



**MODERN
CREDIT RISK
MANAGEMENT**

Theory and Practice

PANAYIOTA KOULAFETIS

Modern Credit Risk Management

This book is a useful compendium of concepts, tools and techniques in the broad area of credit risk management, firmly embedded in the institutional setting of financial instruments, institutions, and markets. While some parts of this topic are also accessible in other books, I have not come across any other volume with this breadth of coverage. The book is also unique in its detailed treatment of the approaches of the major credit rating agencies, which continue to play a major role in the financial world. The hand of someone who is equally at home with the academic literature and the world of credit rating agencies and financial markets is clearly evident throughout the book.

Dr. Koulafetis deserves to be congratulated for putting this book together.

It is a “must have” reference for any student of risk management, whether in academia or in a financial institution, who wishes to have a diverse set of concepts and institutional details relating to credit risk in one place. I would also highly recommend the book to anyone seeking to prescribe a book for a course on risk management with particular emphasis on credit risk.

Marti G. Subrahmanyam

*Charles E. Merrill Professor of Finance and Economics,
Stern School of Business, New York University*

Dr. Koulafetis successfully provides a clear theoretical and practical presentation of the quantitative and qualitative credit risk analysis and management as well as in depth understanding of the rating process and migration of various rated securities.

The book not only explains credit risk theory but goes beyond that through the exposition of practical matters. This is of great value not only for practitioners involved in the credit risk analysis, management, origination, distribution and regulation of various securities but also for all students, researchers and academics that want to understand how theory relates to market practise.

Harry Eliades

Partner and Managing Director, Goldman Sachs

Modern Credit Risk Management Theory and Practise is an extremely valuable book as it successfully covers and tackles a very broad coverage of topics in relation to effective credit risk analysis and management. The book not only focuses on the various quantitative approaches to capture credit risk but extends that and provides an invaluable discussion on the merits of qualitative analysis and practical implications.

Furthermore the book is unique as it serves as an indispensable guide in explaining the practical analytical process and the drivers of credit ratings for Sovereigns, Banks and Corporates as well as of Structured Finance Securities, such as Commercial

Mortgage Backed Securities (CMBS), Residential Mortgage Backed Securities (RMBS), Asset Backed Securities (ABS), Asset Backed Commercial Paper (ABCP), and Collateralised Loan Obligations (CLOs).

Mario Levis
Emeritus Professor of Finance
Cass Business School, City University of London

Modern financial decision making involves superior screening, analysis, and interpretation. What are the tools that enable the financial manager or analyst to complete such a process successfully? One such tool is the good old traditional text book that steps back and applies a rigorous analysis. This book combines academic theory with market practice, providing guidance for effective credit risk management and an insight into the workings of rating agencies. It is a great tool for asset managers and risk practitioners, a genuine bible of credit risk management.

Theo Phanos
Chief Executive Officer
CapeView Capital LLP

Panayiota Koulafetis

Modern Credit Risk Management

Theory and Practice

palgrave
macmillan

Panayiota Koulafetis

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Chapter 1: Introduction

Credit and its Role in Financial Markets

Credit, if managed prudently, can build an economy, produce an efficient allocation of capital and wealth and bring prosperity. It is an absolute must in the financial system, affects everyone and drives the global economy. Credit accommodates one of the main functions of financial markets, that of channelling funds from savers to spenders; it allows funds to move from people that lack productive investment opportunities to the ones that have such opportunities. Credit allows individuals to finance their needs of acquiring a house, car, furniture, etc., assists companies to start or expand their business, and enables governments to finance public interest projects such as utilities, schools, roads etc.

The allocation of credit is performed by financial intermediaries. Financial intermediaries are crucial to the healthy functioning of financial markets. They determine who gets credit and at what price. Financial intermediaries consist of commercial and investment banks, saving and loan associations, insurance companies, mutual funds, pension funds and finance companies. Over the past three decades there has been an immense growth of innovative financial contracts and sophisticated products offered by financial intermediaries. However, if they are not used prudently and their full risk not understood fully, they can have devastating repercussions on the financial system. After the 2007 financial crisis financial intermediaries have been subject to significant developments, there have been changes in the financial markets and an increased focus on the importance of credit and its management. Financial intermediaries have always been regulated, but given the size of bailouts and the nationalization of many financial institutions, their regulation has had to change dramatically.

Credit risk can be defined as the risk of financial loss due to the borrower's, bond issuer's or counterparty's (the "obligors") failure to honour their financial obligations. The obligors' failure to honour their obligations can arise due to inability or unwillingness. Financial loss arising from the unwillingness of the obligors to pay is less common compared to the inability to pay. The unwillingness of the obligors to pay can stem from disputes over the validity or/and the terms of a financial contract, but can also arise in high-leverage transactions, where equity participation is non-existent.

Credit risk in the majority of cases comes from the inability of the obligor to pay. Inability to pay is linked with the concepts of default, insolvency and bankruptcy. Insolvency refers to the situation where the obligor's liabilities exceed its assets and is a legal term meaning that the obligor is unable to pay its debts. Bankruptcy is the legal term that imposes court supervision over the financial affairs of those who are insolvent or in default. Bankruptcy occurs when the court steps in after the obligor files for protection under, for example, Chapter 11 or Chapter 7 in the USA. Chapter 11 is a chapter of Title 11 of the US Bankruptcy Code that allows reorganization under the US bankruptcy laws. Chapter 11 is available to every business, either organized as a corporation, partnership or sole proprietorship, and even to individuals, but is mainly used by corporates. Chapter 7 mainly governs the process of a liquidation bankruptcy, while Chapter 13 governs the reorganization process for most private individuals. Under Chapter 7, the business no longer operates; a trustee sells the assets, and distributes the proceeds to the creditors with any residual amount returned to the company owners. Under Chapter 11, in most cases the debtor continues to operate the business as a debtor in possession, but is subject to the oversight and jurisdiction of the court.

When the obligor reaches the point of bankruptcy his assets have lost value, but the bankruptcy process reduces the asset value even more. Although the court will try to keep the obligor in business, in reality clients, suppliers and counterparties are less inclined to continue to do business. Assets are sold quickly at prices below fair value and intangible assets, such as brand name, have no value. As a result creditors will receive less than what they are owed. The extent of the financial loss of creditors will depend on their payment priority and the jurisdiction they are in. Bankruptcy laws vary from country to country and—as a consequence—bankruptcy costs, such as legal and accounting fees, also differ from country to country. All things being equal, in creditor friendly jurisdictions such as the UK or the Netherlands the bankruptcy related costs tend to be less than in borrower friendly jurisdictions such as Italy, Portugal or Greece. As a result the credit risk and financial loss in creditor friendly jurisdictions is lower.

Default can be defined as a missed or delayed payment of a contractual obligation or a bankruptcy filing or legal receivership of the obligor that will probably cause one or more missed or delayed future payment(s). Furthermore, default can be considered as a distressed exchange whereby the obligor offers creditors restructured debt, securities or assets that result in a diminished financial obligation relative to the original obligation. There are also “technical defaults” that can occur if certain financial covenants are breached, such as maximum leverage or minimum debt coverage covenants as defined in the contractual agreements. These are put in place to restrict the obligor’s leverage above a certain level and maintain a minimum ratio of income received versus debt repayment. Although these do not usually lead to a financial loss, they do however give power to creditors to accelerate the debt owed to them if the obligor fails to resolve the covenant breach within a grace period. Defaults on long-term obligations due to purely “administrative” errors which are not related to the ability or willingness to make the payments and are resolved in 1–2 business days do not usually lead to financial loss; however if they are not resolved quickly there can be interest income foregone. If however the payment due is not on time either due to inability or unwillingness of the obligor then this will lead to financial loss. The extent of loss will depend on how delayed the payment is.

Credit risk also involves credit quality deterioration, which although is less severe than default will increase the future default probability. Credit risk is characterized throughout any exposure’s lifetime by the probability of default, the recovery or the loss given the default, and by the credit exposure, which is the replacement value of the asset. The replacement value of the asset is mainly driven by market risk. It is closely related to the Mark to Market (MtM) of a transaction coupled with other considerations such as liquidity issues, if applicable, netting etc.

Sources of Credit Risk

In order to assess credit risk, someone needs to identify the transactions and products that involve credit risk.

Deposits

Almost everyone can be affected by credit risk. For example individuals that deposit their savings in a bank, building society or credit union face the risk

that the bank may default. In the UK the Prudential Regulation Authority's (PRA's) Deposit Guarantee Schemes (DGS) Directive has certain rules in order to protect depositors under the Financial Services Compensation Scheme (FSCS). Currently there is deposit protection of up to £75,000. However, the FSCS has introduced temporary deposit protection for up to six months above this limit for certain types of deposits classified as Temporary High Balances (THBs), such as the proceeds from private property sales. Protection will be up to £1 million in most cases. This is one of several initiatives brought in to improve the orderly resolution and timely payout of FSCS-covered deposits to depositors. However for amounts higher than the protected amount depositors face the credit risk of the institution they deposit their money with and do need to assess the institution's credit worthiness. It is also prudent to spread funds amongst different institutions to diversify to a certain extent some of that risk.

Accounts Receivable, Prepayment of Goods or Services, Contingent Claims

Accounts receivable also involves credit risk. This is one of the main credit risks faced by corporate entities. The seller or service provider (creditor) sends an invoice for the service provided or goods delivered, and expects to be paid within a certain time period. The risk that it may encounter is that the buyer does not pay or makes a late payment. The creditor may be able to charge late fees or interest if the amount is not paid by the due date. Depending on the industry and the client, accounts receivable payments can be received up to 10–20 days after the due date. Businesses are aware that not all invoices raised will be paid and estimate and record an allowance for doubtful accounts. They usually also analyse how delinquent the payments are (e.g. 30–60 days overdue, 60–90 days overdue or 90+ days overdue). When accounts receivable remain unpaid some businesses turn them over to third party collection agencies that attempt to recover the amount owed by negotiating payment plans, settlement offers or through legal action. Accounts receivable represent money owed to the firm on the sale of products or services and are classified as current assets. Thus businesses could use accounts receivable as collateral to get a loan or could sell them through factoring. Accounts receivable portfolios can be sold through securitization. The credit risk of these securitized assets is discussed in Chap. 5.

Similarly, prepayment of goods or services involves credit risk for the buyer. The goods may not be delivered upon default of the seller or may be delivered

at a later date that could potentially cause business disruptions to the buyer; or the service prepaid may not be provided after all. A contingent claim, i.e. a claim on certain events occurring, has credit risk. For example, someone paying into a pension fund faces the risk that at retirement, if the fund's liabilities exceed its assets and the fund becomes insolvent, he may not actually receive his pension. Pension funds encounter credit risk, similar to any insurer that collects premiums from policyholders and then invest these, and should be in a position to pay claims when they occur. Pension funds and insurance companies are one of the largest institutional investors; if their investment decisions and asset allocation prove to be inadequate, they may encounter losses and default or become insolvent. Thus their policyholders will not receive any payments.

Loans

A loan is a cash outflow provided from the lender to the borrower with the promise to repay it at a later scheduled date. The loan has a cost defined as the interest rate paid by the borrower to the lender on the loan principal amount at scheduled (interest) payment dates. The full terms and conditions of the loan including the obligations, restrictions and covenants are defined in the loan agreement.

Loans can be secured or unsecured. A secured loan has lower credit risk than an unsecured loan, since with a secured loan the borrower pledges asset as collateral that can be repossessed and sold by the lender to recover the sums owed. A mortgage is a common secured loan used by individuals to fund the purchase of a home. The lender is given security, a lien on the title to the house, until the mortgage is repaid. A car loan is another example of a loan secured on the car. Secured loans take into account the useful life of the asset, so car loans have a much shorter life than mortgages.

Home and car loans are common personal loans. Unlike personal loans there are also loans where the debtor is not an individual/consumer but a business. For personal loans the borrower's credit score is the main underwriting criterion and determines the interest rate charged, in line of course with market conditions at the time. For business loans the overall creditworthiness of the business entity or credit rating, if available, is used for underwriting purposes and to determine the interest rate charged on the loan. Unsecured loans are not secured against the borrower's assets. These can be general personal or business loans, credit cards, bank overdrafts or lines of credit. All things being equal, the interest rate charged on unsecured loans is higher than for secured loans to reflect the additional risk. Unsecured loans have no

recourse against the borrower. In insolvency proceedings, secured lenders have priority over unsecured lenders.

Repurchase Agreements (Repos)

In a repo transaction one party acts as the seller of securities in order to receive a very short-term loan and agrees to buy back the securities at a predetermined future day, usually three to 14 days. There is also a market for one to three month repos. The seller of the securities is effectively the borrower, using the securities as collateral in order to obtain a very short-term loan. The securities typically are very liquid securities, such as treasury bills and bonds. The repo market is a very important segment of the money markets that facilitates liquidity. The repurchase price is greater than the original sale price. This difference, i.e. the securities sold at discount represent the repo rate, is the interest rate earned by the lender (the buyer of securities). Although repos are very short-term products they do have credit risk. The risk in a repo transaction is that the borrower may fail to buy back the securities while the value of securities held as collateral has fallen when the buyer/lender attempts to sell them. In order to avoid this, repos can be over-collateralized and can be subject to daily mark to market margining. The borrower in a repo transaction may also face the credit risk of the lender that holds its securities, where the risk depends on the magnitude of over-collateralization: the higher the over-collateralization the higher the credit risk for the borrower. If the lender defaults the borrower receives a loan of lesser value compared to the value of its securities.

Leases

Financial leases, to a certain extent, resemble medium-term secured loans since the lessor can repossess the leased asset upon the lessee's (obligor's) default. However, in a financial lease the lessee is the owner of the asset rather than holding security over the asset as in a secured loan. The lessor usually borrows the funds to finance the acquisition of the asset it leases and requires from the lessee future scheduled payments in order to service the debt. The lessee enjoys the use of the asset by paying a number of scheduled periodic payments. Many firms may prefer leasing assets rather than actually owing them through debt financing, because it allows them—in most cases—to show an improvement of their return on assets and to have a lower depreciation since the asset is not shown on the balance sheet but is providing income, and because of tax deduction advantages.

The valuation of financial leases is much more involved as it needs to take into account the option of the lessee to purchase the leased asset at the end of the lease. The probability of the lessee exercising the option to purchase the asset at the end of the lease depends on whether the asset is essential to the lessee's business and on its replacement cost value. If the leased asset is essential to the lessee's business and is not obsolete, the lessee may prefer to exercise the option to purchase as it may be a much cheaper option than replacement.

If, however, the lease is terminated before the scheduled termination date because of lessee default or for any other reason (e.g. early termination, loss of asset), the lessor would still require the outstanding capital cost of the asset to be paid in order not to experience any loss. In case of asset loss an insurance payment may cover this. Excluding the case of total loss of the leased asset, the residual or terminal value of the asset can be determined by discounting future scheduled rental payments at the rate specified in the lease and deducting this amount from the asset's then market value. Since the secondary/second-hand market value of most assets will be lower at the termination date there will be a balance to be paid by the lessee. However, there are assets characterized by limited supply and increased demand, such as aircrafts or ships, that at certain times may have higher market value, although this is an exception rather than the rule. Large and very active markets tend to drive down the residual value of assets due to availability and supply of similar assets.

The obligations of the lessor and lessee are determined in the lease agreement and depend on the lease type. It is important that the lessor is solvent in order to service the lease contract, manage collections, calculate the residual value and recover the asset/equipment if the lessee defaults. Upon lessee default the lessor will pursue all the legal remedies determined in the lease agreement, and may sell the repossessed asset to retrieve the residual value and repossession costs or remarket and re-lease the repossessed asset. The credit risk of the lessee must be assessed in order to establish whether the lessee has the ability to fulfil its obligations, such as making the scheduled payments, maintaining and insuring the asset etc.

Bonds

A bond has credit risk. The risk is that the bond issuer will not pay on time, pay a negotiated reduced amount or default and not make the scheduled coupon and/or the principal payments. The bond issuer may be unable to make payments because its operations are producing poor cash flows; if the bond has a floating rate coupon, rising interest rates increase the required interest

payments. Other changes that may have an impact on the bond issuer may relate to overall conditions in the marketplace, competition, regulation and technology changes. The credit risk can be assessed by the ratings provided by Nationally Recognized Statistical Rating Organizations (NRSROs) designated by the Securities and Exchange Commission (SEC).

Each NRSRO uses its own rating definitions. The most commonly used NRSROs are Moody's, S&P and Fitch. The highest rating (the best credit quality) is Aaa/AAA. Bonds rated below Baa3/BBB- are considered non-investment grade bonds and are also referred to as high-yield or junk bonds. These bonds have greater credit risk because the issuer's general financial condition is less sound and there is a greater risk that the bond issuer may be unable to meet its scheduled payments of interest and principal. The bond's credit rating is very important as many institutional investors can only hold investment grade bonds. If the bonds that these institutional investors hold are downgraded by the rating agencies from investment grade to non-investment grade they would need to be sold. Due to the large positions held by institutional investors this selling is very likely to cause the bond's price to fall and subsequently magnify the credit losses.

Derivatives

Derivatives are financial instruments whose values are "derived" from the price of an underlying asset/benchmark, such as stocks, bonds, commodities, currencies, precious metals etc. The derivative is a contractual relationship by two counterparties and may be a contract that provides one party to claim on an underlying asset in the future, and bind another counterparty to fulfil the liability. The derivative contract may also bind both parties equally, or offer one party an option to exercise certain rights, or it may cater for assets or obligations to be swapped. The maturity of the derivative contract may vary from a few weeks or months—for example, futures contracts—to many years, such as long-term swaps. Unfavourable movement of the underlying asset/benchmark will significantly increase the counterparty's repayment obligation.

There are derivatives that are standardized contracts and these are traded on exchanges. The advantage of exchange traded derivatives is that the contracts are relatively simple and standard to facilitate liquidity and transparent trading. Furthermore, the exchange mitigates counterparty credit risk through the exchange central clearing mechanism. There are derivatives that are traded Over The Counter (OTC) and these are not standardized but can be tailor made to the needs of the counterparties. There has been significant growth of

OTC derivatives in the past 10 years, peaking just before the financial crisis of 2007, mainly in exotic contracts and credit derivatives. The main reason for their popularity is the fact that they can be customized. Although there has been a decline in demand for credit derivatives since the 2007 financial crisis, there is still significant appetite for these products. OTC derivatives are private negotiated contracts between two parties and are not protected by a customer asset protection or government insurance scheme. Each counterparty undertakes the credit risk of the other counterparty. Since the 2007 financial crisis the efforts to centrally clear OTC derivatives have been intensified in order to mitigate counterparty credit risk. Centrally cleared derivatives include many OTC contracts, such as those originated between two parties that can be not very liquid. However, they need to be standard enough to allow for central clearing through a Central Clearing Party (CCP) that acts as an intermediary and enters into offsetting transactions with the two counterparties. The CCP requires, from both parties, posting of the initial margin and this is subject to a variation margin on a daily basis. If a party does not post a variation margin then the CCP closes out the position. The CCP has a similar role to a clearing house in the exchange traded market. There the margin requirements are based on the volatility of the instruments. In centrally cleared OTC markets though the margin estimation tends to be more involved as the instruments tend to be less standardized compared to exchange traded ones. Derivatives cleared through an exchange have very little credit risk, derivatives cleared through a central counterparty clearing mechanism should have a reduced credit risk, but derivatives cleared bilaterally have significant credit risk. Bilateral clearing involves two parties entering into an International Swaps and Derivatives Association (ISDA) Master Agreement that covers all derivative transactions between them and the associated Credit Support Annex (CSA) of the ISDA Master Agreement that specifies collateral arrangements. Features of the ISDA Master Agreement that can mitigate credit risk, such as netting, collateralization and downgrade triggers, are discussed in Chap. 7. Very popular OTC derivatives consist of interest rate products, followed by foreign exchange products and credit default swaps. These products do have significant counterparty risk, for example cross-currency swaps can be long dated and involve the exchange of notional at maturity, and credit default swaps can be very volatile.

Derivatives are popular instruments that can be used for hedging, speculation, off balance sheet treatment and regulatory arbitrage. Regulatory arbitrage involves reducing a bank's regulatory capital without reducing the bank's exposures. A lot of derivative contracts have the feature that they can be entered into with a very small upfront payment compared to the notional

value of the contract payment, or no upfront payment at all. Thus derivatives may contain significant leveraging, which has the effect of multiplying the impact of positive or negative movements of the benchmark in the derivative instrument. Although derivatives are very useful they do contain many risks that if not understood properly by their users can have disastrous effects.

It is worth noting that the credit risk of derivative contracts has some unique features. In contrast to derivatives, most products, such as loans or bonds, have a notional amount of risk which at any time can be easily estimated with some certainty and only one party takes the risk, i.e. the lender/bondholder. In a derivative contract, its potential future value can be positive or negative depending on market conditions at the time. As the derivative contract's value can be positive or negative the credit risk is bilateral; both counterparties are a risk to one another.

Credit and its Negative Impact

Credit can contribute in building the economy when used in a prudent way. If credit is used recklessly and excessively it can create chaos. The causes of the financial crisis that started in 2007 will be discussed for years to come in a similar manner to the causes of the great depression in 1929. It is however common consensus that a few years prior to the 2007 financial crisis US mortgage lending credit standards were extremely relaxed. This contributed to excessive house price increases and a housing bubble.

Residential loans were provided to sub-prime borrowers (usually individuals with poor credit histories) who could not afford them and as result struggled to pay. Just before 2007 the USA experienced a nationwide house price slump. US financial institutions had to face rising rates of default and foreclosure. These residential mortgages were pooled together and securitized. So delinquencies and defaults affected not only the loans that were still on bank balance sheets but also the loans in the sub-prime securitizations. Securitization has been criticized for its role in the crisis. So it is worth noting that mortgage loans that were not securitized and kept on the originating lender's balance sheet also performed poorly. Further contractual arrangements that provided recourse against sellers of bad mortgages forced them to take these loans back. With regards to the securitized loans, as the credit profile of these sub-prime securitizations deteriorated significantly, the rating agencies followed with downgrades. Furthermore, these tranches of sub-prime securitizations were financially engineered and used to back securities known as Collateralized Debt Obligations (CDOs). The CDO market as a result suffered severe

downgrades. Ultimately, the credit risk of these instruments in contrast to market belief proved to be highly correlated. Investors had made huge investments in sub-prime Residential Mortgage Backed Securities (RMBSs) in an attempt to earn higher returns in a low interest rate environment.

What happened was that sub-prime RMBSs slumped in value and CDOs ended up being almost worthless. These securities were very difficult to sell at any price or use as collateral for short-term funding. Fire-sale prices had the effect of wiping out a significant part of a bank's capital since it had to revalue its assets at significantly lower prices and thus realize huge capital losses. Banks had expanded their balance sheets but they had reserved too little capital to absorb losses. Many banks and firms suffered losses amounting to billions of dollars. Credit became much harder to obtain and much more expensive. As a result lending declined, and consumption and investment fell causing a further sharp contraction in the economy. The uncertainty in the economy went on with major failures of high-profile firms. In 2007 Northern Rock in the UK collapsed. In 2008 Bear Sterns was forced to sell itself to JP Morgan for less than 5 % of its worth of a year earlier. Lehman Brothers filed for bankruptcy (the largest in the history) in the same year; Merrill Lynch was sold to Bank of America for 60 % below its price a year earlier. After the Lehman collapse, market confidence plummeted, and lending stopped! This caused a seizure in the economy as non-financial firms stopped spending as they could not rely on the banking system for funding anymore. After Lehman collapsed, AIG also collapsed.

AIG had written (sold) many CDSs as part of its insurance business and did not buy any. In contrast, most banks and hedge funds would sell CDSs and then buy them from someone else at the same time. As RMBSs and CDOs were almost worthless, AIG had to make huge payouts for the CDSs they had sold. However, as they had not bought any CDSs they were not getting any payments in. Most banks and hedge funds had to pay but they would also get money back in, so their risk was significantly hedged or netted out. AIG took a huge outright credit risk. It thought that providing CDSs is part of an insurance business, but it is not. In a typical insurance business you expect steady predictable trends. If the premium pricing is right, you expect more premiums coming in than payments going out. There is usually low correlation between the risks that can create an insurance payment. Contrary to this, the correlation of CDOs, for example defaulting, was huge; they were all worthless. As AIG had to make huge payouts, counterparties that expected payments and the market in general were concerned whether AIG would actually have the funds to make these payments. Rating agencies responded by lowering AIG's rating. This had a further negative effect on AIG as it had to put up more collateral to guarantee its ability to pay. AIG did not have the

money to pay and had to start selling parts of its business. As a result this had a huge negative impact on the share price.

Another factor in AIG's downfall was its securities lending programme. AIG was lending securities from its life insurance companies' portfolios. AIG took cash collateral from these short-term loans and invested them in illiquid RMBSs. When borrowers stopped renewing the loans, returned their securities and asked for their funds back, AIG was unable to repay as these funds were tied up in reinvestments. In order to meet borrowers' demands, AIG lent more securities and used the cash collateral from new securities lent to pay back existing borrowers. This however only increased the magnitude of the problem. If it was not for the intervention of the government AIG would not have been rescued.

When equity markets collapse there is a "flight to quality"; this means that investors seek to transfer their wealth to less risky assets, such as sovereign bonds. What we have experienced during the recent financial crisis is that there has been a subsequent deterioration of sovereign credits that exacerbated the uncertainty of returns over the medium- to long-term investment horizon. Following the onset of the financial crisis (2007–09), in 2010 we had the start of the sovereign crisis that carried on in 2011 and 2012. Many highly rated countries had their local and foreign currency government bond ratings downgraded by several notches, with some countries falling below investment grade and some defaulting.

The sovereign crisis affected many European countries. It was the result of many factors including: unsustainable sovereign budget deficits and debt levels; relaxed credit standards from 2001 onwards that encouraged high-risk lending; housing bursts; bank bailouts; and, generally, government responses during the financial crisis. Many sovereigns in Europe bailed out their banks due to concerns that if these banks did not survive they could seriously damage the economy. Countries funded the recapitalization of the banking industry and socialized losses. At the same time, due to the contraction in the economy, Gross Domestic Product (GDP) fell. As a result the debt-to-GDP ratios of many sovereigns deteriorated. However the sovereign crisis cannot be solely attributed to the bailout of the banking sector by their sovereigns. Many countries had already large pre-existing debt-to-GDP ratios and weak growth potential. Therefore investors were concerned about their future debt sustainability and as a consequence interest rate spreads for certain government bonds rose sharply. This put a further burden on sovereigns. Four countries (Greece, Ireland, Portugal and Cyprus) found it difficult or could not repay or refinance their debt and had to be rescued by sovereign bailout programmes, by the International Monetary Fund (IMF), the European Union (EU) and the European Central Bank (ECB). These three creditors have been referred to as the "Troika". The sovereign bailouts have been provided on the

understanding that these countries implement a programme of fiscal consolidation, structural reforms, privatizations and setting aside funds for banking industry recapitalization. Ireland and Portugal have completed these reforms.

It is quite common that, for a long period prior to a financial crisis, national economies appear to be doing well with price stability over which excessive risk-taking has presided. Banks, in order to increase shareholders' returns, operated with minimal equity that proved to be inadequate to absorb their losses due to excess risk taking and over-leveraging. Post-2000 there was a period of low interest and fixed income yields with abundant capital. There is a debate as to why interest rates were low and drove investors to riskier investments; *inter alia* Federal Reserve policy and capital flows from emerging markets investing in US government bonds were driving down interest rates. Many investors used borrowed funds to boost the return on their capital. European banks had also invested in worthless US securities and the housing bubble in Spain and Ireland left them with bad debts that eroded their capital. Excessive leverage magnified the impact of the housing downturn, and de-leveraging contributed to the interbank credit market tightening. However, the underlying problem of excessive leverage is the under-estimation of overall risk and credit risk. The 2007 financial crisis was also the result of under-estimating the risks taken by all market participants.

Sound Credit Risk Management

The 2007 financial crisis and the effect it had on everyone is a lesson to be learnt and avoided. Everyone has been affected by the crisis but the most obvious impact is that on the taxpayer.

A sound credit risk management framework is important and starts by identifying the risks involved. If credit risk management does not identify and properly understand the risks then it is bound to fail at some point. Effective credit risk management starts by avoiding the bad transactions to start with. Credit risk management should be proactive and start with the origination process. Transactions should fit the profile and expertise of the organization and make business sense on a risk adjusted basis. Transactions that the organization lacks the expertise and knowledge to effectively structure and monitor should be avoided. The ongoing management/monitoring of transactions, credit risk portfolio management, mitigation techniques and credit risk transfer, discussed in Chap. 7, are very important. However they will not make a bad deal into a good one!

Proactive and effective credit risk management starts with prudent origination, underwriting, credit risk policy and setting appropriate limits and

the credit risk approval process. Credit risk management should be staffed by people with relevant experience, knowledge and skills and be independent from the organization's business centre. Credit risk management staff should have an on-going critical attitude towards credit risk. Financial markets evolve, new products are being developed and new risks arise as a result. Credit risk management techniques, systems and generally the credit risk approach should always be challenged and never taken for granted as time goes by. Relying on systems or computer models that worked in the past does not necessarily reflect the risks appropriately as the financial world comes up with new products and new risks.

Credit Risk Policy and Approval Process

The credit risk policy is an internal document that contains the guidelines and rules that must be complied with at all times prior to and during the life of a transaction. The credit risk policy contains the processes and procedures to carry out business and formalizes the credit risk management process. It is the document which describes how to identify measure, monitor and control credit risk. The goal of credit risk management is to maximize the risk adjusted rate of return by maintaining the credit risk exposure within acceptable levels. The aim of the credit risk policy document is to protect against any unwarranted credit exposures, maintain credit risk at the desirable and manageable level, and identify and avoid a material credit failure.

The credit risk policy should be tailor made, taking into account the organization's activities and business strategy. The policy should be updated as the organization's business and marketplace evolve. Different credit risk policies suit and protect different lines of business. Credit risk policy should address the target markets, portfolio mix, limits, exception processes, approval authorities, reporting etc. Furthermore, for organizations that provide credit internationally their credit risk policy should include procedures for identifying, measuring, monitoring and controlling country risk and transfer risk. The policy, among other parameters such as the potential default of counterparties due to country-specific economic factors, should also take into account the enforceability of loan agreements and the timing and ability to realize collateral under the foreign and national legal framework. Lenders should also have in the credit risk policy the acceptable forms of collateral, and the process for the ongoing valuation of collateral, and this should be enforceable and realizable. Similar procedures should be determined in the policy with respect to the steps taken to evaluate the creditworthiness and legal capacity of a guarantor. Furthermore, processes should be defined in the policy to ensure that

netting agreements, discussed in Chap. 7, designed to mitigate credit risk, are sound and legally enforceable.

The policy should be clearly defined, consistent with prudent practices and regulatory requirements and communicated throughout the organization. The business plan that establishes the business objectives that guide business activities, as well as the credit risk policy, should be approved and periodically reviewed by the board of directors. The chief risk officer is the key person responsible for the credit risk policy document. His duties involve drafting, updating, reviewing and maintaining the credit risk policy.

Sound credit risk management also involves an established formal transaction evaluation and approval process. The proposed transactions should be subject to careful analysis by qualified and experienced credit analysts commensurate with the size and complexity of the transaction. The credit risk policy and evaluation process should establish the minimum information and documentation requirements for the analysis. Approvals should be made in accordance with the organization's business guidelines, be consistent with the credit risk policy and granted by the appropriate level of management. The approval process must be documented and must identify the individuals and credit committees responsible for the decisions. Approval authorities should be commensurate with the expertise of individuals.

The credit committee, especially for complex transactions or matters, should ideally consist of senior executives and a diversity of staff representing different units of the organization, such as the business unit, risk management, legal, tax, accounting and compliance department. The chair should have the authority to do so and be able to facilitate the discussion so that all parties express their opinions about the transaction or matter that has been brought to the credit committee's attention. The credit committee process should be approached in a positive and constructive manner, rather than seen as a mere approval step. Provided that the credit committee is staffed by skilled members it should actually contribute to formulate an even better proposition/transaction.

Setting Limits and Underwriting Criteria

Limits represent the maximum exposure that an organization is willing to withstand and can be set on the basis of:

- counterparty exposure;
- groups of connected counterparties;
- product exposure;

- economic sector exposure;
- industry exposure;
- geographic region exposure;
- country exposure;
- for derivatives, specific exposure, such as delta, gamma and vega exposure;
- potential future exposure.

Stress limits can also factor any unsecured exposure in a liquidation scenario. Certain exposures can be expressed on the basis of:

- exposure amount;
- credit quality/creditworthiness
- tenor/time period of credit exposure.

The notion of credit exposure is discussed in Chap. 2.

Organizations should have the systems in place to ensure that exposures approaching risk limits are brought to the attention of senior management. All exposures and limits should be included in a risk limit measurement system. The system should also be able to report exposures on individual (say counterparty, industry, product, country etc.) and on a portfolio basis, and identify any exceptions to credit risk limits on a meaningful and timely basis.

Underwriting criteria should be related to certain limits/minimum standards that need to be met for an organization to provide funding/loans. Common underwriting standards refer to maximum Loan to Value (LTV) and Debt Service Cover Ratio (DSCR).

Setting appropriate limits is an art: it takes judgement and ultimately depends on the risk appetite of the organization. Value At Risk (VAR) models, which are discussed in Chap. 2, can be used to determine limits and the amount of capital at risk. Ultimately the parameters of the VAR models that determine the model output are set by management. So often the experience, skills and risk appetite of management affect the VAR model output and ultimately the limits.

Understanding and Mitigating Model Risk

VAR models, like most models, provide outputs depending on the model inputs, such as volatilities, correlations, price distribution, confidence interval and time horizons etc. When a VAR model is used to estimate economic capital (discussed in Chap. 2) the horizon of the VAR should be set as the

time it takes that organization to raise new capital. Different financial institutions may need a different time to find new capital. So if the horizon, for example, is set at 10 days then what is assumed is that it will take 10 days to raise new capital. If that is not a reasonable amount of time then the VAR horizon should be increased to whatever time period is deemed reasonable under normal conditions and a stress scenario should also incorporate conditions of financial stress. The same applies for other inputs such as volatilities and correlations. When things go wrong, well diversified portfolios under normal market conditions may become concentrated as correlation patterns break down and instruments and markets move together.

Senior management should be aware of the underlying assumptions of models and whether they make sense. Credit risk management should take into account not only model outputs but also critically assess the market conditions and their business position and risk profile. Many things can go wrong with model assumptions, or it may be that a model's assumptions that used to work before become invalid as markets further develop or simply change. A model can also be mathematically correct and express financial theory, but may not be appropriate for a given situation, transaction or market. The choice of appropriate models, model assumptions and various risk control limits is ultimately based on human judgement. Bad human judgement can lead to inappropriate credit risk limits, poor underwriting standards, selection of bad transactions and potential losses.

The failure of the hedge fund Long-Term Capital Management (LTCM) in September 1998 is an example of the fact that organizations should be aware of the limitations of the models they use. It is worth noting that LTCM's principals included two Nobel laureates. LTCM's arbitrage strategy was based on market neutral or relative value trading. This strategy involves buying one instrument and at the same time selling another. These trades are intended to make money irrespective of whether prices go up or down, provided that the spread of the long and short position moves in the appropriate direction. LTCM in the early 1998 was betting that the spread between corporate bonds and government treasuries in the USA and the UK was way too large and would return to the normal range. An example of a relative value trade may consist of buying corporate bonds and selling short the government bond. When the yield spread narrows, and irrespective of whether prices go up or down, the overall position makes money. The return of these strategies is low and becomes even lower as more players come and take advantage of these opportunities. So LTCM like other hedge funds used leverage excessively to boost overall return. In August of 1998, Russia devalued the ruble and declared a debt moratorium. Investors during that crisis feared

that possibly other nations would follow and this triggered a flight to quality. Investors exited emerging markets and kept away from any risky security. As a result credit spreads did not narrow but widened as prices for treasury bonds increased while prices for lower credit quality bonds fell dramatically. LTCM failed because its trading and risk management models did not anticipate that at times of crises volatilities can rise significantly and correlations between instruments and markets get closer to one; essentially move in one direction, which is down!. At the same time liquidity dried up, and LTCM like others had to either abandon arbitrage trades or sell other holdings at very low prices in order to raise money to meet margin calls. LTCM was excessively over-leveraged and this contributed to its problems. LTCM's market positions were so large, that the Federal Reserve Bank facilitated its bailout by a consortium of investment banks and houses.

Model risk can be managed through an appropriate governance and control framework that includes model validation and vetting. Model validation is typically carried out by a parallel reimplementation of the model, a point by point reconciliation of the two models and an investigation of any bizarre output the model may produce. This process does not typically address the degree of exactness of the model to market behaviour, and does not perform tighter tests to model implementation.

Independent vetting of models that an organization uses can mitigate model risk. The purpose of vetting is to assure senior management that the models used express a reasonable representation of how the instruments are valued in the marketplace and that the models have been appropriately implemented.

The vetting should at least include the following:

- *Documentation*: this includes a term sheet or a full description of the transaction, a mathematical statement of the model and a working version of the implementation. The documentation should include all the information so that risk management can implement the model and should be able to produce the same output, using the same inputs.
- *Model soundness*: risk management should ensure that the mathematical model provides a reasonable representation of the instrument in the marketplace.
- *Benchmark modelling*: risk management should develop a benchmark model based on the assumptions and transaction specification. Further an implementation that is different from that proposed may be employed.
- Compare the outputs of the proposed model with the benchmark model.
- *Stress-test the model*: Examine possible inaccuracies in model valuations in terms of the model structure as well as the parameter values.

Origination

Originating good quality transactions is key to sound credit risk management. The fact that a transaction is within limits and consistent with the underwriting criteria does not necessarily make it a good transaction for the organization. Of course making sure that it is within limits and consistent with the underwriting criteria is the first step in the originating process, but there are other parameters to be considered.

The list below is not exhaustive and provides some key parameters for the origination process.

Limits: check the transaction is within existing limits.

Underwriting criteria: check the transaction is consistent with underwriting criteria.

Transaction risk: Never enter into a transaction you do not fully understand. Have an inquisitive mind. Ask questions. If needed get specialist advice, from experienced lawyers, accountants, consultants etc. Always make sure you understand the transaction risks. If you do not, then pass.

Motivation of the counterparty/seller: for applicable transactions investigate whether the other party or seller has an interest in the transaction. If not why are they, for example, selling? There may be good reasons or maybe not. It could be that the seller has more information than the buyer, which can lead to adverse selection, and he wants to get rid of certain exposures in a selective way. One way to mitigate the risk involved is to require that the seller has some exposure throughout the life of the transaction, so as to align the interest of the buyer with the seller.

Pricing: estimate the return on a risk adjusted basis and the expected loss for the capital at risk. The output of these should obviously make sense. There is no point originating transactions that, for example, involve a great amount of risk for a tiny return.

Transaction fit: assess how well the transaction fits with the organization's strategy and portfolio. Assess if the organization has the know-how to structure and manage the transaction on an ongoing basis.

Transaction surveillance: the organization should be able to successfully monitor the performance of the transaction. This means that it must have the appropriate infrastructure and the staff with the relevant skills, knowledge and experience.

Legal documentation and mitigants: the binding legal documents should incorporate the conditions presented by the business unit and approved by the credit risk committee. Incorporating mitigants into the transaction structure

and legal documents assists in avoiding or reducing losses when the transaction deteriorates. When originating transactions its best to make sure that the documentation is representative of the transaction and that ideally strong mitigants are in place should the transaction under-perform.

Exit options: assess the exit options and their associated costs. Any proposed transaction should be accompanied by an exit strategy. An organization and financial markets are changing, evolving, developing. Transactions that made sense and fit the business model in the past may not do so in the future. An organization should be in a position to exit a particular transaction and should be aware when it enters into this transaction what it may take to do so.

Chapter 2: Quantitative Credit Risk Analysis and Management

Default Probability (DP)

Risk Neutral and Real World DPs

One of the most important inputs in quantifying credit risk is estimation of the obligor's Default Probability (DP). There are different approaches in the estimation of DPs and depending on the purpose of the analysis, these should be followed to best assess the credit risk.

