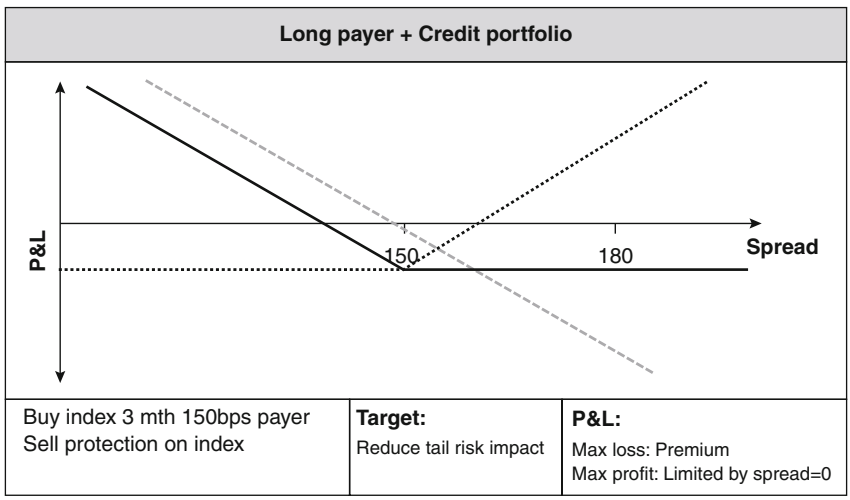


Figure 9.6 Profit and loss of long payer option and credit portfolio

[5] Assuming a DV01 of € 46,506 of the credit portfolio for an average 5-year maturity, identical to the current on the run 5-year iTraxx series.

date in two months. The maximum loss from the combined position in case the expected spread widening materializes as expected is capped at the premium payment for the option which amounts to 15.5 per cent. However, if the concerns turn out to be unfounded, the portfolio manager preserves the upside potential of portfolio value gains from tightening credit spreads net of costs for the protection from the CDS option.

Swaptions offer various strikes and maturities which can be combined in different ways to achieve an optimal cash flow pattern for a predefined scenario. Beside the correct anticipation of market moves, the time frame in which the expectations materialize is also a major contributor to the success of any option strategy since both the swaption maturities are rather short and the costs or swaptions premium include a time value; hence longer dated options are more costly.

9.2.3.3 Payer spread

Hedging a potential credit spread widening in times of elevated volatility often takes place in form of a combination of options which retain a bearish view of spreads, while reducing the total costs and exposure to changes in the implied volatility. For instance, a payer spread is constructed by buying a payer option with a low strike and selling a payer option with a higher strike. This combination allows reduction of the costs of protection against spread widening, while additionally capping the downside either way. The net costs are simply the premium to be paid for the more expensive ATM payer minus the premium to be received for

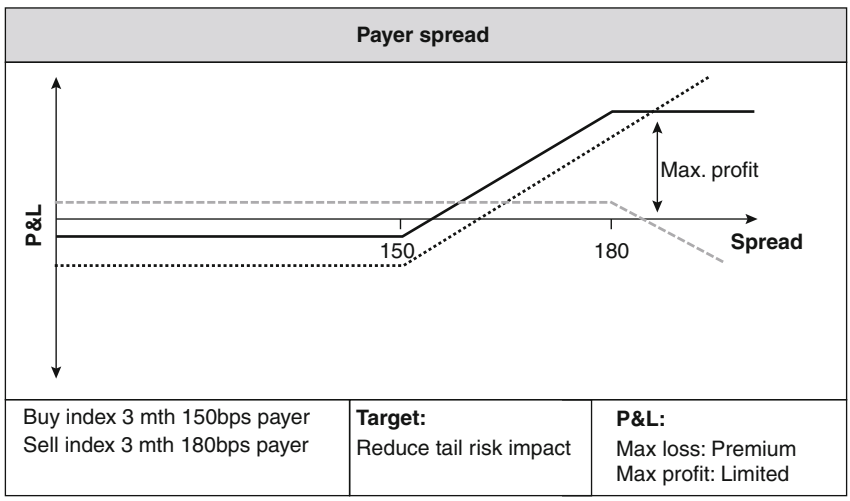


Figure 9.7 CDS swaption payer spread

selling the cheaper OTM payer. The maximum loss of the payer spread is the net premium paid at trade inception. The trade gains the most, when spreads are at or slightly below the strike of the OTM payer sold. If spreads widen beyond the strike of the short payer position, which is 180 bps in the chart below, there will be no further gains. On the other hand, if spreads tighten below 150 bps which is the strike for the long payer position, then the costs of the strategy are limited by the premium paid. Hence, the strategy works well for a moderate spread widening, at a cost which is significantly lower than buying an outright Payer but misses out on the upside of a more substantial spread move.