The main difference in approach has to do with whether the DPs are based on historical real world data or on the risk neutral valuation theory. The risk neutral valuation theory assumes that all investors are risk neutral in the sense that they do not require a premium for bearing risks. A risk neutral world is one in which the expected return required by investors is the risk free interest rate. For example, the historical volatility of an asset is a real world variable whereas the implied volatility derived from an option price of that asset is a risk neutral variable. The DPs that are estimated on historical data are termed real world DPs. Example of those are the DPs produced by the rating agencies. Historical DPs tend to be much lower than risk neutral DPs. In real world DPs investors are not risk neutral; they want to be compensated for bearing risks and expect an excess return (over the risk free rate of interest). In real life investors earn an excess return over the risk free rate when they invest, for example, in corporate bonds to compensate them for bearing the associated risks. If there were no expected excess, return real world DPs and risk neutral DPs would be the same. In the real world an investor expects to earn more than the risk free rate of interest when he/she invests in riskier products.

Historical DPs have a more long-term focus whereas risk neutral DPs focus more on the short-term. Historical DPs, like the ones rating agencies produce, do not/should not change throughout the business cycle. Hence the DP of a company does not increase in a downturn and decrease at the peak of the business cycle. Unless a major change has occurred in relation to the company, the DP and credit rating should be more or less stable. This is what is meant by the fact that rating agencies “rate through the cycle”. Ideally they do not want to downgrade a bond issue and then having to upgrade it a few months later just because of different macroeconomic conditions such as an increase or decrease of interest rates. When they initially rate a bond issue, rating agencies have already taken into account several extreme adverse condition scenarios. The risk neutral DPs (often termed implied DPs) are based on traded instruments, such as asset swaps, credit default swaps and bonds that are traded on a daily basis. It should be noted that risk neutral default probabilities are not actual probabilities of default, rather they reflect the default risk market price.

Risk neutral DPs thus change frequently because as they are based on traded instruments they incorporate additional temporary risks and short-term volatility. Risk neutral DPs incorporate the default correlation of traded instruments and systematic risk which cannot be diversified away. Risk neutral DPs take into account that the defaults and default correlation will increase during unfavourable macroeconomic conditions and this type of risk cannot be diversified away. Furthermore, risk neutral DPs assumed by traders may also incorporate more extreme worst case scenarios than that already in the historical data. Risk neutral and real DPs are not in conflict. Real world DPs reflect the actual DP of a counterparty defaulting and risk neutral DPs reflect the market price. There is no conflict between risk neutral and real default probabilities. Real world default probabilities are the actual assessment of the probability of a counterparty defaulting, which is therefore relevant for any quantitative assessment of return or risk management approach. Risk neutral default probabilities reflect the market price and are therefore relevant for hedging purposes. For credit derivative products or for hedging purposes, risk neutral DPs should be used as derivatives are valued under the risk neutral valuation approach. Real world DPs should be used to assess returns, estimate the Credit Value at Risk (Credit VaR), potential future losses and regulatory capital.

Equity Models: Merton Model, Moody’s Analytics Expected Default Frequencies (EDFs)

Another way to produce the DPs of a company is based on its equity price (Merton (1974)). Moody’s Kealhofer, McQuown and Vasicek (KMV) and Kamakura provide a company’s DP based on its equity price with some adjustments and relaxing

some of the assumptions of the Merton-style approach where the objective is to incorporate more quickly market information in their DPs than credit ratings.

Black and Scholes (1973) and Merton (1974) relate credit risk to the capital structure of the firm. They all assume that the firm's asset value follows a lognormal diffusion process with a constant volatility. The firm has issued equity that receives no dividends and debt through a zero-coupon bond that matures at time T .

According to the model, if at time T the firm's asset value exceeds the promised debt payment, D , the lenders/zero-coupon bondholders are paid the scheduled amount and the shareholders receive the residual asset value. The firm defaults if the asset value is less than the scheduled debt repayment at time T , in which case the lenders receive a payment equal to the reduced asset value, and the shareholders get nothing. Define,

E : the value of the firm's equity

A : the value of the firm's assets.

Let E_0 and A_0 be the values of E and A today and E_T and A_T at time T . σ_A is the volatility of the asset value, and r is the risk free rate of interest, both assumed to be constant.

The payment to the shareholders at time T is given by:

$$E_T = \max[A_T - D, 0]$$

Merton (1974) assumes that a firm's equity is a European call option on the firm's assets with maturity T and a strike price equal to the face value of the debt. Owning the equity of a company is analogous to holding a call option on the company's assets, where the required debt payment at the horizon date serves as the option's strike price. In this framework the value of equity matches the value of the call option.

Black and Scholes (1973) provide the value of equity today as:

$$E_0 = A_0 N(d_1) - De^{-rt} N(d_2)$$

where

$$d_1 = \frac{\ln\left(\frac{A_0 e^{rt}}{D}\right)}{\sigma_A \sqrt{T}} + 0.5 \sigma_A \sqrt{T}; \quad d_2 = d_1 - \sigma_A \sqrt{T}$$

and $N()$ is the cumulative normal distribution function.

Define $D^* = De^{-rT}$ as the present value of the promised debt and let $L = D^*/A_0$ be a measure of leverage. Using these definitions the equity value is:

$$E_0 = A_0 [N(d_1) - LN(d_2)] \quad (1)$$

where

$$d_1 = \frac{-\ln(L)}{\sigma_A \sqrt{T}} + 0.5 \sigma_A \sqrt{T}; \quad d_2 = d_1 - \sigma_A \sqrt{T}$$

Since the equity value is a function of the asset value, Ito's lemma can be used to determine the instantaneous volatility of the equity from the asset volatility:

$$E_0 \sigma_E = \frac{\partial E}{\partial A} A_0 \sigma_A$$

where σ_E is the instantaneous volatility of the company's equity at time zero. From equation (1), this leads to:

$$\sigma_E = \frac{\sigma_A N(d_1)}{N(d_1) - LN(d_2)} \quad (2)$$

Unlike a typical option valuation exercise in which the value of the underlying asset of the option is known, in the Merton model the value of the option, i.e. the equity value, is observable and we seek to uncover the value and volatility of the underlying asset. Thus, we solve backwards from the option price and volatility to get the implied firm asset value and volatility.

Equations (1) and (2) allow us to obtain the unobservable values A_0 and σ_A from E_0 and σ_E which are observable from a public firm's equity prices, taking into account L and T .

The risk neutral probability that the company will default at time T is the probability that shareholders will not exercise their call option to buy the assets of the company for D at time T . It is given by:

$$\pi_Q = N(-d_2)$$

and depends only on the leverage L , the asset volatility σ , and the time to repayment T .

Crouhy, Galai and Mark (2000), show the relationship between risk neutral probability of default and the physical probability of default π_p :

$$\pi_Q = N\left(N^{-1}(\pi_p) + \frac{\mu - r}{\sigma} \sqrt{T}\right)$$

where μ is the expected return of the assets.

Black and Cox (1976), Geske (1977), Longstaff and Schwartz (1995), Leland and Toft (1996) and Collin-Dufresne and Goldstein (2001) have extended Merton's (1974) model, but none has been identified as clearly superior.

Moody's KMV is based on the Merton-style approach where the firm's equity value is regarded as a call option on the firm's underlying assets. Moody's KMV Expected Default Frequency (EDF) is a forward-looking default probability of a firm over a specified period of time, usually a year. Furthermore, the EDF model also generates term structures of EDFs for maturities of up to 10 years. The EDF ranges from 0.01 % to 35 %, i.e. 1 to 3500 basis points. Moody's EDF model assumes that a firm defaults when the firm's asset market value falls below its book value liabilities payable, called the default point and denoted X . Another simple example is when you buy a house financed partly with equity and partly with debt (mortgage), then the further the market value of your house is above the mortgage balance the less likely you are to default on your mortgage.

$$DD = \frac{\ln A_0 - \ln X}{\sigma_A}$$

Distance to Default (DD) incorporates three key pieces of information: the market value of assets, the default point and the asset volatility. The DD numerator captures the firm's financial leverage, while the denominator its business risk. The DD of a firm is the difference between expected asset value at the horizon date and the default point, standardized by its business risk. DD summarizes all this information into a single statistic providing a rank ordering of default risk. The probability of default is calculated as the area under the normal distribution below the default point. The DD is scaled to the actual probability of default using a historical default database. So instead of approximating the distribution of DDs with a standard parametric distributional function (like the standard Merton approach), the EDF model constructs the DD-to-DP mapping based on the empirical relationship (i.e. the relationship evidenced by historical data) between DDs and observed default rates. The DD-to-EDF mapping is achieved by grouping the sample

into buckets based on the firms' DD levels, and fitting a non-linear function between DDs and observed default frequencies for each bucket. Although the KMV approach relies on historical data, the EDF measure will still be dynamic due to constantly changing equity data.

In reality, defaults are not normally distributed. Furthermore, there are changes in asset values during a short time window that are not always small and continuous, as described by the Brownian motion assumption of asset value. Default distribution is right-skewed, with a thick and long right tail relative to the standard normal distribution. Due to the fact that defaults are highly unlikely for extremely high-quality firms, the EDF model cannot calibrate an exact empirical relationship between DDs and expected default rates beyond a certain DD level. Therefore the lower level of EDFs has a floor of 0.01 %. The DD level distinguishes firms likely to default from those less likely to default. There is a negative relationship between DDs and observed default rates. Firms with larger DDs are less likely to default.

The public EDF model is based on the Merton approach but has more realistic features. The EDF model allows default to occur at any time when a firm's asset value falls below its default point. In practice, companies tend to default when their asset values are close or fall below their default points, regardless of whether that time is before the maturity of their debt. The EDF model takes into account cash leakages over time, such as dividends on stock, coupons on bonds and interest payments on loans, to arrive at the dynamic asset value. In reality, cash leakages impact both default probabilities and the value of debt. All things being equal, a firm paying a large dividend has a higher default probability, compared to one paying less or none since less cash is available to service debt.

The KMV is best applied to publicly traded companies, where the value of equity is determined by the stock market. The KMV actual DPs involve the following three steps. First an estimation of the firm's asset market value and volatility, then an estimation of the DD, i.e. the number of standard deviations between the mean of the asset value distribution and the default point; and finally scaling of the DD estimates to actual DPs using a historical default database.

The advantage of structural models, like Moody's KMV, is that they are predictive and highly responsive to changes in the firm's financial condition due to their use of stock price data. The disadvantage is the assumption of normality of the underlying asset returns in their DPs that are not reflected in observed bond spreads.

Equity-based models for default probabilities have an appeal since they model DPs in a dynamic manner but still "back-test" with the historical default experience. They are a mid-way between the static historical DPs and volatile DPs derived directly from the credit market due to the embedded default risk and liquidity premium.

Kamakura Risk Information Services (KRIS) DP

Kamakura provides default probability measures for public firms, non-public firms, US banks and sovereigns. Inputs to the Kamakura models include company specific, industry related and macro-economic factors. The approach can be applied to all type of borrowers.

Kamakura's Public Firm Models, for example, offer four different quantitative approaches to modelling default probabilities: two versions of the Jarrow Chava Model, which are the Merton Structural Model and the Jarrow Merton Hybrid Model. All of these approaches incorporate information on market prices of a firm's equity and interest rates to allow the current market expectations to be reflected in the DPs.

The *Jarrow Chava Model* is a statistical hazard model that relates the probability of firm default to several explanatory variables. These include firm financial ratios, other firm specific variables, industry classification, interest rates, macro-economic factors, and information about the firm's and market price levels and behaviour. In this model, firm default can occur randomly at any time with an intensity determined by the explanatory variables. Both the fourth and fifth generation Jarrow-Chava models incorporate multiple equations for forecasting default at different forward time intervals, conditional on survival up to that point in time. These equations share the same inputs but they have different weights depending on the time horizon. The current and forward conditional default probabilities are combined to derive the full default term structure up to 10 years.

The *Merton Structural Model* uses option pricing methods to relate the firm's DP to its financial structure and information about the firm's market price of equity. The explanatory variables include a measure of the firm's outstanding debt, its market valuation, and information about firm and market equity price behaviour. In this model, firm default occurs when the market value of the firm's assets decline below a threshold related to the firm's outstanding debt.

The *Jarrow Merton Hybrid Model* is a statistical hazard model that relates a firm's DP to the same explanatory variables as the Jarrow Chava Model, but it also incorporates the default probability of the Merton Structural Model as an additional explanatory variable. In this model, firm default can occur randomly at any time with an intensity determined by the explanatory variables. Kamakura offers this model to combine the default prediction capabilities of the associated models. Forward default probabilities and the full-term structure of default are derived in the same fashion as for the Jarrow-Chava models.

Internal Methods Based on Financial Ratio Analysis:

Altman DP

Internal ratings-based approaches for estimating DPs have to be created for many small and medium sized businesses that are not rated by the rating agencies. Effective ratio analysis enables one to assess a firm's financial health. It enables one to assess a firm's performance, profitability, efficiency and financial structure currently (based on the latest financial statements) and historically, and position it relative to its competitors. It can enable one to define financial ratio covenants in legal documents, for example in loan agreements, and further manage the performance of these loans by monitoring the level of financial ratios over time. Additionally, under Basel II rules banks are allowed to use their own internal ratings to determine DPs. In most cases, internal ratings are based on ratio analysis, using profitability ratios (like return on assets), short-term liquidity ratios (such as the current ratio) and long-term solvency/leverage ratios (such as debt to equity ratios). Prior to assessing the long-term solvency risk the short-term liquidity risk should be assessed. First firms should be able to survive in the short-term in order to make it in the long-term.

- Profitability ratios

$$\text{Return on Total Assets} = \frac{\text{Operating profit before income tax} + \text{interest expense (EBIT)}}{\text{Average total assets}}$$

This measures the rate of return earned through operating total assets provided by both creditors and shareholders.

- Short-term liquidity ratios

A viable business can go bust because of liquidity problems, hence the importance of liquidity ratios.

$$\text{Current Ratio (CR)} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

CR measures the ability of the firm to meet its short-term liabilities and, generally, the higher the ratio the better. In a normal case, low or falling ratios indicate trouble.

$$\text{Quick Ratio (QR)} = \frac{\text{Current Assets} - \text{Stock} - \text{Prepayments}}{\text{Current Liabilities}}$$

This ratio gives a more conservative view of the liquidity, by eliminating stock and prepaid expenses/other prepayments. Inventory is less liquid and considered to take more time to convert into cash

$$\text{Cash Ratio (CAR)} = \frac{\text{Cash and Bank} + \text{Marketable Securities}}{\text{Current Liabilities}}$$

This is the most conservative view of the liquidity of a business. While the denominator remains the same, the numerator takes into account only those current assets that can be immediately converted into cash. Although usually only cash, bank and liquid securities are included, other current assets that are realizable in cash immediately can also be considered for the numerator.

- Long-term solvency/leverage ratios

$$\text{Debt to Equity Ratio} = \frac{\text{Total Outstanding Liabilities}}{\text{Total Net Worth (TNW)} + \text{Minorities} + \text{Non-Redeemable Pref. Shares}}$$

A high debt to equity ratio could indicate that the company may be over-leveraged, and should reduce its debt.

There are so many other financial ratios that can be computed in financial analysis depending on the nature of the firm's business etc. Chapter 1a discusses the credit risk assessment of corporate entities and provides a further discussion.

Altman (1968) pioneered the use of five accounting Ratios (R) in order to predict default for industrial companies, called the Z -score.

$$Z = 1.2R_1 + 1.4R_2 + 3.3R_3 + 0.6R_4 + 0.999R_5$$

The predictive ratios are R_1 : Working capital/Total assets.

R_1 is a measure of short-term liquidity risk. It shows the proportion of total assets consisting of relatively liquid net current assets (current assets minus current liabilities).

R_2 : Retained earnings/Total assets, shows the accumulated profitability.

R_3 : Earnings before interest and taxes (EBIT)/Total assets, shows the current profitability.

R_4 : Market value of equity/Book value of total liabilities. This is a long-term solvency risk ratio taking into account the market's assessment of the value of the firm's shareholders' equity.

R_5 : Sales/Total assets, shows the ability of a firm to use assets to generate sales.

Altman (1968) finds that Z -scores of less than 1.81 indicate a high probability of bankruptcy. Z -scores higher than 3.00 indicates a low probability of bankruptcy. Scores between 1.81 and 2.99 are in the grey area, indicating uncertainty and difficult in distinguishing between good and bad credits. One of the disadvantages of the Z -score is a type II error. Although all defaulting firms were identified, other firms that after all did not default were also classified as bad credits.

The Z -score can be expressed as a probability using the normal density function in Excel (=NORMSDIST(1- Z score)). Higher positive Z -scores imply a lower default probability.

Altman has developed variations of his original Z -score for private manufacturing companies, for non-manufacturing companies and for emerging markets companies. These variations use different weights and financial ratios to estimate the Z score.

The concern with these type of models is that accounting data are available only at discrete intervals (e.g. quarterly) and are based on historic or book value accounting principles. Therefore these models will not be able to pick up on a firm that is deteriorating very fast or events due to financial crises.

Another model called ZETA addresses some of the Z -score model disadvantages. The ZETA uses data from companies' financial statements to provide trends and warning signals about their financial health.

Recovery Rate

Recovery rate refers to the amount that would be recovered in the event of a counterparty defaulting. It is the ultimate recovery rate, or the value creditors realize at the default event resolution. For issuers filing for bankruptcy, the ultimate recovery is the present value of cash/securities that creditors receive at the issuer's bankruptcy exit. The bankruptcy exit may take one to two years following the issuer's default. Common recovery rates are assumed to be a percentage of the notional amount (the exposure). This is in line with the legal right of all creditors to receive a proportion of what they are owed. Recovery rates are sometimes expressed via Loss Given Default (LGD), which is simply

one minus the recovery rate (in percentage terms). For example, a low recovery rate of 20 % implies a high loss given default of 80 %.

- Recovery rates tend to be negatively correlated with default rates.
- Recovery rates usually depend on the:
 - total amount of assets available;
 - asset quality;
 - security package;
 - seniority of the position/priority of claim.

All things being equal, the better quality and more assets available and the stronger and more senior the priority of claim, the higher the recovery rate.

Table 1 shows Moody’s average corporate debt recovery rates measured by ultimate recoveries, 1987–2014 for North American non-financial companies.

Table 2 shows Moody’s average corporate debt recovery rates measured by post-default trading prices. Overall, both tables show evidence that recovery rates are correlated with the priority of claims in the capital structure. The higher priority of claim has a higher average recovery rate. An exception is that of the senior subordinated bonds’ recovery rate of 46.9 % versus the senior unsecured bonds’ recovery rate of 43.3 %. However the senior subordinated average is based on only four defaults. Overall, Table 2 shows that 2014’s recoveries are higher compared to the long-term average.

Table 3 shows that the lowest sovereign recovery rates were Greece’s two defaults in 2012 and Cyprus’s default in 2013. The average sovereign

Table 1 Moody’s average corporate debt recovery rates measured by ultimate recoveries, 1987–2014

Lien position	Emergence year (%)			Default year (%)		
	2014	2013	1987–2014	2014	2013	1987–2014
Loans ^a	81.0	76.7	80.2	68.4	76.6	80.2
Senior secured bonds ^b	57.1	84.2	63.0	59.4	56.9	63.0
Senior unsecured bonds ^c	44.6	61.3	48.8	0.0	34.4	48.8
Subordinated bonds	0.0	21.0	28.2	0.0	21.0	28.2

Source: Moody’s Investor Service

^a2014 loans’ recovery rate is based on seven observations (by year of default) and 14 observations (by year of emergence)

^bUnusually high recoveries of 2013 senior secured bonds stem from a small sample of 17 observations, which were a part of only seven defaults (by year of emergence), with debt instruments from American Airlines bankruptcy skewing the average recovery rate toward the higher side

^cAverage recovery rate of senior unsecured bonds which emerged in 2013 is impacted by a high proportion of American Airlines senior unsecured bonds (53 % of the entire sample), that recovered fully upon emergence from bankruptcy

Table 2 Moody's average corporate debt recovery rates measured by post-default trading prices

Lien position	Issuer-weighted (%)			Volume-weighted (%)		
	2014	2013	1982–2014	2014	2013	1982–2014
1st lien bank loan	78.4	75.1	66.6	80.6	67.7	62.5
2nd lien bank loan ^a	10.5	78.7	31.8	10.5	69.2	28.5
Sr. unsecured bank loan	n.a.	n.a.	47.1	n.a.	n.a.	40.2
Sr. secured bond	59.5	59.8	52.8	76.5	59.5	52.4
Sr. unsecured bond	43.3	43.8	37.4	34.3	29.2	33.6
Sr. subordinated bond ^a	46.9	20.7	31.1	28.3	26.6	26.0
Subordinated bond ^b	38.8	26.4	31.4	38.0	33.7	26.3
Jr. subordinated bond	n.a.	n.a.	24.7	n.a.	n.a.	17.1

Source: Moody's Investor Service

^aThe average recovery rates for 2014's and 2013's second lien bank loans and senior subordinated bonds were each based on fewer than five defaults

^bThe average recovery rates for 2014's subordinated bonds was based on fewer than five defaults

Table 3 Moody's recovery rates on defaulted sovereign bond issuers

Year of default	Defaulting country	Average trading price ^a (% of PAR)	PV ratio of cash flows ^b (ratio in %)
1998	Russia	18	50
1999	Pakistan	52	65
1999	Ecuador	44	60
2000	Ukraine	69	60
2000	Ivory Coast ^c	18	NA
2001	Argentina	27	30
2002	Moldova	60	95
2003	Uruguay	66	85
2003	Nicaragua	NA	50
2004	Grenada ^c	65	NA
2005	Dominican Republic	95	95
2006	Belize	76	NA
2008	Seychelles ^c	30	NA
2008	Ecuador	28	NA
2010	Jamaica	90	80
2012	Greece	24	29
2012	Greece	37	40
2012	Belize	40	65
2013	Cyprus	NA	53
2013	Jamaica	NA	89
2014	Argentina	68	NA
Issuer-weighted recovery rates		50	63
Value-weighted recovery rates		29	43

Source: Moody's Investor Service

^a30-day post-default price or distressed exchange trading price

^bRatio of the present value of cash flows received as a result of the distressed exchange versus those initially promised, discounted using yield to maturity immediately prior to default (Source: Bank of England (2005) and Moody's)

^cNot rated by Moody's at the time of default. Pricing information is not available for three other recent unrated sovereign defaults on local currency bonds—Turkey 1999, Dominica 2003 and Cameroon 2004

issuer-weighted recovery rate during 1983–2014 has been 50 % whereas the value-weighted one was 29 %, mainly due to the large Argentinean, Russian and Greek defaults of low recovery rates.

Any material differences in the estimates of recovery rates between these two approaches have to do, in some cases, with the recovery estimate timing. In Russia's case, the default was recorded when the payment was missed, whereas the distressed exchange was announced more than a year later, when the yield on the existing bonds was used to estimate the NPV reduction.

In other cases the difference may arise due to the fact that the present value method assumes a flat yield curve/constant discount rate, whereas the trading price method at default may reflect different expectations.

Credit VAR and Economic Capital

Credit Metrics: Credit Migration Approach

Credit Risk Plus: Actuarial Approach

Financial institutions, such as commercial and investment banks, hold capital as a cushion against losses stemming from adverse market, credit, liquidity, operational and any other business risk events. If there is sufficient capital held this will absorb any losses and will prevent the financial institution from insolvency. The total economic capital for a bank is the sum of the economic capital for market, credit and operational risk, allowing in most cases certain less than perfect correlations between these risks. Financial institutions can estimate their economic capital any way that best suits their purposes, it is the regulatory capital requirements that they need to comply with. Credit VAR assists in estimating the amount of credit risk economic capital needed under certain confidence interval, say 99.9 %, for an assumed time horizon (e.g. one year). Credit VAR is similar to market VAR and can be defined as the credit risk loss over a predefined time period that will not be exceeded with a given confidence level. To establish the appropriate level of capital to cover unexpected losses one first has to establish an adequate confidence level. From one point of view, it is safe to assume confidence levels close to or at 100 %. In practice, however, this is not possible since loss distributions are never perfectly identified and the level of capital required would be way too high and subsequently at a high cost. If, for example, a financial institution rated AA/Aa has a one year DP of 0.03 %, this may suggest that the confidence interval should be at least

99.97 % for it to maintain the AA/Aa rating. The time horizon assumed for credit VAR is longer than that for market risk VAR. Market risk VAR is often estimated as a one-day time horizon and scaled up to 10 days. The confidence intervals and time horizon assumed to estimate the credit risk regulatory capital is set by the regulator.

Credit VAR for instruments not held for trading can be estimated within a one-year period at a certain confidence interval (say at 99.9 %). For trading instruments calculate both a 10-day 99 % and a one-year 99.9 % credit VAR with a constant level of risk assumption.

Apart from making assumptions with regard to the confidence interval and the time horizon one needs to decide how to “estimate the losses”. There are two main approaches to compute the Credit VAR and this has to do with how one defines how losses should be estimated. One approach, called the Default Model (DM) approach, considers losses only arising from default of the obligor. It is more likely for a firm to adopt this view when it feels that there is not really a secondary market for its exposures or it is a very illiquid one, and as a result it intends to hold its credit risk positions until maturity. Effectively, under the DM approach, it is assumed that even though the creditworthiness of the obligor may deteriorate, this is not taken into account if it is expected that the obligor will pay. There are only two states, the obligor does not default or defaults; there is no migration in the creditworthiness of the obligor taken into account. The DM approach is common for firms with specific exposures like trade receivables, leases or loans. The model developed by Credit Swiss First Boston (CSFP) called Credit Risk Plus is a DM.

Simulation is the common technique used to estimate the Credit VAR. The assumption of normal distribution in the portfolio value changes may be reasonable for assessing market risk. However, it is not suitable to the nature of credit returns as they are highly skewed with fat tails. Thus unlike market VAR, for Credit VAR the percentile levels of the distribution cannot be estimated from the mean and variance only. Credit VAR requires simulation of the full distribution of the changes in portfolio value.

Under the DM approach, Credit VAR can be estimated with a Monte Carlo simulation as follows: first, sample a default rate and estimate the DP for each counterparty. Second, sample the number of defaults for each counterparty bucket. Third, sample the exposure at default for each default and subsequently sample the loss given default for each default. Finally, estimate the total loss from the defaults. Repeat the same exercise many times

(say 10,000 times) in order to build a distribution for the total loss. Then estimate the required credit VAR.

A different view to the DM is the Mark-To-Market (MTM) model approach that takes into account the impact of changes in the obligor's creditworthiness, rating upgrades and downgrades, and hence credit spread changes on exposures as well as the impact of default. Credit Metrics is a MTM model. The MTM approach allows an upside and a downside for the exposure, say a loan. In contrast, the DM approach caps the upside of the value of the loan to its book or face value. The DM approach does not take into account credit rating migration. At any point in time two possibilities are allowed: default and non-default.

If economic capital is estimated with the DM approach it is based on actuarial approaches found in the property insurance literature and related to the book value accounting concept; whereas if estimated with the MTM approach it is related to the market value accounting concept. The main advantage of the DM approach and Credit Risk Plus is the minimal data requirements: for example, no data on credit spreads are required, just mean loss rates and severities. The main limitation is that it only takes into account loss rates and ignores, for example for a loan, the loan value changes.

The difference of both Credit Metrics and Credit Risk Plus in relation to Moody's KMV is that both Credit Metrics and Credit Risk Plus rely on historical default frequencies provided by the rating agencies, whereas Moody's KMV determines its own EDFs.

In order to estimate the credit VAR we need to estimate a credit loss distribution. Under the MTM model we need (1) a default probability or credit rating for each exposure, (2) the probability that the rating will change over the next year (the rating transition matrix), (3) recovery rates, (4) credit spreads and yields in the bond (or loan) market and (5) default correlations.

The credit VAR with MTM approach can be estimated via a Monte Carlo simulation of rating transitions or instruments in the portfolio over a one-year period. Each exposure has a rating and on each simulation trial from the credit transition matrix provides the final rating. Similarly, the credit spread changes are estimated and exposures are revalued at the end of the year to assess the total credit loss. The simulation trials build the loss distribution. The required credit VAR can then be computed.

The Credit Metrics approach can be used to carry out the Credit VAR for the trading book. For trading instruments a 10-day 99 % is common. This involves estimating a rating transition matrix for 10 days. Historical data on

credit rating changes define a probability distribution for the credit spread changes within each rating category at the end of 10 days. On each trial of the Monte Carlo simulation one samples a transition matrix and a probability distribution of credit spread changes that provides the credit spread at the end of 10 days for each rating bucket. Following this the portfolio value is estimated at each trial and the VAR computed.

Expected Losses (EL) are given by the mean of the distribution, and Unexpected Losses (UL) are estimated by the chosen percentile cut off of losses. The Credit VaR can be defined as the difference of the percentile from the mean, or the percentile itself. However economic capital is determined by the difference of the unexpected loss (the percentile) and the expected loss (the mean). The reason for this is that the financial institution has already provisioned the “expected loss”. If the mean expected loss on a portfolio of £100 million is 10 % and the 99.9 % percentile cut off is represented by £40 million, then the economic capital is $£40 - £10 = £30$ million. For 10,000 loss scenarios generated, the loss amount when ordered from highest to lowest at the 95 % confidence level is the 500th highest, at 99 % the 100th highest and at the 99.9 % the 10th highest.

Credit Exposure

Credit exposure represents the potential maximum amount that can be lost for most products with the exception of derivative products. For a bond, credit exposure during the life of the bond may vary if the bond market value changes, but it will be close to the principal or notional value, and at maturity it is the principal value. For traditional lending products such as receivables, financial letters of credit etc. the maximum credit exposure will be very close to the notional amount. For these products, we can define credit exposure as the asset replacement value if positive on the target date, which is its market price. For derivatives the exposure can be significantly less or much more, — due to leverage, than the notional amount. Therefore, since for derivatives the notional amount is not representative of the potential loss that can be materialized upon counterparty default, the credit exposure is adjusted to include an add-on factor that captures the potential exposure. This add-on factor for derivatives accounts for the time horizon of the exposure and the volatility of the asset class. Furthermore, effective and legally binding netting and collateral arrangements can be taken into account in order to reduce the credit exposure.

Basel I

Basel I, the 1988 Basel Accord, represents the first internationally agreed standards for setting capital requirements for banks. Basel I raised capital ratios and harmonized minimum capital ratio requirements in major jurisdictions internationally. Basel I defined the amount of capital held to protect against losses should be dependent on the inherent riskiness of the asset. Basel I set 8.00 % as being the minimum level of capital against all the Risk Weighted Assets (RWA). Basel I initially referred to credit risk.

Capital, defined by the Cooke ratio, is broader than equity capital.

Tier 1 or core capital includes common shareholder's equity, non-cumulative perpetual preferred stock and minority equity interests in consolidated subsidiaries minus goodwill and other deductions.

Tier 2 or supplementary capital have features of both equity and debt and include hybrid capital instruments such as cumulative perpetual preferred shares and instruments of limited life, such as subordinated debt, with an original maturity of at least five years.

In Basel I, Tier 1 and Tier 2 capital should be at least 8.00 % of the RWA and at least 50 % should be in the form of Tier 1 capital in order to protect banks against credit risk.

In 1996 there was an amendment to incorporate market risk. This was implemented in 1998. Although this amendment is now superseded by the more recent Basel requirements, banks with that amendment at the time could have used Tier 3 capital to cover market risk in the trading book.

Tier 3 or sub-supplementary capital included short-term subordinated debt (unsecured and fully paid up) with an original maturity of at least two years and with lock up clauses preventing the issuer from repayment prior to debt maturity or even at maturity if the capital ratio were to fall after debt repayment.

The 1996 market risk amendment allowed the more sophisticated banks to use their VAR model to estimate the regulatory capital for market risk in the trading book. However the bank was allowed to use an internal VAR model to calculate the regulatory capital in relation to market risk provided that it had a solid risk management system and policy in place, and a sound risk management department that is independent of the business generating unit. In addition, the person in charge of the risk management department (i.e. head or risk officer) should report to a senior executive of the bank.

Furthermore, the amendment set concentration limits. Risks greater than 10.00 % of the capital base had to be reported and banks were not allowed to have positions exceeding 25.00 % of their capital.

Basel II and Basel 2.5

Basel II, issued in 2004, kept the definition of capital as defined in Basel I and the minimum requirement of 8.00 % and made the following main changes. It extended the risk estimation to include operational risk.

$$\text{Capital Ratio}_{\text{min requirement} \leq 8.00\%} = \frac{\text{Total Regulatory Capital}}{\text{RWA}}$$

Under Basel II, RWA are the assets that are subject to credit, market and operational risk. The total regulatory capital is the sum of Tier 1 and Tier 2 capital, and Tier 2 capital cannot exceed 50.00 % of the total regulatory capital.

Basel II further set out an improved standardized approach known as the Standardized Approach and two more sophisticated approaches based on banks' internal models. These are known as the Foundation Internal Ratings Approach and the Advanced Internal Ratings Approach, for the estimation of credit risk, discussed in this chapter.

Basel 2.5, which enhances the Basel II market risk framework, creates additional capital charges for banks. Basel 2.5 was an initial emergency response to the 2007 financial crisis and showed that many banks made huge losses that their VAR models had not captured. The main purpose of Basel 2.5 was to incorporate in the calculation of the market risk capital requirement, stressed VAR and an incremental capital charge to cover losses arising from credit migration and loss of liquidity. It also tightens the capital ratios for securitization tranches.

The revised framework introduces a *stressed VaR capital requirement* based on a continuous 12-month period of significant financial stress and the application of an incremental risk capital charge to measure specific or idiosyncratic risk in credit sensitive positions when using VAR.

Basel 2.5 requires that each bank must meet on a daily basis the following capital requirement:

$$\text{Capital Requirement}_{\text{Daily}} = \max\{VAR, K \times (\text{Average VAR over 60 days})\} + \max\{\text{Stress VAR}, K \times (\text{Average Stress VAR over 60 days})\} + IRC$$

where

$$k \geq 3$$

VAR: 99 % confidence level VAR over a 10-day period.

Stress VAR: VAR estimation based on data reflecting a stressful period, for example 2007–09.

IRC: Incremental Risk Charge, is a Credit VAR estimated over a one-year period at 99.9 % confidence and should incorporate default and credit migration risk and be calibrated to the bank's own historical loss experience.

Basel 2.5, as it was an emergency response to the under-capitalization of banks' trading books during the 2007 financial crisis, has several shortcomings. The main criticism is that it is over-conservative; in some cases the amount of capital for the trading book may actually exceed the face value of the position!

Basel I regulation formed the basis of prudential supervision of risks, and the Basel II regulation further extended the approach, whereas Basel III regulation focused mainly on addressing the challenges resulting from the 2007 crisis, such as insufficient capital, excessive leverage and systematic risk.

Basel III

Basel III consists of reforms to Basel II in a more fundamental response to the 2007 financial crisis. One of the Basel III objectives is to capture major on and off balance sheet risks, as well as derivative related exposures, as these were factors that amplified the 2007 financial crisis.

Basel III, which became European law on 16 April 2013, has changed the principles underlying the regulatory requirements for Counterparty Credit Risk (CCR), discussed in this chapter. As a result the regulatory framework under Basel II has been broadened with new rules and constraints. These capital requirements refer to the Over The Counter (OTC) and Securities Financing Transactions (SFTs) such as asset loans and repo, and reverse repo agreements, with exposures implied by the potential one-year horizon counterparty default. This risk takes into account the immediate counterparty replacement cost and the risk of its potential future exposure variation, incorporating the mark-to-market volatility.

Basel III main reforms also increase the amount and the quality of capital and attempt to improve a bank's funding and liquidity.

Basel III, to a certain extent is still a work in progress, as Table 4 shows.

Table 4 Basel III Phase-in arrangements (bold figures indicate transition periods—all dates are as of 1 January)

	2013	2014	2015	2016	2017	2018	As of 1 January 2019
Leverage Ratio	Parallel run 1 Jan. 2013–1 Jan. 2017 Disclosure starts 1 Jan. 2015					Migration Pillar 1	
Minimum Common Equity Capital Ratio (%)	3.5	4.0	4.5	4.5	4.5	4.5	4.5
Capital Conservation Buffer (%)				0.625	1.25	1.875	2.50
Minimum common equity plus capital conservation buffer (%)	3.5	4.0	4.5	5.125	5.75	6.375	7.0
Phase-in of deductions from CET1 (including amounts exceeding the limit for DTAs, MSRs and financials) (%)		20	40	60	80	100	100
Minimum Tier 1 Capital (%)	4.5	5.5	6.0	6.0	6.0	6.0	6.0
Minimum Total Capital (%)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Total Capital plus conservation buffer (%)	8.0	8.0	8.0	8.625	9.25	9.875	10.5
Capital instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital (%)	Phased out over 10-year horizon beginning 2013						
Liquidity coverage ratio (%)			60	70	80	90	100
Net stable funding ratio						Min. standard	

Source: Bank for International Settlements

Under Basel III, there is a stricter definition of capital. Total regulatory capital will consist of the sum of the following:

1. Tier 1 capital (going-concern capital)
 - (a) Common Equity Tier 1
 - (b) Additional Tier 1

2. Tier 2 capital (gone-concern capital, following insolvency and upon liquidation)

Table 4 shows that Common Equity Tier 1 must be at least 4.5 % of risk-weighted assets at all times. Tier 1 capital must be at least 6.0 % of risk-weighted assets at all times. Total capital (Tier 1 capital plus Tier 2 capital) must be at least 8.0 % of risk-weighted assets at all times.

The 2007 crisis showed that only common equity including retained earnings provided loss absorption. Shareholders suffered losses because the share prices of banks fell. However, hybrid instrument investors hardly suffered any losses since banks continued to make debt service payments so as not to be shut out of the market. As a result of this *Hybrid Tier 1 capital* (previously limited to 15 % of Tier 1 capital) in the Basel III capital definition will be *phased-out* over a 10-year horizon that started in 2013. Tier 1 capital must consist of common shares and retained earnings. The remaining Tier 1 capital base must be comprised of instruments that are subordinated, have fully discretionary non-cumulative dividends or coupons, and have neither a maturity date nor an incentive to redeem. In addition, Tier 2 capital instruments will be harmonized. Tier 2 capital consists of instruments such as subordinated debt and contingent convertible capital. Tier 3 capital, previously only available to cover market risks, is eliminated.

Basel III introduces new measures to manage liquidity risk. During the 2007 financial crisis many banks, although they had sufficient capital levels, got into trouble because of lack of liquidity. The recent crisis showed how important liquidity is in financial markets. Especially after the collapse of Lehman Brothers liquidity dried up. Funding was in very short supply for a very long time. Nobody trusted anybody and ultimately central banks had to intervene and assume the role of money market maker in providing liquidity.

Liquidity Coverage Ratio (LCR)

The Basel III Committee's first objective in relation to the liquidity coverage ratio was to ensure the short-term resilience of a bank's liquidity risk profile. The Committee developed the Liquidity Coverage Ratio (LCR) for this objective.

The LCR ensures that banks maintain sufficient unencumbered High-Quality Liquid Assets (HQLA) that can be turned into cash to meet liquidity needs for a 30-calendar day liquidity stress scenario determined by supervisors. The LCR aims to strengthen a bank's ability to absorb shocks from financial crisis and further reduce spill-over effects to the economy. The LCR

minimum requirement is set at 60 % and rises in equal annual steps to reach 100 % on 1 January 2019. The reason for this is that the new liquidity standards will affect the profitability of banks. In order to mitigate this, the Basel Committee in January 2013 revised the LCR by expanding the range of assets classified as high-quality assets, for example by allowing banks to use equities, corporate debt and mortgage backed securities.

$$LCR = \frac{\text{Stock of HQLA}}{\text{Total Net Cash Outflows Over the Next 30 Calendar Days}} \geq 100.00\%$$

HQLA are comprised of Level 1 and Level 2 assets. Level 1 assets include cash, central bank reserves, and certain marketable securities backed by sovereigns and central banks, among others. These are of the highest quality and the most liquid assets. Level 2 assets consist of Level 2A and Level 2B assets. Level 2A assets can include certain government securities, covered bonds and corporate debt securities. Level 2B assets include lower-rated corporate bonds, residential mortgage backed securities and equities that meet certain conditions. Level 2 assets may not in aggregate account for more than 40 % of a bank's stock of HQLA. Level 2B assets may not account for more than 15 % of a bank's total stock of HQLA. There is no limit on Level 1 assets.