In general, an at-the-money payer spread virtually replicates the underlying index but caps the up- and downside. Investors in payer spreads are exposed to skew and volatility which determine the breakeven and costs of the strategy. A positive skew allows the investor to sell the payer with the wider strike at an higher implied volatility, hence at a higher premium which increases the income received, while the payer with the lower strike is bought at a lower implied volatility which makes the option cheaper for the investor. As a consequence, any decrease of the skew will add to the gains of the payer spread while a rise in skew will decrease the profit. Unfortunately, the short skew position makes the strategy less attractive for hedging an extremely negative event for credit spreads since in this scenario the skew is likely to rise. Nonetheless, payer spreads are a good way to express the view of moderate spread widenings while concerns exist about large spread widening and tightening.

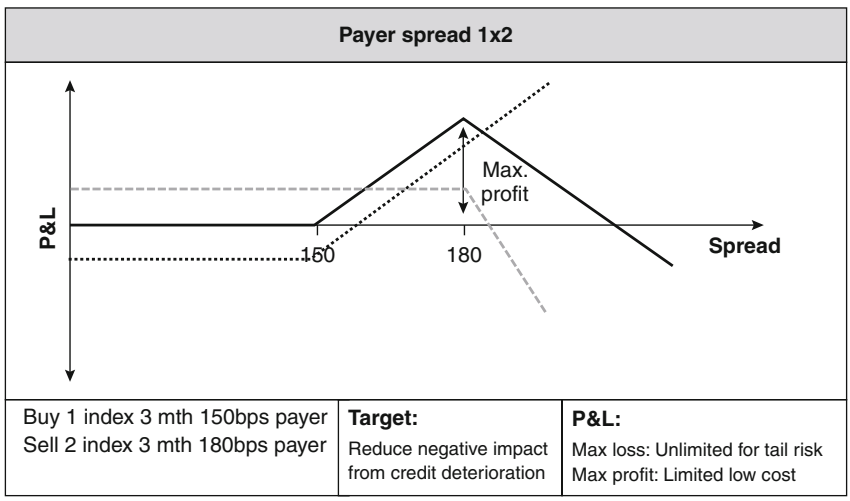


Figure 9.8 CDS swaption payer spread 1×2

9.2.3.4 Payer spread 1×2

A 1×2 payer spread reduces the costs of protection while preserving the protection for an immediate and pronounced spread widening. However, the investor becomes exposed to losses from a severe widening beyond the point of protection, which would add to losses from an underlying credit portfolio when using the options as an overlay. Therefore, the strategy is less suitable for a shock-event-driven collapse in prices of risky assets but may be appropriate to hedge out the risk of an adverse development of credit spreads in the foreseeable future.

9.2.3.5 Long butterfly

There are several ways to construct a butterfly. We use four payer options, buying one ATM, selling two OTM and buying one OTM with a higher strike than that of the payer sold. In any case, a butterfly always consists of as many options bought as options sold. The result is a profit triangle which benefits from a moderate spread widening while the more severe the market conditions become, the less profit remains. Finally, in an extreme event where spreads widen massively, the value of the butterfly at expiration date becomes a flat line resulting from the sum of premiums received net of premiums paid which is slightly negative. Again, the strategy offers cheap protection for spread volatility and uncertainty while it does not fit perfectly well to tail risks where spreads blow out. The net premium is determined by the selection of the strikes: The most expensive costs of the ATM payer bought must be compensated by the

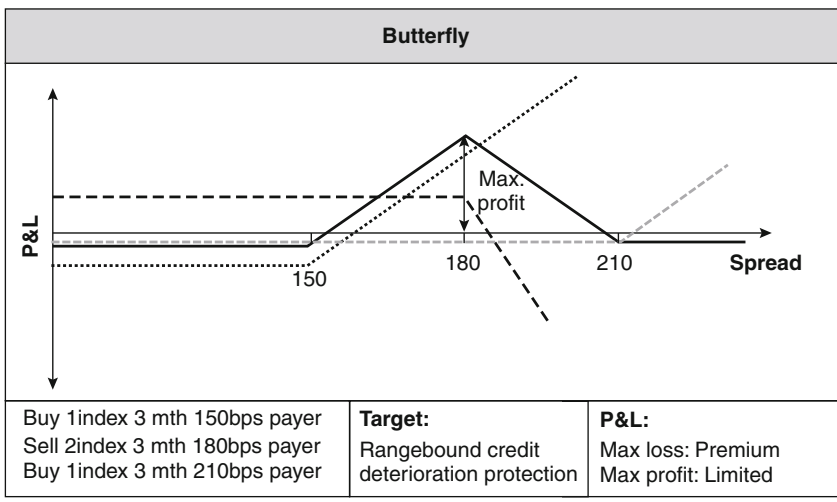


Figure 9.9 CDS swaption butterfly

two payers sold since the costs for OTM payer bought with a high strike are comparably low. Different strikes can also be used to modify the profit triangle. For example, adding low cost OTM payers extends the range in which the strategy is in the money. The flexibility to shape the payoff profile to match the view on credit spreads by choosing corresponding strikes makes the butterfly a popular instrument for portfolio managers.