The total net cash outflow is the total expected cash outflow, minus total expected cash inflow for the subsequent 30 calendar days. Total expected cash outflows are calculated by multiplying the outstanding balances of various categories or types of liabilities and off balance sheet commitments at the rates at which they are expected to run off or be drawn down. Total expected cash inflows are calculated by multiplying the outstanding balances of various categories of contractual receivables by the rates at which they are expected to flow in. Total cash inflows are subject to an aggregate cap of 75 % of total expected cash outflows, thereby ensuring a minimum level of HQLA holdings at all times.

The stress scenario for the LCR comprises a combination of bank specific and market wide shocks that results in:

- the run-off of a proportion of retail deposits;
- a partial loss of unsecured wholesale funding capacity;
- a partial loss of secured, short-term financing with certain collateral and counterparties;
- additional contractual outflows arising from a downgrade of the bank's credit rating of up to three notches, including collateral posting requirements;

- increases in market volatilities affecting the quality of collateral or potential future exposure of derivative positions;
- unscheduled drawdowns on committed but unused credit and liquidity facilities; and
- the potential need for the bank to buy back debt or honour non-contractual obligations in the interest of mitigating reputational risk.

Net Stable Funding Ratio (NSFR)

The second objective is to promote resilience over a longer one-year period by developing the Net Stable Funding Ratio (NSFR).

Banks, other than leverage, may also have incentives to expand their balance sheets, often very fast, by relying on comparatively cheap and abundant short-term wholesale funding. Nevertheless, fast balance sheet growth can weaken the ability of banks to respond to liquidity and possibly solvency shocks. This can have systemic implications. The 2007 financial crisis showed that under rapid reversal in market conditions how quickly liquidity can dry up and furthermore how long it can take to come back!

The NSFR limits over-reliance on short-term wholesale funding, promotes better assessment of funding risk across all on and off balance sheet items, and encourages funding stability. The NSFR addresses liquidity mismatches and provides a more sustainable maturity structure of assets and liabilities. A more sustainable funding structure should reduce disruptions to a bank's regular sources of funding that could otherwise erode its liquidity position in a manner that would increase the risk of its failure and furthermore lead to systemic stress.

The NSFR is defined as the amount of available stable funding relative to the amount of required stable funding. This ratio should be equal to at least 100 % on an ongoing basis.

$$NSFR = \frac{\text{Available Stable Funding}}{\text{Required Stable Funding}} \geq 100.00\%$$

Available Stable Funding (ASF) is defined as the portion of capital and liabilities expected to be reliable over the time horizon considered by the NSFR, which extends to one year. The amount of Stable Funding Required (SFR) is a function of the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its Off Balance Sheet (OBS) exposures.

The NSFR is scheduled to be re-examined by the Basel Committee prior to its application in 2018. The NSFR will disadvantage European banks relative to US banks. In the USA most corporations use the capital markets for long-term financing and the banks have been disintermediated for some time. In Europe most corporations still rely on bank funding and European banks are involved in maturity intermediation much more than their US counterparties. In order to meet the NSFR, European banks will have to close this gap which may translate into higher funding costs for them and force them to reduce the maturity and size of loans they offer.

Leverage Ratio (LR)

The 2007 financial crisis showed that in many cases banks had strong capital ratios but still were allowed to build up excessive on and off balance sheet leverage. During the most severe part of the crisis banks were forced by the market to de-leverage in a way that put downward pressure on asset prices, increased losses, declined bank capital and caused a further contraction in credit availability.

The Basel Committee, as a result, designed a non-risk-based leverage ratio that is calibrated to act as a credible supplementary measure to the risk-based capital requirements and constrain the build-up of banks' leverage.

This ratio basically requires banks to hold a minimum ratio of bank's Tier 1 capital as a percentage of its assets plus the bank's off balance sheet and derivatives exposures without any reference to risk weights.

$$\text{Leverage Ratio} = \frac{\text{Tier 1 Capital}}{\text{Exposure}} \geq 3.00\%$$

The committee will test a minimum Tier 1 leverage ratio of 3.00 % during the parallel run period from 1 January 2013 to 1 January 2017. Banks need to disclose their LR in January 2015. The Committee will monitor these results during the parallel run period and any final adjustments to the definition and calibration of the LR will be carried out in the first half of 2017, with a view to migrating to a Pillar 1 treatment on 1 January 2018.

The capital for the LR is based on the new definition of Tier 1 capital (Basel III). Items that are deducted completely from capital do not contribute to leverage, and for consistency should be deducted from the measure of exposure.

The exposure estimation for the LR should take into account the following general guidelines:

- on balance sheet, non-derivative exposures are net of specific provisions and valuation adjustments, for example any credit valuation adjustments;
- physical or financial collateral, guarantees or credit risk mitigation purchased is not allowed to reduce onbalance sheet exposures; and
- netting of loans and deposits is not allowed.

For derivatives the accounting measure of exposure plus an add-on for potential future exposure calculated according to the Current Exposure Method should be used (see Basel II). This ensures that all derivatives are consistently converted to a “loan equivalent” amount and consistent with the regulatory netting rules based on Basel II.

Capital Conservation Buffer and Countercyclical Buffer

The *Capital Conservation Buffer (CCB)* is designed to ensure that banks build up capital buffers outside periods of stress that can be drawn down as losses are incurred. CCB is designed to avoid breaches of minimum capital requirements. Outside of periods of stress, banks should hold buffers of capital above the regulatory minimum. The Basel III guidelines on buffers state that if these have been drawn down, banks should look to rebuild them through reducing distributions of earnings, such as dividend payments, share buy-backs and staff bonus payments. Banks may raise new capital from the private sector.

A CCB of 2.5 %, comprised of Common Equity Tier 1, is established above the regulatory minimum capital requirement. CCB begins at 0.625 % of RWAs on 1 January 2016 and increases each subsequent year by an additional 0.625 percentage points, to reach its final level of 2.5 % of RWAs on 1 January 2019. However for countries that experience excessive credit growth, national authorities have the discretion to impose shorter transition periods accelerating the build-up of the CCB and the countercyclical buffer. Banks that already meet the minimum ratio requirement during the transition period but remain below the 7 % Common Equity Tier 1 target (minimum plus conservation buffer) should maintain prudent earning retention policies with a view to meeting the CCB as soon as reasonably possible.

Table 5 shows the minimum capital conservation ratios a bank must meet at various levels of the Common Equity Tier 1 (CET1) capital ratios. For example, a bank with a CET1 capital ratio in the range of 5.125 % to 5.75 %

Table 5 Individual bank minimum capital conservation standards

Common Equity Tier 1 ratio (%)	Minimum capital conservation ratios (as a % of earnings)
4.5–5.125	100
>5.125–5.75	80
>5.75–6.375	60
>6.375–7.0	40
>7.0	0

Source: Bank for International Settlements

is required to conserve 80 % of its earnings in the subsequent financial year (i.e. pay out no more than 20 % in terms of dividends, share buy-backs and discretionary bonus payments). However, if the bank wants to make payments in excess of the constraints imposed it can raise capital in the private sector equal to the amount above the constraint it wishes to distribute and this would have to be discussed with the bank's supervisor.

In addition to the CCB, Basel III introduces the *countercyclical buffer* to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate. If the local regulator judges a period of excess credit growth to be leading to the build-up of system-wide risk, a counter-cyclical buffer requirement can be put in place. This will vary from 0.00 % to 2.50 % of risk weighted assets.

Credit Risk Approaches under Basel II

There are two general approaches to assess credit risk under Basel II, that still underpin Basel III.

(1) The Standardized Approach (SA)

The Standardized Approach (SA) has the same concept as in Basel I with the difference that it is designed to have more sensitivity to risk. Under the SA, the bank allocates a risk weight to each of its assets and off balance sheet positions to calculate the total RWA. Under the SA, banks assess the risk of their exposures using external ratings. All non-retail exposures are allocated to risk buckets and every bucket is then assigned a capital charge based on Basel Committee on Banking Supervision (BCBS) (2006) tables. Risk weights depend on the type of borrower, sovereign, bank, corporate and on

the ratings provided by rating agencies. The risk weight varies from 0.00 % for AAA/Aaa rated sovereigns to 150.00 % for entities (sovereigns, banks, corporates) rated below BB–/Ba3. Although the SA clearly is improved compared to Basel I, there are still significant shortcomings, for example, there is insufficient differentiation among risk buckets. An example of this is the fact that the same risk weight of 100.00 % is allocated to both an investment grade corporate (BBB+/Baa1) and a non-investment grade one (BB–/Ba3). Then the risk weight increases to 150.00 % for corporates rated below BB–/Ba3, but for completely unrated entities is at 100.00 %, the same as the investment grade! This clearly does not account for the riskiness in different positions between investment grade, non-investment grade and unrated corporates. The same shortcoming applies to other types of borrowers such as sovereigns and banks. For example, a risk weight for a below BB–/Ba3 sovereign is 150.00 % while for an unrated one it is 100.00 %. Similarly for a BB–/Ba3 bank it is 150.00 %, while for an unrated one it is 50.00 %. The SA approach probably assigns too much capital for the better quality credits whereas it assigns insufficient capital to the lower credit ones. A caveat to this is that an unrated entity may not always be of low credit quality, but in most cases this is the case.

The Capital Requirement (CR) under the SA approach can be summarized as:

$$CR_{SA} = Exposure \times Risk Weight \{0, 20, 50, 100, 150\} \times 8\%$$

where $RWA = Exposure \times Risk Weight \{0, 20, 50, 100, 150\}$

Therefore $CR_{SA} = RWA \times 8\%$ or $RWA = \frac{CR_{SA}}{8\%} \Rightarrow RWA = CR_{SA} \times 12.5$

where RWA are the Risk Weighted Assets.

Under the SA approach all inputs are defined by the regulator.

(2) Internal Ratings-Based (IRB) Approach

The IRB approach has a foundation version and an advanced one.

Under the Foundation IRB (F-IRB), as a general rule banks use the model to estimate only the DP and rely on supervisory estimates for other risk components: **Exposure at Default (EAD)**, **Loss Given Default (LGD)**, and **effective Maturity (M)**.

Under the Advanced IRB (A-IRB) banks use their own models to estimate the DP, EAD, LGD and M subject to meeting minimum regulatory standards.

Under the IRB approach the regulator sets the Risk-Weighted Asset (RWA) amount as the product of K , 12.5 and the EAD.

$$RWA = CR_{IRB} \times 12.5 \times EAD$$

where CR_{IRB} is the regulatory capital requirement under the advanced approach. CR_{IRB} depends on the PD, LGD and M and incorporates asset correlation parameters. $CR_{IRB} \leq CR_{SA}$.

The Advanced IRB (A-IRB) approach provides banks with the opportunity to measure risk consistently across products and business units and to set and monitor limits. They can also adjust their risk appetite expressed through these limits in the continuously changing market place. A more consistent and appropriately modelling approach in relation to a bank's exposures can result in: the detection of deteriorating positions; an opportunity to better diversify; a better price on a risk adjusted basis; an improvement in overall credit risk assessment and management; and a reduction in operational risk from better measurement systems and controls.

Exposure at Default for Counterparty Credit Risk

Prior to the Basel's Committee's introduction of the Standardized Approach for Counterparty Credit Risk (SA-CCR) there were three approaches to estimate the Exposure at Default (EAD) for CCR. The Current Exposure Method (CEM), the Standardized Method (SM), both referred to as non-internal methods, and the Internal Models Method (IMM). The Basel Committee introduced this new standardized approach (SA-CCR) which is envisaged to replace both the CEM and the SM in the capital adequacy framework. This is scheduled for 1 January 2017. However the SA-CCR method draws on elements of each of the CEM, SM and IMM.

1. *The Current Exposure Method (CEM)* is simple to implement and has limited data requirements, such as nominal value, maturity, mark-to-market, netting node and collateral levels.
2. *The Standardized Method (SM)* is an approach that banks follow if they do not use internal models to assess regulatory credit risk, but want to model netting more effectively than the CEM. SM can be used until another method (SA-CCR) takes effect, which is scheduled for 1 January 2017.

The Basel Committee introduced the SA-CCR on 31 March 2014: this will replace both the CEM and the SM in the capital adequacy framework. Furthermore, the IMM shortcut method is planned to be eliminated from the framework once the SA-CCR takes effect, which is scheduled for 1 January 2017. Due to the fact that there is a transition period and the SA-CCR is scheduled for 1 January 2017 and that it retains the same general structure as that used in the CEM, consisting of two key regulatory components—replacement cost and potential future exposure—all methods are discussed.

Under the SA-CCR, an alpha factor is applied to the sum of these components in arriving at the exposure at default (EAD). The EAD is multiplied by the risk weight of a given counterparty in accordance with either the Standardized or Internal Ratings-Based approaches for credit risk to calculate the corresponding capital requirements.

3. *The Internal Models Method (IMM)* where banks rely on their internal estimates of DP, LGD or RR, EAD and effective maturity.

The IMM is the most advanced model and thus assesses CCR more realistically without having to make conservative assumptions like the SD and CEM. As a result IMM estimates are more precise, more dynamic and closer to the economic reality of the exposures.

The CEM and SM approach are adopted by banks that do not use the internal model to model counterparty credit exposures.

(1) Current Exposure Method

$$\text{EAD} = \max [0, ((\text{CE} + \text{add on}) - \text{volatility adjusted collateral})]$$

Current Exposure (CE) is also called replacement cost and is the market value of a transaction or portfolio of transactions within a netting set of counterparty default, assuming no recovery.

The volatility adjusted collateral aims to reduce the CE by the current market value of the counterparty collateral, which is subject to a haircut.

The current exposure method is to be applied to OTC derivatives only. SFTs are subject to the treatments set out under IMM.

Under the CEM, banks must calculate the current replacement cost by marking contracts to market, and adding all the contracts with a positive value, thus capturing the current exposure, and then adding the add-on to reflect the potential future exposure over the remaining life of the contract.

Table 6 Add-on factors

	Interest rates (%)	FX and gold (%)	Equities (%)	Precious metals exc. gold (%)	Other commodities (%)
One year or less	0.00	1.00	6.0	7.0	10.0
More than one year to five years	0.50	5.00	8.0	7.0	12.0
More than five years	1.50	7.50	10.0	8.0	15.0

Source: Bank for International Settlements

The add-on is the estimated amount of potential future exposure over the remaining life of the contract, defined as the product of the notional principal amount of its book and the add-on factor. The add-on factor is determined based on the type of underlying instrument and remaining maturity.

Table 6 shows the add-on factors.

Forwards, swaps, purchased options and similar derivative contracts not covered by any of the columns of Table 6 are to be treated as “other commodities”.

However, no potential future credit exposure has to be estimated for single currency floating/floating interest rate swaps. The credit exposure on these products is based only on the basis of their mark-to-market value.

Under the CEM, transactions’ legally enforceable bilateral agreements can be netted (at the netting set level) to estimate the EAD. Basel II defines as a netting set a group of transactions with a single counterparty that are subject to a legally enforceable bilateral netting arrangement and for which netting is recognized for regulatory capital purposes. Each transaction that is not subject to a legally enforceable bilateral netting arrangement that is recognized for regulatory capital purposes is interpreted as its own netting set.

Credit exposure on bilaterally netted forward transactions is calculated as the sum of the net mark-to-market replacement cost, if positive, plus an add-on based on the notional underlying principal. The add-on for netted transactions (A_{Net}) will equal the weighted average of the gross add-on (A_{Gross}) and the gross add-on adjusted by the ratio of net current replacement cost to gross current replacement cost (NGR).

$$A_{Net} = 0.4 A_{Gross} + 0.6 NGR A_{Gross}$$

$$Add - on = (0.4 + 0.6 NGR) \sum_i Add - on_i$$

where NGR = level of net replacement cost/level of gross replacement cost for transactions subject to legally enforceable netting agreements.

NGR defines the current impact of netting in percentage terms; a NGR of zero implies perfect netting and a NGR of 100 % implies no netting benefit.

Under CEM only 60 % is given as credit for netting of future exposures, which is quite conservative and implies that the netting benefit will decrease over time whereas that may not be the case. It may just as well increase.

Under the CEM, although there is a netting benefit when the CE component is computed, the impact and benefit of netting is not as straightforward with regards to the potential future exposure captured by the add-on component as the mark-to-market of each transaction changes over time.

(2) Standardized Method

Banks that do not have the approval to apply the IMM for OTC transactions may use the SM. *The SD can be used only for OTC derivatives.* SM is an approach that banks follow if they do not use internal models to assess regulatory credit risk, but want to model netting more effectively than the CEM. Under the SD approach, EAD for derivatives can be calculated within a netting set as a combination of hedging sets, which are positions depending on the same risk factor. A hedging set is a portfolio of risk positions (depending on the same risk factor) from the transactions within a single netting set for which only their balance is relevant for determining the exposure amount or EAD under the CCR SD. Thus within each hedging set, offsets are taken into account but netting between hedging sets is not. The exposure amount for a counterparty is the sum of the exposure amounts or EADs calculated across the netting sets with the counterparty. SD allows for the use of delta-equivalent notional values for options and this is a notable difference compared with the CEM. The CEM adopts a transaction-by-transaction approach instead of considering the netting set as a portfolio. The SM, in contrast, allows for the netting of positions and positions such as short options (that would not contribute under the CEM) will offset some of the exposure risk.

The exposure amount under the standardized approach for credit risk or EAD has to be calculated separately for each netting set as follows:

$$\text{Exposure Amount or EAD} = \beta \max \left\{ CMV - CMC \sum_i \left| \frac{\sum_i PRT_{ij}}{-\sum_i PRC_{ij}} \right| \times CCF_j \right\}$$

where

CMV = current market value of the portfolio of transactions within the netting set with a counterparty gross of collateral

CMC = current market value of the collateral assigned to the netting set

i = index designating transaction

l = index designating collateral

j = index designating supervisory hedging sets. These hedging sets correspond to risk factors for each risk position of opposite sign

RPT_{ij} = risk position from transaction i with respect to hedging set j

RPC_{lj} = risk position from collateral l with respect to hedging set j

CCF_j = supervisory credit conversion factor with respect to the hedging set j , according to the type of risk position

β = supervisory scaling parameter, set at 1.4, which can be considered similar to the alpha factor

$RPT_{ij} - RPC_{lj}$ represents a net risk position within a hedging set j .

Credit Conversion Factors (CCFs) for financial instrument hedging sets other than debt instruments and for foreign exchange rates are given in Table 7.

The credit conversion factors for risk positions from debt instruments are as follows:

0.6 % for high risk positions.

0.3 % for risk position from a reference debt instrument that underlies a credit default swap and that is of low specific risk.

0.2 % otherwise.

Underlying instruments of OTC derivatives that are not in any of the categories above are assigned to separate individual hedging sets for each category of underlying instrument. A credit conversion factor of 10 % is applied to the notional equivalent amount.

Table 7 Credit conversion factors

Exchange rates	2.50%
Gold	5.0%
Equity	7.0%
Precious metals exc. gold	8.5%
Electric power	4.0%
Commodities exc. precious metals	10.0%

Source: Bank for International Settlements

(3) Internal Models Method (IMM)

Basel II allows for banks that have approval to estimate their exposures to CCR *using IMM* to include within a netting set SFTs, or both SFTs and OTC derivatives (i.e. allow netting across both SFTs and OTC derivatives) subject to a bilateral netting that satisfies the following criteria for a Cross-Product Netting Arrangement. The bank has executed written bilateral netting agreements such that it would either have a claim to receive or obligation to pay only the net sum of the positive and negative close-out values and mark-to-market values of any included individual transactions. In addition, the bank needs to obtain legal opinions stating that the bank's exposure would indeed be the net amount and that these arrangements are valid and enforceable. Furthermore, on an operational level the bank should integrate in its systems the different type of agreements between the International Swaps and Derivatives Association (ISDA) of OTC transactions and Global Master Securities Lending Agreement (GMSLA) of SFTs.

The IMM is the most sophisticated and the least conservative method as it models CCR more realistically. Unlike the CEM and SD, the EAD and maturity under the IMM are assessed from the distribution of the bank's future exposures using internal models that account for the real effective maturity and give credit to proper collateral and netting arrangements. The IMM approach allows for netting across all asset classes and cross products between OTC derivatives and SFTs.

Under the IMM, the internal model for measuring counterparty credit exposure specifies the forecasting distribution for changes in the market value of the netting set attributable to changes in market variables. As a next step the model then calculates the bank's CCR exposure for the netting set at each future date given the changes in the market variables. Eligible financial collateral in forecasting distributions for changes in the market value of the netting set can be incorporated provided the quantitative, legal and operational and data requirements are satisfied.

If a bank gets credit for collateral in the exposure amount or EAD through the current exposure, then the LGD is not permitted to include collateral (because it would be doubling the credit).

Under the IMM method, Expected Exposure (EE) or Peak Exposure (PE) estimates have to be calculated based on a distribution of exposures that accounts for non-normality of the distribution of exposures, such as fat tails. EE is the mean of the distribution of exposures at any particular future date up until the longest maturity date of transactions in the netting set. PE is a high percentile (such as 95 % or 99 %) of the distribution of exposures at

any particular future date up until the longest maturity date of transactions in the netting set. Effective Expected Exposure (EEE) at a specific date is the maximum EE that occurs at that date or any prior date. In effect, the EEE is the EE that is constrained to be non-decreasing over time. Expected Positive Exposure (EPE) is the weighted average over time of expected exposures where the weights are the proportion that an individual expected exposure represents of the entire time interval. When calculating the minimum capital requirement, the average is taken over the first year or, if all the contracts in the netting set mature before one year, over the time period of the longest-maturity contract in the netting set.

Under the IMM, exposure amount or EAD is the product of alpha times Effective EPE:

$$\text{EAD} = \alpha \times \text{Effective EPE}$$

Effective EPE is calculated by estimating Expected Exposure (EE_t) as the average exposure at future date t , where the average is taken across possible future values of relevant market risk factors, such as interest rates, foreign exchange rates etc. The internal model estimates EE at a series of future dates $t_1, t_2, t_3 \dots$. Effective EE is estimated as:

$$\text{Effective } EE_{t_k} = \max(\text{Effective } EE_{t_{k-1}}, EE_{t_k})$$

where the current date is denoted as t_0 and Effective EE_{t_0} equals current exposure.

Effective EPE is the average Effective EE during the first year of future exposure. If all contracts in the netting set mature before one year, EPE is the average of expected exposure until all contracts in the netting set mature. Effective EPE is computed as a weighted average of Effective EE:

$$\text{Effective EPE} = \sum_{k=1}^{\min(1 \text{ year, maturity})} \text{Effective } EE_{t_k} \times \Delta t_k$$

where the weights $\Delta t_k = t_k - t_{k-1}$ allow for the case when future exposure is calculated at dates that are not equally spaced over time.

The α multiplier accounts for the finite number of counterparties, correlations between exposures and general wrong way risk. Under IMM α is fixed at 1.4. However it is up to supervisors' discretion to require a higher alpha if the bank's CCR exposures are characterized by low granularity of counterparties,

extreme high exposures to general wrong-way risk and high correlation of market values across counterparties. Overall 1.4 may be conservative for large OTC dealers assuming insignificant wrong way risk. Therefore, subject to supervisory approval, banks under IMM have the option to estimate their own alpha subject to a floor of 1.2.

Alpha equals the ratio of economic capital from a full simulation of counterparty exposure across counterparties (numerator) and economic capital based on EPE (denominator). Qualifying banks must demonstrate that their internal estimates of alpha capture in the numerator the material sources of stochastic dependency of distributions of market values of transactions or of portfolios of transactions across counterparties (e.g. the correlation of defaults across counterparties and between market risk and default). In the denominator, EPE must be used as if it were a fixed outstanding loan amount.

Under Basel II, the effective remaining maturity in the case of simple instruments such as loans is defined as the weighted average maturity of the relevant transactions given by a simple duration formula without interest rate effects.

M is defined as the greater of one year and the remaining effective maturity in years as defined below. The one-year floor does not apply to certain short-term exposures, comprising fully or nearly-fully collateralized capital market-driven transactions (i.e. OTC derivative transactions and margin lending) and repo-style transactions (i.e. repos/reverse repos and securities lending/borrowing) with an original maturity of less than one year, where the documentation contains daily remarking clauses. In all cases, M is capped at five years. Effective maturity M is defined as:

$$\text{Effective Maturity } (M) = \frac{\sum_t t \times CF_t}{\sum_t CF_t}$$

where CF_t denotes the cash flows (principal, interest payments and fees) contractually payable by the borrower in period t .

If the original maturity of the longest-dated contract contained in the set is greater than one year, the formula for effective maturity (M) above is replaced with the following:

$$M = \frac{\sum_{k=1}^{t_k \leq 1 \text{ year}} \text{Effective } EE_k \times \Delta t_k \times df_k + \sum_{t_k > 1 \text{ year}}^{\text{maturity}} EE_k \times \Delta t_k \times df_k}{\sum_{k=1}^{t_k \leq 1 \text{ year}} \text{Effective } EE_k \times \Delta t_k \times df_k}$$

where df_k is the risk free discount factor for future time period t_k and the remaining symbols are defined above.

Standardized Approach for Counterparty Credit Risk (SA-CCR)

Banks that do not have approval to apply the IMM for the relevant OTC transactions will use the Standardized Approach for counterparty credit risk (SA-CCR). The SA-CCR is envisaged to replace (as from 1 January 2017) both the current non-internal models approaches—the CEM and the SM.

The SA-CCR has been developed in order to provide a simple but more risk-sensitive capital methodology for bilateral OTC derivatives. The SA-CCR may provide a better recognition of netting (though netting is limited to products in the same asset class), more risk sensitive treatment of collateral and a recognition of negative mark-to-market that will reduce capital. There is criticism that SA-CCR may potentially provide higher capital requirements due to the use of more conservative parameters (see, ‘Counterparty Calamity: Inside Basel’s New Standard Charge’, *Risk*, June 2015).

SA-CCR will be used for measuring the EAD for CCR. The SA-CCR will apply to OTC derivatives, exchange-traded derivatives and long settlement transactions. SFTs are subject to the treatments under the IMM.

The exposures under the SA-CCR consist of two components: replacement cost (RC) and potential future exposure (PFE).

Exposure at Default Under SA = $EAD = \alpha \times (RC + PFE)$ where alpha equals 1.4. This is carried over from the α set by the Basel Committee for the IMM. The PFE portion consists of a multiplier that allows for the partial recognition of excess collateral and an aggregate add-on, which is derived from add-ons developed for each asset class (similar to the five asset classes used for the CEM, i.e. interest rate, foreign exchange, credit, equity and commodity).

The methodology for calculating the add-ons for each asset class hinges on the key concept of a “hedging set”. A “hedging set” under the SA-CCR is a set of transactions within a single netting set within which partial or full offsetting is recognized for the purpose of calculating the PFE add-on. The add-on will vary based on the number of hedging sets that are available within an asset class. These variations are necessary to account for basis risk and differences in correlations within asset classes.

Basel III—Counterparty Credit Risk (CCR)

Basel III strengthens the capital requirements for counterparty credit exposures arising from banks’ derivatives, repo and securities financing activities and provides incentives to move OTC derivatives to central counterparties in

an attempt to reduce systemic risk. Many of the changes that Basel III introduced relate to CCR and Credit Valuation Adjustment (CVA).

CVA is an adjustment that reflects the market value of credit risk due to a counterparty failure or the market value of the credit risk of both the bank and the counterparty.

A short summary of the main changes brought by Basel III are:

1. *Stressed EPE*. Banks capital requirement for CCR are determined by using stressed inputs, such as volatilities and correlations. EPE has to be estimated with calibration parameters on stressed data in order to correct capital charges becoming too low during periods of market volatility. The EEPE measure is complemented by a “stressed” EEPE estimation based on data over a three-year period including a one-year period of increased credit spreads. The RWA are estimated under two scenarios: one non-stressed and one with stressed parameters. The highest estimate observed between non-stressed RWA and stressed RWA is the one that is finally used for regulatory purposes.
2. *CVA capital charge*. Banks will be subject to a capital charge for potential mark-to-market losses. The additional capital charge captures the risk CVA change associated with a deterioration in the credit worthiness of a counterparty. Although Basel II covers the risk of a counterparty default, it does not address such CVA volatility risk, which during the financial crisis was a greater source of losses than those arising from outright defaults. During the period 2007–10, two-thirds of the losses inherent in counterparty risk on market transactions were caused by valuation discrepancies (mark-to-market based) resulting from counterparty credit rating downgrades. Only one-third of those losses were due to real defaults by counterparties.
3. *Longer margining periods*. Banks with large and illiquid derivative exposures to a counterparty will have to apply longer margining periods to determine the regulatory capital requirement.
4. *Incentives for central clearing*. A bank’s collateral and mark-to-market exposures to CCPs are subject to a low risk weight at 2 %.
5. *Asset correlation multiplier for large financial institutions*. Basel III imposes the use of a correlation factor greater than 1.25 times the one used in calculating the Basel II regulatory capital for institutions of significant size (institutions with a trading book exposure over \$100 billion).
6. *Assess better specific “Wrong-Way Risk”(WWR)*. WWR arises when the exposure increases as the credit quality of the counterparty deteriorates. Transactions carrying specific WWR with unfavourable correlation will have to be identified, isolated from the overall compensation node of

origin and assigned to a particular computational processing to calculate their exposure at default (EAD).

An example of wrong-way risk includes a bank that enters a swap with an copper producer where the bank receives fixed and pays the floating London Metal Exchange (LME) price (lower copper prices simultaneously worsen the credit quality of an copper producer and increase the value of the swap to the bank). The risk is right way if exposure decreases as the counterparty credit quality worsens. Right-way risk includes a bank that enters a swap with a copper producer where the bank pays fixed and receives the floating LME price.

The valuation of CCR should allow that exposure (market risk) and default probability (credit risk) may not be independent, especially during volatile market conditions. Thus wrong-way and right-way risk should be assessed. The dependence between exposure and default probability varies depending on the instruments. Right/wrong-way risk may be important for commodity, credit and equity derivatives, but a lot less significant for FX and interest rate contracts.

Advanced CVA Risk Capital Charge-CVA VAR

For portfolios valued using IMM (and in the case of banks already using an internal model for interest rate VaR), the method is based on applying the VaR model used for bonds to the regulatory CVA.

The CVA VAR under the advanced approach is similar to the market risk VAR using a 99 % confidence level and a 10-day horizon. A multiplier of 3 is used for market risk VAR.

$$CVA = (LGD_{MKT}) \sum_{i=1}^T \max \left(\begin{array}{l} 0; \exp \left(-\frac{S_{i-1} t_{i-1}}{LGD_{MKT}} \right) \\ -\exp \left(-\frac{S_i t_i}{LGD_{MKT}} \right) \end{array} \right) \left(\frac{EE_{i-1} D_{i-1} + EE_i D_i}{2} \right)$$

where

t_i is the time of the i -th revaluation time bucket, starting from $t_0 = 0$

t_T is the longest contractual maturity across the netting sets with the counterparty

s_i is the credit spread of the counterparty at tenor t_i , used to calculate the CVA of the counterparty

LGD_{MKT} is the loss given default of the counterparty. This LGD_{MKT} , which inputs into the calculation of the CVA risk capital charge, is different from the LGD that is determined for the IRB and CCR default risk charge, as this LGD_{MKT} is a market assessment based on risk neutral probabilities rather than an internal estimate

The first factor within the sum represents an approximation of the market implied marginal probability of a default occurring between times t_{i-1} and t_i . Market implied default probability (also known as risk neutral probability) represents the market price of buying protection against a default and is in general different from the real world likelihood of a default

EE_i is the expected exposure to the counterparty at revaluation time t_i , where exposures of different netting sets for such counterparty are added, and where the longest maturity of each netting set is given by the longest contractual maturity inside the netting set

D_i is the default risk free discount factor at time t_i , where $D_0 = 1$.

Standardized CVA Risk Capital Charge

When a bank does not have the required approvals to calculate a CVA capital charge for its counterparties, it must calculate a portfolio capital charge using the following formula:

$$k = 2.33 \sqrt{h} \sqrt{\left(\sum_i 0.5 w_i \left(M_i EAD_i^{total} - M_i^{hedge} B_i \right) \right)^2 - \sum_{ind} w_{ind} M_{ind} B_{ind}} \sum_i 0.75 w_i^2 \left(\frac{M_i EAD_i^{total}}{-M_i^{hedge} B_i} \right)^2$$

The formula is a simple variance type approach whereas the 2.33 represents a 99 % confidence level for a normal distribution, where

h is a one-year time horizon, i.e. $h + 1$

w_i is the (risk) weight of the counterparty. It ranges from 0.7 % to 10 % depending on the credit quality of the counterparty, as shown in Table 8. When a counterparty does not have an external rating, the bank must, subject to supervisory approval, map the internal rating of the counterparty to one of the external ratings

EAD_i and M_i represent the (discounted) exposure at default of counterparty i (including the effect of credit risk mitigation) and the effective maturity of the transactions with counterparty i

EAD_i^{total} is the exposure at default of counterparty i (summed across its netting sets), including the effect of collateral as per the existing IMM, SM or CEM rules as applicable to the calculation of counterparty risk capital charges for such counterparty by the bank. For non-IMM banks the exposure should be discounted by applying the factor $(1 - \exp(-0.05 \times M_i)) / (0.05 \times M_i)$. For IMM banks, no such discount should be applied as the discount factor is already included in M_i

B_{ind} is the full notional of one or more index CDS of purchased protection, used to hedge CVA risk. This notional amount should be discounted by applying the factor $(1 - \exp(-0.05 \times Mind)) / (0.05 \times Mind)$

w_{ind} is the weight applicable to index hedges. The bank must map indices to one of the seven weights w_i based on the average spread of index ‘ind’

M_i is the effective maturity of the transactions with counterparty i .

M_{ihedge} is the maturity of the hedge instrument with notional B_i (the quantities $M_{ihedge} B_i$ are to be summed if these are several positions)

M_{ind} is the maturity of the index hedge ‘ind’. In case of more than one index hedge position, it is the notional weighted average maturity.

For any counterparty that is also a constituent of an index on which a CDS is used for hedging counterparty credit risk, the notional amount attributable to that single name (as per its reference entity weight) may, with supervisory approval, be subtracted from the index CDS notional amount and treated as a single name hedge (B_i) of the individual counterparty with maturity based on the maturity of the index.

The weights are given in Table 8, and are based on the external rating of the counterparty.

Table 8 Weights

Rating	Weight w_i (%)
AAA	0.70
AA	0.70
A	0.80
BBB	1.00
BB	2.00
B	3.00
CCC	10.00

Source: Bank for International Settlements

X-Value Adjustments (XVA)

During the recent years there have been a number of adjustments to the pricing of an OTC derivative, often referred to as X-Value Adjustments (XVA). XVA is a term referring to the valuation of the credit, funding and regulatory capital requirements embedded in derivative contracts. XVA not only incorporates the CVA but also the Debit Valuation Adjustment (DVA) to account for credit risk; the Funding Valuation Adjustment (FVA) for the impact of funding costs as well as the Margin Valuation Adjustment (MVA) for the funding cost connected with the initial margin; further the Capital Valuation Adjustment (KVA) for the impact of regulatory capital and the Tax Valuation Adjustment (TVA) for the impact of tax on profits and losses.

The XVA concept envisages full assessment of the lifetime cost of an OTC derivative by taking into account the above mentioned economically relevant terms. CVA and DVA assess the bilateral valuation of counterparty risk. DVA represents the counterparty risk from the perspective of a party's own default. The CVA assessment assumes that the party itself making the estimation cannot default. However, international accounting standards suggest that a party should consider its own default in the valuation of their liabilities. As the credit exposure has a liability component this can be incorporated in the pricing of counterparty risk as the DVA component. MVA defines the cost of posting the initial margin both bilaterally and to central counterparties and any other over-collateralization elements such as the requirement for liquidity buffers over the lifetime of the transaction.

The FVA assesses the cost stemming from funding the transaction. From a certain perspective the FVA concept is not really new. Before the recent financial crisis, LIBOR was used to discount cash flows, not because it reflected a risk free rate but because it was a good approximation of a bank's unsecured short-term funding cost. After the financial crisis banks realized that they cannot entirely rely on short-term funding or fund at LIBOR. This higher funding cost can be incorporated with the FVA adjustment. KVA defines the cost of holding economic and regulatory capital over the lifetime of the transaction. Capital is a cost, as investors require a return on their investment. Increased regulatory requirements with Basel III, with the CVA charge, other capital constraints such as the leverage ratio—coupled with the increased cost of raising new capital—has made pricing capital through KVA extremely important.

However, XVA concepts are still developing; a potential exception to this is the CVA where some market standards do exist.

Chapter 3: Credit Ratings: Credit Rating Agencies, Rating Process and Surveillance

Credit Rating Agencies—Nationally Recognized Statistical Rating Organizations

Credit rating agencies originated in the USA in the early 1900s. The construction of the railroad system led to the development of corporate bond issues in order to finance the work. Then ratings began to be applied to the issues. In Europe, the bond markets in the UK and the Netherlands were established earlier on but were much smaller and more focused on sovereign debt so that investors could trust that they would get their investment back. Following the 1907 financial crisis, there was increased demand for independent analysis of bond creditworthiness. In 1909, financial analyst John Moody issued a publication focused solely on railroad bonds. He was the first to introduce subscription fees to investors and his ratings were the first to be widely published. In 1913, his business expanded to include industrial firms and utilities. A few years later the antecedents of the largest rating agencies to date were established. Poor's Publishing Company began issuing ratings in 1916, Standard Statistics Company in 1922 and the Fitch Publishing Company in 1924.

The term Nationally Recognized Statistical Rating Organization (NRSRO) came into effect in 1975 when the Securities and Exchange Commission (SEC) promulgated rules in relation to the bank and broker-dealer net capital requirements. The concept behind those rules was that institutions that had invested in relatively safer securities did not have to keep in reserve the same amount of capital to protect their institution. The safety of these securities was expressed by their credit ratings rated by the NRSROs. Basically, a

NRSRO is a credit rating agency that provides credit ratings that the SEC allows other financial institutions to use for certain regulatory purposes. In short, the SEC defines a NRSRO as a credit rating agency that assesses the creditworthiness of an obligor as an entity or specific securities or money market instruments. A credit rating agency has to apply to the SEC for registration as a NRSRO. Furthermore, the SEC's Office of Credit Ratings administers the SEC's rules relating to NRSROs, in addition to performing various other functions with respect to NRSROs.

Since the 2007 financial crisis, both in the USA and the UK efforts have been made to regulate NRSROs and ensure more transparency and competitiveness. The 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act and the European Securities and Markets Authority (ESMA), created in 2011, have attempted to hold NRSROs accountable in order to protect investors.

The European Commission adopted three delegated regulations in September 2014 that have been published in the *Official Journal*, and set out regulatory technical standards with key provisions on the regulation of credit rating agencies. These technical standards set out:

- the disclosure requirements for issuers, originators and sponsors on structured finance instruments;
- reporting requirements for Credit Rating Agencies (CRAs) regarding fees charged by CRAs to their clients;
- reporting requirements for CRAs for the European Rating Platform.

In the USA, Title IX, Subtitle C of the Dodd-Frank Act mandated the Commission to prescribe rules to improve regulation of NRSROs. The motivation of Congress was also based on its finding that credit rating agencies, including NRSROs, play a critical “gatekeeper” role in the debt market that is similar to that of securities analysts. Credit ratings are of “systemic importance” and based on the reliance placed by individuals, institutional investors and financial regulators on them, the activities and performance of CRAs, including NRSROs, are of national public interest. Credit rating agencies perform evaluative and analytical services on behalf of clients and are central to capital formation, investor confidence and the efficient performance of the economy. In addition, CRAs' activities are fundamentally commercial in character and as a result should be subject to the same standards of liability and oversight as those for auditors, securities analysts and investment bankers. The amendments and new rules adopted to implement sections 932, 936 and 938 of the Dodd-Frank Act are designed to address these findings of Congress and increase the integrity and transparency of credit ratings and promote public oversight and accountability of NRSROs. The amendments and new rules also prescribe new disclosure requirements for

structured finance products to address concerns about the role of NRSROs in the financial crisis of 2007. Chapter 8 discusses further the Dodd Frank Act.

To date there are 10 organizations designated as NRSROs by the SEC. Ratings by NRSROs are used for a variety of regulatory purposes in the USA.

The 10 NRSROs are:

- A.M. Best Company, Inc. (A.M. Best);
- DBRS, Inc. (DBRS);
- Egan-Jones Ratings Company (EJR);
- Fitch, Inc. (“Fitch”);
- HR Ratings de Mexico, S.A. de C.V. (HR Ratings);
- Japan Credit Rating Agency, Ltd. (JCR);
- Kroll Bond Rating Agency, Inc. (Kroll);
- Moody’s Investor’s Services, Inc. (Moody’s);
- Morningstar Credit Ratings, LLC (Morningstar); and
- Standard & Poor’s Ratings Services (S&P).

Although there are 10 NRSROs, the rating industry is very concentrated. Based on the approximate number of outstanding credit ratings as reported by each NRSRO in its annual certification for the 2013 calendar year end, S&P accounts for about 46 % of the total NRSRO credit ratings outstanding, followed by Moody’s (37 %) and Fitch (13 %), which means that the two largest NRSROs—S&P and Moody’s—account for 83 % of all credit ratings outstanding and adding the third largest, which is Fitch, the three of them (S&P, Moody’s and Fitch) account for approximately 97 % of the total. The main reason that in this book we mainly reference S&P and Moody’s credit ratings and criteria is simply because they control the rating agency market (i.e. 83 % of it).

Introduction to Credit Ratings

Credit ratings are opinions about relative credit risk and by nature are subjective. Credit ratings express relative opinions about the creditworthiness of an issuer, from strongest to weakest, within a universe of credit risk. For example, a corporate bond that is rated Aaa/AAA is viewed by the rating agency as having a higher credit quality than a corporate bond with a Baa/BBB rating. But the Aaa/AAA rating is not a guarantee that the bond will not default, only that it is less likely to default than the Baa/BBB bond.

Credit ratings are the result of the rating process. They are not just simply based on a defined set of financial ratios and strict computer models but are the outcome of a comprehensive analysis of each individual issue and issuer

by credit analysts in a rating committee. As a rule of thumb, the greater an issuer's cash flow predictability and the cushion supporting expected debt payments, the higher the rating will be. Credit ratings have a longer-term nature. Rating agencies assess the fundamental factors that drive each issuer's long-term ability to meet debt payments. As a result, credit ratings will not vary with supply-demand cycles or just simply reflect last quarter's earnings report. Rating committees examine a variety of scenarios. They aim to assess the issuer's ability to meet debt obligations against adverse economic scenarios specific to its circumstances. Global credit ratings (rather than national scale ratings) are universally comparable. International ratings typically are limited to the sovereign ceiling rating of the nation in which the issuer is domiciled.

The credit quality of most issuers and obligations is not fixed over a period of time and may change. Therefore credit ratings may also change. Bonds of lower credit quality and rating are expected to change more frequently than bonds of higher quality and rating. However the user of bond ratings should check on all ratings to monitor their status.

The Rating Process

The rating process starts with an introductory meeting or teleconference call. During this meeting a high-level discussion of the rating process is undertaken. When the issuer wants to start the process and has signed and returned the rating application, the rating process will begin. The rating agency will assign the particular issuer, debt obligation or transaction to a lead analyst. The lead analyst will start the credit analysis by collecting all relevant information on the issuer, obligation or transaction from publicly available sources. The issuer or its representative is expected to provide relevant information of a financial or/and non-financial nature. The information requested may vary depending on the sector, such as sovereign, corporate, structured finance etc. The lead analyst interacts frequently with issuers or their representatives during the process. After the necessary information has been collected the lead analyst will conduct the initial analysis using the appropriate relevant methodology(s) that usually take into account both quantitative and qualitative parameters. Once the lead analyst formulates his/her recommendation he/she presents the analysis and arguments of the recommendation to a rating committee. The purpose of the rating committees is to ensure as much as possible the quality, consistency and integrity of the rating process. Credit ratings are not the outcome of any individual's credit analysis but the outcome of a majority vote of the rating committee's members. Following the rating committee's decision the lead analyst will contact the issuer or its representative to inform it of the committee's decision. Then the credit ratings are communicated to

the general public via credit rating announcements published on the credit rating's website and are distributed to major financial newswires. The credit ratings that are private are not announced to the public but most tend to be public. Following the publication of credit ratings, rating agencies will monitor that credit rating, on an ongoing basis, and will modify the credit rating if necessary in relation to any changes to the creditworthiness of the issuer or issue. Exhibit 1 illustrates the main steps in the rating process.

Rating agencies may initially assign a preliminary/provisional rating prior to assigning a final/definitive rating upon completion of certain contingencies.

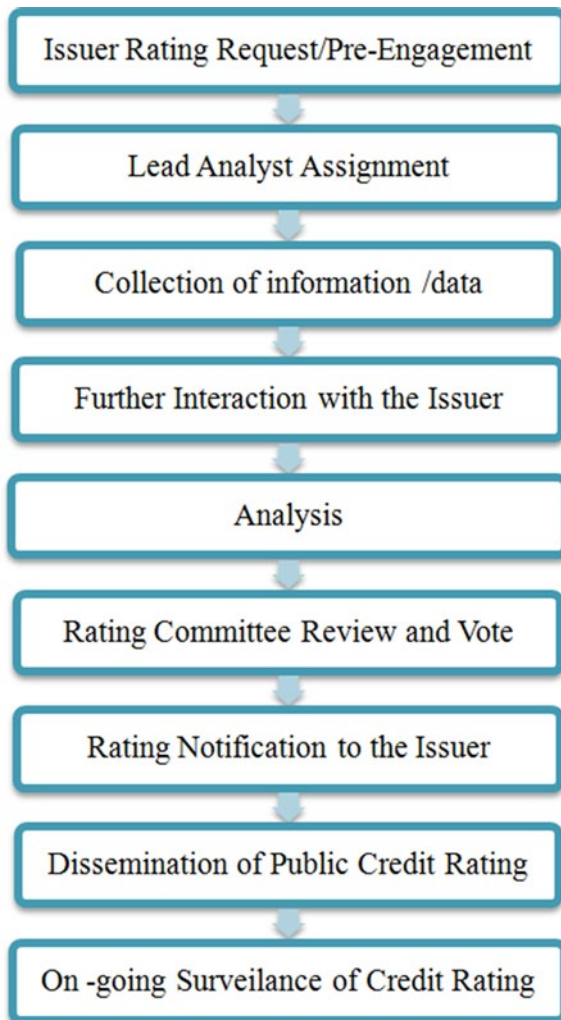


Exhibit 1 The Rating process

The rating agencies reserve the right not to issue a definitive/final rating if these conditions have not been met. Furthermore, if these conditions have not been met in full the definitive/final rating issued may differ from the provisional/preliminary rating. When a rating agency no longer rates an obligation on which it previously maintained a rating, the rating is then “withdrawn” (WR).

Moody’s Provisional Ratings—(P)

Moody’s will often assign a provisional rating to programme ratings, an issuer or instrument when the assignment of a definitive rating is subject to the fulfilment of contingencies. Upon fulfilment of these, for example receipt of signed final documents or/and legal opinions that drafts have been provided, the provisional notation—shown by placing a (P) in front of the rating—is removed.

S&P’s Preliminary Ratings: “Prelim”

S&P may assign preliminary ratings, with the “prelim” suffix to obligors or obligations, most commonly structured and project finance issues and financial programmes. Preliminary ratings may be assigned to obligations upon the obligor’s emergence from bankruptcy or similar reorganization, based on late-stage reorganization plans and documentation of the obligor. Preliminary ratings may be assigned to entities or obligations of these entities that are in the process of being formed or independently established when documentation is almost final. Preliminary ratings may also be assigned when a previously unrated entity is undergoing a well-formulated restructuring, recapitalization or financing when investor or lender commitments are invited. S&P would be likely to withdraw these preliminary ratings if the conditions under which these preliminary ratings were issued have not been met.

Surveillance

The goal of surveillance is to keep the rating current by identifying issues that may result in either an upgrade or a downgrade. Analysts review ratings by assessing if there have been any changes to the key analytical factors that supported the ratings opinion. If the circumstances of the factors have changed and are deemed appropriate, analysts will present their recommendations for ratings changes to a rating committee for potential action. Examples of changes to key analytical factors may have to do directly with the issuer’s performance, or changes in the industry sector, in the credit enhancement or in the rating of

key counterparties in a transaction, such as the servicer or swap counterparty etc. Generally, on average, higher ratings have been more stable than lower ratings. Rating upgrades and downgrades take place across the entire credit range. However they tend to occur more frequently in lower-rated categories, reflecting the increased volatility of these categories. With downgrades there is a greater likelihood of default; with upgrades there is less likelihood of default.

The surveillance activities may result in a:

- rating outlook change;
- rating on review placement/removal;
- credit rating upgrade;
- credit rating downgrade;
- credit rating withdrawal;
- credit rating suspension.

Usually the rating agencies communicate the outcomes with an announcement and a short explanation and make them available on their websites.

Rating Outlook

Rating agencies may assign a rating outlook. With this they inform the market place that they have assessed the potential but not the certainty for a ratings change. Rating Outlooks tend to have a longer time frame than Rating on Review/CreditWatch listings. An outlook is not an indication that a rating will be listed on Rating on Review/CreditWatch. A rating outlook is an opinion about a possible rating direction over the medium term. After the initial assignment of a positive or negative rating outlook by Moody's, the next rating action has, on average, followed within about a year, but some Moody's outlooks have been in place for a shorter or longer period. An S&P rating outlook remains typically from six months to two years.

Rating outlooks are Positive (POS), Negative (NEG), Stable (STA) and Developing (DEV). However a designation of Rating Under Review (RUR) will override the outlook designation. A designation of Rating Withdrawn (RWR) means an issuer has no active ratings. Rating outlooks are not necessarily assigned to all entities. This is indicated by No Outlook (NOO). A stable outlook indicates a low likelihood of a rating change over the medium term. A negative, positive or developing outlook indicates a higher likelihood of a rating change over the medium term. The next rating action following a negative (positive) rating outlook has historically been, in many cases, a downgrade or review for possible downgrade (upgrade or review for possible

upgrade). However, after the initial assignment of a stable outlook, there is no change for the majority of ratings during the following year.

Rating Review

A rating review indicates that a rating is assessed for a change in the near term. A rating review can be triggered following a significant and unexpected deviation from anticipated issuer/issue performance, or a change in criteria/rating methodology has been adopted that necessitates a review of the sector or affects multiple issues. Moody's can place a rating on review for upgrade (UPG), downgrade (DNG) or, more rarely, with direction uncertain (UNC). A review may end with a rating being upgraded, downgraded or may actually get confirmed without any change. Similarly S&P's "positive" designation means that a rating may be raised; "negative" means a rating may be lowered; and "developing" means that a rating may be raised, lowered or affirmed. Ratings on review are said to be on Moody's "Watchlist" or on S&P's "CreditWatch". Although being on watch signals the potential for a rating change in the near term, it does not necessarily imply a ratings change. It simply indicates that more information or analysis is required before taking action, if any.

It should be noted that ratings can change without them having first to be placed in review and appear on a watch list. Rating agencies can upgrade (downgrade) at any time if the creditworthiness has been affected. Once a rating is placed under review, its conclusion depends on the reason for the review and the amount of time needed to obtain and analyse the information. Usually Moody's reviews are typically concluded within 30 to 90 days unless they are dependent on information or an event taking place where the reviews can last 90 to 180 days or even longer.

What Drives Credit Rating Downgrades and Upgrades

Credit ratings change, when the credit risk profile of an issuer or issue initially assumed by the rating committee when assigning initial ratings has changed. In short, any event, performance or deviation from the assumptions and expectations of the rating committee when it initially assigned the ratings can signal a rating change. These assumptions are typically communicated for publicly rated ratings via the rating agency websites. Depending on the nature of the obligor/obligation some of these rating changes are driven by issuer/issue specific factors (e.g. adverse business results) and some because of industry or sovereign related reasons (e.g. political instability).

The list below, which is by no means exhaustive, shows some examples that may trigger a change in the credit risk of an issue or issuer:

- Business environment changes and unanticipated operating developments, beyond the ones already anticipated and incorporated in the existing ratings, such as new technological developments, increased competition, loss of barriers to entry to a sector that used to be a monopoly/oligopoly.
- Debt burdens and capital spending requirements changes beyond the ones already anticipated and incorporated in the existing ratings, either increasing (downward pressure on ratings) or shrinking (upward pressure on ratings).
- Projected revenues changes, beyond the ones already anticipated and incorporated in the existing ratings, either increasing (upward pressure on ratings) or decreasing (downward pressure on ratings)
- Regulatory changes, recapitalizations, mergers and acquisitions may also trigger ratings changes. For example an aggressive large acquisition or expansion in unproven markets as well as potentially the high risks involved carrying out this strategy may impact the ratings downwards.
- Rating agency methodology/criteria changes. These evolve over time in order to capture new identified risks or mitigants and reflect new situations. As a result the ratings may subsequently change.
- Structured finance related obligations will be affected by changes in the credit performance and decrease the credit quality of the underlying assets which back the structured finance instruments; increased concentration that would take away any diversification benefit initially given in the initial analysis and a downgrade of key counterparties can also trigger a downgrade.
- Sovereign ratings may be impacted by political and economic changes.

Rating Confirmation, Affirmation, Withdrawal and Suspension

A Confirmation is a public statement that a previously announced review of a rating has been completed without a change to the rating.

An Affirmation is a public statement that the current Credit Rating assigned to an issuer or debt obligation, which is not currently under review, continues to be appropriately positioned. An Affirmation is generally issued to communicate Moody's opinion that a publicly visible credit development does not have a direct impact on an outstanding rating.

Rating agencies may withdraw or suspend a credit rating at any time. The withdrawal may result in the issues having to be repaid in full. A withdrawal

may arise when there is not sufficient information to monitor the rating. A suspension rather than a withdrawal may arise when the appropriate information is expected to become available. Sometimes ratings may get withdrawn at the request of the issuer.

Credit Ratings' Usefulness

Exhibit 2 shows the main uses of credit ratings.

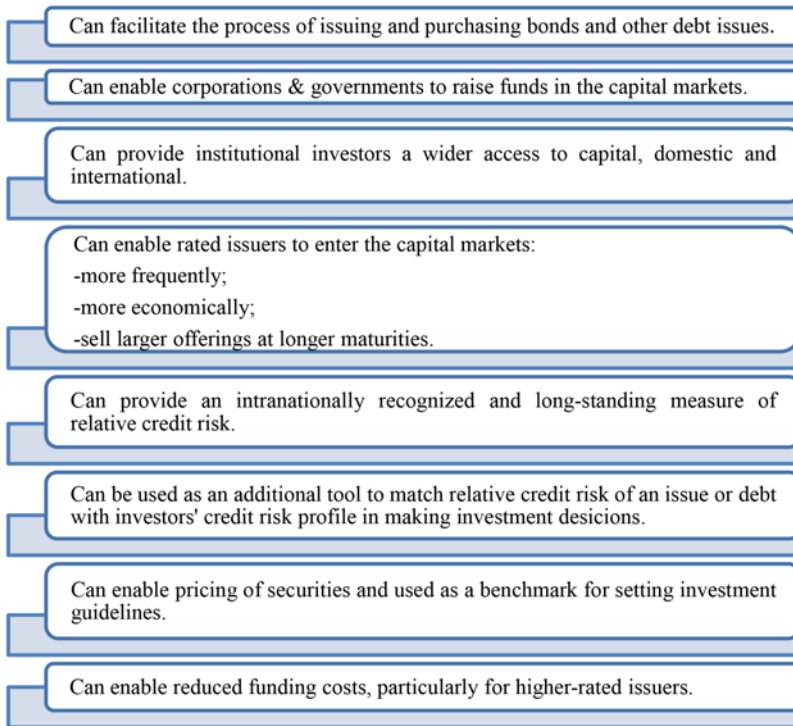


Exhibit 2 Credit ratings' uses

Credit Ratings' Limitations

Credit ratings are opinions about relative credit risk. Rating agencies have always claimed that their ratings are their opinion about relative creditworthiness. Not only that but they have also argued that their opinions are independent and therefore entitled to First Amendment free speech protection, like those afforded to journalists, in their defence against investors who have demanded compensation following the 2007 financial crisis.

Securities with the same rating are not necessarily of absolutely equal credit quality. Broadly, they simply have a similar position. There are thousands of instruments to position into a limited number of rating classes. Sometimes the symbols cannot reflect the exact same shadings of risk which actually exist. Credit ratings should not be the only tool used for investment decisions. There are many other considerations to take into account, such as the market risk of instruments, which is not always driven by credit quality but also by the money markets, maturity length and general financial environment. Even a very highly rated bond can exhibit wide price movements, while retaining its high credit rating! There also other parameters that one should look at when assessing the attractiveness of a bond, such as its yield, its maturity date or any other specific factors. Furthermore, although ratings may be used by the banking authorities to classify bonds as part of their procedure, the rating agencies do not produce ratings with these bank regulations in mind. Credit ratings represent the opinion of each rating agency with regards to the relative creditworthiness of securities and should be used in conjunction with the descriptions and statistics appearing in each rating agency publication.

Exhibit 3 summarizes credit ratings' limitations, the characteristics that are not incorporated in credit ratings and that a user of credit ratings should be aware of.

- Not an absolute default probability measure, but a "relative" one.
- Not an exact probability that a certain issuer or debt will or will not default.
- Not assigned with exact science, but with certain criteria/methodology that do change over time!
- Especially for certain sectors such as Structured Finance, assumptions made about the mean default, recovery rate and correlation parameters can affect the ratings outcome. Always check the assumptions in the New Issue Report.
- Not a guarantee of certain credit quality or of future credit risk. If rating drivers change, ratings will change!
- Not a recommendation to buy, hold or sell, invest or not invest.
- Absolutely not the only factor investors should consider in making investment decisions. There are so many other risks to take into account.
- Not an indicator of the market liquidity of a debt security or its price in the secondary market.

Exhibit 3 Credit ratings' limitations

Criticism of Credit Ratings

In the 2007 financial crisis rating agencies faced accusations that their ratings on structured financial products were proven to be inaccurate and that they misrepresented the risks associated with mortgage-related securities. As a result they contributed significantly to the mismanagement of risks by financial institutions and investors, and adversely impacted the global economy. Regulators have now prescribed new disclosure requirements relating to structured finance products and, in particular, asset-backed securities. These requirements aim to address the concerns about the role of NRSROs in the financial crisis of 2007 in terms of how they rated certain types of structured finance products and any potential conflict of interest.

The information used to rate structured finance products is, to a certain extent, of a different nature from the information used, for example, for corporate bonds, whose ratings are based on publicly available data such as audited financial statements. The information used in rating structured finance products is mainly provided by the sponsor or underwriter. Another feature when rating structured finance products is that the ratings are sensitive to assumptions made about default, recovery rate and correlation of defaults etc.

Furthermore, for structured finance products the sponsor, arranger or underwriter when presenting the transaction to the rating agencies may have presented a “desired” capital structure. During the crisis concerns were raised that the inherently iterative nature of the process between the credit rating agency and the sponsor, arranger or underwriter may give rise to potential conflicts of interest.

Just prior to the 2007 financial crisis, the structured finance market boomed driven by huge investor demand. Residential mortgage originators, having exhausted the supply of traditional quality mortgages and to keep up with investor demand for Residential Mortgage Backed Securities (RMBSs), increasingly popularized sub-prime lending. As a result the number of delinquencies and defaults on sub-prime residential mortgages suddenly soared in late 2007, RMBSs lost a considerable amount of value, and investors began to question the accuracy of credit ratings assigned to them and the Collateralized Debt Obligation (CDOs) linked to them.

In August 2007, the Commission staff started examining the role of the three largest credit rating agencies in the sub-prime mortgage-related crisis. Among other things they found that credit rating agencies struggled to adjust the number of staff and resources employed in the rating

process to the increasing volume and complexity of RMBSs and CDOs. Certain elements of the process and methodologies utilized to rate RMBSs and CDOs were not documented or disclosed; the credit rating agencies examined did not have specific written procedures for rating RMBSs and CDOs and did not appear to have specific written policies and procedures to identify or address model errors. In some cases Commission staff felt that model adjustments were made without appropriately documenting a rationale for model deviations. Furthermore, the surveillance process for outstanding credit ratings on an ongoing basis appeared to be less robust than the initial processes of assigning credit ratings. Additionally, in the Commission staff's view, the necessary steps were not taken to avoid consideration of fees (the issuer-pays system), market share or other business interests from affecting credit ratings and criteria. Another concern was that it appeared that the examined credit rating agencies were relying on the information provided by RMBS sponsors and did not appear to verify the integrity and accuracy of the information as, in the rating agencies' view, due diligence duties lie with other parties and they did not appear to request representations from sponsors that due diligence had been carried out.

The rating agencies, in their defence, responded that there is no conflict of interest. This is because credit ratings are the outcome of a rating committee and not of individual analysts, and that employees' compensation is not based on ratings. Rating agencies have also argued that the subscriber-pays system has its own conflicts of interest, since investors can also put pressure on rating agencies to deem securities as risky, as low-rated securities pay a higher yield. Following the 2007 financial crisis, the Dodd-Frank Act mandated regulatory actions with the intention to enhance the regulation, accountability and transparency of NRSROs with regard to all credit ratings, not just in relation to structured finance products. These include requirements for NRSROs, issuers, underwriters, and third-party due diligence providers to disclose information about due diligence services carried out with respect to asset-backed securities.

In Europe, the criticism focus was more on rated sovereign debt. European Union (EU) governments and European Central Bank (ECB) policymakers criticized the three largest rating agencies as being aggressive in rating Eurozone countries, thus exacerbating the financial crisis. They claimed that the negative evaluations accelerated the European sovereign debt crisis as it spread through Portugal, Spain, Ireland and Greece. These countries received EU-International Monetary Fund (IMF) bailouts. S&P, in April 2010, downgraded Greece's debt to junk status. This contributed to weak investor

confidence that resulted in a huge increase in the cost of borrowing and made a financial rescue package in May 2010 inevitable.

In January 2012, S&P downgraded nine Eurozone states, leaving only Germany with a AAA rating. In December 2013, S&P downgraded EU debt as a whole. Many Europeans felt that the three largest rating agencies favoured the USA having an Aaa/AAA rating despite a growing deficit and high levels of public debt. However, in August 2011, S&P downgraded the US credit rating to AA+ for the first time in history over the deficit and debt ceiling. In October 2013, Fitch placed the US AAA rating on negative watch.

To date the US Dodd-Frank legislation has created an Office of Credit Ratings at the SEC and has empowered the SEC with additional oversight authority. The Commission has the role to examine NRSROs on an annual basis, levying fines if deemed appropriate, and even potentially de-registering agencies that provide inaccurate ratings. The EU's oversight mechanism, the ESMA, has a similar role. In Europe officials have also called for the creation of an independent European rating agency in order to reduce the oligopolistic power of the three large rating agencies, but attempts to secure funding have been unsuccessful.

Chapter 8 discusses in more detail regulation related matters. In the USA, as a result of several actions against rating agencies in 2015, S&P has paid billions of dollars in settlements (\$1.37 billion settlement, \$125 million to the nation's largest pension fund, the California Public Employees' Retirement System (Calpers), while settling with the SEC for \$80 million in a post-crisis fraud case). Moody's has come under Justice Department investigation since 2014.

However, despite several legal and regulatory actions against ratings agencies and all the negative press the bottom line is that they have maintained their market dominance.

As already mentioned, ratings, especially in the eyes of the rating agencies, are their opinions of creditworthiness and it is always very good to have opinions. However, prior to making any investment or decision, it is best not only to get someone else's opinion but to form one's own opinion! Credit ratings are useful but not the only basis for making decisions.

Credit Rating Types

Moody's Global Long-Term Issue Credit Rating Scale and Definitions

Moody's long-term ratings reflect both the likelihood of a default on contractually promised payments and the expected financial loss suffered in the event

of default. Moody's differentiates structured finance ratings from fundamental ratings on non-financial corporate, financial institution and public sector entities on the global long-term scale by adding the term (sf) to all structured finance ratings. The (sf) indicator was introduced on 11 August 2010 and indicates that otherwise similarly rated structured finance and fundamental securities may have different risk characteristics.

Gradations of creditworthiness are indicated by rating symbols, with each symbol representing a group in which the credit characteristics are broadly the same. Moody's appends numerical modifiers 1, 2 and 3 to each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks at the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking at the lower end of that generic rating category. Additionally, a (hyb) indicator is appended to all ratings of hybrid securities issued by banks, insurers, finance companies and securities firms.

Exhibit 4 shows a summary of Moody's global long-term rating scale and definitions.

Aaa: are considered of the highest quality, subject to the lowest level of credit risk.
Aa: are considered of high quality and subject to very low credit risk.
A: are considered of upper-medium grade quality and subject to low credit risk.
Baa: are considered medium-grade quality and subject to moderate credit risk so may entail certain speculative features.
Ba: are considered speculative and subject to substantial credit risk.
B are considered speculative and subject to high credit risk.
Caa: are considered speculative, of poor standing and subject to very high credit risk.
Ca: are considered highly speculative and are likely in, or very near, default with some prospect of recovery of principal and interest.
C: are the lowest rated and are typically in default, with little prospect for recovery of principal or interest.

Exhibit 4 Moody's global long-term issue credit rating scale and definitions

P-1: superior ability to repay short-term debt obligations.
P-2: strong ability to repay short-term debt obligations.
P-3: acceptable ability to repay short-term obligations.
NP: do not fall within any of the Prime rating categories.

Exhibit 5 Moody's global short-term issue credit ratings and definitions

Moody's Global Short-Term Issue Credit Rating Scale and Definitions

A short-term rating is assigned to obligations with an original maturity of 13 months or less and reflects both the likelihood of a default on contractually promised payments and the expected financial loss suffered in the event of default.

Exhibit 5 shows Moody's global short-term rating scale and a summary of definitions for issuers (or supporting institutions).

Linkage amongst the Moody's Global Long-Term and Short-Term Rating Scales

Typically, issuers with short-term ratings also have long-term credit ratings. Generally the higher an issuer's long-term rating the lower is the default risk in relation to the issuer's short-term debt. This is the case as effectively the features which can lead issuers to default over the long-term can also lead to default over the short-term. Highly rated issuers enjoy a strong credit profile, with liquidity, strong franchise and sufficient capital buffers. All of these contribute to a very low probability of default or insolvency.

For example, corporate and non-bank financial institution issuers rated Prime typically maintain sufficient liquidity and liquid assets, as they are expected to withstand losing access to both short-term and long-term debt markets for at least a year. The analysis involved in short-term ratings for banks can prove to be more challenging due to considerations relating to

third-party support for both their long- and short-term ratings. Banks rated Prime also have liquid assets and access to unsecured interbank markets and eligible collateral that can be used to obtain central bank funding. Therefore both long-term and short-term ratings assigned to banks incorporate support from a parent, government or central bank.

Typically, sovereign governments rated Prime also have unconstrained access to liquidity and international capital markets.

The key determinant for assigning a short-term rating to an issuer is the issuer's long-term risk of default. There is a certain relationship/mapping between long-term and short-term ratings. For example, when both long-term and short-term ratings exist it would not make sense if an Aaa issuer had a Prime-3 (P-3) rating. An Aaa issuer is of the highest credit quality so it is expected that it also has superior ability to pay short-term obligations. Typically, a long-term rating range of Aaa-A2 will have a short-term rating of Prime-1 (P-1).

A long-term rating range of A3-Baa2 will typically have a short-term rating of Prime-2 (P-2). A Baa2 long-term rating may also have a Prime-3 (P-3) short-term rating. A Baa3 long-term rating will typically have a Prime-3 (P-3) short-term rating. The non-investment grade rating range of Ba1-C is Not Prime.

The typical mapping between long-term and short-term ratings reflects not only the predictive content of long-term ratings for short-term ratings but also the transition risk of an issuer's short-term rating falling from Prime to Not Prime as this is directly linked to the transition risk of the issuer's long-term rating falling from investment-grade to speculative-grade.

For non-bank issuers or bank issuers without direct central bank access to have a P-1 rating, they are expected to maintain exceptionally strong liquidity features. These include alternative liquidity provisions through committed bank facilities that are at least as large as their total short-term debt, including any expected commercial paper outstanding. These liquidity facilities assume same-day access to available funds in the commercial paper issuance market and have no restrictions on funding related to adverse changes in the borrower's financial condition.

In the absence of a highly reliable liquidity, a non-bank issuer rated A2 or even higher would typically not achieve a P-1 rating on its commercial paper. Typically, any aggressive approach to liquidity can result in a lower long-term rating and a lower short-term rating.

There are however cases where the typical mapping does not hold. These cases may be affected by other factors, such as an external guarantee or a

certain credit enhancement or due to any other factor that creates a valid rationale for divergence in the default risk associated with an issuer's short-term and long-term debt. An example is when the parent entity guarantees the short-term debt of its subsidiary issuer. As a consequence the subsidiary's short-term rating may then map to the parent's long-term rating instead of its own.

Moody's Rated Obligations and Issuers on the Global Long-Term and Short-Term Rating Scales

A short summary of Moody's rated obligations and issuers on the global long-term and short-term rating scale are as follows:

- *Bank Deposit Rating*: a Bank Deposit Rating is an opinion about the bank's ability to repay on time its foreign and/or domestic currency deposit obligations. This rating also reflects the expected financial loss of the default.
- *Corporate Family Rating*: a Corporate Family Rating is a long-term rating that reflects the relative likelihood of a default on a corporate family's debt and debt-like obligations. This rating also reflects the expected financial loss in the event of default.
- *Credit Default Swap Rating*: a Credit Default Swap Rating reflects the credit risk of the obligation that a credit protection provider has with respect to credit events under the transaction. This rating does not incorporate any potential losses from an early transaction termination and the transaction's market risk.
- *Enhanced Rating*: an enhanced rating is only relevant to US municipal securities and reflects an obligation's credit quality without any insurance or wrap from a financial guarantor. This rating assesses the underlying issue's standalone credit quality and any credit support from a state credit enhancement programme.
- *Insurance Financial Strength Rating*: an Insurance Financial Strength Rating is an opinion about the ability of the insurance company to pay on time senior policyholder claims and obligations. This rating also takes into account the expected financial loss in the event of default.
- *Insured Rating*: an insured rating is the credit assessment of the credit quality of an obligation provided by the credit enhancement of a financial guarantor. Moody's insured ratings follow a credit substitution methodology, according to which the debt rating is the higher of either the guarantor's

financial strength rating or any underlying or enhanced rating of this security.

- *Issuer Rating*: an Issuer Rating is an opinion about the ability of the issuer to honour senior unsecured debt and debt like obligations. An Issuer Rating incorporates any external support to all current and future issuance of senior unsecured financial obligations and contracts. Examples of those consist of explicit support from a guarantee of all senior unsecured financial obligations and contracts, and/or implicit support for issuers subject to a joint default analysis.
- *Medium-Term Note Programme Rating*: a medium-term note programme rating is the rating likely to be assigned to drawdowns issued from the programme (this is a provisional rating assigned) with the specified claim priority (senior or subordinated). A definitive rating is then assigned to the individual debt securities issued from the programme.
- *Structured Finance Counterparty Instrument Rating*: a rating assigned to a financial contract which measures the credit risk posed to a counterparty arising from a special purpose vehicle's default with respect to its obligations under the financial contract.
- *Structured Finance Counterparty Rating*: a rating assigned to structured financial operating companies and based on the evaluation of their ability and willingness to honour their obligations under financial contracts.
- *Structured Finance Interest Only Security Rating*: a rating that addresses the credit risk that noteholders bear from credit losses to the security, securities or assets referenced by the structured finance interest only security.
- *Underlying Rating*: a rating of the assessment of a particular obligation's credit quality without any insurance or wrap from a financial guarantor or other credit enhancement.

Moody's National Scale Long-Term Ratings

Moody's long-term National Scale Ratings (NSRs) are opinions about the relative creditworthiness of issuers and financial obligations within a particular country. NSRs are not designed to be compared between countries; rather, they address relative credit risk within a given country. In each specific country, the last two characters of the rating indicate the country in which the issuer is located. For example, Aaa.cz for the Czech Republic. Similar to the global rating scale, Moody's appends numerical modifiers 1, 2 and 3 to each generic rating classification from Aa through Caa. The

modifier 1 indicates that the obligation ranks at the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking at the lower end of that generic rating category. National scale long-term ratings of D.ar and E.ar may also be applied to Argentine obligations.

Table 1 shows a summary of Moody's national long-term rating scale and the corresponding definitions.

Table 2 shows the countries and the respective symbols of Moody's long-term and short-term NSRs.

Moody's National Scale Short-Term Ratings

Moody's short-term NSRs are opinions about the ability of issuers in a given country, relative to other domestic issuers, to repay debt obligations that have

Table 1 Moody's long-term national ratings scale

Aaa.n	Reflects the strongest creditworthiness relative to other domestic issuers.
Aa.n	Reflects very strong creditworthiness relative to other domestic issuers.
A.n	Reflects above-average creditworthiness relative to other domestic issuers.
Baa.n	Reflects average creditworthiness relative to other domestic issuers.
Ba.n	Reflects below-average creditworthiness relative to other domestic issuers.
B.n	Reflects weak creditworthiness relative to other domestic issuers.
Caa.n	Reflects very weak creditworthiness relative to other domestic issuers.
Ca.n	Reflects extremely weak creditworthiness relative to other domestic issuers.
C.n	Reflects the weakest creditworthiness relative to other domestic issuers.

Table 2 Countries with Moody's long-term and short-term NSRs

Argentina (.ar)
Bolivia (.bo)
Brazil (.br)
Colombia (.co)
Czech Republic (.cz)
Kazakhstan (.kz)
Lebanon (.lb)
Mexico (.mx)
Russia (.ru)
Slovakia (.sk)
South Africa (.za)
Tunisia (.tn)
Turkey (.tr)
Ukraine (.ua)
Uruguay (.uy)

Source: Moody's Investors Service

Table 3 Moody's short-term national ratings scale

N-1	Strongest ability to repay short-term senior unsecured debt obligations compared to other domestic issuers
N-2	Above average ability to repay short-term senior unsecured debt obligations compared to other domestic issuers.
N-3	Average ability to repay short-term senior unsecured debt obligations compared to other domestic issuers.
N-4	Below average ability to repay short-term senior unsecured debt obligations compared to other domestic issuers.

an original maturity not exceeding one year. Short-term NSRs in one country should not be compared with short-term NSRs in another country, or with Moody's global ratings.

There are four categories of short-term national scale ratings, generically denoted N-1 through N-4. In each specific country, the first two letters indicate the country in which the issuer is located: for example, BR-1 through BR-4 for Brazil. The short-term rating symbols P-1.za, P-2.za, P-3.za and NP.za are used in South Africa. National scale short-term ratings of AR-5 and AR-6 may also be applied to Argentine obligations.

Table 3 shows Moody's national short-term rating scale and a summary of the corresponding definitions.

Moody's Credit Estimate

A credit estimate is an unpublished point-in-time opinion about the approximate credit quality of individual securities, financial contracts, issuers, corporate families or loans. It must be noted that credit estimates are not credit ratings and are not assigned by rating committees. Further credit estimates are not monitored but are often updated from time to time.

Although they are not ratings, credit estimates are widely used to assess credit risk in transactions for which a traditional rating is to be determined. Credit estimates are provided for example for granular pools (where no one obligor represents an exposure of more than 3 % of the total pool), chunky pools (where individual exposures represent 3 % or more of the total pool) or single exposures. Credit estimates can be based on public information or on various third parties and usually do not involve any participation from the underlying obligor.

CEs are not expressed through the use of Moody's traditional 21-point, Aaa-C alphanumeric long-term rating scale; rather, they are expressed on a simple numerical 1–21 scale. They are calibrated, however, to be broadly

comparable to Moody's alphanumeric rating scale and Moody's Rating Factors, which are used in CDO analysis.

Moody's Originator Assessments

Moody's originator assessments are Moody's opinions about the strength of originators' policies and practices as they affect defaults and losses in structured finance securities backed by loans. These assessments take into account early loan performance and the originator's ability and stability. Furthermore, these assessments seek to isolate the impact on loan performance from the macroeconomic environment and the servicer's ability.

Moody's assigns originators one of the following six assessment levels:

- Strong;
- Above Average;
- Average;
- Below Average;
- Weak;
- Unacceptable.

Moody's Servicer Quality (SQ) Assessments

Moody's servicer quality assessments are opinions about the ability of a servicer to prevent or mitigate losses in a securitization. SQ assessments are provided for servicers who act as the Primary Servicer, Special Servicer (servicing only the more delinquent assets) or Master Servicer (overseeing the underlying servicers). These assessments take into account the servicer's operational and financial stability and look into the servicer's organizational structure, management, goals and operational controls and procedures. Where appropriate, a "+" or "-" modifier will be appended to the SQ2, SQ3 and SQ4 rating category and a "-" modifier will be appended to the SQ1 rating category. A "+" modifier indicates the servicer ranks at the higher end of the designated rating category. A "-" modifier indicates the servicer ranks at the lower end of the designated rating category. Moody's also assigns National Scale Servicer Quality Assessments. National Scale Servicer Quality Assessments append a suffix of ".nn" to the ratings on the above scale in order to signify the relevant country: for example SQ1.ru for Russian National Scale Servicer Quality Assessments.

Table 4 shows Moody's servicer quality assessment rank—how strong/weak the combined servicing ability and servicing stability is.

Table 4 Moody's servicer quality assessment rank

SQ1	Strong
SQ2	Above Average
SQ3	Average
SQ4	Below Average
SQ5	Weak

AAA: Obligor's capacity to meet its financial commitment is extremely strong.
AA: Obligor's capacity to meet its financial commitment is very strong.
A: Obligor's capacity to meet its financial commitment is strong.
BBB: Reflects adequate protection parameters. Although adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to meet the financial commitment.
BB: Less vulnerable to nonpayment than other speculative issues. However, major ongoing exposure to adverse business, financial, or economic conditions could lead to inadequate capacity to meet financial commitment.
B: More vulnerable to nonpayment than obligations rated 'BB', but with the capacity to meet financial commitment.
CCC: Currently vulnerable to nonpayment, and dependent on favorable business, financial, and economic conditions to meet financial commitment.
CC: Currently vulnerable to nonpayment.
C: Currently highly vulnerable to nonpayment, obligations that have payment arrearages allowed by the terms of the documents, or obligations of an issuer that is the subject of a bankruptcy petition or similar action which have not experienced a payment default.
D: Reflects payment default, filing of a bankruptcy petition or the taking of similar action if payments on an obligation are jeopardized. Further upon completion of a distressed exchange offer, whereas the issue is either repurchased for an amount of cash or replaced by other instruments with a total value that is less than par.

Exhibit 6 S&P's long-term issue credit rating scale and definitions

Standard & Poor's Long-Term Issue Credit Rating Scale and Definitions

Exhibit 6 shows a summary of S&P's long-term issue credit ratings and definitions. These are based on the likelihood of payment; that is the capacity and willingness of the obligor to meet its obligation. S&P's issue ratings are

an assessment of default risk, but may incorporate an assessment of relative seniority or ultimate recovery in the event of default. The ratings are also based on the nature and provisions of the obligation and the promise imputed (i.e. timely payment of principal and interest, timely payment of principal). Furthermore, the ratings also take into account the relative position and possible protection of the obligation in the case of bankruptcy, reorganization or any other situation under the law that may affect creditors' rights.

S&P assigns the “(sf)” identifier to structured finance transactions, which are transactions separated from the sponsor's operating or bankruptcy risk and dependent upon the performance of a pool exposure and the subordination of tranches determining the distribution of losses during the life of the transaction. If the credit risk cannot be separated from the operating or bankruptcy risk of the sponsor, the rating of such transactions will likely be linked to the rating of the sponsor, like a “notched” corporate rating, and will not have the “(sf)” identifier.

Standard & Poor's Short-Term Issue Credit Rating Scale and Definitions

Exhibit 7 shows a summary of S&P's short-term issue credit rating scale and definitions.