9.2.4 Option Greeks

Managing option positions involves some key metrics to evaluate the risks which are often called the 'Greeks'. The most common measures are the Delta, Gamma, Vega and Theta.

Delta, δ: The delta denotes the ratio of the change in the value of the option to that of the underlying index. A positive delta indicates that the value of the option increases when the spread of the underlying widens. In general, the delta ranges from 90 per cent for deep ITM payers to 50 per cent for ATM payers and 30 per cent for OTM payers, depending on the spread of the underlying. Shorter maturities exhibit a lower delta of OTM

Table 9.4 Change in market value of swaptions for a widening in the spread of the option underlying

	Payer		Receiver	
	Long	**Short**	**Long**	**Short**
Spread of the Underlying (Spot) ▲	▲	▼	▼	▲

Table 9.5 Change in market value of swaptions for an increase in volatility of the underlying spread

	Payer		Receiver	
	Long	**Short**	**Long**	**Short**
Volatility ▲	▲	▲	▼	▼

Table 9.6 Change in market value of swaptions for a decrease in the residual time to expiry of the swaption

	Payer		Receiver	
	Long	**Short**	**Long**	**Short**
Residual time to expiry ▼	▼	▼	▲	▲

options compared to longer maturities. Delta hedging describes the replication of an option by the corresponding delta amount of the underlying in a continuous process.

Gamma, γ: The gamma, also called spread convexity, describes the rate of change in the option delta for a change of 1 bps in the curve of the underlying index. Buying a receiver exposes the investor to positive gamma, meaning that when the spread of the underlying tightens, the delta of the option becomes more negative. Option gamma decreases with rising volatility. Short dated ATM options trade with the highest gamma.

Vega[6]**:** The vega expresses the change in the option value induced by a 1 per cent change in volatility. Vega falls when volatility decreases, the longer dated the option, the more pronounced the effect. The sensitivity of an option to volatility can be a key driver of the option profit and loss.

Theta, θ: The theta of an option denotes the time value or time decay by the change of the option value for a 1 day shorter remaining lifetime. The theta decreases significantly for short dated options which run out-of-the-money as the probability for a jump in spreads large enough to bring the option back into the money diminishes. Options with high gamma also exhibit high theta.

9.2.5 Conclusion

A major disadvantage from tail risk hedges and in particular CDS options is the fact that in case of large systemic crises, the liquidity of less well known and non-plain-vanilla instruments falters. This in turn increases transaction costs to the detriment of gains from hedging positions to be realized. Worse, in some cases it might be difficult or impossible to close larger hedges because of the unwillingness of traders to enter into deals which cannot be neutralized immediately at the market, leaving them exposed to significant mark-to-market risk from sudden market moves. Additionally, in times of stress, the internal limits banks apply for these mark-to-markets risks are scaled back as a measure of caution. Furthermore, an increased market volatility leads to a rise in the internally calculated VaR with a rising limit consumption of the existing trades, leaving less or sometimes no room for traders to add on new positions without breaching limits. So, even when a portfolio manager correctly anticipates credit negative events, there is no assurance that the positions aimed at protecting for such events can be monetized accordingly. Default swaptions have

[6] Vega is not a Greek letter. It is often referred to as Lambda λ or Kappa κ. Sigma σ denotes the standard deviation which is replaced by volatility to value swaptions.

emerged after the crisis as a popular and comparably liquid instrument. Hence, they serve well for hedging credit market risk for a shorter period of time. However, the short expiration dates of typically 3–6 months do not allow for a medium to long term view which is more relevant for the credit risk of a portfolio. Since the value of options is determined by a variety of factors including volatility, a precise and complete formulation of the hedge scenario is a prerequisite for a tailorized option overlay strategy that creates the intended cash flow profile.

9.3 Cross asset hedging strategies

Portfolio managers apply macro or correlation hedges where perfect hedges are not available in sufficient size and liquidity or where regulatory or other restrictions prevent from a direct hedge. For instance, large ticket loan hedging of weaker corporates by their core banks can create a misperception within the financial community that might suspect that those banks have better information due to their closeness to the customer which gives them access to more timely and better (inside) information. In that case a portfolio manager may want to use alternatives in order to avoid sending misleading signals to the market even though the solution in discussion is only a second best alternative to a perfect hedge. A perfect credit risk hedge denotes an instrument such as a CDS, guarantee or sub-participation that provides full protection for losses arising from a default of the borrower of the hedged underlying. By contrast, an imperfect hedge exhibits a close but not full correlation in valuation of the hedge and hedged item, meaning that credit losses from the portfolio will be compensated to a large extent but not completely. The degree of mismatch between macro hedge and debt security, the basis risk, which is acceptable to the risk manager clearly depends on the alternatives at hand.

9.3.1 Selection criteria for macro hedges

When engaging into macro hedges, the following criteria are helpful to assess in order to develop optimal hedge strategies:

- **Correlation:** closeness of hedge to hedged item, the maximum variance, the basis risk or hedge error;
- **Hedge ratio stability:** steadiness of the correlation over time, in particular under stress
- **Hedge instrument:** in some cases, a portfolio manager might have identified a closely correlated security but may be prevented from buying protection on it in whatever form. For example, some portfolio

management units are not allowed to engage in stock or index options or to go outright short stocks or bonds;
- **Liquidity:** the correlation hedge must trade in decent liquidity to avoid of getting stuck with the hedge position when trying to monetize the gains which should compensate for losses on the hedged item;
- **Protection costs:** even though a reasonable correlation hedge may be available, the costs of it must be acceptable and below the expected loss from the hedged underlying. Hedge costs include the running costs, which could be seen as an insurance premium, and transaction costs, i.e. bid/offer.

Correlation hedges are useful both on a single name and a portfolio level. For example, some hedge funds run a debt/ equity or capital structure arbitrage where they explore the relative value or cheapness of a firm's debt to equity and then go long the debt and short equity or vice versa, depending on the result of the analysis. For a credit portfolio of European multinational or large corporates, the iTraxx European index comprised of 125 investment-grade names may serve as a good proxy for hedging purposes because of its presumably high correlation.

9.3.2 Isolating sovereign risk

Macro hedges also allow hedging isolated risks out of a portfolio. Buying protection on Spain sovereign CDS will mitigate spread and credit risks of those firms which are either associated with Spain because of the location of their domicile or due to their economic dependence on the country. The inherent sovereign risk premium is currently observable within most of the Spanish, Portuguese and Italian corporates and even more so for domestic financial institutions. A portfolio manager who wants to hedge out the country risk of a credit portfolio but is banned from buying Spain sovereign CDS due to the EU regulation[7] may consider buying put options on the Spanish stock index IBEX instead. An analysis of the trends of the Spain stock index, IBEX, and the five year CDS for Spain since 2010, when the sovereign crisis began to dominate the headlines, exhibits a close correlation.

Surprisingly, the correlation is more pronounced than those of the Spain sovereign CDS to the relative performance of IBEX versus the broader European stock market index Euro Stoxx 50. Hence, credit market participants take the absolute development of the stocks of the largest listed corporates within the equity index of a country as a better approximation

[7] See Regulation (EU) No 236/2012 of the European Parliament and of the Council of March 14, 2012 on short selling and certain aspects of credit default swaps.

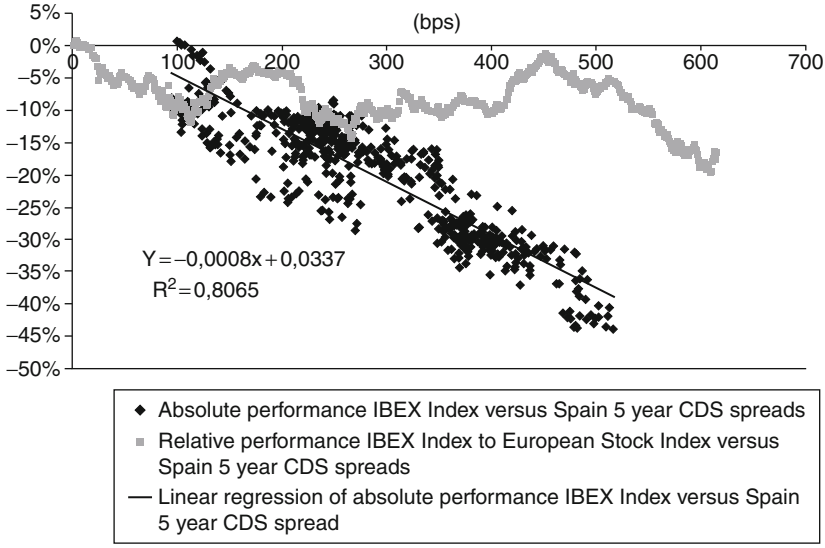


Figure 9.10 Spain 5 year CDS spreads versus IBEX performance (2010–2012)
Data source: Bloomberg.

for the country's sovereign risk than the out- or underperformance of those stocks compared to broader and regionally more diversified index such as the Euro Stoxx 50.

9.3.3 Equity versus debt hedge

The connectivity of equity and debt, which is the foundation of the Merton theory applied by risk managers for measuring credit risk, also offers cross asset hedging opportunities. The Merton Asset Value or Structural Credit Risk model was originally proposed by Black and Scholes in 1973[8] in their paper on option pricing and discussed in more detailed by Merton in 1974,[9] already anticipated in 1970[10]. In simplified terms, the model assumes that a firm will default on its debt if the value of the firm's assets at the time the debt matures is lower than the value of the debt repayment. Thus, the formula is similar to the payoff of a call option on the firm's value with the stockholders as buyers of the call option who will not exercise the option or walk away from the company if the value of the firm is below the debt value which therefore serves as the option strike. In that case, bondholders

[8] See Black and Scholes (1973).
[9] See Merton (1974).
[10] See Merton (1970).