Standard & Poor's Special-Purpose Ratings

S&P's special purpose ratings are summarized as follows:

- *Dual Rating*: this rating is assigned to debt issues that have a put option or demand feature. The first component of the rating addresses the likelihood of repayment of the principal and interest and can relate to either a short-term or long-term transaction. The second component of the rating addresses only the demand feature; it relates to the put option and is assigned a short-term rating.
- *Fund Credit Quality Rating* is identified with a “f” suffix and assigned to fixed-income funds and other actively managed funds that have variable net asset values. The rating is based on the credit quality of the portfolio investments and the likelihood of counterparty defaults and reflects the protection against losses from credit defaults.
- *Fund Volatility Rating* reflects a fund's sensitivity to interest rate movements, credit risk, investment diversification or concentration, leverage,

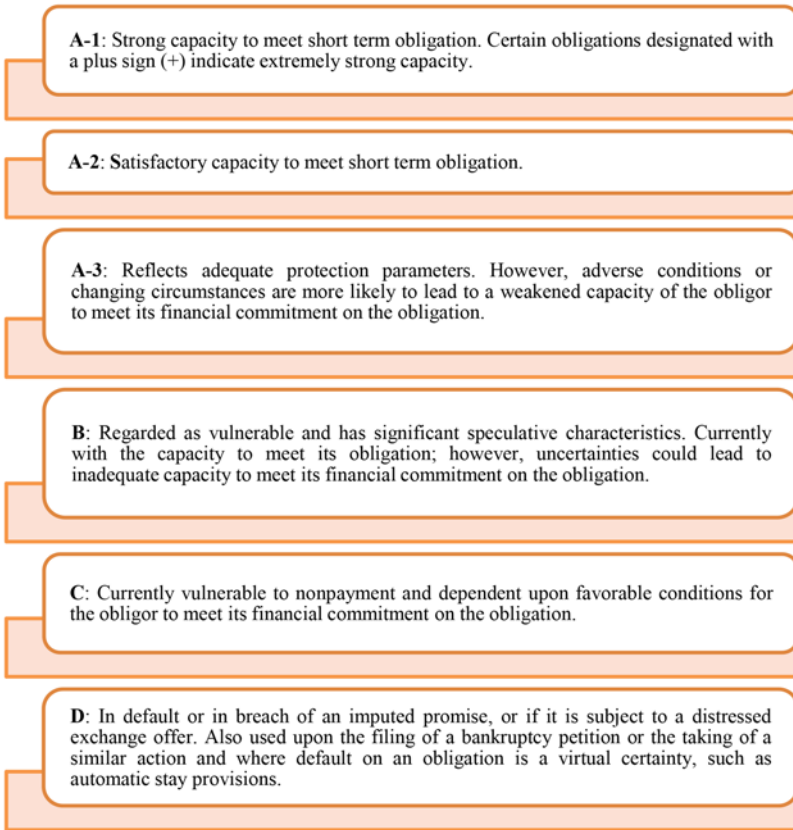


Exhibit 7 S&P's short-term issue credit rating scale and definitions

liquidity and some other factors. S&P has different symbols to denote the fund volatility ratings from the traditional issue or issuer credit ratings.

- *Insurance Financial Enhancement Rating* reflects the insurer's creditworthiness with respect to insurance policies or other financial obligations that are used as credit enhancement and/or financial guarantees.
- *Insurer Financial Strength Rating* reflects the financial security characteristics of an insurance company and also applies to health maintenance companies with respect to the ability to pay under the insurance policies and contracts.
- *Municipal Short-Term Note Rating* reflects the liquidity factors and market access risks unique to the notes. A note rating is likely to be assigned to notes due in three years or less. A long-term debt rating will most likely be assigned to notes with an original maturity of more than three years.
- *Principal Stability Fund Rating* is also known as a money market fund rating and reflects a fixed income fund's capacity to maintain a stable principal

(i.e. net asset value). The analysis involves assessment of the creditworthiness of the fund's investments and counterparties, as well as evaluation of the fund's investment maturity structure, the management's ability and policies to maintain the fund's stable net asset value. Principal stability fund ratings are identified by the "m" suffix to distinguish them from a S&P's traditional issue or issuer credit rating.

- *Mid-Market Evaluation rating* assesses a mid-market company's relative capacity and willingness to meet its financial commitments. The rating can be assigned on the obligor or on the debt instrument as well. A specific long-term credit rating scale ranging from "MM1" (highest) to "MM8" and "MMD" (default) is used for these ratings. This scale is used to assign an obligor-level rating in relation to a company's overall capacity to meet its financial commitments, or to assign an issue-level rating in relation to a company's capacity to meet its commitment in relation to a particular debt instrument. The symbols "+" and "-" can apply only to debt instruments.
- *Recovery Rating* takes into account only the expected recovery in the event of a payment default of a specific issue, and a numerical scale from 1+ to 6 is used. The recovery rating is not linked to the issuer credit rating or any other rating.
- *Underlying Rating reflects the* stand-alone capacity of an obligor to pay debt service on a credit-enhanced debt issue, taking away the effect of the enhancement that applies to it. Usually this rating is published only at the request of the debt issuer/obligor with the designation "SPUR" to distinguish it from the credit-enhanced rating of the debt issue.
- *Swap Risk Rating* reflects the likelihood of loss connected with a swap transaction by two counterparties. This rating takes into account the swap transaction terms such as the creditworthiness of one or more reference or underlying obligations or obligors above a certain specified threshold percentage/amount, termination events and the potential recovery percentage (or amount) of the portfolio. A swap risk rating may have the following designations: portfolio, single counterparty-protection buyer and single counterparty-protection seller. A swap risk rating (portfolio) takes into consideration only the creditworthiness of the credit default swap portfolio and does not address counterparty risk. A swap risk rating (single counterparty-protection buyer) takes into consideration the creditworthiness of the portfolio and addresses the counterparty risk of the buyer of protection under the swap transaction. A swap risk rating (single counterparty-protection seller) takes into consideration the creditworthiness of the portfolio and addresses the counterparty risk of the seller of protection under the swap transaction. However the swap risk ratings do not address the specific

amount of termination payments that would be payable under the swap transaction. A swap risk rating is not meant to be used as a benchmark of swap risk across different swap transactions. This is because a swap can be tailor-made so each swap may have different terms. Swap risk ratings may have one of the following suffixes so that the type of swap risk rating assigned is identified. Portfolio (srp) ratings; single counterparty-protection buyer (srb) ratings; and single counterparty-protection seller (srs).

Standard & Poor's National and Regional Scale Credit Ratings

S&P's national scale credit ratings are an opinion about an obligor's credit-worthiness (issuer, corporate or counterparty credit rating) or overall capacity to meet specific financial obligations (issue credit ratings), relative to other issuers and issues in a given country or region. National scale credit ratings provide a rank ordering of credit risk within the country and are not comparable between countries. S&P also assigns regional scale credit ratings for certain groups of countries. Similarly, regional scale credit ratings are not comparable to other national or regional scales. The national and regional scale credit ratings use S&P's global rating symbols with the addition of a two-letter prefix to denote the country or region. For three countries prefixes are not used. The credit ratings from "xxAA" to "xxCCC" may be modified by the addition of a plus (+) or minus (-) to show relative strength with the rating category.

Standard & Poor's Long-Term National and Regional Scale Credit Ratings

Table 5 shows a summary of S&P's national and regional long-term rating scale.

Table 6 shows a summary of S&P's country or regional prefixes and the associated countries or regions.

Standard & Poor's Short-Term National and Regional Scale Credit Ratings

Table 7 shows a summary of S&P's national and regional short-term rating scale.

Table 5 S&P's long-term national and regional rating scale

Category	Definition
xxAAA	The obligor's capacity to meet its financial commitments on the obligation, relative to other national obligors, is extremely strong.
xxAA	The obligor's capacity to meet its financial commitments on the obligation, relative to other national obligors, is very strong.
xxA	The obligor's capacity to meet its financial commitments on the obligation, relative to other national obligors, is strong.
xxBBB	Reflects adequate protection parameters relative to other national obligations. However, adverse circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments on the obligation.
xxBB; xxB; xxCCC; xxCC; and xxC	Reflect high risk relative to other national obligations. Although these obligations will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposure to adverse conditions relative to other national obligations.
xxBB	Reflects somewhat weak protection parameters relative to other national obligations.
xxB	The obligor currently has a weak capacity to meet its financial obligations. Adverse conditions, however, would likely impair capacity or willingness of the obligor to meet its financial commitments on the obligation.
xxCCC	Currently vulnerable to non-payment, relative to other national obligations. In the event of adverse conditions, the obligor is not likely to have the capacity to meet its financial commitment on the obligation.
xxCC	Currently highly vulnerable to non-payment relative to other national obligations. A default has not yet occurred, but is expected.
xxC	Currently highly vulnerable to non-payment, and the obligation is expected to have lower relative seniority or lower ultimate recovery compared to obligations that are rated higher.
D	In default or in breach of an imputed promise or if it is subject to a distressed exchange offer. Also used upon the filing of a bankruptcy petition or the taking of similar action and where default on an obligation is a virtual certainty, such as to automatic stay provisions.

Standard & Poor's Credit Estimate and Credit Assessment

A credit estimate is an indication of the likely S&P issue or issuer credit rating on an unrated obligation or obligor and typically provided to a third party on a confidential basis. This estimate does not involve direct contact with the obligor's management or in-depth insight into operating, financial or other strategic issues. S&P may provide periodic updates on credit estimates but does not provide ongoing surveillance. These estimates are expressed using S&P's traditional credit rating symbols, but in lower case: for example, rather than BB it is bb.

Table 6 S&P's country or regional prefixes

Prefix	Country/region
ra	Argentina
ax	Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam
br	Brazil
cn	China, Hong Kong, Macau, and Taiwan
gc	Bahrain, Kuwait, Oman, Qatar, Saudia Arabia, United Arab Emirates
il	Israel
kz	Kazakhstan
mx	Mexico
ng	Nigeria
None	Denmark, Finland, Sweden
ru	Russia
za	South Africa
tw	Taiwan
tr	Turkey
ua	Ukraine
uy	Uruguay

Table 7 S&P's national and regional short-term rating scale

Category	Definition
xxA-1	The obligor's capacity to meet its commitments on the obligation, relative to other national obligors, is strong. Certain obligations designated with a plus sign (+) reflect is extremely strong capacity.
xxA-2	The obligor's capacity to meet its financial commitments on the obligation, relative to other national obligors, is satisfactory.
xxA-3	Reflects adequate protection parameters relative to other short-term national obligations.
xxB	Reflects weak protection parameters relative to other short-term national obligations.
xxC	Reflects doubtful capacity for payment.
D	In default or in breach of an imputed promise or if it is subject to a distressed exchange offer. Also used upon the filing of a bankruptcy petition or the taking of a similar action and where default on an obligation is a virtual certainty, such as automatic stay provisions.

A credit assessment is an indicator of creditworthiness and can be expressed in descriptive terms, a broad rating category or with the addition of a plus (+) or minus (−) sign to indicate relative strength within the category. It reflects the general credit strengths and weaknesses of an issuer, obligor or a proposed financing structure or its elements. A credit assessment is usually a confidential, point-in-time evaluation and without any ongoing surveillance. Credit assessments are expressed using S&P's traditional credit rating symbols, but in lower case.

Foreign Currency Ratings and Local Currency Ratings

A major distinction is made between foreign currency ratings and local currency ratings. An issuer's foreign currency rating will be different from its local currency rating when the obligor has a different capacity to meet its obligations denominated in its local currency versus its obligations denominated in a foreign currency.

The local currency rating measures the likelihood of repayment in the currency of the jurisdiction the issuer is domiciled and does not take into account the possibility that it will not be possible to convert the local currency into foreign currency, or make transfers between sovereign jurisdictions (transfer and convertibility risk).

Foreign currency ratings additionally consider the profile of the issuer or note after taking into account transfer and convertibility risk. This risk is usually communicated for different countries by the Country Ceiling, which "caps" the foreign currency ratings of most, though not all, issuers within a given country.

Where the rating is not explicitly as local or foreign currency, the reader should assume that the rating is a "foreign currency" rating.

Foreign and local currency ratings are internationally comparable assessments.

Country Ceilings for Bonds, Bank Deposits and Other Foreign Currency Obligations

Rating agencies assign long-term and short-term ceilings for foreign-currency bonds and notes and bank deposits to the relevant countries. These are expressed on the long-term and short-term global rating scales. The ceilings generally indicate the highest ratings that can be assigned to a foreign-currency denominated security issued by an entity. Ratings that pierce the country ceilings may be permitted in the cases where the foreign-currency denominated securities have a lower risk of government interference than that dictated by the ceilings.

Country Ceiling for Bonds, Bank Deposits and Other Local Currency Obligations

Rating agencies also assign local currency ceiling for bonds and notes and bank deposits to every country. Local currency ratings measure the credit

performance of obligations denominated in the local currency and therefore exclude the transfer risk relevant to foreign-currency obligations. Local currency ratings are intended to be globally comparable, in contrast to the national ratings. For example, the local currency country ceiling for bonds indicate the rating level that is assigned to the financially strongest obligations in the country, whereas obligations benefiting from support based outside the country may on occasion be rated higher. The country ceiling for local currency bonds, bank deposits and notes is expressed on the long-term global scale.

Rating Migration

Generally the lower a borrower is rated, the more significant the debt's seasoning to default probability. Hence non-investment grade borrowers are more likely to default short-term until about three years out, at which point the likelihood begins to reverse. On the other hand, higher-rated borrowers tend to have lower average default rates. Typically upgrades and downgrades take place less frequently at higher ratings compared to lower ratings. Intuitively this makes sense because entities with higher ratings are of better credit quality and their creditworthiness is expected to be more stable with much less transition.

Figure 1 shows S&P's sovereign foreign-currency ratings remaining at the same rating level over one year from 1975–2014. Sovereigns with higher ratings tend to maintain the same rating longer than sovereigns with lower ratings. On average, 96.8 % of sovereigns rated AAA at the beginning of the year were rated AAA at the end of the year—whereas it is 86.3 % after five years.

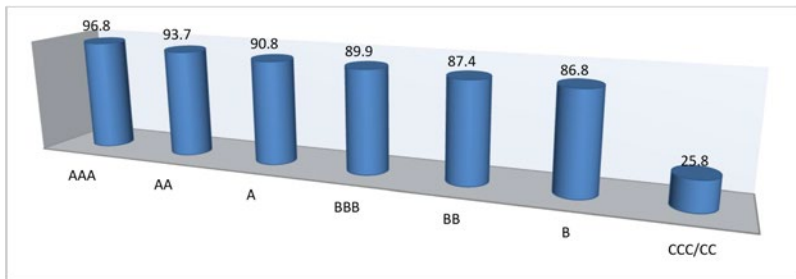


Fig. 1 Sovereign foreign-currency ratings remaining at the same rating level over one year (1975–2014) (%). Source of data: S&P

Overall the ratings are typically more stable during shorter time periods and higher rating levels.

A measure of rating stability is also the average time a sovereign has a certain rating. Figure 2 shows the average number of years spent at all ratings held prior to the rating on 31 December 2014. It is evident that the number of years declines with lower creditworthiness (lower ratings) showing much less stability at lower ratings.

Figure 3 shows that similar to the sovereign sector over the long-term, higher ratings are more stable than lower ratings in the corporate sector. AAA-rated issuers were still rated AAA one year later 87 % of the time, and CCC/C ratings remained CCC/C 43.9 % of the time.

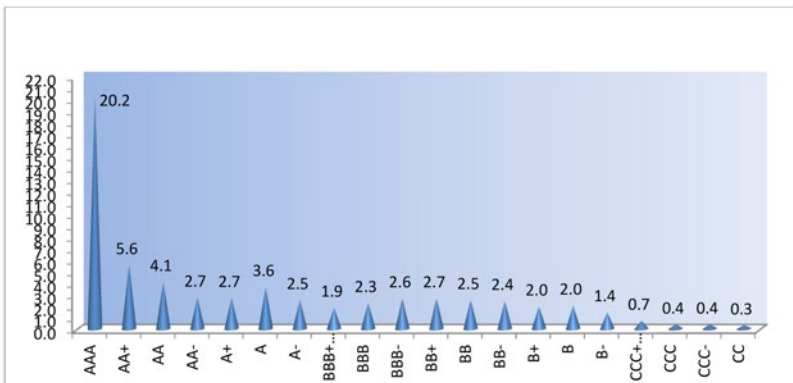


Fig. 2 Average time spent at each rating (years). Source of data: S&P

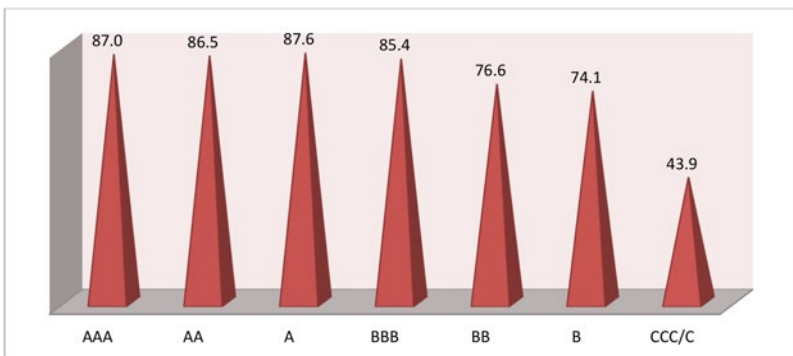


Fig. 3 Global corporate ratings remaining at the same rating level over one year (1981–2014) (%). Source of data: S&P

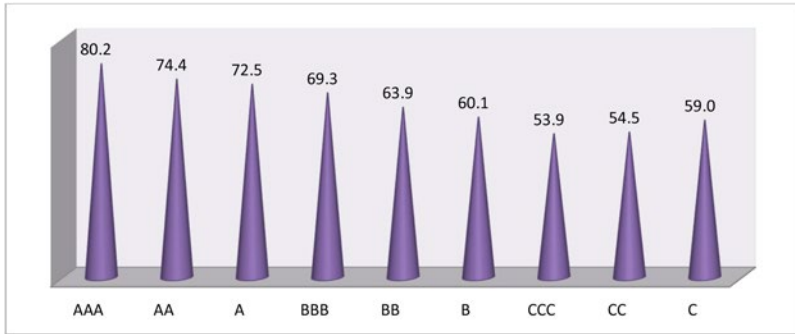


Fig. 4 Global structured finance ratings remaining at the same rating level over one year (1976–2014) (%). Source of data: S&P

Figure 4 shows the global structured finance ratings remaining at the same rating level over one year from 1976–2014. The ratings of global structured finance securities were stable up until 2007, but there were significant downgrades between 2007 and 2010. For structured finance transactions the credit and economic characteristics of a transaction's vintage can significantly impact its future credit performance. Generally transactions issued prior to 2007 (particularly securities issued in 2003–06) experienced higher downgrade and default rates than other vintages, owing to ongoing credit deterioration among mortgage securities and CDOs backed by these mortgage securities. Although ratings continued to decline since 2014, the downward transition rate has slowed, with investment-grade ratings starting to increase from late 2014. S&P reports that the average credit rating for all structured finance securities declined by 3.5 notches during 2009 and 1.4 notches in 2010. The rate of decline moderated to only 0.9 notches in 2012, 0.4 notches in 2013 and 0.1 notches in 2014.

Chapter 4: Credit Risk Assessment of Sovereigns, Banks and Corporates

Credit Risk Assessment of Sovereigns

National governments issue debt to obtain funding to finance public interest projects, such as transportation systems, hospitals, schools, utilities etc. Common debt issued consists of bonds, bills and notes. Typically bills mature in less than a year; notes have a maturity of one to 10 years and bonds 10 to 30 years. Sovereigns are the largest borrowers in the debt capital markets and their credit profile is used for benchmarking other debt issues.

Sovereign issuers differ from other issuers to the extent that they have great powers in controlling expenditures, adjusting taxation to service outstanding debt, setting legislation and controlling the money supply. Furthermore, in contrast to corporate issuers that may default and disappear, defaulted countries do not disappear. Those characteristics form a unique credit profile for sovereign entities.

The following parameters affect the ability and willingness of sovereigns to service outstanding debt: rating agencies use in their assessments of sovereign creditworthiness; the economic, institutional, fiscal, monetary and international position; as well as the ability of the sovereign to effectively manage event risk.

Economic Position

The overall economic position and growth is a key factor in the ability of the sovereign to generate revenue and service the debt. The economic position

depends on the national income, the competitiveness of the economy, and the volatility, diversification of revenue sources and overall growth potential. A wealthy, resilient and flexible sovereign with a long-term sustained economic growth can promote effective fiscal and monetary policy and increase debt affordability. A country with a large and diversified economy is in a better position to generate stable revenues to service its debt. Furthermore, a strong diversified economy can withstand better adverse external shocks or economic downturns. On the other hand, significant concentration of government revenues that also experience high volatility can threaten the economic standing of a country, especially during economic downturns. High debt is often associated with sovereign defaults. The inability of the sovereign to create sufficient economic growth in order to gradually reduce high outstanding debt makes it in the long run unsustainable. Economic stagnation together with adverse external shocks increase not only the probability of default but often the recovery rate is much lower than average.

Sovereigns that manage to create the economic environment that promotes and sustains economic growth are better positioned to deal with relatively high outstanding debt and successfully reverse increases in debt-to-Gross Domestic Product (GDP) ratios triggered by adverse financial shocks. Whereas countries with limited growth potential are more likely to default as their high debt becomes unsustainable. Economic position and growth can be assessed by GDP, real GDP growth and its volatility. Countries with high levels of national income have relatively lower default risk.

The relationship between GDP and credit should also be assessed. If the credit growth of a country is much greater than GDP growth, the default probability and potential loss severity increases considerably. For example, Ireland had a multiple of about 1.8× of annual credit growth to nominal GDP between 2003 and 2007 before the country went into recession in 2008.

Institutional Position

Solid institutional, stable political position and sound governance are key factors in the ability and even more the willingness of the sovereign to service the outstanding debt. The ability of the government to put in place a sound budget management plan and an economic policy that enhances growth, coupled with the effectiveness of the sovereign's central bank, enhances its creditworthiness and reduces the risk of default.

Historically there have been sovereign defaults of countries with low debt-to-GDP ratios that were due to institutional and political reasons. The

historical debt default record of a sovereign should also be looked at when assessing the sovereign credit risk. It is worth noting that sovereign bond restructurings constitute default. Although restructuring provides immediate liquidity relief it does not, however, solve the underlying problem of reducing unsustainable debt burden that has probably been built up over a long time period.

The effectiveness of the government's policy and central bank's capability can be assessed with the level of inflation experienced. Low inflation provides price stability which, as a consequence, can accommodate better economic growth and financial stability. On the other hand, high inflation is often a predecessor of economic and political instability. It creates lack of confidence in the markets and domestic currency, and is often associated with currency and balance of payments crisis. Deflation is also a concern since it is associated with negative real growth and an increase in the debt-to-GDP ratio. The inflation volatility is also useful to look at, as it shows the ability of the central bank to implement a stable monetary policy that promotes prosperity.

Fiscal Position

Overall, the fiscal position of a sovereign has a huge impact on its overall creditworthiness as it reflects the government finances, the overall debt affordability, the outstanding debt and its structure. Ratios such as debt to GDP and debt to revenues can be used to assess the fiscal position. High levels of these ratios imply fiscal weaknesses. If the government does not take measures to tighten its fiscal policy and reduce its deficit further debt accumulation is inevitable.

Interest payments relative to revenue and GDP reflect the level of debt affordability. High levels of these ratios have not only fiscal but economic repercussions. Since high ratios mean that the sovereign has to meet a relatively large interest service that will, from one point of view, increase fiscal deficits and, from the other, restrict public capital expenditure. As a result economic growth will be negatively affected.

Some countries can afford to have higher debt than others at more favourable rates, whereas countries that have, for example, defaulted in the past not only have high debt but the interest rates they are charged are at a much higher rate. Countries with fiscal imbalances often have both unsustainably high debt and deterioration in debt affordability.

High levels of foreign currency government debt in relation to total debt and high reliance on external creditors can increase the probability of default

for a sovereign. Macroeconomic or balance of payments shocks, or both, can lead to a currency crisis and large depreciation, which as a result leads to higher debt servicing and an overall outstanding debt burden in local currency terms.

Monetary Position

Monetary policy is an important tool that when used effectively can ease credit conditions when economic growth is below potential and tighten them when the economy overheats. The ability of the government to carry out an effective monetary policy in conjunction with the overall economic and fiscal policies affects its creditworthiness. Countries with open, deep and diversified markets with a high level of financial intermediation tend to have greater flexibility in applying monetary policy. Inflation is a key parameter in assessing monetary flexibility. Sovereigns with asset prices moving in line with fundamentals, well contained consumer price inflation, positive real interest rates and relatively stable exchange rates have a more effectively implemented monetary policy. Furthermore, these sovereigns, through their central bank, have a greater flexibility to act as a lender of last resort to the financial sector to provide sufficient liquidity and overall deal with systemic problems.

On the other hand, countries with a high level of consumer price inflation, those with a currency controlled by another country, those that apply exchange restrictions or those with high levels of deposits or loans in a foreign currency are weak in being able to apply any monetary policy or may not be able to have a monetary policy at all. As a result, these countries have no control in affecting economic conditions and have very little cushion against adverse financial events.

Event Risk

Unexpected adverse shocks can arise from political, liquidity, banking sector or general external events and can have a significant impact on a sovereign. The sovereign's ability to face these unexpected extreme events is very important. The Russian default of 1998 and the Argentinean default of 2001 are examples of a combination of debt, banking and currency crises. These have been of the largest sovereign defaults with severe disruptions to the economy and substantial investor losses.

Sovereigns that have access to a diversified pool of finances including local investors and an overall developed financial system can access funds easier and faster and mitigate liquidity risk than those whose financial system is less

developed. Government liquidity risk indicators can include Gross Borrowing Requirements to GDP. The higher this ratio the higher the liquidity risk. The share of the General Government Debt that is held by non-residents is also useful as the higher the share the higher its liquidity risk.

Sovereign credit risk rose significantly as a result of the financial sector bailouts in the 2007–08 financial crisis. After the bailout of the banking sector from national governments that started in the late 2008, the Credit Default Swap (CDS) markets show a fall in the CDS fees on banks while the CDS fees for sovereigns rose sharply. The banking sector risk was transferred to the government balance sheet. Ultimately, the banking sector default risk was transferred to the sovereign. The bailouts alleviate further distortion in the financial sector. Consequently, increased taxation is inevitable for current and future taxpayers. The impact of increased taxation is that it discourages financial sector investment.

However, the sovereign and banking sectors are closely linked. During the summer of 2011 in the Eurozone, sovereign CDS were at very high levels because of sovereign default threats. This led to concerns of a renewed banking crisis and as a result banks' CDS rose again. The sovereign crisis damaged the banks' balance sheets by losses on sovereign bond holdings and by the drop in value of government guarantees and support.

The banking sector risk and contingent liabilities affect the creditworthiness of a sovereign. The sovereign crisis stemmed from the fact that many governments stepped in and provided support to the countries' banks. If the internal strength of the banking sector is strong, it reduces the probability that the government will have to provide external support. If the share of the banking sector is relatively large it can potentially increase contingent liabilities. The size can be measured by the ratio of total domestic bank assets to GDP. A banking sector that has a flexible depositor base and low dependence on capital market funding has lower risk. A sovereign has higher banking sector risk if it has a relatively higher banking system's loan to deposit ratio. The case of Iceland is a recent example of how a large and highly leveraged banking sector in relation to the (Icelandic) economy can negatively affect sovereign creditworthiness. In September 2008, three Icelandic banks were put into receivership under the supervision of the Icelandic government. However, the Icelandic government was not able to save the Icelandic banks. The outstanding debts of the three biggest banks were over \$62 billion in foreign currency obligations, which was an order of magnitude bigger than Iceland's 2007 GDP. Then the Icelandic government separated the banks' domestic and international operations and kept the foreign liabilities within the failed lenders, providing no support to banks' foreign bondholders and depositors. As a result Iceland's banks were bankrupt. The banking sector crisis was

followed by high inflation, a large currency depreciation and a contraction of the economy.

Government support can be provided through the issuance of guarantees to facilitate bank debt and direct injections of capital. However, governments may ultimately prefer to assist with recapitalizing banks as having guarantees that are being called carries a greater financial and reputational risk. Banking sector liabilities often constitute the main contingent liability for a country. Contingent Liabilities (CLs) are off balance sheet liabilities that may migrate onto the government's balance sheet upon certain triggers. Other than banking sector liabilities, any other government guarantee or support that a government may be compelled to provide and government-owned or related companies (or even private companies that have a vital activity for the country or employ an important share of the country's workforce) is considered systemic. Government finances and debt are affected when contingent liabilities crystallize. Depending on how the government funds its intervention its finances are affected. If the government resorts to getting new borrowing this will increase the government's gross debt; selling assets would only impact the government's net debt. If the support takes the form of a subsidy, or any other non-financial transaction, only the government's budget deficit will be affected.

Moody's Approach for Sovereigns Ratings

Moody's assesses sovereign credit risk globally based on economic, institutional, fiscal strength and susceptibility to event risk factors. Each of these factors is analysed into sub-factors carrying a certain weight. Each sub-factor is assessed from a number of international sources, such as the International Monetary Fund, the Organization for Economic Cooperation and Development, the European Commission, the World Bank, the Bank for International Settlements and data provided by national statistical sources.

The analysis involves first estimating each sub-factor indicator; secondly the outcomes for each of the indicators are mapped to one of 15 ranking categories. These categories range from Very High plus (VH+) that represents the best credit quality to Very Low minus (VL-), the worst credit quality. These mappings determine the score for the relevant sub-factor (using the same scale) and then the score for the broad rating factors.

Table 1 shows Moody's economic resiliency, by combining economic strength and institutional strength factors with equal weight.

		Economic Strength														
		VH+	VH	VH-	H+	H	H-	M+	M	M-	L+	L	L-	VL+	VL	VL-
Insitutional Strength	VH+	VH+	VH+	VH+	VH	VH	VH-	VH-	H+	H+	H	H	H-	H-	M+	M
	VH	VH+	VH	VH	VH-	VH-	H+	H+	H	H	H-	H-	M+	M+	M	M-
	VH-	VH+	VH	VH-	VH-	H+	H+	H	H	H-	H-	M+	M+	M	M	L+
	H+	VH	VH-	VH-	H+	H+	H	H	H-	H-	M+	M+	M	M	M-	L+
	H	VH	VH-	H+	H+	H	H	H-	H-	M+	M+	M	M	M-	M-	L
	H-	VH-	H+	H+	H	H	H-	H-	M+	M+	M	M	M-	M-	L+	L
	M+	VH-	H+	H	H	H-	H-	M+	M+	M	M	M-	M-	L+	L+	L-
	M	H+	H	H	H-	H-	M+	M+	M	M	M-	M-	L+	L+	L	L-
	M-	H+	H	H-	H-	M+	M+	M	M	M-	M-	L+	L+	L	L	VL+
	L+	H	H-	H-	M+	M+	M	M	M-	M-	L+	L+	L	L	L-	VL+
	L	H	H-	M+	M+	M	M	M-	M-	L+	L+	L	L	L-	L-	VL
	L-	H-	M+	M+	M	M	M-	M-	L+	L+	L	L	L-	L-	VL+	VL
	VL+	H-	M+	M	M	M-	M-	L+	L+	L	L	L-	L-	VL+	VL+	VL-
	VL	M+	M	M	M-	M-	L+	L+	L	L	L-	L-	VL+	VL+	VL	VL-
	VL-	M	M-	L+	L+	L	L	L-	L-	VL+	VL+	VL	VL	VL-	VL-	VL-

Table 1 Moody's economic resiliency
 Source: Moody's Investors Service

		Fiscal Strength														Weight (ER/FS)		
		VH+	VH	VH-	H+	H	H-	M+	M	M-	L+	L	L-	VL+	VL	VL-		
Economic Resiliency	VH+	VH+	VH+	VH+	VH+	VH+	VH+	VH+	VH+	VH+	VH	VH	VH	VH	VH	VH-	80/20	
	VH	VH	VH	VH	VH	VH-	VH-	VH-	VH-	VH-	H+	H+	H+	H+	H+	H		
	VH-	VH	VH-	VH-	VH-	VH-	VH-	H+	H+	H+	H+	H	H	H	H	H-		
	H+	VH-	VH-	H+	H+	H	H	H	H	H	H	H-	H-	H-	M+	M+	M	70/30
	H	VH-	H+	H+	H	H	H	H-	H-	H-	H-	M+	M+	M+	M	M		
	H-	H+	H	H	H	H-	H-	H-	M+	M+	M+	M+	M	M	M	M-		
	M+	H+	H	H	H-	H-	M+	M+	M	M	M-	M-	M-	L+	L	60/40		
	M	H	H-	H-	H-	M+	M+	M	M	M	M-	M-	L+	L+	L			
	M-	H	H-	M+	M+	M+	M	M	M-	M-	M-	L+	L+	L	L			
	L+	M+	M	M	M	M-	M-	M-	M-	M-	L+	L+	L+	L	L	L-	75/25	
	L	M	M-	M-	M-	M-	L+	L+	L+	L	L	L	L	L	L-			
	L-	M-	M-	L+	L+	L+	L+	L	L	L	L	L-	L-	L-	L-	VL+		
	VL+	L-	L-	L-	L-	L-	L-	L-	L-	VL+	VL+	VL+	VL+	VL+	VL+	VL+	90/10	
	VL	VL+	VL+	VL+	VL+	VL+	VL+	VL+	VL+	VL	VL	VL	VL	VL	VL			
	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-	VL-			

Table 2 Moody's government financial strength
 Source: Moody's Investors Service

Having obtained the economic resiliency score, this is then combined with the fiscal strength factor to produce the government financial strength. Moody's assigns a larger weight of fiscal strength for countries with moderate economic resiliency, because the creditworthiness of countries with moderate economic resiliency is more sensitive to changes in their fiscal strength (Table 2).

		Government Financial Strength																	
		VH+	VH	VH-	H+	H	H-	M+	M	M-	L+	L	L-	VL+	VL	VL-			
		Aa1-Aa2	Aa1-Aa3	Aa2-A1	Aa1-A2	A1-A3	A2-Baa1	A3-Baa2	Baa1-Baa3	Baa2-Ba1	Baa3-Ba2	Ba1-Ba3	Ba2-B1	Ba3-B2	B1-B3	B2-Caa1			
Factor 4: Susceptibility to Event Risk	VL-	Aa1	Aa1	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3			
	VL	Aa1	Aa1	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3			
	VL+	Aa1	Aa1	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3			
	L-	Aa1	Aa1	Aa3	A1	A2	A3	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1			
	L	Aa1	Aa1	Aa3	A1	A2	A3	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1			
	L+	Aa1	Aa1	Aa3	A1	A2	A3	Baa2	Baa3	Ba1	Ba3	B1	B2	B3	Caa1	Caa2			
	M-	Aa1	Aa3	A1	A2	A3	Baa1	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2			
	M	Aa1	Aa3	A1	A2	A3	Baa1	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3		
	M+	Aa3	A1	A2	A3	Baa1	Baa2	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3			
	H-	Aa3	A1	A2	A3	Baa1	Baa2	Ba1	Ba2	Ba3	B2	B3	Caa1	Caa2	Caa3	Caa3			
H	A1	A2	A3	Baa1	Baa2	Baa3	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Caa3				
H+	A1	A2	A3	Baa1	Baa2	Baa3	Ba2	Ba3	B1	B3	Caa1	Caa2	Caa3	Caa3	Caa3				
VH-	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Caa3	Caa3				
VH	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba3	B1	B2	Caa1	Caa2	Caa3	Caa3	Caa3	Caa3				
VH+	A3	Baa1	Baa2	Baa3	Ba1	Ba2	B1	B2	B3	Caa1	Caa2	Caa3	Caa3	Caa3	Caa3				

Table 3 Moody’s rating range: combination of government financial strength and event risk

Source: Moody’s Investors Service

Finally the susceptibility to event risk is taken into account and combined with the government financial strength in order to arrive to the sovereign rating indicated by the scorecard. The susceptibility to event risk works more as a constraint in this case, having very little impact when the event risk is very low (Table 3).

Moody’s Sovereign Rating Factors

Table 4 shows Moody’s four broad rating factors, which in turn comprise of sub-factors and the sub-factor indicators.

Standard & Poor’s Approach for Sovereign Ratings

S&P uses the following factors to assess sovereign credit risk: institutional and governance effectiveness (institutional assessment); economic structure and growth (economic); external liquidity and international position (external); fiscal performance and flexibility (fiscal); and monetary flexibility (monetary).

Each factor is assessed using a six-point numerical scale from “1” (the strongest) to “6” (the weakest). These five assessments are combined to form a sovereign’s institutional and economic profile and its flexibility and performance profile. The two profiles are then used to determine an indicative rating level.

The institutional and economic profile is the average of the institutional and economic assessment. The flexibility and performance profile is the average of the external, fiscal and monetary assessment.

Broad Rating Factors	Rating Sub-Factor	Sub-factor Weighting (towards Factor)	Sub-Factor Indicators
Factor 1: Economic Strength	Growth Dynamics	50%	Average Real GDP Growth _{t,t+10m-1}
			Volatility in Real GDP Growth _{t,t+10m}
	Scale of the Economy	25%	WEF Global Competitiveness Index
	National Income	25%	Nominal GDP (US\$) _{t,t-1}
			GDP per capita (PPP, US\$) _{t,t-1}
Factor 2: Institutional Strength	Adjustment Factors	1 - 6 scores	Diversification
			Credit Boom
	Institutional Framework and Effectiveness	75%	World Bank Government Effectiveness Index
			World Bank Rule of Law Index
	Policy Credibility and Effectiveness	25%	World Bank Control of Corruption Index
		Inflation Level _{t,t+10m-1}	
Adjustment Factor	1 - 6 scores	Inflation Volatility _{t,t+10m-1}	
Factor 3: Fiscal Strength	Debt Burden	50%	Track Record of Default
			General Government Debt/GDP _t
	Debt Affordability	50%	General Government Debt/Revenues _t
			General Government Interest Payments/Revenue _t
			General Government Interest Payments/GDP _t
Adjustment Factors	1 - 6 scores	Debt Trend _{t,t+10m-1}	
		General Government Foreign Currency Debt/General Government Debt _t	
Factor 4: Susceptibility to Event Risk	Political Risk	Max. Function	Other Public Sector Debt/GDP _t
			Public Sector Financial Assets or Sovereign Wealth Funds/GDP _t
	Government Liquidity Risk	Max. Function	Domestic Political Risk
	Banking Sector Risk	Max. Function	Geopolitical Risk
			Funding Vulnerabilities
External Vulnerability Risk	Max. Function	Fundamental Metrics	
		Market Funding Stress	
		Strength of Banking System	
		Size of Banking System	
		Net International Investment Position/GDP _t	

Table 4 Moody's sovereign rating factors
 Source: Moody's Investors Service

Unless further adjustments are required, the sovereign foreign-currency rating is within one notch of the indicative rating level. Adjustments may be due to the fact one of the five rating factors is in a positive/negative transition that supports/detracts from the indicative rating level or there is an event risk.

Standard & Poor's Key Sovereign Rating Indicators

Table 5 shows short definitions of the main S&P's sovereign indicators.

Foreign and Local Currency Ratings

Sovereign credit ratings and ceilings have a huge impact on the private sector. Sovereign credit ratings exist in both foreign and local currency ratings. The servicing of local currency obligations are met through taxation and control

Table 5 Summary of S&P's key sovereign rating indicators**Economic and monetary indicators**

GDP per capita (USD)

(% change) of real GDP per capita

(% change) of Consumer Price Index (CPI)

(% change) of depository corporation claims

Monetary base: that is the local currency in circulation in addition to the monetary authority's local currency liabilities to other depository corporations.**External indicators***Current Account Receipts (CAR)*: that is proceeds from exports of goods and services in addition to factor income earned by residents from non-residents and official and private transfers to residents from non-residents.*Official Reserves*: that is monetary authority liquid claims in foreign currency, including gold, on non-residents.*Usable Reserves*: that is official reserves minus items not readily available for foreign exchange operations and repayment of external debt*Narrow Net External Debt/CAR (%)*: that is stock of foreign and local currency public and private sector borrowings from non-residents minus official reserves minus public sector liquid claims on non-residents minus financial sector loans to, deposits with, or investment in non-resident entities, as a % of CAR.*Gross External Financing Needs (% of CAR plus usable reserves)*: that is current account payments plus short-term external debt at the end of the prior year, including non-resident deposits at the end of the prior year plus long-term external debt maturing within the year, as a % of CAR plus usable reserves.*Current Account Balance/CAR (%)*: that is exports of goods and services minus imports of the same plus net factor income plus official and private net transfers, as a % of CAR.*Net Foreign Direct Investment (FDI)/GDP (%)*: that is direct investment by non-residents minus residents' direct investment abroad, as a % of GDP.*Net External Liabilities/CAR (%)*: that is total public- and private-sector liabilities to non-residents minus total external assets, as a % of CAR.*Terms of Trade*: that is the price of goods exports relative to price of goods imports.**Fiscal score key indicators***General Government*; aggregate of the national, regional, and local government sectors, including social security and other defined benefit public-sector pension systems, and excluding intergovernmental transactions.