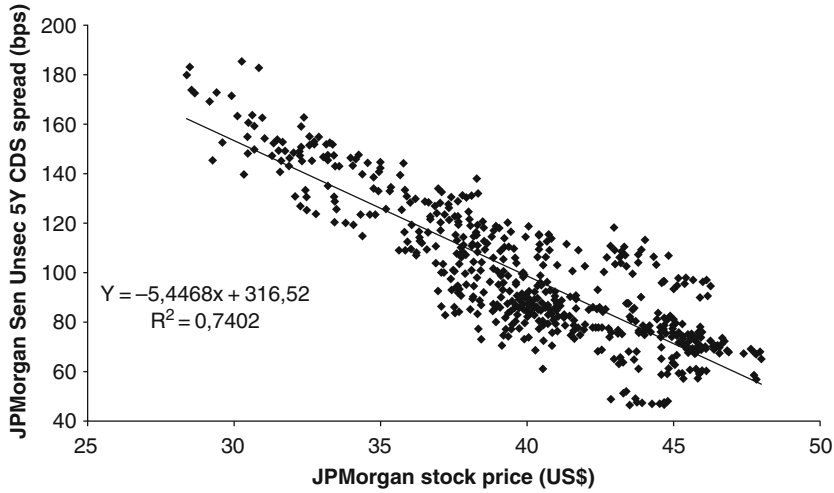


Figure 9.11 JPMorgan stock price versus CDS spread
Data source: Bloomberg.

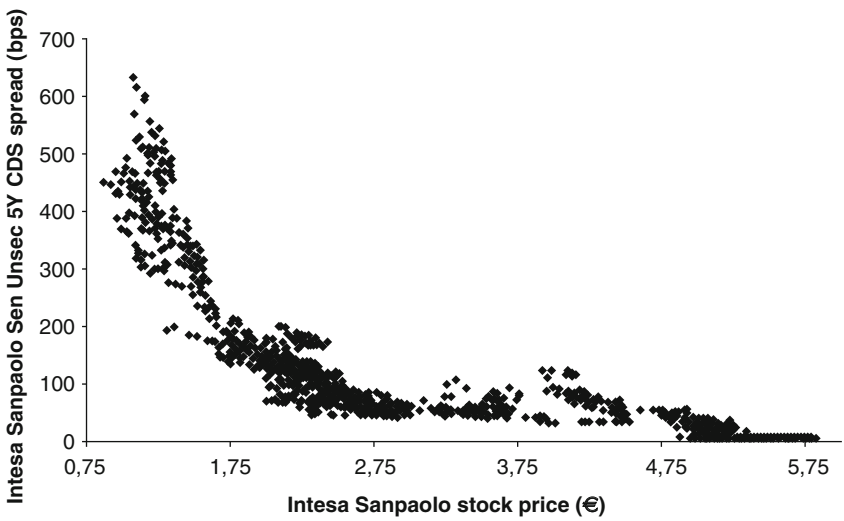


Figure 9.12 Intesa Sanpaolo stock price versus CDS spread
Data source: Bloomberg.

will receive the remaining asset values of the corporation while stockholders would receive nothing. Economically, the probability of default is precisely the probability of the equity holders' call option expiring worthless, that is, out-of-the-money or below the strike level.

Even though there are some short comings in the model, i.e. the reliance on the Black-Scholes approach which assumptions do not fit well for corporate debt and the overly simplistic assumption of a one-year zero bond as the only financing source for a firm, the approach is widely accepted by financial market participants. Its use has been promoted by KMV which started as a service provider for credit quality assessments that are non- judgmental and purely based on market information and prices, and is now owned by the rating agency Moody's. For credit risk managers, the debt–equity relationship, which becomes visible through the correlation stock prices to bond prices and CDS spreads, allows hedging of credit risk through buying put options on the borrower's stock or by going short the stock outright. This view is supported by an analysis performed by Domian and Reichenstein (2007) who found that high-yield bonds are sensitive to both high-grade bond returns and stock returns with the stock component increasing when the rating deteriorates.

For example, the connectivity of the U.S. bank JPMorgan share price to its 5-year senior unsecured CDS spread shows a determination coefficient or R^2 of 0.74. The Merton model determines by how many standard deviations the call option is in-the-money; the smaller the value the closer is the firm's distance to default or the higher the likelihood of a default. The relationship between stock prices and debt risk premium takes the shape of a hockey stick for those firms where a significant decrease of the stock price reflects concerns regarding the sustainability of the business model.

Given the close relationship of debt and equity and concerns about negative feedback loops where rising CDS spreads were suspected to drive down stock prices of a firm and vice versa as well as substantial losses of market value of financial institutions has led to a ban of shorts on some bank stocks in the aftermath of the financial crisis. Since the CDS spread is of fundamental importance to any corporate as it determines at least partly its funding costs, a reverse engineering of the Merton model reveals the recapitalization requirement which is necessary to increase the distance to default for those names that trade at higher spread levels.

9.3.4 Conclusion

While the hedge strategy based on equity indices or stocks appears to be a valid alternative, it may also be a cost efficient alternative since those options are more liquid and often trade at lower transaction costs compared to CDS. However, macro hedges in general do not offer a direct compensation for losses from a default of borrowers. Therefore, any such strategy aims at covering potential losses from changes in the market

valuation of the hedged item or spread risk rather than default risk. In case of higher basis risks or where the hedged item is not measured at fair value, significant profit and loss volatility can be introduced. Moreover, regulators do not accept macro hedges for capital relief purposes even though these strategies may be effective to mitigate risks within a credit portfolio thus optimize economic capital.

References

Abberger, K and W. Nierhaus (2010), 'The Ifo Business Cycle Clock: Circular Correlation with the Real GDP', CESIFO Working Paper No. 3179.

Avdjiev, Stefan, Jacob Gyntelberg and Christian Upper,(2009), 'Highlights of International Banking and Financial Market Activity'. *BIS Quarterly Review,* December 2009.

Bain and Company (2012), *Managing Risk and Capital*. www.bain.com.

Banks, Erik, Morton Glantz and Paul Siegel (2007), *Credit Derivatives. Techniques to Manage Credit Risk for Financial Professionals*. McGraw-Hill.

Banks, Erik and Paul Siegel (2007), *The Options Applications Handbook. Hedging and Speculating Techniques for Professional Investors*. McGraw-Hill.

Banks, Erik (2011), *See No Evil*. Palgrave MacMillan.

Basel Committee on Banking Supervision (1988), *International Convergence of Capital Measurement and Capital Standards*. www.bis.org.

Basel Committee on Banking Supervision (2000), *Principles for the Management of Credit Risk*. www.bis.org.

Basel Committee on Banking Supervision (2001), *The New Basel Capital Accord*. www.bis.org.

Basel Committee on Banking Supervision (2006a), *International Convergence of Capital Measurement and Capital Standards: a Revised Framework. Comprehensive Version*. www.bis.org.

Basel Committee on Banking Supervision (2006), *Studies on Credit Risk Concentration*. Working Paper No. 15. www.bis.org.

Basel Committee on Banking Supervision (2009), *Principles for Sound Stress Testing Practices and Supervision*. www.bis.org.

Basel Committee on Banking Supervision (2010), *Principles for Enhancing Corporate Governance*. www.bis.org.

Basel Committee on Banking Supervision (2011), *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*. www.bis.org.

Basel Committee on Banking Supervision (2011 b), *High Cost Credit Protection*. www.bis.org.

Becker, Axel (2008), *Kreditreporting und Kreditrisikostrategie*. Erich Schmidt Verlag GmbH & Co., Berlin.

Beinstein, Eric (2003), *Corporate Bonds and Credit Default Swaps. A Simple and Robust Method to Compare Bonds to CDS*. J.P. Morgan, Credit Derivatives Research.

Beinstein, Eric and Andrew Scott (2006), *Credit Derivatives Handbook. Detailing Credit Default Swap Products, Markets and Trading Strategies*. J.P. Morgan, Corporate Quantitative Research.

Black, Fischer and Myron S. Scholes (1973), 'The Pricing of Options and Corporate Liabilities'. *Journal of Political Economy,* 81.

Bohn, Jeffrey R. and Roger M. Stein (2009), *Active Credit Portfolio Management in Practice*. Wiley Finance.

Bohn, Jeffrey R. and Roger M. Stein (2011), 'Some Observations on Improving a Bank's Share Value with Credit Portfolio Management, Credit-Transfer Pricing and Stress Testing'. Draft.

Bonti, Gabriel, Michael Kalkbrener, Christopher Lotz and Gerhard Stahl (2006), 'Credit Risk Concentrations under Stress'. *Journal of Credit Risk*, Volume 2, No. 3. 115–136.

Böve, Rolf, Klaus Düllmann and Andreas Pfingsten (2010), 'Do Specialization Benefits Outweigh Concentration Risks in Credit Portfolios of German Banks?' Deutsche Bundesbank, Discussion Paper, Series 2: *Banking and Financial Studies*. No 10/2010.

Brigo, Damiano and Naoufel El-Bachir (2010), 'An Exact Formula for Default Swaptions' Pricing in the SSRJD Stochstic Intensity Model'. *Mathematical Finance,* Volume 20, Issue 3. 365–382, July 2010.

Bruyere, Richard, Rama Cont, Rama, Régis Copinot, Fery Loic, Fery, Chrisophe Jaeck and Thomas Spitz (2006), *Credit Derivatives and Structured Credit. A Guide for Investors*. Wiley Finance, Chichester, England.

Burmeister, Christian (2009), 'Credit Portfolio Management: Accounting Implications'. In *The Handbook of Credit Portfolio Management*, McGraw-Hill.

Cappiello, Lorenzo, Kadareja, Arjan, Sorensen, Christoffer Kok and Protopapa, Marco (2010), *Do bank loans and credit standards have an effect on output?*. European Central Bank, Working Paper Series No. 1150/ January 2010.