Change in general government debt as a % of GDP.

Net General Government Debt/GDP (%).

General Government Liquid Financial Assets.

Gross General Government Debt/GDP (%).

General Government Interest/General Government Revenues(%).

of monetary policy and financial system. In contrast, foreign currency debt is serviced by foreign exchange. Country ceilings are not ratings, but expressions of a maximum limit for the foreign currency issuer ratings of most, but not all, issuers in a given country. Foreign currency ceilings determine the highest rating possible for debt instruments denominated in foreign currency issued by domestic borrowers other than the national government. The foreign currency bond ceiling reflects the probability that a government would, in the

event of a default, impose a moratorium on the foreign currency payments of domestic issuers. The foreign currency deposit ceiling reflects the risk that a government would restrict the repayment of foreign currency deposits.

A sovereign can have a local currency rating that is at the same level or one to two notches higher than the foreign currency rating. Local currency debt has lower default rates than foreign currency debt. If a country has a higher local currency rating it has probably been assessed to be able to effectively and independently manage and implement monetary policy. In this way it can set interest rates, control its currency and pay its local currency debt. A sovereign has greater flexibility to apply monetary policy if it has deep and very active secondary capital markets. Narrow bid-ask spreads are a common feature of deep and liquid markets.

Sovereign Risk and Credit Default Swap (CDS) Spreads

A sovereign CDS insures against losses from a credit event and generally protects against the default or debt restructuring of the issuing sovereign. The protection buyer pays a premium (spread) to the protection seller depending on the sovereign risk determined by the market.

Generally CDS are bilateral agreements that transfer the credit risk of debt obligations of certain “reference entities” and these can be not only sovereigns but corporations (financial and non-financial), other entities or securitization special purpose vehicles. CDS purchasers are protected against losses relating to predefined credit events, such as failure to pay during the term contract, in return for premium payments to the protection seller. If a credit event occurs, the premium payments terminate and the contract is settled. Settlement involves the protection seller paying an amount equal to the contract notional value less any recovery of the debt issued by the reference entity.

Sovereign CDS developed to address the needs of hedging and trading sovereign credit risks. Sovereign debt owners can buy sovereign CDS as a protection against losses arising from a default or other credit event of the underlying debt. Furthermore, sovereign CDS can also be used to hedge the risks of other assets highly correlated with the credit of the sovereign, such as domestic banks or utilities.

Sovereign CDS contracts can be used for speculation to buy or sell protection on a naked basis, meaning an entity does not need to hold an offsetting position in the underlying reference asset, but simply have a negative or positive perception of the credit outlook of the underlying bond issuer. CDS can also be used for basis trading. This can be achieved by taking offsetting positions between

the CDS and underlying debt. Sovereign CDS can be used to take advantage of pricing differences between sovereign CDS and the underlying debt obligations. Although in theory, the basis should be close to zero, in practice it may not be. This assumes that CDS can be used to replicate the cash flows of underlying obligations. So when CDS spreads are narrower than the credit spreads of the underlying debt, the basis is negative, and arbitragers may buy the debt obligations and buy CDS protection and vice versa if the basis is positive.

Sovereign CDS, similar to Corporate CDS, have been controversial during the recent financial crisis since they allowed speculation on government default. This led to important political debates and, effective as of November 2012, the European Union has banned the use of naked sovereign CDS. This means that an entity needs to hold the bond to buy insurance; if not, then that entity cannot buy a sovereign CDS. This had the effect of collapsing the European sovereign CDS market. Elsewhere the sovereign CDS market recovered post-implementation of the European ban.

The International Swaps and Derivatives Association (ISDA) proposed important changes to the CDS contract design and published the 2014 Definitions in February 2014. These changes affect the European financial and global sovereign CDS. There were many changes, one of these include a new credit event applicable to financial entities. Other changes relate to trading terms, bond exchanges, succession and substitution events.

The International Monetary Fund (IMF) in its Global Financial Stability Report (2013) on the role of sovereign CDS and further in relation to the European ban, concluded that sovereign CDS are the same as bonds in reflecting a country's creditworthiness based on the same economic fundamentals, and can help investors hedge risk, thus enhancing financial stability. Similar to other instruments the IMF study finds that not only sovereign CDS but also the underlying bond markets, like any financial market, may destabilize during periods of stress. The IMF study does not support the need to ban purchases of naked CDS protection. Additionally, it claims that hindering the use of sovereign CDS causes market liquidity to be further reduced, increases hedging costs and can raise funding costs for governments.

CDS spreads as explained in Chap. 2 can be expressed as default probabilities. While sovereign credit ratings tend to rely on lower frequency economic data, such as monthly, quarterly or annual, CDS prices can reflect high-frequency information on a daily basis. CDS spreads and their implied default probabilities, because they are determined by high-frequency information, convey much more forward looking information.

CDS spreads and their associated default probabilities are an indicator of the market's price of sovereign risk. Spreads of sovereign CDS and sovereign

bonds reflect economic fundamentals, and other relevant market factors. Relative to bond spreads, sovereign CDS spreads may reveal new information faster during periods of stress.

CDS spreads reflect the market price of credit risk and incorporate the country's fundamentals, liquidity, counterparty risk and risk appetite. CDS spreads are impacted by bid/ask spreads. An increase in the bid/ask spread that proxies liquidity, will be incorporated into the CDS spread with an associated increase. Fundamentals also affect sovereign CDS spreads. All else being equal, forecasts of significantly higher growth or much more positive macro-economic forecasts should reduce CDS spreads. On the other hand, negative news such as significant increases in the fiscal deficit forecast will increase CDS spreads.

It should be highlighted that there are differences between sovereign and corporate CDS. A major difference is that the credit event which triggered a contingent default insurance payment under a sovereign CDS is a repudiation/moratorium of sovereign reference entities. Typically, this takes place if the reference entity repudiates one or more relevant obligation(s) or declares a moratorium in respect of one or more relevant obligation(s) in excess of an agreed default requirement. In corporate CDS, the standard corporate credit events include bankruptcy, failure to pay and, if applicable, restructuring.

Another complication in relation to sovereign CDS is the currency denomination of the CDS contract. This is due to the fact that in the event of default there is high risk of currency depreciation or redenomination by the sovereign. If France were ever to default, a payout in another currency other than Euro would probably be preferred. Avoiding the currency depreciation risk and having the pay out in another currency (for the same underlying sovereign) would be incorporated in the CDS fee. Although depreciation risk also affects the corporate CDS of companies domiciled in the subject sovereign (i.e. France), the impact of currency depreciation is likely to be greater on the sovereign CDS compared to the corporate.

Credit Risk Assessment of Banks

The credit risk of a bank depends on the bank's stand-alone financial strength, and on how likely it could be supported externally, if needed. External support may be institutional support sourced from the bank's shareholders or sovereign support from the government, where the bank is domiciled. Therefore the ability and propensity of the potential supporter to provide assistance is also an important factor in assessing credit risk. The credit risk of a bank also

involves the risk that it could fail to make payments to honour its domestic or foreign currency obligations due to sovereign actions.

The business and risk profile of banks differs significantly from any other firm. Banks are characterized by high leverage. Banks have illiquid assets (loans) which are financed mainly by short-term liabilities (deposits) and operate in a very cyclical environment.

Factors Affecting the Independent Financial Strength of Banks

The following factors affect the intrinsic value of a bank. These are to a certain extent inter-related.

- franchise value, business strategy and management team;
- risk profile and management;
- financial fundamentals;
- macroeconomic, operating and regulatory environment.

Franchise Value, Business Strategy and Management Team

Franchise value, business strategy and management team is key to a bank's market standing in a given market. A solid franchise can create economic value, generate and sustain profitability which in turn allows capital to be preserved and improved and better positioned to withstand difficult market conditions.

A bank that enjoys a brand name with big market share and thus pricing power has relatively lower credit risk compared to one with insignificant market share and positioning. However, even if a bank has a strong market presence, if it concentrates on a single line of business, in the absence of diversification this bank can be highly vulnerable to sudden and unexpected changes in market dynamics as it would lack alternative earnings capacity to protect its economic solvency. Therefore earnings diversification is quite important and a significant risk mitigant. A bank can be considered to have a good diversification of earnings if the total profits stem from a combination of different lines of businesses such as retail banking, consumer lending, asset management and transaction services business lines etc. A traditional retail bank is diversified between lending and deposit taking. On the other hand, banks that obtain most of their earnings (say three-quarters or more) from one single line, such as only credit cards, or mortgage banking, factoring,

leasing, project financing, ship finance etc. have a concentrated earnings base and thus higher credit risk. In any type of bank—retail, wholesale, trading—large exposures to single obligors, industries or regions are a potential source of asset impairment and consequently earnings volatility. Excessive concentration on lending in a single geographic area with relatively undiversified economies increases the credit risk profile of a bank. On the other hand good geographic diversification should enable a bank to go through business cycles. For example, a small bank operating in a single geographic area is more likely to suffer earnings volatility than one that is geographically diversified across regions. However during times of extreme market volatility even exposures that were previously considered to be highly diversified can become very much correlated, so the benefit given to diversification should be carefully thought through. Positive correlation between exposures can occur where regions have the same currencies, are financially linked and exposed to the same legal, regulatory changes and financial shocks.

Business strategy is key determinant of credit risk. Banks that are retail-based tend to be more resilient during times of extreme market volatility and financial crisis compared to wholesale/corporate banking or trading-based banks. Traditional retail banking has overall more predictable risk adjusted earnings stemming from higher switching costs for customers and highly granular loan portfolios. Banks that focus on wholesale/corporate banking or trading (especially in derivatives) often have more volatile earnings, driven by a more sophisticated customer base, lower switching costs and less granular loan exposures. Therefore business stability during economic and market fluctuations is very important. A bank whose revenues are vulnerable to significant volatility during adverse conditions is associated with weaker business stability and is more likely to default. Customers and counterparties can walk away, and access to liquidity in the capital market can dry up, a lesson well learnt during the 2007 crisis.

The quality, stability and experience of executive and senior management are key parameters as management decision making affects an institution's credit profile, such as compensation and strategic vision. Strong management teams will demonstrate a high degree of credibility, experience and competence and will have strategic objectives clearly set reflecting long-term sustainable levels of business and financial performance.

Risk Profile and Management

The way a bank manages risks, such as credit, interest rate, trading, reputation, new product or operational, is a key factor in strategic decisions.

Liquidity risk is one of the most important risks faced by a bank. Basically if a bank runs out of money it cannot function. The assessment of bank liquidity management involves an assessment of the degree to which a bank's illiquid assets (primarily loans) are funded by stable liabilities (primarily customer deposits, long-term debt and equity). Banks with stable funding in excess of their illiquid assets have lower liquidity risk compared to banks with less stable and more "market confidence" sensitive sources of funding, such as short-term money markets and the interbank market. A bank that systematically and over a long time period (over a year) needs to access the unsecured capital markets to obtain funding is of higher liquidity risk. If the bank cannot access the capital markets it will have to reduce its business and this will have a negative impact on its franchise value. Banks that over time are seen to be very dependent on central bank funding have more credit risk than banks which have diversified sources of funding.

The market risk profile of a bank is a key element in assessing a bank's financial strength. Market risk can affect the financial standing of a bank as changes in the market such as changes in interest rates, equity prices, foreign-exchange rates and credit spreads can affect the banking and trading book of a bank. A bank's estimates of economic capital, Value at Risk (VAR), stress tests and market risk-weighted assets to total risk-weighted assets can be used to assess market risk. Stress tests can include (outside the trading book) assessing the impact of a 100 basis points (bps) or 200 bps shift in the yield curve, changes in the shape of the yield curve or movements in foreign exchange rates.

The risk profile of a bank can be seen from its underwriting standards and how these compare to peers and to the broader banking sector as the loan portfolio is usually the largest source of risk for most banks. Factors that reduce the credit risk may include low loan to value ratios for secure lending with robust valuations, a low proportion of unsecured lending, combined with reserving policies and prudent limits that effectively reduce borrower, sector and geographic concentrations. Furthermore, if a bank's securities holdings are large relative to the loans and there is a large investment in illiquid and complex securities this increases its credit risk.

The effectiveness of the bank's risk management tools is key to its credit risk. These include limits to product or credit concentrations, geography, market risks, operational controls, internal ratings or third-party data sources such as national credit bureaus. The independence of the internal audit function and the attitude to breaching and violations is also an important risk parameter. A robust stress-testing framework, effective hedging practices, mitigation tools, limit monitoring and controls, can all reduce a bank's risk.

Financial Fundamentals

Financial fundamentals ultimately reflect the profitability and capital held as well the quality of assets of the bank. The asset quality is critical since the better the quality of the asset the better they will withstand adverse market conditions and potentially have lower market value declines (e.g. collateral backing residential and commercial loans). All things being equal, the better the quality of assets, the stronger the profitability and capitalization, the more enhanced the bank solvency. Good quality and relatively more liquid assets means that the bank will not have to sell at fire sales prices in case it faces funding problems. The capital held should be adjusted in relation to the quality of the assets held by the bank. If the assets are of low quality then more capital should be held. Furthermore, if the quality of the assets deteriorates capital should be increased. Appropriate and strong capitalization for the risk profile of the bank enhances solvency, since it increases the capacity to absorb losses and further boosts market confidence in the bank.

The financial profile of the bank also reflects the liquidity position, source and structure of the bank. A bank with unreliable funding sources, such as of short-term duration from risk sensitive investors and counterparties may experience more difficulties in refinancing its debt. Banks that rely a lot on market funding will experience more funding problems than others that do not, especially during adverse market conditions. The fact that banks borrow short-term and lend long-term has an inherent vulnerability. However, this maturity mismatch varies across banks.

Basel III main reforms increase the amount and the quality of capital, attempt to improve a bank's funding and liquidity and further deal with CCR so as to tackle the issues arising from the 2007 financial crisis and avoid further crisis in the banking and general financial system. A bank has to meet the regulatory requirements set by the Basel Committee. If a bank's capital and liquidity, leverage and other regulatory requirements are close to or very near to be in breach of the minimum regulatory requirements, all things being equal, this bank then is of greater credit risk. Chapter 2 discusses the Basel regulatory requirements.

Macro-economic, Operating and Regulatory Environment

The state of the macro-economic environment affects the strength of a bank and the probability of bank failure/survival. Macro-economic factors such as GDP growth, private-sector credit relative to GDP and its growth rate,

real interest rates, exchange rate, capital flows and asset prices all contribute to the state of the banking system. Furthermore, the presence of liquidity mechanisms encouraged by a healthy and reliable financial system, where law and order prevails, also affect the credit risk of any bank operating in such an environment.

Therefore, the credit analysis of a bank needs to factor in the impact of the environment in which the bank is operating. Banks in developing markets face different challenges compared to banks in mature markets. The regulatory environment in developing markets is more unproven, the operating environment is more volatile and the financial reporting is less reliable. On the other hand, banks in mature markets benefit from more effective financial reporting and regulatory environments and less volatile operating environments. As a result, the riskiness of a bank in mature market is far less.

Moody’s Approach for Bank Ratings

Exhibit 1 summarizes Moody’s methodology for determining bank ratings.

Step 1 refers to the Baseline Credit Assessment (BCA) of a bank’s intrinsic strength. This is Moody’s assessment of the standalone financial strength of the bank, referring to the probability of default in the absence of any external support, or otherwise its probability of standalone failure. The analysis starts assessing the macro-economic profile that the bank operates in, expressing the general view on systemic banking risk. Then the financial profile and other more qualitative factors are assessed which, combined with the

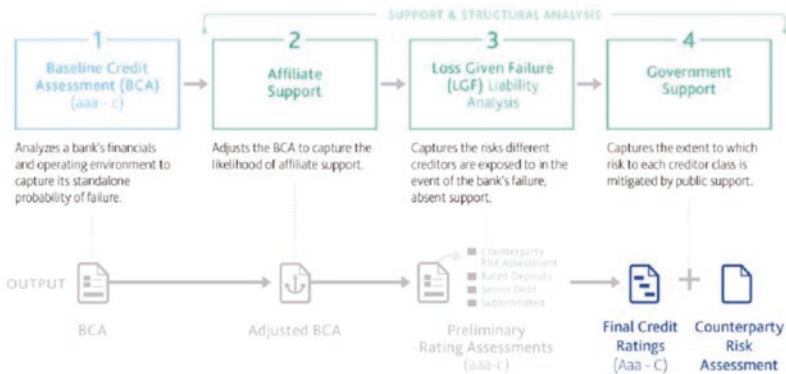


Exhibit 1 Summary of Moody’s bank ratings methodology. *Source:* Moody’s Investors Service

Baseline Credit Assessment		Banking Group ABC Inc Country XYZ					
Macro Factors							
	Country / Region	Macro Profile	Weight				
	Country 1	Very Strong	60%				
	Country 2	Strong	20%				
	Country 3	Moderate +	20%				
	Weighted Macro Profile	Strong +	100%				
Financial Profile							
		Historic Ratio	Initial Score	Expected trend	Assigned Score	Key driver #1	Key driver #2
Solvency							
	Asset Risk						
	Problem Loans / Gross Loans	2.0%	a1		baa2	Geographical diversification	Capital market risk
	Capital						
	Tangible Common Equity / RWA	8.5%	ba2	↔	b1	Risk-weighted capitalisation	Nominal leverage
	Profitability						
	Net Income / Tangible Assets	0.5%	baa2	↔	a3	Loan loss charge coverage	
	Combined Solvency Score				baa3		
Liquidity							
	Funding Structure						
	Market Funds / Tangible Banking Assets	15.0%	a2	↔	baa2	Term structure	
	Liquid Resources						
	Liquid Banking Assets / Tangible Banking Assets	20.0%	baa1	↑	baa1	Expected trend	Intragroup restrictions
	Combined Liquidity Score		a3		baa2		
	Financial Profile				baa3		
Qualitative Adjustments					Adjustment	Comment	
	Business Diversification				0		
	Opacity and Complexity				-1	Highly complex organisation	
	Corporate Behavior				0		
	Total Qualitative Adjustments				-1		
	Sovereign or Affiliate constraint						
					Aaa	Government rating	
	BCA range				baa3 - ba2		
	Assigned BCA				ba1	Appropriate position vs peers	

Exhibit 2 BCA example. Source: Moody's Investors Service

macro-economic profile, produce the BCA. The BCA is expressed as a point on the BCA scale from “aaa” to “c”.

Exhibit 2 shows a BCA example.

It should be noted that it is very unlikely the BCA assigned is higher than the long-term local currency rating of the sovereign country within which it is based, as banks have significant exposure to sovereigns. However, there could be some cases where the BCA exceeds the sovereign ratings of the bank’s home country. Although this would typically not be by more than one notch, it can happen if, for example, direct exposures to the government are relatively small or the bank has a high degree of diversification outside its home country.

Step 2 refers to the assessment of support from affiliates, layered onto the BCA to determine an adjusted BCA. This establishes the probability that a

given bank will either default or will require extraordinary government support to prevent a default, i.e. its probability of failure, having exhausted any support from affiliates.

In summary the following parameters are taken into account to determine the adjusted BCA:

- *The bank’s unsupported probability of failure, the BCA.*
- *The probability of the affiliate’s providing support.* The probability of the affiliate’s provision of support range from “Affiliate-backed”, to “Very High”, “High”, “Moderate” and “Low”. For example, an entity 100 % owned by a group, which also carries the group’s brand and logo, and has activities considered core to the group’s strategy is likely to have a “Very High” probability of specific support. If an entity is 100 % owned but has peripheral activities and disposal would not impact the group significantly then the probability of specific support may be “Moderate”.
- *The affiliate’s capacity to provide support.* To establish the affiliate’s capacity to support the bank, Moody’s generally use the affiliate’s own BCA. However, as BCAs are based on consolidated financial statements—that include subsidiaries—this BCA may be modified to reflect the affiliate’s financial strength excluding the supported subsidiary.
- *The dependence between the respective entities.* This depends on the integration between the affiliates and the links between the markets, business lines and product types, as well as the geographic location in which the affiliates operate.

The Joint Default Analysis (JDA) is used in rating committees with an indicative range of potential uplift from the BCA. The BCA, together with this uplift, form the adjusted BCA.

Exhibit 3 shows an example of adjusted BCA.

Assumptions				
Country of supporting affiliate	Country XYZ			
Supporting Affiliate	Parent Bank Inc			
Reference creditworthiness	BCA			
Creditworthiness of support provider	baa1			
Dependence	Very High			
BCA	Level of support	Notching guidance (Min - Mid - Max)	Assigned notching	Assigned Adjusted BCA
ba1	High	1 - 1 - 2	1	baa3

Exhibit 3 Adjusted BCA example. *Source:* Moody’s Investors Service

Step 3 refers to the “Loss Given Failure” (LGF) analysis of the impact of the bank’s failure on the expected loss of each creditor class in response to (where applicable) different forms of expected resolution, firm-wide loss rates and liability structure, together with additional notching relating to other risks, to arrive at Moody’s Preliminary Rating Assessment (PRA). The LGF approach is similar to a classic Loss Given Default (LGD) analysis used by Moody’s to rate some corporate debt, but triggered by the failure of a bank, and not necessarily its default.

The LGF framework takes two forms. A simple notching approach (Basic LGF) is applied to banks that are not subject to an Operational Resolution Regime (ORR), and for which Moody’s expects to be “resolved” through bai-out, bankruptcy, or ad hoc resolution measures. Under the Basic LGF approach, Moody’s typically positions the senior unsecured debt and deposits at the adjusted BCA level, before government support and additional coupon-related notching considerations, and subordinated instruments at one notch below the adjusted BCA—again, excluding support and additional notching.

The advanced LGF analysis is applied to banks subject to an ORR—that is, systems with legislation intended to facilitate the orderly resolution of failed banks and clarity exists over the impact of the failure on depositors and other creditors. The key variables of advanced loss given failure are:

- *Loss rate*: the greater the overall loss rate in resolution, the more of a bank’s liabilities are at risk of loss.
- *Subordination*: the greater the volume of debt subordinated to a given instrument class, the greater the protection offered to that instrument and the lower its expected loss.
- *Instrument volume*: the greater the volume of a given instrument class, the lower its loss severity, as more creditors can absorb a given loss.

The advanced LGF expresses loss severity in terms of the notch differential relative to the adjusted BCA. This approach identifies differences in likely loss severity that arise from distinctions in liability structures and can range from one notch below the adjusted BCA, where the loss severity is expected to be high in the event of failure, to three notches above the adjusted BCA, where loss severity is expected to be extremely low.

Additional notching may be applied to reflect other instrument-specific characteristics affecting the probability of payment, such as coupon skip mechanisms. The adjusted BCA, LGF notching and any additional notching result in a measure of Moody’s intrinsic creditworthiness in the absence of any government support, called the PRA.

Step 4 refers to the assessment of potential support from a public body (usually a government but sometimes a central bank or supranational institution). Moody’s also generate a Counterparty Risk Assessment, which provides a probability of default assessment on a bank’s operating obligations, such as payment obligations associated with covered bonds, derivatives, letters of credit, third party guarantees, servicing and trustee obligations and other similar obligations that arise from a bank in performing its essential operating functions.

The analysis for determining government support is similar to that from an affiliate and the following parameters are taken into account: The JDA is used, based on:

- the unsupported creditworthiness of each debt class;
- the probability of public sector support being provided to a given debt class: probability that will support an institution according to one of five categories, “Government-backed”, “Very High”, “High”, “Moderate” and “Low”;
- the public body’s capacity to provide support: the public body’s long-term local currency rating best reflects its capacity to provide support;
- the dependence, or correlation, between support provider and bank.

The JDA is also used to provide rating committees with an indicative range of potential ratings uplift from the PRA. The rating committee’s outcome results in the long-term local and foreign currency ratings, taking into account the country ceilings. Short-term ratings are mapped from these long-term ratings. Outlooks are assigned to long-term senior debt and deposit ratings, indicating the direction of any rating pressures.

Exhibit 4 shows a summary of rating parameters example.

Banking Group ABC Inc		Country XYZ		Local Currency ratings			Foreign Currency ratings		
Macro Profile		Strong +		Long-term	Outlook	Short-term	Long-term	Outlook	Short-term
Standalone assessment									
Baseline Credit Assessment		ba1							
Affiliate Support uplift		1							
Adjusted Baseline Credit Assessment		baa3							
Debt class	Instrument notching	Preliminary Rating Assessment	Government Support Notching	Long-term	Outlook	Short-term	Long-term	Outlook	Short-term
Counterparty Risk Assessment (CRA)	3	a3 (cr)	1	A2 (cr)	--	Prime-1 (cr)	--	--	--
Deposits	2	baa1	1	A3	Stable	Prime-2	A3	Stable	Prime-2
Bank senior unsecured long-term debt	1	baa2	1	Baa1	Stable	Prime-2	Baa1	Stable	Prime-2
Holding company senior unsecured long-term debt	-1	ba1	0	Ba1			Ba1		
Bank dated subordinated debt	-1	ba1	0	Ba1			Ba1		
Bank non-cumulative preference shares	-2	ba2	0	Ba2 (hyb)			Ba2 (hyb)		

Exhibit 4 Summary of banks rating parameters example. Source: Moody’s Investors Service

The Banking and Sovereign Linkage

After the collapse of Lehman Brothers in September 2008 and in order to avoid further financial turmoil governments stepped in with huge funds to support banks in distress. Effectively, governments provided almost certainty in their willingness to bail out failing systemically important banks. These developments incentivized banks to grow larger and with government blessing for bank mergers, the banking sector has become more concentrated. Concentration incorporates potential high systemic risk. Assuming a country has, say, only three top banks the failure of one of them could potentially affect the confidence and destabilize that country's financial system. In 2008, the US government and Federal Reserve supported three significant acquisitions: the purchases by JPMorgan Chase of Bear Stearns and of Washington Mutual Bank, then the largest US savings and loan association, and the purchase by Wells Fargo of Wachovia. There are of course benefits to large banks as they may generate economies of scale and scope. For example, large banks can benefit from diversifying their investments across different sectors and geographical regions. Similarly an extensive branch network enhances the competitive advantage of a bank. Concentration in the banking sector can cause concerns since they are "too big to fail"; they could engage in riskier activities, increasing systemic risk compared to smaller in size/non-systemic banks.

There is a two-way linkage between the banking sector and its sovereign. A large bank in a financially distressed position can destabilize the sovereign's fiscal position and increase sovereign risk. The transmission of banking sector risk to sovereigns can arise from government support through debt guarantees, capital injections, and asset guarantees or purchases. On the other hand, a sovereign can also transmit risk to the banking sector. Higher sovereign risk can lower banks' sovereign debt holdings market value. Higher sovereign risk implies higher sovereign borrowing costs which, in turn, can increase banks' funding costs. Furthermore, a country with great sovereign risk and thus poor creditworthiness cannot provide a reliable backstop to a large bank.

In order to address these concentration concerns in the financial institution's sector, policymakers introduced financial reforms. They raised the capital buffers and strengthened the supervision of global systemically important banks. For instance Basel III minimum regulatory capital requirements are to be supplemented by capital surcharges. These consist of 1 % to 3.5 % on top of the Basel III requirements (7 % level of common equity and a 10.5 % level of minimum capital requirement, with a capital conservation buffer for both cases). However, other countries have introduced stricter reforms than Basel III. In the USA a version of the leverage ratio requirement is 5 % for

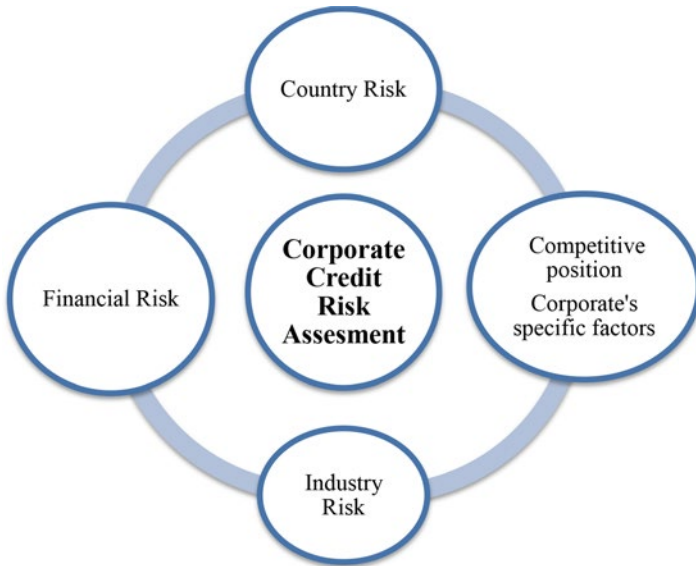
large bank holding companies and 6 % for their Federal Deposit Insurance Corporation insured subsidiaries (Basel III is at 3 %). Policies have also been pursued to lower counterparty risks, through the centralization of large shares of over-the-counter (OTC) derivative transactions at central counterparties (CCPs) and through margin requirements and increased capital charges on non-centralized OTC transactions.

The USA has also put in place structural measures. The Volcker Rule in the Dodd-Frank Act prevents deposit-taking institutions and their group firms from engaging in proprietary trading, with a few exceptions such as for market making purposes.

Credit Risk Assessment of Corporates

In order to assess the creditworthiness of a corporate the most critical issue to analyse is the resources available to it (the same applies for any other obligor) for fulfilling its commitments fully and in a timely manner. The assessment involves estimating or projecting future income and cash flows from ongoing operations or investments and their potential volatility; and may further take into account the current economic conditions and forecasts as well as the regulatory environment. In terms of the quantitative part of the analysis, financial analysis is very important. For most corporates, key financial indicators may consist of leverage, liquidity, profitability and cash flow stability measures as well as an assessment of the corporate's accounting principles and practices. Liquidity assessment may include analysis of the ability to absorb low-probability high-impact events and the relationships of the corporate with its bank and overall standing in the credit markets.

The financial profile is very important and the cash flow, leverage analysis as well as assessing how the corporate is funded are critical in a corporate financial profile assessment. The corporate's capital structure must also be assessed as there may be additional risks that could result from maturity date or currency mismatches between the corporate's financing sources and its assets or cash flows. An example is currency risk that can arise when the corporate borrows in a currency other than the currency in which it generates revenues without hedging its exposure. A corporate's debt maturity profile which is not front loaded but more spread out gives it more ability to manage it and, all things being equal reduces the refinancing risk. The corporate's interest rate risk of debt should also be assessed (proportion of fixed- or/and floating-rate debt) and if any hedging has been put in place. Generally if a firm can predict its debt obligations it can better manage these.



Corporate credit analysis also focuses on various factors, such as country risk, industry features and company specific factors. The country risk assessment involves the overall institutional, operational, economic, financial, legal and payment culture of the country that the corporate operates in. Industry risk analysis assesses the health and stability of the corporate's industry. Industry characteristics can include growth prospects, technological change, volatility and level of competition. Company specific factors can include differentiation of the company versus its peers and its competitive advantages and disadvantages within its market. The competitive position, industry risk and country risk contribute to the assessment of the overall business risk position of a corporate. The overall business position affects the financial risk that a company can take and determines its expected economic success.

Credit risk assessment of corporates involves financial analysis. A corporate's financial statements are key in the analysis as well as its accounting principles and frameworks. Understanding the accounting principles and framework is necessary in order to establish whether the information in the statements reflect a company's performance. Furthermore, one should assess whether this information can be used to make comparisons with its peers. Hence it is very important to understand accounting frameworks, such as International Financial Reporting Standards (IFRS), US Generally Accepted Accounting Principles (US GAAP), and any other local or statutory

GAAP. Understanding any differences that may arise between accounting frameworks enables any adjustments to be applied to the information in order to compare corporates worldwide as it provides the basis of globally comparable financial information.

For example, under IFRS and the US GAAP amortized cost method, debt is defined as the original proceeds amount, plus interest calculated using the effective interest rate, minus interest and principal payments. The effective interest rate is equivalent to a bond's yield to maturity with compounding of interest. However, corporates may not always report debt in this manner. Some may measure debt by excluding accrued and unpaid interest. Therefore, in order to enable the comparisons of two corporates that use different methods, say for reporting debt, the same principle should be applied to both, otherwise any financial ratio comparisons based on debt will be distorted.

Another example of how different accounting methods can distort comparisons between corporates is the choice of inventory accounting method employed. This distortion is of course more evident in inventory intensive sectors, especially when the price of inventory fluctuates significantly. This is due to the fact that the method a company uses affects the inventory amount it can charge as an expense, and subsequently its taxable income. Under US GAAP the inventory accounting methods are "first in first out" (FIFO), "last in first out" (LIFO), weighted-average cost, and specific identification. A company in the USA that uses LIFO for tax purposes must also use it for its financial statements. On the contrary IFRS does not allow LIFO.

A corporate's financial results and comparisons between two companies one using FIFO the other LIFO can be greatly distorted. When using FIFO as opposed to LIFO, when inventory cost is rising, the LIFO method results in lower income than under FIFO because the last and higher cost of inventory is transferred to the income statement, while the remaining inventory is at the older, lower cost on the balance sheet. In addition, the LIFO can produce higher cash flows for that period because income taxes are lower. LIFO shows a real (latest) amount of current costs on the income statement. However, it distorts the balance sheet as the inventory is shown there at an older cost. FIFO has the advantage of a providing an up-to-date valuation of inventory on the balance sheet, but at the same time can under-state the cost of inventory sold during a period of rising prices and hence can overstate income. An analyst applying financial statement analysis should be aware of differences in accounting methods, if any and make necessary adjustments.

Standard & Poor's Key Ratios

These are S&P's key ratios and their interpretation.

- **Core debt-payback ratios:**

- Funds from operations (FFO)/debt
- Debt/EBITDA
- EBITDA: (Earnings Before Interest, Taxes, Depreciation and Amortisation). A company's revenue minus operating expenses, plus depreciation and amortization expenses, including impairments on non-current assets and impairment reversals (plus or minus all applicable adjustments). Dividends (cash) received from affiliates, associates and joint ventures accounted for under the equity method are added, while the company's share of profits and losses from these affiliates is excluded.
- FFO (Funds From Operations): EBITDA, minus net interest expense minus current tax expense (plus or minus all applicable adjustments).
- Debt: gross financial debt (including items such as bank loans, debt capital market instruments and finance leases) minus surplus cash (plus or minus all applicable adjustments).

- **Supplemental debt-payback and debt-service ratios:**

- Cash flow from operations (CFO)/debt
- CFO reflects cash flows from operating activities, including all interest received and paid, dividends received, and taxes paid in the period (plus or minus all applicable adjustments). For companies that do not use US GAAP, S&P reclassify as CFO any dividends received, or interest paid or received, that a company reports as investing or financing cash flows.
- Free Operating Cash Flow (FOCF)/debt
- FOCF: CFO minus capital expenditures (plus or minus all applicable adjustments).
- Discretionary Cash Flow (DCF)/debt
- DCF: FOCF minus cash dividends paid on common stock and preferred stock (plus or minus all applicable adjustments).
- (FFO + interest)/cash interest (FFO cash interest cover)
- EBITDA/interest

- Cash interest: for the purposes of calculating the FFO cash-interest-cover ratio, “cash interest” includes only cash interest payments on gross financial debt (including bank loans, debt capital market instruments, finance leases and capitalized interest). Cash interest does not include any S&P adjusted interest on debt-like obligations, such as post-retirement benefit obligations or operating leases.
- **Profitability ratios:**
 - EBIT/revenues (EBIT margin)
 - EBITDA/revenues (EBITDA margin)
 - EBIT/average beginning-of-year and end-of-year capital (return on capital)
 - EBIT/average beginning-of-year and end-of-year capital (return on capital)
 - EBIT: a traditional view of profit that factors in capital intensity, but also includes interest income, the company’s share of equity earnings of associates and joint ventures, and other recurring non-operating items (plus or minus all applicable adjustments).
 - Capital: debt plus non-current deferred taxes plus equity (plus or minus all applicable adjustments).
 - Interest: this is the reported interest expense figure, including non-cash interest on conventional debt instruments (such as payment-in-kind, zero-coupon and inflation-linked debt), minus any interest income derived from assets structurally linked to a debt instrument (plus or minus all applicable adjustments).
 - Revenues: total sales and other revenues we consider to be operating (plus or minus all applicable adjustments).

Moody’s Approach for Rating Companies in the Global Packaging Industry

Corporate credit risk rating analysis consists of assessing factors that are common across all industries such as ownership, management, corporate structure, liquidity, governance, country related risks and factors that may be useful on a company specific basis.

This section explains Moody’s approach in assessing credit risk for packaging manufacturers in the metal, glass and plastic containers industry globally. This is a simple summary and a general guidance of the most important qualitative



Exhibit 5 Moody's global packaging industry grid factors

and quantitative risk characteristics that can affect the ratings of companies in the packaging manufacturer industry and does not always include all rating considerations that are subject for discussion in rating committees. Other rating considerations that are common to all entities in any industry sector, such as the country risk, management quality and experience, corporate governance, financial reporting quality and information disclosure are also discussed.

Exhibit 5 shows the global packaging industry grid factors in Moody's ratings assessment of companies in the packaging manufacturer sector.

The first factor refers to scale. All things being equal, larger scale allows companies to leverage costs and provides power in dealing with purchasing organizations, customers and suppliers. Scale can also provide information about global market presence and franchise strength. Scale involves more resources that may reduce operational exposure.

The second factor refers to the business profile which is important to packaging manufacturers, as with any other company. A strong business profile contributes to stability of revenue, margins, earnings and cash flow. Companies that are innovative, have the capacity to differentiate their products and use proprietary technology tend to have a significant advantage over competitors. Furthermore, the competitive position of a company is strengthened the higher the switching costs for its customers or—even better—if there are limited alternative suppliers. This ensures a steady revenue stream.

The third factor refers to the company's financial policy that ultimately expresses the management's and board's financial risk appetite that determines the debt level, credit quality and the risk of adverse changes in the company's overall structure. For example, the more conservative the financial policy, with strong commitment to a very strong credit profile over the long-term, the higher the rating allocated to that factor.

The fourth factor refers to leverage and interest coverage measures, proxying for the company's financial flexibility and viability. The packaging manufacturing industry has highly capital intensive needs and at the same time modest levels of sustainable free cash flow. Therefore, leverage and coverage of interest expense are important variables to assess. Generally packaging manufactures with sizable fixed assets, significant revenue and secured long-term contracts are in a much better position.

Exhibit 6 shows the weights for each factor and sub-factors where applicable.

As a first step in the rating process, the sub-factors/factors are estimated and discussed. The factors may be measured based on various time periods, historical data (the last 12 months of reported results) or/and expected future performance for periods of several years or more. The source of information is based on Moody's standard adjustments to income and cash flow statement and balance sheet amounts for restructuring, impairment, off balance sheet accounts, receivable securitization programmes, under-funded pension obligations and recurring operating leases. Having estimated each sub-factor/factor, the outcomes are mapped to a broad Moody's rating category (Aaa, Aa, A, Baa, Ba, B, Caa or Ca). Exhibit 5 (earlier) summarizes the criteria according to which each factor and sub-factor are allocated a rating. In order to determine the overall grid indicated rating, Moody's converts each of the seven sub-factor ratings into a numeric value based upon the scale in Exhibit 7.