Committee of European Banking Supervisors (2006a), *Guidelines on the Application of the Supervisory Review Process under Pillar 2 (CP03 revised)*. http://www.eba.europa.eu

Committee of European Banking Supervisors (2006b), *Technical aspects of the management of concentration risk under the supervisory review process – CP 11–2*nd *Part*. http://www.eba.europa.eu

Committee of European Banking Supervisors (2009), *Guidelines of the implementation of the revised large exposure regime*. http://www.eba.europa.eu

Committee of European Banking Supervisors (2010a), *CEBS Guidelines on the management of concentration risk under the supervisory review process (GL31)*. http://www.eba.europa.eu

Committee of European Banking Supervisors (2010b), *CEBS Guidelines on Stress Testing (GL32)*. http://www.eba.europa.eu

DeYoung, Robert, Dennis Glennon, Dennis and Peter Nigro (2006) *Borrower-Lender Distance, Credit Scoring, and the Performance of Small Business Loans*, FDIC Center for Financial Research Working Paper No. 2006–04.

Doctor, Saul, Abel Elizalde and Harpret Singh (2010), *CDS v2.0. The New Architecture of the CDS Market*. J.P.Morgan, Europe Credit Research.

Doctor, Saul, Abel Elizalde, Harpret Singh and Danny White (2011), *Restructuring Credit Events. Case Studies of Restructuring and the Impact on CDS*. J.P.Morgan, Europe Credit Research.

Domian, Dale L. and William Reichenstein (2008), 'Returns-Based Style Analysis of High-Yield Bonds'. *The Journal of Fixed Income* 17, No. 4, Spring 2008.

Du, Songzi, Haoxiang Zhu (2011), 'Are CDS Auctions Biased?' Working paper, Stanford University GBS.

Duffie, D. and K. Singleton (2003), *Credit Risk: Pricing, Measurement, and Management*. Princeton University Press, Princeton, New Yersey.

European Central Bank (2009), *Credit Default Swaps and Counterparty Risk*. www.ecb.int.

European Commission (2011), Commission Staff Working Paper: *European Financial Stability and Integration Report 2010*, May 2011.

Felsenheimer, Jochen, and Philip Gisdakis(2008), *Credit Crises. From Tainted Loans to a Global Economic Meltdown*. Wiley Finance.

Financial Services Authority Board Report (FSA) (2011), *The Failure of the Royal Bank of Scotland*. www.fsa.gov.uk.

Foux, Mikhail and Ratul Roy (2008), *LCDS – A Step in the Right Direction*. Citi Corporate Bond Strategy, High Grade Strategy Notes.

Gann, Philipp and Hofmann, Bernd (2005): 'Die Bedeutung des Kreditrisikohandels für spezialisierte Kreditinstitute'. In *Österreichisches Bankarchiv,* 53. Jg., Nr. 7, S. 473–482

Gann, Philipp (2008): *Der Internal Capital Adequacy Assessment Process als regulatorischer Treiber eines aktiven Kreditportfoliomanagements*. Münchener Wirtschaftswissenschaftliche Beiträge (BWL) 2008–2011.

Gann, Philipp (2009), *Liquidität, Risikoeinstellung des Kapitalmarktes und Konjunkturerwartung als Preisdeterminanten von Collateralized Debt Obligations (CDOs) – Eine simulationsgestützte Analyse*. Münchener Wirtschaftswissenschaftliche Beiträge (BWL) 2009–2018.

Gann, Philipp (2010), *Der marktphasenabhängige Einfluss der Liquidität auf die Credit Spreads von Corporate Bonds*. Münchener Wirtschaftswissenschaftliche Beiträge (BWL) 2010–2017.

Gürtler, Marc, Martin Hibbeln, Martin and Clemens Vöhringer (2009), *Measuring Concentration Risk for Regulatory Purposes*.

Haworth, Helen (2011), *A Guide to Credit Events and Auctions*. Credit Suisse, Fixed Income Research.

IMF (2010), *IMF Staff Comments on EU Commission Consultation on Short Selling*. www.imf.org.

Institute of International Finance (2009), *Risk Culture. Reform of the Financial Services Industry: Strengthening Practices for a More Stable System*. December 2009. www.iif.com.

International Association of Credit Portfolio Managers (2005), *Sound Practices of Credit Portfolio Management*.

Jersey, Ira, Alex Makedon, Alex and David Lee, (2007), *Credit Derivatives Handbook*. Credit Suisse, Fixed Income Research.

Levy, Cindy, Eric Lamarre, and James Twining (2010), 'Taking Control of Organizational Risk Culture'. *McKinsey Working Papers on Risk,* No. 16. February.

Mahadevan, Sivan, Ashley Musfeldt,,and Phanikirian Naraparaju (2012), *Credit Derivatives Insights. Handbook of Credit Derivatives and Structured Credit Strategies*. Sixth Edition. Morgan Stanley Research.