Rating Factors	Factor	Sub-Factors	Sub-Factor
Scale	20%	Revenue	20%
Business Profile	30%	Product Strengths & Differentiation	15%
		Competitive Position/Switching Cost	15%
Financial Policy	15%	Financial Policy	15%
Leverage and Coverage	35%	FFO/Debt	10%
		Debt/EBITDA	10%
		EBITDA/Interest Expense	15%
Total	100%	Total	100%

Exhibit 6 Global packaging industry grid factor weights. *Source:* Moody's Investors Service

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
1	3	6	9	12	15	18	20

Exhibit 7 Scale. *Source:* Moody's Investors Service

Grid-Indicated Rating	Aggregate Weighted Total Factor Score
Aaa	$x < 1.5$
Aa1	$1.5 \leq x < 2.5$
Aa2	$2.5 \leq x < 3.5$
Aa3	$3.5 \leq x < 4.5$
A1	$4.5 \leq x < 5.5$
A2	$5.5 \leq x < 6.5$
A3	$6.5 \leq x < 7.5$
Baa1	$7.5 \leq x < 8.5$
Baa2	$8.5 \leq x < 9.5$
Baa3	$9.5 \leq x < 10.5$
Ba1	$10.5 \leq x < 11.5$
Ba2	$11.5 \leq x < 12.5$
Ba3	$12.5 \leq x < 13.5$
B1	$13.5 \leq x < 14.5$
B2	$14.5 \leq x < 15.5$
B3	$15.5 \leq x < 16.5$
Caa1	$16.5 \leq x < 17.5$
Caa2	$17.5 \leq x < 18.5$
Caa3	$18.5 \leq x < 19.5$
Ca	$x \geq 19.5$

Exhibit 8 Ranges. *Source:* Moody's Investors Service

The numerical score for each sub-factor is multiplied by the weight for that sub-factor (see Exhibit 6) with the results summed to produce a composite weighted factor score. The composite weighted factor score is then mapped back to an alphanumeric rating based on the ranges in Exhibit 8.

For example, an issuer with a composite weighted factor score of 11.7 would have a Ba2 grid indicated rating.

Exhibit 9 summarizes the criteria for each factor and sub-factor for each rating category. A very simple example: if the revenues of a company exceeds \$60 billion that company will be allocated Aaa for factor 1 and that Aaa will carry a 20 % weight in the overall rating.

Exhibit 10 shows the Moody's ratings of 14 packaging companies. Out of these 14 manufacturers four have investment grade ratings and 10 have speculative grade ratings. Exhibit 10 provides a simple mapping example of the Moody's Grid, whereas ratings have been allocated for each factor and its sub-factor—if applicable—and then an overall Grid-Indicated Rating is illustrated. The information is based mainly on the last 12 months of financial data. For some companies the actual Rating is different from the

Sub-Factor									
Weight	Aaa	Aa	A	Baa	Ba	B	Caa	Ca	
Factor 1: Scale (20%)									
Revenue (USD Billion)	20%	≥600	\$40 - \$60	\$15 - \$40	\$5 - \$15	\$2 - \$5	\$0.75 - \$2	\$0.25 - \$0.75	<\$0.25
Factor 2: Business Profile (30%)									
Product Strengths & Differentiation	15%	100% of business from custom products, unique processes and proprietary technology which are not reproducible by other manufacturers. Leading, very well-known brands and history of innovation and execution. Well diversified product line and balanced global footprint.	Majority of business from custom products, unique processes and proprietary technology. No commodity products. Leading, very well-known brands and history of innovation and execution. Well diversified product line with a global footprint.	Majority of business from custom products, unique processes and proprietary technology. Leading, very well-known brands and history of innovation and execution. Diversified product line with a global footprint.	High percentage of business from custom products, unique processes and proprietary technology. Predominantly high value-added products. Very well-known brands and history of innovation and execution. Global footprint or reach.	High percentage of business from custom products, unique processes and proprietary technology. Well-known brands and history of innovation and execution. Global footprint or reach.	Mixture of custom, value-added and commodity-like products. Some innovative technology. Limited global footprint or reach.	Most products are commodity-like. Few brands and limited proprietary technology and/or unique processes. Limited global footprint or reach.	Products are commodity-like. No brands or process recognition. Limited global footprint or reach.
Competitive Position/Switching Cost	15%	Entrenched with all customers with onsite facilities. Significant degree of shared R&D costs. Significant percentage of FDA/other approvals. Significant percentage of patented products. All business under long-term contract with well-structured pass-through provisions for all input costs that apply immediately. Market leader with significant pricing power. Limited alternate suppliers.	Entrenched with all customers with onsite facilities. Significant degree of shared R&D costs. Significant percentage of FDA/other approvals. High percentage of patented products. Substantially all business under long-term contract with well-structured pass-through provisions for all input costs with lags of less than 15 days. Market leader with significant pricing power. Limited alternate suppliers.	Entrenched with majority of customers with onsite facilities. High degree of shared R&D costs. High percentage of FDA/other approvals. High percentage of patented products. Substantially all business under long-term contract with well-structured cost pass-through provisions for all costs of no more than 30 days and/or market leadership and pricing power. Limited alternate suppliers.	Entrenched with majority of customers with onsite facilities. High degree of shared R&D costs. High percentage of FDA/other approvals. High percentage of patented products. Most business under long-term contract with well-structured cost pass-through provisions for all costs and/or pricing power. Limited alternate suppliers.	Entrenched with a high percentage of customers with onsite facilities. Shared R&D costs. FDA/other approvals. Patented products. Most business under long-term contract with well-structured provisions for most costs and/or pricing power. Limited alternate suppliers.	Not strongly entrenched with customers. Business under long-term contract, but input cost pass-through provisions not well-structured, not all costs passed through, and/or significant lags in passing through costs. Multiple alternate suppliers.	Customers could move substantially all of business to other suppliers at relatively low costs. Multiple alternate suppliers.	Pure spot or readily substitutable business. Multiple alternate suppliers.
Factor 3: Financial Policy (15%)									
Financial Policy	15%	Expected to have extremely conservative financial policies; very stable metrics; public commitment to very strong credit profile over the long term.	Expected to have very stable and conservative financial policies; stable metrics; minimal event risk that would cause a rating transition; public commitment to strong credit profile over the long term.	Expected to have predictable financial policies that preserve creditor interest. Although modest event risk exists, the effect on leverage is likely to be small and temporary; strong commitment to a solid credit profile.	Expected to have financial policies that balance the interest of creditors and shareholders; some risk that debt funded acquisitions or shareholder distributions could lead to a weaker credit profile.	Expected to have financial policies that tend to favor shareholders over creditors; above average financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.	Expected to have financial policies that favor shareholders over creditors; high financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.	Expected to have financial policies that create elevated risk of debt restructuring in varied economic environments.	Expected to have financial policies that create elevated risk of debt restructuring even in healthy economic environments.
Factor 4: Leverage and Coverage (35%)									
FFO / Debt	10%	≥80%	50% - 80%	35% - 50%	20% - 35%	12.5% - 20%	6% - 12.5%	1% - 6%	<1%
Debt / EBITDA	10%	<0.8x	0.8x - 1.5x	1.5x - 2.3x	2.3x - 3.5x	3.5x - 4.8x	4.8x - 6x	6x - 8x	≥8x
EBITDA / Interest Expense	15%	≥30x	18x - 30x	10x - 18x	6x - 10x	4x - 6x	1.9x - 4x	0.8x - 1.9x	<0.8x

Exhibit 9 Summary of criteria for each factor and sub-factor for each rating category. *Source:* Moody's Investors Service

Company	Reporting Period	Rating	Outlook	Grid-Indicated Rating	Scale	Business Profile		Financial Policy	Leverage and Coverage		
					Revenue (USD)	Product Strengths & Differentiation	Competitive Position / Switching Cost	Financial Policy	FFO /Debt	Debt / EBITDA	EBIDA/ Interest Expense
AEP Industries, Inc.	1/31/2015	B2	Stable	B2	B	Can	B	B	Ba	Ba	B
Amcor Limited	6/30/2014	Baa2	Stable	Baa1	Baa	A	A	Baa	Baa	A	Baa
Ardagh Packaging Holdings Limited	3/31/2015	B3	Stable	B2	Baa	B	B	B	Caa	Ca	Caa
Ball Corporation	3/31/2015	Ba1	RUR	Ba1	Baa	B	Baa	Ba	Ba	Baa	Ba
Bemis Company, Inc.	3/31/2015	Baa2	Stable	Baa3	Ba	Baa	Baa	Baa	Baa	Baa	Baa
Berry Plastics Group, Inc.	3/28/2015	B1	RUR	Ba3		B	B	B	Ba	Ba	B
Crown Holdings, Inc.	3/31/2015	Ba2	Stable	Ba2	Baa	B	Baa	Ba	B	B	Ba
Greif, Inc.	4/30/2015	Ba1	Stable	Ba2	Ba	B	Ba	Ba	Ba	Baa	Ba
Gerresheimer AG	2/28/2015	Baa3	RUR	Ba1		Baa	Baa	Ba	Baa	Baa	Baa
Multi-Color Corporation	12/31/2014	Ba3	Stable	B1	B	B	B	Ba	Baa	Baa	Ba
Owens-Illinois Inc.	3/31/2015	Ba3	Stable	Ba2	Baa	B	B	Ba	Ba	Ba	Ba
REXAM PLC	12/31/2014	Baa3	RUR	Baa2	Baa	Ba	Baa	Baa	Baa	Baa	A
Reynolds Group Holdings Limited	3/31/2015	B3	Stable	B1	Baa	Ba	Ba	B	Caa	Ca	Caa
Scaled Air Corp.	3/31/2015	Ba3	Positive	Ba1	Baa	Baa	Ba	Ba	Ba	Ba	B
Silgan Holdings Inc.	3/31/2015	Ba1	Stable	Ba2	Ba	B	Baa	Ba	Ba	Ba	Baa

Exhibit 10 Example Moody's ratings of 14 packaging companies. *Source:* Moody's Investors Service

Grid-Indicated Rating. Moody's comments that positive or negative "outliers" for a given sub-factor are defined as issuers whose grid sub-factor score is at least two broad rating categories higher or lower than a company's rating (e.g. a B-rated company whose rating on a specific sub-factor is in the Baa-rating category is flagged as a positive outlier for that sub-factor). Green is used to denote a positive outlier whose grid indicated performance for a sub-factor is two or more broad rating categories higher than Moody's rating. Red is used to denote a negative outlier whose grid indicated performance for a sub-factor is two or more broad rating categories lower than Moody's rating. For example, Reynolds Group Holdings and Ardagh Packaging are outliers within Factor 1: Scale. Although Reynolds has significant revenues, this is the result of a number of debt financed acquisitions and the firm is financially aggressive (low scores for Factor 3: Financial Policy). Ardagh with pro forma revenues expected to exceed €5 billion in FY 2015, has a large Scale but it has been through debt funded acquisitions resulting in low scores for Factor 3: Financial Policy and Factor 4: Leverage and Coverage.

Corporate Risk, Company Value, Bond Spreads and CDS

Typically used traditional measures of solvency and adequate capital include the Discounted Cash Flow (DCF), comparable company multiples and comparable transaction multiples. However, these methods although quantitative can be manipulated because their inputs depend on subjective judgements.

Projected cash flow forms a significant part of solvency analysis as it can address the question of whether the company can pay its debts as they become due and whether the company is worth more than it owes. In order to carry through the DCF analysis one needs projections of future cash flows, a discount rate to convert future cash flows to present value, and a terminal value to cap the projection period. An experienced analyst can of course manipulate the DCF analysis outcome. This can easily be done by selectively using certain projections that suit his/her purposes better. Similarly the terminal value can be manipulated by choosing a growth rate leading to the “desired” outcome. This can be done by selecting a growth rate that is similar to the historical growth rate of the company, the industry or even the broader economy, whatever works best!

Plaintiffs’ experts will typically use a high discount rate and low projections, whereas defence experts will typically use a low discount rate and high projections.

Years after the consequences of the 2007 financial crisis bankruptcy courts were given the power to allocate hundreds of billions in losses between different classes of creditors. Then questions about what is the company worth arise. Commonly, investors can disagree with each other about value and “experts” who are asked to provide their professional opinions are motivated to serve the interest of whoever is paying their fees and often can come to very different estimates and conclusions. It is not uncommon that experts for the debtor and the creditors can come up with different results. Courts will have to decide what side they are going to take. After this is decided upon and as soon as the debtor exits bankruptcy, it is interesting to see what the “market” believes about the company.

The comparable multiples methods can be used as a reality check on the DCF analysis. This can also be easily manipulated. This approach aims to compare “similar” firms. The problem with this is that every company is effectively different and not 100 % comparable (i.e. different brand position and name, cost efficiency, growth potential etc.). Thus the selection of comparable companies allows room for manipulation by an expert. For example, a defence expert will probably select guideline companies with a high multiple, and thus a high valuation of the debtor. On the other hand, a plaintiff’s experts will

tend to pick guideline companies with a low multiple. The challenge for a court is, that without extensive knowledge of many companies and industries, it cannot easily assess which comparables are more appropriate.

No doubt CDS are cutting edge financial innovations and may also provide some valuable insights to regulators and courts managing insolvency. CDS may assist bankruptcy courts to determine whether a corporate debtor who has filed for bankruptcy was solvent at a certain point in the past and thus can assess fraudulent transfer claims in large business bankruptcies (i.e. fraudulent transfer law).

CDS is similar to any debt instrument traded in a liquid market, such as a corporate bond for which a yield to maturity can be calculated, in that it can be used to estimate market implied probabilities of default.

A CDS is a type of derivative that can resemble bond insurance but can also be used to speculate as well as to hedge. In a CDS transaction, there are two counterparties: a protection buyer and a protection seller that bet in the opposite direction on whether a company (third party) will default on its debt (“reference entity/debt”). The protection seller agrees in the event of a “credit event” to pay the protection buyer. For this “insurance” the protection buyer pays periodic fees to the protection seller. A “credit event” is typically an event where the third party defaults on its debt, restructures or files for bankruptcy.

A CDS contract can settle either with a cash settlement or physical delivery of one among a set of deliverable reference obligations. With the cash settlement, the monetary exchange involves the actual incurred losses and the claimant retains the debt claim on the underlying reference entity’s balance sheet. Whereas settling by physical delivery, the claimant transfers the obligation referenced in the contractual agreement to the protection seller, and receives the full notional amount of the underlying contract. The protection seller then has a position similar to any put option seller who takes delivery of the underlying asset upon exercise. For the claimant this is an important point, particularly for the “restructuring credit event” as he/she effectively holds a Cheapest-To-Deliver (CTD) option, as he/she may deliver the least valuable bond among the set of eligible reference obligations.

It is worth noting that CDS contracts, like other derivatives, have a special treatment in bankruptcy. Unlike creditors that are subject to automatic stay when companies file for bankruptcy, derivative counterparties have the right to terminate their contracts and receive payments by selling collateral. Additionally netting privileges further enrich the position of the derivative counterparty having a positive credit balance (i.e. net offsetting positions and avoiding payments to a bankrupt company). As a result derivative counterparties are in a much stronger position than other claims.

A CDS allows counterparties to bet on the likelihood of default of a company and may provide a more clear indication of the likelihood of default than bond spreads. Furthermore, it is much easier with a CDS to have a short position rather than with a bond. Someone wishing to have a short position does not need to source the bond to bet against it, but instead finds a well-capitalized counterparty that is willing to take an opposite position; this is a key point. The difference of shorting with a CDS, rather than the bond, is that the value of a CDS depends not only on the creditworthiness of the reference entity, but also on the creditworthiness/solvency of the protection seller.

Some empirical research seems to indicate that in certain instances the CDS market may lead the bond market. Blanco, Brennan and Marsh (2005) find that the theoretically implied parity between CDS prices and yield spreads holds for all of the US bonds and for some of the European bonds considered in their study. The parity condition refers to the situation that the price of a CDS should equal the credit spread. If the parity condition does not hold, opportunities for profitable arbitrage may exist. However, some conditions may affect perfect parity, such as bonds selling at a premium or discount to par, high interest rates and a very steep yield curve. Furthermore, lack of an active secondary market for the underlying bond and problems in shorting the bond can contribute to the fact that it may not be feasible to pursue all arbitrage opportunities and thus perfect parity may not be achieved. Furthermore, CDS prices contain a cheapest-to-deliver option, and liquidity premiums exist in both the bond spot and CDS markets. Blanco, Brennan and Marsh (2005) find that in three instances where the parity does not hold, CDS prices are higher than credit spreads. They attribute this to the cheapest-to-deliver option in CDS and that the calculated yield spreads under-state the true yield spread. Furthermore, they find that CDS prices adjust prior to changes in the bond spot market, contributing a high percentage of price discovery suggesting that CDS prices are useful indicators of credit risk to market participants. They find that CDS prices lead the spot market in price discovery because they believe that the CDS market is the easiest place to trade credit risk. Unlike the bond market, it has no constraints on short sales and large transactions are more easily carried out.

Nashikkar, Subrahmanyam and Mahanti (2011) find a liquidity spillover effect from the CDS market to the bond market, where the CDS liquidity has an impact on bond prices and bond liquidity. Furthermore, Das et al. (2014) examine the effect of CDS trading on the secondary corporate bond market from 2002 to 2008. Their study implies that CDS trading hurts bond market efficiency. In their study they find that after the start of CDS trading there is no reduction in pricing errors and no improvement in liquidity in the bond

market. These results can potentially be justified by the fact that the more liquid CDS market becomes a more attractive market for better informed institutional investors to trade in. As a consequence, this migration has the effect of a decline in the cash bond market's efficiency and liquidity. Another study by Massa and Zhang (2012) provides evidence that CDS contracts improve bond liquidity because of a reduced fire sale risk in the face of lower liquidation needs around credit rating downgrades.

Regulators are eager for CDS centralized clearing. Research (see Singh, 2010a, Fontaine et al., 2014, Duffie and Zhu, 2011, Cont and Kokholm, 2014, Duffie et al., 2015) has looked at the trade-off through changing collateral demands connected to central clearing. A CCP leads to multi-lateral netting gains among market participants across a single class of derivatives. However, clearing through a CCP results in a loss of bilateral netting benefits across different contract types, such as CDS and interest rate derivatives. Hence there is a good argument that, for a CCP to be valuable, there has to be sufficiently large multi-lateral netting benefits.

Examples 1 and 2 illustrate simple methods to estimate DPs from credit spreads and CDS.

Example 1

A five year credit spread for a company ABC is 235 basis points (bps) (i.e. 2.35 %) per year, the expected recovery rate in the event of default is 35 %. The Expected Loss rate Given Default (ELGD) is $1-R = 1-35\% = 65\%$, where R is the recovery rate.

The credit spread can be defined as:

$$\text{Credit spread} = \text{Corporate Bond yield} - \text{Risk Free Rate} \quad (1)$$

An Average Default Probability (ADP) per year (average hazard rate) between time zero and time t (i.e. over the five-year period), conditional on no earlier default, can be estimated approximately as follows:

$$\text{ADP} = \text{Credit spread for a maturity of } \tau / \text{ELGD} \quad (2)$$

Hence the $\text{ADP} = 0.0235 / (1 - 0.35) = 3.615\%$.

This equation demonstrates that an increase in the bond spread suggests either an increase in the perceived probability of default or an increase in the expected loss rate given default.

Note that the above works well for CDS spreads, bond yield spreads and asset swap spreads when the underlying bond is selling close to its par value: that is the reason we estimate "approximately". Bear in mind that there is another (more exact) method when the underlying bond price is not close to par.

Example 2

The CDS spread for three-, five- and 10-year instruments is 45, 55 and 95 bps and the expected recovery rate is 65 %. See below for approximate calculations of the following examples:

1. The average hazard rate over the three-year period is $0.0045/(1-0.65) = 0.0129$

2. The average hazard rate over five-year period is $0.0055/(1-0.65) = 0.0157$

3. The average hazard rate over 10-year period is $0.0095/(1-0.65) = 0.0271$

4. The average hazard rate *between* year three and year five is $[(5*0.0157)-(3*0.0129)]/2 = 0.0200$

5. The average hazard rate *between* year five and year 10 is $[(10*0.0271)-(5*0.0157)]/5 = 0.03857$

The following formula provides a more precise description:

$$\begin{aligned} \text{Default Probability (DP) year 1} = \\ \left[1 - \frac{1 + \text{risk free rate}}{1 + \text{corporate bond yield}} \right] / (\text{ELGD}) \end{aligned} \quad (3)$$

For CDS spreads the equation can be expressed as:

$$\begin{aligned} \text{Default Probability (DP) year 1} = \\ \left[1 - \frac{1 + \text{risk free rate}}{1 + \text{CDS spread} + \text{risk free rate}} \right] / (\text{ELGD}) \end{aligned} \quad (4)$$

For the last equation though the complication is, that unlike corporate bond yields for the CDS spread and the risk free rate, the ELGD can be more challenging as it cannot be directly observed in the market.

Figure 5 shows the credit spreads of BofA Merrill Lynch AAA, AA, A and BBB Global Corporate index from 1996 until September 2015. All credit spreads, AAA, AA, A and BBB peaked during December 2008 with the BBB spread over 700 basis points while in December of 1996 it was at 80 basis points and in September 2015 just over 200 basis points.

For bond yields, historical recovery rates may be used. It is worth noting that credit spreads may incorporate not only credit risk but other risks such as liquidity risk. Tang and Yan (2007) examine the effect of liquidity characteristics and liquidity risk on CDS prices. In their study they find that liquidity is priced, and that higher illiquidity is associated with higher CDS prices. Bongaerts et al. (2011) find that over the 2004–08 period CDS liquidity, measured by the bid/ask spread, significantly affects CDS prices. Shachar (2012) finds evidence that the order imbalances of endusers may have a CDS pricing impact that depends on the sign of the dealers' inventory. Tang and Yan (2013) looking into the changes in CDS spreads, find non-trivial effects of excess demand and liquidity changes on movements of CDS spreads. Similarly

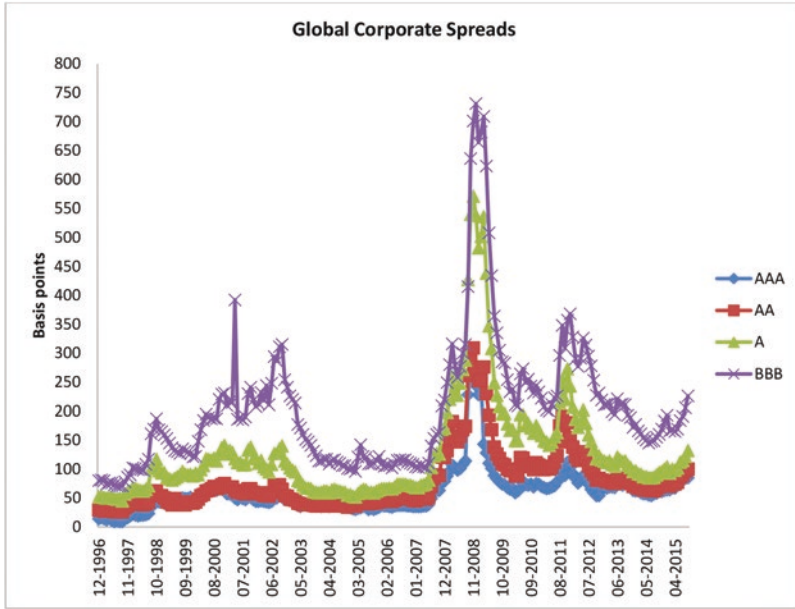


Fig. 5 Global corporate spreads. *Source of data:* Bloomberg (BofA Merrill Lynch AAA, AA, A, BBB Global Corporate index)

Siriwardane (2014) measure CDS sellers’ capacity to supply CDS and finds that dealers’ risk bearing capacity determines pricing and aggregate risk premia in CDS markets. Someone using bond spreads to calculate DPs should be aware that it could be the case that the result may be over-estimated. Further defaults are most likely to peak during a depressions or a financial shock. Since it is usually difficult to predict the timing, this risk could be priced into bonds all the time even though during a certain shorter time measured, the actual default rates may be lower than their spread had implied.

Treasury-to-corporate bond spreads tend to be wider compared to the real world historical probability of default. LIBOR can be used as a risk free rate instead of Treasuries. Since LIBOR is higher than Treasury yields, the estimated spread will be lower and so will the DP. However LIBOR is not necessarily appropriate especially during financial distress, since banks are not risk free. This can be seen when banks are at risk, the spread between LIBOR and Treasuries widens and thus the impact on the result of DP by using LIBOR instead of Treasuries is felt.

There also more sophisticated techniques to derive DPs, based on more complex models that are as precise as the input assumptions a user makes, some of which are discussed in Chap. 2.

Elkamhi et al. (2014) calculate recovery rates using CDS spreads for multiple maturities during the 2004–07 period. They find using a quadratic pricing model that the average recovery rate is 53.8 % with significant cross-sectional variation, a much higher estimate than the standard assumption used in the industry. They also find that their estimated five-year default probabilities are on average 67 % higher than what is obtained using the standard 40 % recovery assumption. Hence using the long-run historical averages of recovery rates may lead to valuation inaccuracies. Jankowitsch et al. (2014) further find variation in recovery rates across different characteristics, such as types of default events, industries and seniority of debt.

Chapter 5: Credit Risk Assessment of Structured Finance Securities

Securitization

Securitization is the process of converting cash flows arising from underlying assets or debts (receivables), due to the originator into a repayment stream, thus enabling the originator to raise finance through the issue of securities. The portfolio of assets is “pooled” and transferred to a Special Purpose Vehicle (SPV), the issuer, a tax-exempt company or trust formed for the specific purpose of funding the assets. The arranger typically establishes the SPV. The issuer SPV issues securities in order to buy the assets from the originator. The investors purchase the securities, either through a private offering or on the open market. Once the assets are transferred to the issuer, there is normally no recourse to the originator (initial owner of the assets). The issuer is “bankruptcy remote”, meaning that if the originator goes into bankruptcy, the issuer’s assets will not be distributed to the originator’s creditors. In order to achieve this, the governing documents of the issuer restrict its activities to only those necessary to complete the issuance of securities. The performance of the securities is directly linked to the performance of the assets. Typically credit rating agencies rate the securities that are issued and provide their opinion on their creditworthiness (Diagram 1).

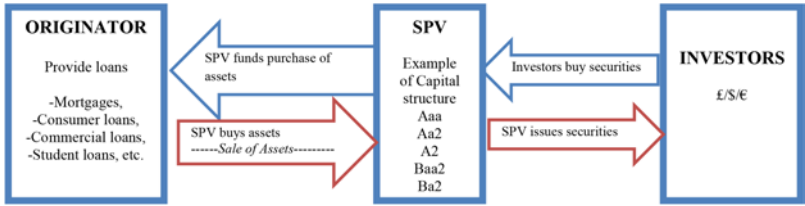


Diagram 1 True sale securitization

True Sale Securitization

Securitization: Key Steps

- Set up of a legal structure allowing an economic result by the arranger.
- Creation of a legal issuing entity (SPV).
- Sale/transfer of assets from the originator/sponsor to the issuer. This is necessary as the structure needs to de-link/isolate the bankruptcy of the sponsor from the SPV. The structure needs to avoid any consolidation with the sponsor or/and its corporate family in event of originator/sponsor bankruptcy. Thus the originator sells the assets to be securitized to the SPV and funds this purchase by issuing debt securities to investors on a public stock exchange or privately on a fixed or floating rate basis. If the debt securities are publicly listed, the listing requirements based on the rules of the regulated exchange must be satisfied.
- Enter into a servicing agreement, an issuance agreement of cash flow programming (waterfall) and any other agreement required such as for liquidity facility, hedging etc.
- The SPV typically grants security interests over its securitized assets and rights (including bank accounts and transaction documents) to secure its obligations to pay back the funds raised. These security interests are granted in favour of the SPV's secure creditors (mainly the investors) and held typically by a trustee. The securities are constituted under a trust deed or a US indenture that contains the terms and conditions of the issued securities and the rights in the securities held by the trustee. In jurisdictions that do not recognize the "trust" concept, other methods may be used.
- The debt service on the issued securities/notes are funded from the cash flows generated by the underlying securitized assets. When these cash flows are received they are used to pay the SPV's obligations under the issued securities and to meet any other costs in the structure according to the cash flow waterfall.

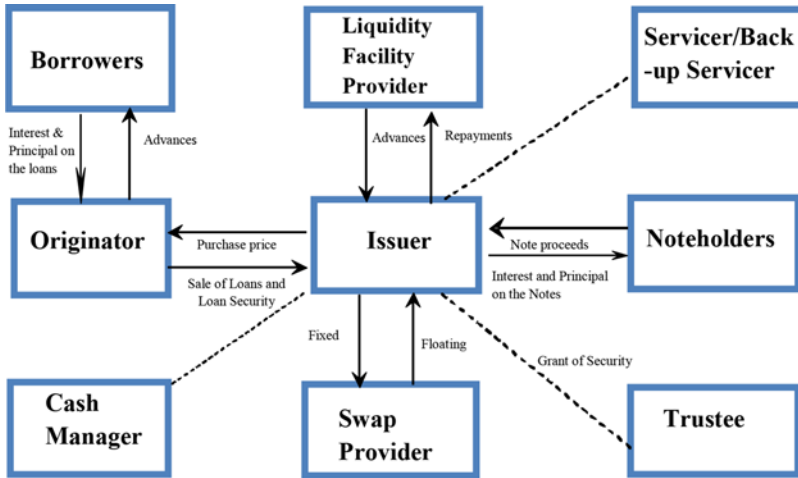


Diagram 2 True sale securitization transaction structure

- A cash flow waterfall provides a way for cash flow received to be prioritized and allocated. For example, (i) for the payment of fees to contracted parties such as servicer and trustee, (ii) for the interest and principal to be paid to investors (potentially in multiple classes) and finally to residual equity interest holders.

Diagram 2 shows a common transaction structure and the role of the main parties in a true sale securitization.

Securitization Asset Requirements

- Assets that are/can be legally identified and ideally have predictable cash flows.
- Assets whose performance is independent from the sponsor’s existence.
- Assets that are/can be serviced by an unaffiliated third party.

Securitization Motivation

- Remove originator risk from assets/pool of assets.
- Free up originator’s balance sheet.
- Capital adequacy; such as capital relief for risk transfers.
- Cheaper source of funds for issuers (i.e. possible Aaa rated cost of funds to lower-rated companies).

- Access to alternative sources of funding.
- Investor appeal, including:
 - attractive yield (typically in excess of similarly rated corporates);
 - exposure to assets otherwise not easily available;
 - more choice of credit risk to meet investor appetite with various structured tranches available (e.g. from Aaa to Ba), lower to higher credit risk investments with different payment priorities, interest rates and characteristics.

Credit Enhancement

- Internal credit enhancement:
 - *Subordination*. Junior classes of notes provide credit enhancement/support to more senior classes as payments are allocated first to senior classes and losses—if any—to the junior classes.
 - *Over-collateralization*. This is achieved by issuing a lesser nominal amount of notes than the nominal amount of the assets held as collateral.
 - *Reserve fund*. This is a cash fund available to cover losses. This can be funded at closing/and or after closing of the transaction from extra cash flow.
 - *Excess spread*. This occurs when there is an excess coming from the asset gross income that the SPV receives from the assets over the SPV's liabilities (costs to service/manage the debt service on notes). This excess spread can be used as a reserve fund to cover costs and expenses and as a result enhances the creditworthiness of the transaction.
 - *External credit enhancement*, such as letter of credit, swap. See Chap. 7.

Waterfall

The waterfall can be used to create multiple classes with varying priorities. Tranches at the bottom are allocated losses before more senior classes are allocated. Tranches at the top are allocated payments before more junior classes.

The waterfall can be used to prioritize cash flows in multiple ways:

- Repayment may be prioritized: (Interest) I/I/(Principal) P/P vs I/P/I/P, with P being pro-rata or sequential.

- Excess spread may be transferred to the sponsor or applied in many ways, such as applied in full or in part to the “fast pay principal” (also known as the turbo feature). Applied as principal upon certain events and to the extent that an intended repayment target is not met.

Repayment Structures

- *Static pools.* Static pools of amortizing assets usually have matching amortizing principal repayments.
- *Revolving pools.* Revolving pools have short repayment windows. Asset payments are recycled to acquire new assets and typically pay only interest during this period. At expected maturity the recycling stops and cash receipts are applied to repay the principal. These may be structured as what comes in is paid out (irregular amortization); or may be structured to pay out fixed amounts only (controlled amortization); or may be structured to accumulate funds and pay out all at once (soft bullet).
- *Pools of long-term assets structured with a “soft bullet”.* These have an “expected repayment date” and depend solely on the sponsor’s ability to refinance. Non-repayment may result in amortizing pay out over time at a much higher interest rate (the penalty rate).

Liquidity Facility

The liquidity facility agreement is very important as it deals with the risk of the SPV making payments on time without unnecessary liquidation of assets in the asset pool. There can be timing issues that can comprise the timely payment of interest and, if applicable, the principal, therefore ensuring that there is a creditworthy liquidity facility provider is key. Timing problems may arise if the assets’ underlying debtors make late payments, or there is a mismatch in the asset and liability profile, for example the assets’ maturity dates do not match up with the securities’ maturity dates. Furthermore, the liquidity facility is put in place to cover any unexpected one-off costs.

Hedging

A securitization transaction may also be subject to interest rate and currency risk. An interest rate risk can arise if the assets pay a fixed rate into the SPV but the SPV pays a floating rate for the issuing securities. Thus if the floating rate goes up

the SPV will have a shortfall. This can arise if the assets pay in one currency, say Euros, and the debt service on the issued securities is based in Sterling. If the Euro depreciates the SPV will also have a shortfall. In order to prevent this from happening the SPV enters into one or more hedging agreements with a creditworthy swap counterparty, such as an interest rate and/or currency swap agreement.

Servicing

A key party in a securitization is the servicer. It is quite common for the originator to fulfil that role of administering, managing and collecting the receivables from the assets. This is done though under a servicing agreement and in return for a servicing fee on the SPV's behalf. The difference is that after the securitization the SPV has title to the receivables and not the originator and the bank account that the underlying obligors pay is usually charged in favour of the security trustee. Furthermore, the transaction needs to have suitable back up servicer provisions in place should the existing servicer becomes insolvent etc. The assets should be serviceable by another entity and the servicing fee should be at a reasonable market rate.

Paying Agent

The role of a paying agent(s) is to transfer the funds from the SPV to the parties in the transaction. The receivables are typically collected by the servicer and passed through the SPV's bank accounts to the paying agent(s). The paying agent(s) makes payments as per the priority of payments specified in the waterfall, such as interest and principal due on the note and other costs and expenses the SPV has.

SPV Insolvency Remoteness

The success of any securitization also relies on ensuring that the SPV is insolvency remote. It is critical that the SPV is set up in such a manner that makes it as much as legally feasible for it not to be subject to any insolvency proceedings. In any case, should the originator become insolvent the SPV should be beyond reach of the originators' administrators and liquidators. Ensuring insolvency remoteness will vary from jurisdiction to jurisdiction but some main points to consider are typically common, such as restricting the SPV's activities to only those required for the securitization and prevent it from incurring liabilities other than those relating to the securitization. All

main documents should incorporate the non-petition and limited recourse language (see Chap. 6 for a discussion of limited recourse and non-petition language) that ensures that the counterparty in the securitization cannot take unilateral enforcement action against the SPV and also confines the counterparty's recourse only to assets that the SPV actually holds and which the counterparty has security over. Other important points include the appointment of independent directors for the SPV other than those of the originator. This is very important as directors' vote are required for a board resolution in relation to the SPV's insolvency and further independent directors not connected to the originators should approve the SPV's activities if there is a need to do so. Furthermore, the SPV should be a separate legal entity, have the ability to hold the securitized assets and do business separately from the originator. The SPV's requisite authorizations must also be documented and recorded. These contribute to establishing a legal separable SPV and reduce the likelihood of any possible lifting/piercing of the corporate veil (substantive consolidation in the USA), whereas the SPV could be treated as an affiliate entity to the originator and the SPV's assets made available to meet the obligations of the originator if it becomes insolvent.

Main Securitization Transaction Document

The main securitization document consists of the offering circular, a key disclosure document, which is not a contractual one, unlike the other transaction documents. Chapter 6 discusses the various securitization documents that consist of primary contractual documents and opinions, secondary documents and due diligence reports.

Synthetic Transactions

Securitization transactions can be achieved through a true sale structure or a synthetic structure that mimics a true sale, although there is no sale of assets/receivables. Most of the synthetic securitizations are so called "funded" transactions rather than "unfunded" ones. A Credit Default Swap (CDS) is an example of an unfunded credit derivative according to which the credit protection seller does not make any upfront payment to the credit protection buyer. The credit protection seller is obliged to make a payment to the credit protection buyer to cover losses only when a credit event occurs.

The difference with a "funded" transaction is that the credit protection seller makes an upfront payment to the credit protection buyer. These funded

transactions generally involve a SPV whereas payments are funded using a securitization structure and notes are issued by the SPV to support these obligations. The investors make an upfront payment through the SPV and buy the note. If no credit event occurs, the investor receives the redemption value of the note on its maturity. If a credit event does occur, the investors are paid the redemption value less the nominal value of the reference asset. Effectively a synthetic transaction involves the transfer of the credit risk of the originator's pool of assets to the investors without the transfer of a legal or beneficial interest of those assets to the investors.

Under a fully funded synthetic transaction the loans (reference obligations) of the securitized portfolio (reference portfolio) remain on the balance sheet of the originator (credit protection buyer). The issuer receives the proceeds from the investors and deposits the proceeds either in a cash deposit account or invests the proceeds in highly rated securities (eligible securities) through a repurchase agreement (repo) with a highly rated repo counterparty (typically the originator/credit protection buyer). The issuer as a credit protection seller enters into a CDS with the originator as a credit protection buyer whereas the issuer provides credit protection against potential losses in the reference portfolio and in exchange for this service receives the CDS premium. Typically the CDS premium is close/equal to the interest payable on the loans. The source of the interest paid on the issued credit linked notes may come from the CDS premium, the interest received on the cash deposit, and/or interest earned on the eligible securities (repo securities). Care should be taken when structuring the transaction that transaction costs are taken into account. The principal on the credit linked notes is paid by liquidation of the cash deposit and/or eligible securities. So any amount equivalent to an amortization repayment, prepayment proceeds or recovery amount received under the loans is paid by liquidation of the cash deposit and/or eligible securities. The credit linked notes are typically paid down sequentially. Should there be a loss on the reference portfolio, the issuer as credit protection seller will compensate the credit protection buyer/originator. The protection payment will come again from the liquidation of the cash deposit/eligible securities. Any losses are applied on the notes in reverse sequential order as the credit protection payment is made.

Diagram 3 shows a transaction structure and the role of the main parties in a synthetic securitization.

A credit event is an event that under the documents can trigger a loan event of default. The definition of credit events typically include bankruptcy of the reference entity, failure to pay under a reference obligation and restructuring of a reference obligation. The restructuring credit event should be carefully reviewed from the investor's point of view especially with more concentrated pools/transactions. If restructuring is at the discretion of the servicer/lender,

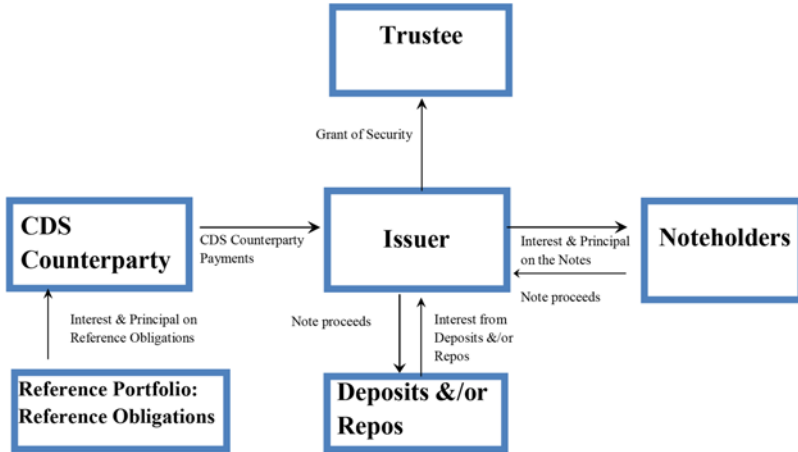


Diagram 3 Synthetic securitization transaction structure

in order to preserve its relationship with a borrower, it may be incentivized to “restructure” and to forgive payments. Whereas, for example, if the trustee can effectively challenge the decision of the servicer to do a restructuring of the loan that would lead to a restructuring credit event and to an associated credit protection payment; investors may be better protected, but the originator is worse off as it will have to take the loss.