McKinsey and Company (2009): *Shaping the Future of CPM: A Workshop Discussion*. Discussion document for the IACPM 2009 Fall Annual Meeting.

Merton, Robert C. (1974), 'On the Pricing Of Corporate Debt: The Risk Structure of Interest Rates'. *Journal of Finance*, 29.

Merton, Robert C. (1970), *A Dynamic General Equilibrium Model of the Asset Market and Its Application to the Pricing of the Capital Structure of the Firm*. Unpublished manuscript. Available in Merton, Robert C. (1990), Continuous-Time Finance.

Moody's Analytics (2011), *2011 Stress Testing Progress Survey*. Preliminary highlevel findings.

Musfeldt, Ashley, Sivan Mahadevan, Sivan, Vishwas Patkar and, Phanikirian Naraparaju (2012), *Credit Derivatives Insights. What Happens in a Default?* Morgan Stanley Research.

Oltmanns, E. (2009), *Das Bruttoinlandsprodukt im Konjunkturzyklus*, Wirtschaft und Statistik 10/2009, 963–969.

Oricchio, Gianluca (2011): *Credit Treasury. A Credit Pricing Guide in Liquid and Non-Liquid Markets*. Palgrave McMillan.

Polleit, Thorsten and Jonathan Mariano (2011), 'Credit Default Swaps from the Viewpoint of Libertarian Property Rights and Contract Credit Default Swaps Theory.' *Libertarian Papers* 3, No. 32.

PricewaterhouseCoopers (1999), *Active Credit Portfolio Risk Management*.

Rudolph, Bernd (2009), *Die internationale Finanzkrise: Ursachen, Treiber, Veränderungsbedarf und Reformansätze*. Münchener Wirtschaftswissenschaftliche Beiträge (BWL) 2009–2010.

Rudolph, Bernd and Julia Scholz (2007): *Pooling und Tranching im Rahmen von ABS-Transaktionen*. Münchener Wirtschaftswissenschaftliche Beiträge (BWL) 2007–4.

Rutkowski, Marek and Armstrong, Anthony (2009), 'Valuation of Credit Default Swaptions and Credit Default Index Swaptions'. *International Journal of Theoretical and Applied Finance,* 12.

Sachs, Angelika (2010), 'Completeness, Interconnectedness and Distribution of Interbank Exposures: A Parameterized Analysis of the Stability of Financial Networks'. Deutsche Bundesbank, Discussion Paper. Series 2: *Banking and Financial Studies* No 08/2010.

Schmidt, Wolfgang M. (2007), 'Default Swaps and Hedging Credit Baskets'. Working Paper.

Scholz, Julia (2009), 'Collateralized Debt Obligations: Anreizprobleme im Rahmen des Managements von CDOs'. *Münchener Wirtschaftswissenschaftliche Beiträge* (BWL) 2009–15.

Schubert, Dirk (2009), 'Credit Solution'. In: *Risk Magazine,* February 2009.

Schubert, Dirk (2010), 'The Risks of Tailoring Credit Default Swaps'. In *Risk Magazine,* June 2010.

Schubert, Dirk (2011a), 'Die Gestaltung eines CDS-Vertrages als Finanzgarantie – Anforderungen der ISDA und des IASB'. In Die *Wirtschaftsprüfung,* May 2011.

Schubert, Dirk (2011b), *The Financial Economics of Hedge Accounting of Interest Rate Risk According to IAS 39*.

Schuh, Dirk Wilhelm (2009), *Finanzmarktkrise: Chancen für das Risikomanagement*. Präsentation im Rahmen des Arbeitskreises 'Strategieentwicklung und Controlling in Banken' der Schmalenbach-Gesellschaft am 20. März 2009.

Schwarz, Christian, Tom Gibney, Tom, Helen Haworth, Somaia Chiraag and Ali Atif (2010), *European Credit Views: Crossing Barriers*. Credit Suisse, Fixed Income Research.

Standard and Poors (2011a), *Why Basel III and Solvency II Will Hurt Corporate Borrowing in Europe More Than in the U.S*. September 27, 2011.

Standard and Poors (2011b), *Banks: Rating Methodology and Assumptions*. November 9, 2011.

Tschirhart, John, James O'Brian, Michael Moise, Michael and Emily Yang (2007), *Bank Commercial Loan Fair Value Practices*. Finance and Economics Discussion Series, Federal Reserve Board, Washington, D.C. www.federalreserve.gov.

Tolk, Jeffrey S. (2001), *Understanding the Risks in Credit Default Swaps*. Moody's, Structured Finance Special Report.

Towers Perrin (2010), *Risk Appetite. The Foundation of Enterprise Risk Management*. www.towersperrin.com.

Vause, Nicolas (2011), *Enhanced BIS Statistics on Credit Risk Transfer*. www.bis.org.

Zhiyong, Chen and Paul Glasserman (2006), 'Fast Pricing of Basket Default Swaps'. Working paper.

Index