The eligibility criteria list is a list of conditions that needs to be met for a loan to be part of the reference portfolio and to be eligible for a credit protection payment to be made if the loan defaults. A realized loss is the amount of loss on a defaulted loan, calculated according to a defined formula.

From the investors’ point of view a detailed and restrictive list of eligibility criteria is better. Typically, if a loan defaults, the calculation agent has to check if a reference obligation is eligible for credit protection, estimate the amount of loss and the associated credit protection payment, if the reference obligation is indeed eligible. However, if the reference obligation is not eligible for credit protection, then the originator will have to bear the loss. This is a much stronger positive feature from the investors’ point of view than the common representations and warranties provided by the originators in a typical true sales transaction.

A synthetic transaction allows the originator/credit protection buyer to keep the loans on balance sheet. This may be preferred for a number of reasons, such as the loan agreement or regulation do not permit the sale of a loans to a third party, or the loans may not fulfil the requirements for a securitization. A synthetic transaction can be more tailor made based on the requirements of the originator and according to the features of the loans. From the investors’ point

of view, depending on the transactions, in certain cases a synthetic structure can be more beneficial than a true sale as, for example, losses can be defined as principal only exclusion of loss allocation if certain criteria are not met.

On the other hand, synthetic transactions may be more difficult to place in the market as fewer investors can invest in synthetic transactions. As there is usually less liquidity in the secondary market they can potentially have higher spreads. Investors investing in synthetic transactions have the risk of the CDS counterparty defaulting, i.e. non-receipt of the swap premium. In addition, investors have the risk of downgrade of eligible securities or any market value decline of the eligible securities, if proceeds have not been invested in cash.

In most synthetic transactions, there is no liquidity facility in place as the liquidity is implicitly provided by the CDS counterparty through its payments. The interest shortfalls under the loans are met by the CDS payments together with the interest earned from the deposits (or repo securities) that would be liquidated when the credit protection payment is made and recoveries will be applied to the notes most commonly on a sequential basis. However, there are some synthetic transactions that have a small protective liquidity facility in the event of non-payment by the CDS counterparty of the associated payment and allowing the issuer to pay amounts to its third party creditors.

Securitization Major Sectors

- *RMBS*: Residential Mortgage Backed Securities (backed by home loans).
- *CMBS*: Commercial Mortgage Backed Securities (backed by commercial real estate).
- *ABS*: Asset Backed Securities (backed by consumer, commercial financial, operating assets).
- *ABCP*: Asset Backed Commercial Paper (a conduit of various RMBS/ABS/CMBS/CDO and whole loan interests supported by committed bank liquidity).
- *CLOs*: Collateralized Loan Obligations.

Credit Risk Assessment of Commercial Mortgage Backed Securities (CMBS)

Commercial Mortgage Backed Securities (CMBS) are securities backed by loans on commercial properties, such as office buildings, retail properties, warehouses, storage facilities etc. The difference between CMBS and mortgage

Real Estate Investment Trusts (REITs) is that mortgage REITs are niche financial stocks that mainly invest in CMBS and RMBS. Mortgage REITs borrow funds with short-term debt and buy longer-term CMBS and RMBS, benefiting from the spread between the short-term and long-term interest rates. An economic environment with low short-term interest rates overall provides low funding costs to boost the economy and as a result provides cheap funding for mortgage REITs. However, government backed purchases of mortgage securities as a tool of quantitative easing has the effect of increasing the mortgage bond prices and lowering the yields. Consequently, the profitability of mortgage REITs can be negatively impacted. Mortgage REITs is relatively a small sector in financial markets compared to the trillions of issuance of RMBS and CMBS.

Since CMBS are backed by commercial property loans, in order to assess and manage their risk someone needs to understand the dynamics, characteristics and inherent risks associated with the actual property that provides the collateral for these loans. The property analysis is a key parameter in assessing CMBS. The amount of detail and effort in the property analysis does vary depending on how granular the pool is. A very concentrated CMBS transaction would typically consist of a single loan secured on a single property and occupied by a single tenant. On the other hand, a granular CMBS transaction is a credit tenant lease transaction, as well as a transaction with multiple loans secured on multiple properties.

The property attractiveness is very important and depends on the location of the property, its quality, construction and overall competitive position. The more attractive a property is, then all things being equal, it would attract better tenants, better lease terms, better rent, have less void periods, would be easier to relet, resulting in better and more stable cash flow/income.

Assuming a very concentrated transaction consisting of a single loan secured on a single property secured by a single tenant, then the CMBS analysis would start with how attractive that property is, the credit quality of the tenant and its lease term. For example, a great property in demand occupied by an Aaa/AAA tenant that has a lease term exceeding the loan term with no break clause provides a lot more comfort and will produce more stable cash flows over the loan term and at its refinancing date. If there is a break clause then the strategic importance of that particular property to the existing tenant should be taken into account, as if it is important to the tenant, then it can be assumed that it will renew the lease. Of course the credit quality of the tenant is not the only matter of importance as the net income that remains to pay the debt service on the loans is of utmost importance. Therefore from the gross income received from the tenant lease, expenses must be taken off, such as

maintenance and management costs, capital expenditures, taxes etc., to assess the net income and Debt Service Coverage Ratio (DSCR) (income divided by debt service). Obviously it is best to have the higher DSCR possible; in reality most borrowers, especially when there is plenty of lending available with thin margins, will seek the highest leverage possible (more debt) on the property that ultimately brings the DSCR down. The higher the DSCR the less the probability of the loan defaulting during its term and thus the notes backed by this loan should then receive their debt service. If, however, there is a cash flow shortage leading to a DSCR below 1, over a sufficient long time period (in the short-term the liquidity facility should continue to make payments) then according to the documentation the single loan could default and this could lead to a default on the note level. For more granular transactions consisting of many loans backed by various properties that are leased to multiple tenants, the default on one of the loans should not lead to a note event of default. As there is a lot of diversity in the transaction there should be enough cash flow to continue to make payments under the notes. However, each transaction is unique and should be reviewed individually. From the investors' point of view, there could be conflicting views. For example, an Aaa/AAA senior investor would probably continue to receive payments, but a subordinated non-investment grade investor may not get any more payments and start absorbing losses. Another element to bear in mind is the nature of the borrowing entity holding the properties. Ideally it is better if the borrowing entity is newly established for acquiring the property and securing the loan with the sole purpose of just holding and letting the property with restrictions on incurring further debt and hiring employees. This borrowing entity typically is not expected to have the features of an SPV issuer. In the sense of being insolvency remote, it will typically have creditors that have not signed a limited recourse agreement (Chap. 6 discusses limited recourse) with the borrower; however, if that entity is allowed to incur further liabilities or if it has potential employee pension liabilities etc. this may increase the loan default risk.

The loan(s) also have the risk of defaulting at the refinancing date, as typically commercial loans do not fully repay during the term of the loan. The probability of this happening will of course depend on the market conditions and the availability of credit at the time, which cannot be predicted. However, a very important driver of refinancing risk at the loan maturity is the Loan to Value (LTV) of the loan. Other parameters do influence the refinancing default probability of the loan, such as the quality of the property, the credit worthiness and diversity of the tenant(s) as well as the weighted average remaining lease term at the refinancing date. All things being equal,

a low LTV loan secured by an excellent in demand property and occupied by many highly creditworthy tenants with a weighted average long remaining lease term at the refinancing date has a low probability of default at the refinancing date. This loan has a much lower probability of default than a high LTV loan. For example, a loan with 25 % LTV is a low LTV loan. A loan with an LTV of 95 % is a high LTV loan.

Another point to bear in mind is that there is typically a trade-off between amortization during the term of a loan and refinancing. The lower the scheduled amortization, the lower is the default risk during the term of a loan, as the debt service is lower. However, the refinancing risk at maturity is higher because—due to lower amortization—the amount to be refinanced at maturity will not have been reduced much. For example, all things being equal, take two loans with the same LTV at the beginning of the term of 70 %; loan 1 has scheduled amortization and as a result its refinancing LTV (LTV at maturity) is then 55 %. Loan 2 has limited amortization and as a result its refinancing LTV is 68 %. Loan 2 has a much higher risk at the refinancing date (more debt to refinance); however a much lower risk of default during the term of the loan, as its required debt service is lower.

Rating agencies use commercial real estate information and analysis along with their internal models and procedures to rate CMBS transactions. Moody's in Europe, the Middle East and Africa (EMEA) allocate a property grade to the properties securing the loans on a scale of 1 to 5 (1 is the best and 5 the worst). The rating agency cash flow may differ from the underwriter's cash, as rating agencies may apply a haircut to the cash flows based on their assessment of the property quality, tenancy quality, lease terms and costs. In addition, the rating agencies may also apply a haircut to the value of the property by applying their yields to their cash flow. Typically at the loan level, Moody's performs additional analysis on the loan and borrower structures to derive the term and refinancing default probability for each loan in the transaction. Based on their assessment of the term and refinancing default risk profile of the loan(s), and property value assessment, a simulation tool is used by the analyst to assess the loan's expected loss. For this, as a first step, based on the tool the loan may or may not default each year of its loan term. The tool simulates many different default paths for each loan in the portfolio, which generates a default distribution and default timing profile. The second step involves estimating the loss severity upon default. The model compares the loan amount outstanding at the default date with the simulated property value at time of enforcement in order to arrive at any potential loss. This process takes into account any enforcement costs and accrued interest during the enforcement period based on assumptions about the transaction's jurisdiction

(tiering assumptions) as well as on other parameters such as the legal nature of the loan/borrower group, any hedging and loan-level tranching; property types and granularity etc. The model takes into account correlations between loan defaults, property values and default severities. Finally, based on the simulation tool a loss distribution on the loan or loan portfolio is estimated.

Based on the transaction waterfall the cash flows from the loans to the different notes are applied, taking into account the structural features. Basically, after deriving the loss distribution, this is then used as an input in the issuer level cash flow model that derives an expected loss for each class of notes. The notes' expected losses and their weighted average lives are mapped to Moody's idealized loss targets for each rating level. Further transaction specific characteristics, such as pay structures, triggers, counterparty and country related risks, are also taken into consideration. However, all these model outputs will be discussed by the rating committees that will also take into account qualitative parameters such as operational, legal and/or counterparty risks. As a result, the final ratings assigned may differ from the quantitative model outputs.

Credit Risk Assessment of Residential Mortgage Backed Securities (RMBS)

In order to assess the credit risk in RMBS, understanding and assessing the underlying collateral is very important. Key parameters in assessing the individual loans in RMBS include the LTV ratio of each loan, the borrower's Debt-to-Income (DTI) ratio or the borrower's overall credit score. The DTI or overall borrower's score expresses features of the probability of default and the ability of the borrower to keep up with the debt service. The LTV can be used to assess the loss severity of a loan, as well as how motivated a borrower is to pay the debt service. A borrower with hardly any equity (i.e. high LTV) may be much less motivated to pay the debt service upon conditions of stress compared to a borrower that has a lot of his capital invested in the property (i.e. low LTV). In particular, if that property is his home rather than a property he rents out. To estimate the LTV, the current balances of all loans (if applicable) secured by the same property should be aggregated. So therefore, all prior and equal ranking claims on the property should be considered. For example, if a residential house is valued at £100,000 and has a loan secured on that of a £100,000 the LTV ratio is 100 %. If there is a decrease in the housing market in the range of 35 % then severity upon default is £35,000 excluding foreclosure costs and accrued interest. Hence the loss as a percentage of

the current loan balance is 35 %. If the same residential property secures a £50,000 loan that is also subordinated to prior ranks of £50,000, the LTV is again 100 %. The default probability in both cases is the same. Given a house price decline of 35 %, the loss on the property is again £35,000. However the proceeds from the property are applied first to pay back the prior ranks. As a result the loss for the securitized loan is £35,000 and expressed as a percentage of the current loan balance, the loss is 70 %. All things being equal, the loan with prior rank has much higher loss severity and would need a lot more credit enhancement compared to the loan without prior ranks.

Typically a haircut on the property value is applied which will produce a higher and a stress scenario LTV. The loss for any individual loan will be dependent on the value (recovery value) obtained upon sale (this may be a fire sale, so a stress on the property value is wise), the loan balance outstanding, the costs in relation to the foreclosure of the property and any accrued interest. House price declines differ from region to region and from country to country. Haircuts on property value should be applied based on the individual property characteristics, and for this historical property value declines can be used. However, historical information does not guarantee that future market value declines will not exceed those already experienced. Further foreclosure costs and the time taken to actually foreclosure differ from country to country so appropriate assumptions should be made, as the longer the time to foreclosure the higher the accrued interest on the loans and the higher the severity of loss. This is the case for true sale transactions and most RMBS transactions are true sale transactions. However, for the synthetic RMBS transactions the realized loss definition could exclude either interest or foreclosure costs or both, and as a result, if this is the case, it can decrease the severity significantly.

So the analysis of the pool or residential loans can begin with a loan by loan analysis, analysing key inputs such as LTV and DTI, and borrower credit scores. Furthermore, several adjustments can be applied on a single loan level. With regards to the credit risk profile, an adjustment can be applied if the borrower has had County Court Judgments (CCJ) in the UK or Bureau Krediet Registratie (BKR) codes in the Netherlands. In other countries adjustments can be made based on the number and value of adverse credit registrations. Other adjustments that can be applied on the loan level are property based, such as the occupancy type, owner occupied or buy to let. Other loan based adjustments can be applied on the basis of whether the loan is amortizing or bullet (i.e. a non-amortizing/Interest Only (IO) loan), and the origination source of the loan, i.e. if it is broker originated. Credit for seasoning can also be applied if the debt service payment has been made consistently: in this way, the loan's historical payment performance can be taken into account. All things being

equal, an IO loan/pool of loans that has been broker originated with a high LTV that is provided to a borrower with an adverse credit history and secured by a property that is used as a buy to let would need a lot more credit enhancement compared to an amortizing loan/pool of loans that has been originated by the seller of the loans with a low LTV that is provided to a borrower with no adverse credit history and secured by a property for the borrower's own use.

Further adjustments can be made on a pool basis. Although RMBS portfolios are typically well diversified in terms of borrowers and single loan sizes there could be cases of a low average loan size portfolio of very few large and many small loans. The borrower or loan concentration can be measured with a concentration index, such as the Hirschman Herfindahl Index. Other than borrower or loan concentration, a portfolio of RMBS can exhibit significant geographic concentration or have a large exposure to a single employer or industry. These concentrations would require further credit enhancement to protect the senior notes and in some cases of extreme concentration may require additional mitigants. Additionally, during the life of a transaction, the pool size decreases and credit risk exposure to large borrowers may increase substantially. The effect of this potential concentration depends on the amortization profile of the loans: for example, if the loans to large borrowers amortize more slowly than the rest of the pool. However, this potential borrower concentration build-up may be offset by an equivalent build-up of credit enhancement through sequential amortization of the notes which, if the transaction has been carefully structured, should protect against the default risk of the largest borrowers in the portfolio. Other structural features can also mitigate potential residual concentration risk, such as reserve funds with an appropriate floor level.

Assessment of the originator of the transaction as well as the servicer is also important. The originator's ability and profile as well as the originator's past loan performance should be looked at. Assessment of the originator's past loan performance and its marketing, property valuation, underwriting policies, credit risk management and technology can have an impact on loan quality and performance. The quality of data of the loan portfolio is provided by the originator. Therefore RMBS are assessed and rated on the basis of this data. Thus data quality as well as the strength of the representations and warranties of the originator is very important in any transaction. Furthermore, the role of the servicer is very critical since the practices and policies of the servicer will have an impact on the performance of loans. The servicer is the party that administers the loans and manages the assets and the loan arrears. The servicer's effectiveness in managing the arrears and mitigating losses will have an effect on the portfolio losses and therefore in the RMBS. Furthermore, the

servicer's IT systems, its staff experience, overall management and strategy are key parameters in any securitization.

The sovereign risk should be taken into account. If loans are denominated in a currency that is different from the country's local currency the transaction may be at risk of redenomination risk. Furthermore, if the local currency depreciates significantly, the government may redenominate the foreign currency loans into the local currency. This redenomination though may be at an unfavourable exchange rate for the transaction. As a result this will have a loss at the time of the currency exchange as well as a future loss, since the local currency may continue to depreciate.

Typically, rating agencies assess the credit risk in RMBS and assign ratings. Moody's uses a scoring model, called MILAN (Moody's Individual Loan Analysis Credit Enhancement (MILAN CE)) in order to assess the credit risk of residential mortgage loan portfolios in EMEA. The MILAN model works on assumptions about the performance of country specific benchmark loans and how deviations from these benchmarks can affect default probability and loss severity. Furthermore, the model assumes that deviations in overall portfolio diversification from a country specific benchmark RMBS portfolio influences performance. These assumptions are country specific.

The results of the analysis produce the portfolio's expected losses (Portfolio EL) and the MILAN CE. The Portfolio EL expresses Moody's expectations of performance taking into account the economic outlook and the MILAN CE captures the expected loss on the portfolio in the event of a severe recession scenario.

MILAN CE estimation can be summarized as follows:

- Single loan level

As a first step the Country Specific Benchmark Loan and Portfolio is defined, then the default frequency and loss severity is estimated. The next step involves the estimation of the Base Benchmark CE (which is subject to country specific minimum/floor loan CE):

$$\text{Base Benchmark CE} = \text{Default Frequency} \times \text{Loss Severity}$$

The next steps apply adjustments to the Base Benchmark CE, in relation to the following: borrower credit profile and any other borrower related adjustments, property, loan, performance, originator and servicer adjustments. Based on the above adjustments that can have a positive or negative impact on the Base Benchmark CE, the *MILAN CE Single Loan* is produced, again subject to country specific minimum/floor loan CE.

- Portfolio level

The next steps involve adjustments to the portfolio level. These involve any adjustment/penalty for any regional and borrower concentration. This results in the *Model-driven MILAN CE*, which is again subject to a minimum/floor portfolio MILAN CE and minimum expected loss multiples. Furthermore, qualitative and quantitative adjustments can be applied during the rating committee process that can further increase/penalize or reduce the necessary MILAN CE. The *rating committee approved MILAN CE* is the final output.

The Portfolio EL and the rating committee approved MILAN CE are used to determine a probability loss distribution. The probability loss distribution associates a probability with each potential future loss scenario for the portfolio. Then a cash flow model is used to assess the characteristics of the transaction's assets and liabilities on the potential losses to investors. The model calculates each tranche's expected loss, in conjunction with the tranche's average life. The cash flow model estimates the loss to investors resulting from each portfolio loss scenario of the lognormal distribution. The model then weights each loss with the corresponding probability of the loss scenario to estimate the tranche's expected loss. Then the tranche's expected loss with an estimate of the average life of the tranche is used/mapped to derive the rating model implied assessment from Moody's idealized expected loss table.

The final rating adjusts the cash flow model implied assessment, to incorporate counterparty default risks that are not explicitly modelled in the cash flow model, as well as the legal risks of the transaction. They also typically consider the sensitivity of the model implied assessment to alternative Portfolio EL and MILAN CE assumptions.

The cash flow model consists of the asset and liability cash flow side. The cash flow model incorporates assumptions regarding the assets (asset cash flow), such as the timing of losses. Recovery rate and arrears modelling assumptions ultimately affect the interest and principal receipts of the portfolio. As well as prepayment rates and amortization assumptions, such as scheduled amortization prepayment rate assumptions. For transactions that are not fully hedged, a stress on the interest payable on the notes or a haircut of the interest payable on the assets can be applied. For substituting transactions, any anticipated changes to the asset yield can be incorporated as new assets are being added to the pool and the transaction does not have strong substitution criteria safeguarding the quality of the assets entering the pool.

The cash flow model on the liability side takes into account the transaction's structural characteristics, such as priority of payments, tranching,

triggers in relation to performance and servicing fees or any stress applied to these, assessed on a transaction basis.

The model also incorporates modelling of counterparty default risks and makes modelling assumptions in relation to this. These involve the risk of set-off. When set-off risk cannot be eliminated fully in the transaction structure, additional asset loss in the cash flow modelling can be assumed. Other risks such as commingling, if applicable, will typically be taken into account (commingling and set-off is discussed in Chap. 6). As every transaction can be unique rating committees decide additional modelling or stresses that can be applied. Furthermore, risks not modelled within the cash flow model can be separately assessed by the rating committees and ratings adjusted if needed: these may involve but are not limited to risk in relation to swaps, bank accounts, operational disruption risk, etc.

Credit Risk Assessment of Asset Backed Securities (ABS)

The Asset-Backed Securities (ABS) sector is very diverse. The portfolio of underlying assets can include credit cards, auto loans, student loans, other consumer loans, esoteric cash flows from aircraft leases, other leases etc. Generally ABS are backed by the cash flows of a discrete pool of receivables or other financial assets that can be fixed or revolving. Although the new assets added to the pool during the revolving period should have the same general features as the original pool assets, ABS can also be backed by a pool of delinquent and non-performing assets. Typically the portfolio of assets backing ABS consists of a group of small and illiquid assets that would be difficult to be sold individually.

As the ABS sector is vast, this section focuses on an ABS backed by auto loans and auto leases, a quite popular asset class within ABS. Loan and lease transactions entail risks from potential obligors' defaults, risks arising from the transaction structure and counterparty defaults as well as risks from operational legal factors. Furthermore, depending on the jurisdiction of the transaction there could be sovereign risk considerations. The main difference and the additional risk of ABS backed by auto leases is that of the Residual Value (RV) risk and may be subject to termination risk in many jurisdictions. RV risk refers to the risk that, when the lease matures, there is a large unamortized amount/residual value of the lease (i.e. the lessee typically does not pay down the full value of the auto). Thus if the lessee decides to return the vehicle there is a significant risk that the market value of the vehicle will be lower than the securitization's valuation of the unamortized portion of the lease. In some

jurisdictions, such as the UK, lease contracts allow the lessee to voluntarily terminate its lease prior to expiration under certain conditions; these situations create additional RV risk. The lessor or originator in leases remains the owner of the asset, whereas through a loan the borrower has title to the asset.

ABS backed by an auto loan or leases ultimately have the risk of the underlying portfolio credit quality of the loans/leases. Typically, originators provide the risk profiles of obligors by FICO score or internal credit scores and other borrower characteristics, such as their capacity to pay, for example payment-to-income ratio. Other critical information is about the asset itself, such as the loan- or lease-to-value ratio, term, interest rate, whether the asset is new or used, if the loans are fully amortizing or not etc. These factors can affect the borrowers' performance as well as the recovery from borrower default.

An important part of the analysis is based on historical loss data from the originator in order to project those losses in the future. Originators typically provide data of net losses or gross defaults and recoveries. Static pool information can provide cumulative losses on an historical pools of assets comparable to the securitized pool. Although it is most likely that an originator's prior static pool has not reached its maturity, the data are still invaluable as they can produce likely lifetime losses based on losses to date since they can be extrapolated for the remainder of the pool's life. Extrapolation can be based on average changes in the cumulative loss rate in similar pools during those periods or on extrapolation of the gross default rate, depending on the availability of data. Further adjustments may need to take place, such as adjusting for differences in pool composition from the one that historical data has provided to the securitized pool. Another key element in assessing the risk of ABS is obtaining a relative measure of variability surrounding the level of expected losses on the pool. Typically, variability of losses in the pool will be higher with a lower level of expected losses, as losses can increase significantly above low non-stressed losses. Given the pool's losses and their variability a probability distribution of the pool's losses can be built.

For ABS backed by leases the RV risk must also be assessed. This is the risk that the lessee is likely to return the vehicle and expose the securitization to a loss equal to the difference between the market residual value and the securitization's valuation of the unamortized contract. In EMEA, in some transactions, there is a guarantee by the originator that covers residual value risk. In other transactions there may be a dealer buy-back agreement in place between the lessor and dealer. However, in this case there is a risk of the originator/dealer not performing its obligation and transferring the rights under the buy-back agreement to the SPV. Generally, residual value risk can be assessed through historical depreciation rates or forecasted market residual values.

Similar to any securitization transaction, other than analysing the pool, the transaction structure must be understood and assessed, such as priorities of payments, general forms of credit enhancement, cash reserves, reserve funds and cash-trapping mechanisms. Revolving transactions (i.e. transactions where the pool can be replenished with new loans or leased assets) can add some uncertainty to the portfolio composition and criteria should be put in place so that the new leases or loans have the same credit characteristics as the original pool. Further legal analysis should be carried out to assess risks in terms of the effective assignment of the assets to the SPV, and its bankruptcy remoteness etc. The potential risk posed by lease terminations and set-offs against amounts owed by the lessees that may arise in the event of a bankruptcy of the sponsor should also be assessed. As with any structured finance transaction, a review of the relevant agreements of the main parties in the transaction (servicer, cash manager, hedge counterparty) should be performed in relation to counterparty risk and mitigants in place, such as counterparty replacement triggers.

Rating agencies typically have specific criteria and methodologies when they rate different types of ABS transactions that address the specific asset pool characteristics. Moody's, for auto loan deals, estimates the auto loan or lease pool expected loss and its variability in order to derive the pool credit loss distribution. For granular pools the loss distribution assumed is lognormal. On the other hand, if the pool is concentrated a pool-specific probability distribution from the simulated loss behaviour of the individual assets is used. The loss behaviours are based on individual asset default probabilities adjusted based on a specific asset's characteristics and correlations among the assets. Then a cash flow model is used to estimate the loss in each tranche that investors would suffer in each pool loss scenario. From this estimation the probability distribution of tranche losses can be derived by associating each tranche loss scenario with its corresponding probability. The tranche loss distribution is used to estimate the amount of credit enhancement consistent with Moody's benchmark for the rating being considered. For leases transactions, the level of credit enhancement to offset residual value risk, if applicable, is estimated consistent with the rating being considered. The credit enhancement level is based on assumptions of the future depreciation of the vehicles and some haircuts. The total amount of credit enhancement is estimated by summing the credit enhancement for credit risk and the credit enhancement for residual value risk given the rating in question. The rating committee finally determines the ratings by also factoring the operational counterparty risk and the legal structure of the transaction as well as by taking into account any sovereign risk (applying local currency rating ceilings).

Credit Risk Assessment of Asset Backed Commercial Paper (ABCP)

The basic structure of an Asset Backed Commercial Paper (ABCP) programme involves setting up an SPV to fund a portfolio of assets through the issuance of commercial paper. In ABCP, each transaction funded by the conduit has a structure very similar to the structure of a true sale term securitization, according to which the originator/seller of assets sells them to a SPV. In some cases conduits fund the purchase of rated securities. The SPV buys the assets that may be funded by the conduit through a direct purchase, a loan agreement, a repurchase agreement, CDS etc. The conduit issues ABCP to finance the purchase of the assets. The amount of funding varies and mainly depends on the quality of assets (amount of non-defaulted, non-delinquent assets) that are usually financed with a haircut or otherwise a portion of face value (less than 100 %) in order to provide credit enhancement. If ABCP cannot be issued, liquidity will be used to pay back maturing ABCP. Many programmes have programme credit enhancement to cover any shortfalls that arise. Similar to a true sale term securitization, the conduit transaction will have triggers leading to early amortization and generally limit investors' exposure to assets as their quality deteriorates. The administrator has overall responsibility for the activities of the conduit, such as asset recommendation, issuing and repaying ABCP, monitoring and servicing the assets, etc.

A main difference with a term securitization is that typically most ABCP programmes only have a short-term rating (for example Prime-1 (sf) if rated by Moody's). Another difference is that the rating for the ABCP is less closely aligned with the asset credit quality, whereas a term securitization has long-term ratings closely related to the quality of assets securitized. In an ABCP, the liquidity funding is typically limited by the amount of performing assets. Thus in an ABCP, provided that the amount of performing assets is always greater than the amount of ABCP outstanding, liquidity will be used to repay maturing paper. Therefore the rating for the ABCP issued by the conduit is typically very closely related to the rating of the liquidity and support provider.

The key feature of an ABCP analysis is to make sure that liquidity/cash will be available to repay maturing ABCP with a high degree of certainty. Since the liquidity funding is capped by the amount of performing assets, an analysis of the liquidity funding formula and the asset characteristics is very important. Furthermore, the liquidity funding formula should incorporate the ultimate characteristics of the assets involved. For example, if the liquidity funding formula considers 60-day delinquent assets as non-performing, then there will be no liquidity funding. However if most 60-day delinquencies of

that particular asset are ultimately cured, then the liquidity will not fund for after all “good assets”. In other ABCP structures there is no liquidity facility and the repayment is carried out from funds through assets’ amortization. In such structures the analysis of the stability and management of cash flow in relation to the commercial paper maturity is key. In other structures the repayment of ABCP is dependent on the sale of assets. In such cases the stability of prices and the time required for a sale should be taken into account.

There are different types of ABCP programmes. One type of ABCP programme depends on the type of credit support that can be full or partial. Investors buying into an ABCP programme with full-support are entirely dependent on a third party, such as the liquidity facility/support provider and the terms of the liquidity facility/support agreement to ensure timely repayment of ABCP. Investors under that type of ABCP are not per se exposed to the credit deterioration of the assets but mainly rely on the financial strength of the support provider and strength of the support agreement. In most cases, the rating of the ABCP programme is linked to the short-term rating of the support provider. In the event that the provider’s rating is lowered (for example from Prime-1 (sf) to Prime-2 (sf)) then the ABCP will most likely be lowered. Another type of ABCP based on credit support is an ABCP programme with only partial support. Investors buying into such a programme are exposed not only to the financial strength of the liquidity/support providers but also to the credit quality of the assets, as this programme is only partially supported, or a combination of both. Typically, liquidity support is limited to the amount of performing assets, but depending on the programme may also cover specific asset or seller risks. Furthermore, depending again on the programme there could be the case of having additional credit support to cover any shortfall. It is worth noting that although an ABCP may be partially supported, individual transactions in that partially supported programme may be organized with full support.

An ABCP programme can be differentiated other than from its type of credit support, full or partial, from the type of its structure. Typical structures are multi-sellers, single sellers and securities arbitrage. Structured Investment Vehicles (SIVs) and CDOs have also issued ABCP. The type of structure is chosen by the ultimate sponsor of the programme that best suits its needs. Multi-sellers are mainly sponsored by banks and fund a diversified portfolio of assets. Single sellers are typically sponsored by non-bank financial firms to fund assets from their line of business and sometimes in order to obtain warehouse funding before a term securitization. Securities arbitrage programmes invest in portfolios of securities, and with these programmes investors are exposed to the portfolio management rules, credit quality of the assets,

support provider and terms of support agreements. Some collateralized CP programmes are sponsored by banks that issue ABCP to finance securities sold to the conduit under repurchase agreements, whereas repo programmes are non-bank sponsored and fund a variety of assets typically through repurchase or similar agreements.

The credit risk in an ABCP programme, depends on the type of ABCP programme and can involve assessing risks in relation to the credit quality of assets, liquidity/hedging or any other support facilities, legal-structural and operational issues. Similar to a term securitization, an ABCP programme can have a risk/ flaw in its structure that puts it in danger of being trapped in a bankruptcy or similar proceeding that can delay or prevent paying investors. Like any true sale structured finance, an ABCP programme should be structured as a limited-purpose specialty finance company with the objective of minimizing the risk of insolvency. Typically, the SPV is set up by a legal owner with the sponsor's direction. The sponsor does not generally own the SPV. The SPV should have no employees, and its objectives should be limited to acquiring and funding assets. Furthermore, all counterparties must agree to non-petition, limited recourse language to limit the risk of bankruptcy. Similar to an ABS securitization, ABCP programmes, such as the ones having only partial support, have the likelihood that the assets financed through the programme will suffer credit-related losses. These losses, depending on the terms of the transaction, will lead to loss of liquidity support or incomplete repayment. The evaluation of the credit strength of an asset depends on the type of asset and undergoes a similar analysis to a stand-alone securitization, such as a stand-alone ABS. An ABCP programme can be at risk of liquidity and timely payment as there could be a timing mismatch between cash flow from the assets held by ABCP programmes and payments that are required to be made on time on maturing ABCP. In order to account for this, ABCP programmes have liquidity back-up facilities at least equal to the amount of ABCP outstanding. These are typically provided by highly rated banks and can take the form of liquidity back-up loan or purchase commitments. Sometimes letters of credit, cash collateral accounts, etc. can be set up. Other risks in ABCP programmes can arise from operational risk to perform all of the activities required to manage the conduit. This can include, but are not limited to, managing the conduit's assets and liabilities, issuing and repaying ABCP, paying expenses, monitoring performance, etc. Review of the programme's document should provide the role and assignments of the parties, the representations, warranties, their standard of care (which should be set high), indemnities etc. Effectively the role of third parties should clearly match and fulfil the needs of the ABCP programme.

Rating agencies assess the risks in relation to the credit quality of assets, support facilities, legal-structural and operational issues. Generally short-term ratings are assigned by rating agencies. A Prime-1 or Prime-1 (sf) Moody's short-term rating is typically consistent with a long-term debt rating from Aaa to A2 (or Aaa (sf) to A2 (sf) and, in some instances, A3 (or A3 (sf)). A few ABCP programmes that issue Medium-Term Notes (MTNs) have long-term ratings on those instruments.

Credit Risk Assessment of Collateralized Loan Obligations (CLOs)

Collateralized Loan Obligations (CLOs) also fall into structured finance transactions. In a CLO the SPV acquires the assets, typically a pool of diversified syndicated leveraged loans that can cover a wide range of issuers and industries and whose income and principal payments are paid out to investors. CLOs provide investors with the opportunity of having exposure to the leveraged loan market while choosing a specific risk/return profile that best suits their needs as well as getting more diversity. The CLOs have tranches ranging from the most senior to the most junior tranche/equity that receives all the residual income from the collateral pool of loans. CLO investors in below investment-grade bonds and preference share equity investments include hedge funds and private equity funds.

They can be structured with a reinvestment period whereas available principal proceeds can be used to obtain additional portfolio assets, and typically have mechanisms to protect investors from portfolio deterioration. The CLO structure typically has a trustee that protects the noteholders' interests and a collateral administrator that provides back-office support. The trustee acting as a fiduciary agent for the CLO investors maintains custody of the CLO pool of assets, cash flows and accounts, and remits funds to investors as per the indenture's priority of payments. The trustee approves and reconciles the collateral manager's trades to ensure that these are consistent with the indenture's portfolio requirements. The trustee also acts on behalf of the investors with certain voting rights. The collateral administrator is usually an affiliate of the trustee and does the bookkeeping for the CLO. The administrator typically prepares and posts investors' reports and provides information on the CLO portfolio composition, purchases, sales, balances and reconciliation of accounts etc. The placement agent is usually a bank hired by the CLO or an asset manager to structure and place the CLO securities. Usually the placement agent undertakes the CLO marketing and closing-date activities.

Since the creation of the CLO market several types of CLOs have been structured with different aims:

- *Managed versus Static CLOs:* Managed CLOs have dynamic collateral pools as the collateral manager actively buys and sells assets, therefore the pool will change over time subject to the transaction covenants. Static CLOs have the same collateral pool throughout the life of the transaction.
- *Arbitrage versus Balance Sheet CLOs:* Arbitrage CLOs typically arbitrage/take advantage of the income from the loan pool over the CLO cost of financing. In an arbitrage CLO investors want to maximize the difference between the weighted average spread of the collateral pool minus the cost to finance that pool (weighted average spread of the liabilities). This relationship drives the return/risk profiles for CLO investors. When loan spreads tighten, it can be expected that the CLO spreads also tighten. Balance Sheet CLOs were structured to remove loans from balance sheets to reduce regulatory capital requirements.
- *Cash Flow versus Market Value CLOs:* Cash Flow CLO tests are based on the par value of the collateral. Market value CLOs use the market value of the collateral, which exposes the transaction to mark-to-market risk. Market value CLOs are very sensitive to price volatility in the loan market. If the collateral value falls below the market value CLO limits, the manager has to sell assets to pay off liabilities until the triggers are no longer breached. These forced sales take place at the worst time with very bad terms. Most of these did not survive the 2008 crisis.
- *Cash versus Synthetic CLOs:* Cash CLOs have leveraged loans as the underlying asset collateral. Synthetic CLOs are backed by credit default swaps on loans.

A type of structure developed to fund a credit derivatives contract is a synthetic CLO. In a standard synthetic CLO, the SPV, that serves as the seller of credit protection, enters into a portfolio CDS-funded CDS—with a counterparty, commonly the arranger. This swap is typically cash settled. In order to fund the SPV's potential obligations under this swap the SPV issues bonds that are sold to investors. The investors provide the funds that are then invested in highly rated securities, a repo or placed in a bank account.

The SPV, as a buyer of credit protection, also enters into an unfunded CDS with a highly rated financial institution referenced to the portfolio of obligations covered by the funded swap. As security for the SPV's obligations under the funded swap, the funded swap counterparty has a security interest over the SPV's rights in the unfunded swap and the SPV's investments.

If a credit event under the funded swap is triggered, the SPV funds this payment to the CDS counterparty by selling the necessary amount of investments. As a consequence the principal amount of bonds will then be reduced accordingly. Typically the losses will be absorbed by the most subordinated bonds and their principal balance reduced accordingly. If the principal amount of each class of bonds becomes exhausted, the unfunded CDS counterparty will then make payments under the unfunded CDS that in turn will fund the payments due under the funded CDS.

At the transaction's maturity the investments proceeds (if any) are used to repay the remaining principal amount of the bonds.

Most outstanding CLOs and new transactions in the market to date are managed, cash flow, arbitrage deals. A managed CLO structure involves a collateral manager. Typically this is the bank or asset manager that sponsors the SPV. The manager performs different functions for a CLO compared to what a servicer does for other types of securitization, such as RMBS, CMBS and ABS. In a CLO, the manager is actively managing the issuer's collateral according to the transaction documents. The transaction documents determine the concentration limitations, eligibility criteria, collateral quality thresholds, and over-collateralization/interest coverage tests that need to be met throughout the CLO's life cycle. The manager makes decisions in terms of which assets are replaced or purchased, and during the CLO's reinvestment period invests principal proceeds received from the underlying loans in new loans.

The underwriters can offer a warehouse facility to CLO issuers to assist with financing the ramping stage. The warehouse facility assists the manager to purchase the CLO collateral prior to issuing the notes. Underwriters can require an equity investment that may come from the equity investors in the CLO or the manager. The CLO SPV issues the notes and preferred shares or subordinated notes into the capital markets. Then upon the closing of the CLO transaction the manager uses the proceeds from the sales of the notes to repay the underwriter for providing the warehouse facility. CLOs provide credit enhancement through priorities of payments, and portfolio over-collateralization as in other forms of securitization.

Most CLOs to date are managed so it is very important to assess the manager's ability to trade as well as the transaction covenants. If a CLO has a static structure or no longer permits reinvestment the assessment focuses on the characteristics of the actual portfolio.

A manager should have fundamental and structural credit expertise and experience. Ideally the manager should have a long track record of managing loans, experienced staff and restructuring expertise is also very useful. The amount of corporate assets under management, credit strategy, policies,

systems, decision process, performance relative to benchmarks, as well performance of the manager's existing CLO transactions are all useful in assessing the CLO manager. However, the way that the manager carries out his/her role depends on the provisions of the Collateral Management Agreement (CMA). The standards of care and liability of the manager in the CMA should be very strong. The manager should agree to exercise a degree of care that is no less than that which an international institutional manager would exercise when managing similar assets. In addition, the degree of care should be no less than that which the manager exercises when managing similar assets for him or herself. The CMA should also have provisions allowing investors to remove the manager for cause, including any wilful violation or breach of the CMA as well as for misrepresentations and breaches of warranties. The removal for cause should be allowed to be implemented by the resolution of a single class of noteholders in order to avoid delays and further, under certain conditions, the noteholders should be allowed to remove the manager without showing cause, subject to a majority or super-majority vote. The CMA typically provides that the manager deals with related parties on an arm's-length basis. The trustee's role is also very important as one of the most important responsibilities of the trustee is to report on CLO compliance with the many requirements of the CLO indenture. Therefore the trustee should be able to fulfil its role, as the rating agencies expect to receive the trustee report every month for the purpose of monitoring the assigned ratings

Rating agencies in the process of assigning their ratings model CLO cash flows; review the features of CLO assets and liabilities; the transaction structure, legal opinions; and evaluate the ability of the CLO manager and other parties to fulfil their roles.

Moody's ratings of CLO tranches are based on the Expected Losses (EL) posed to investors. The default and recovery properties of the CLO portfolio are incorporated into a model that calculates the EL for each rated CLO liability. The model consists of a mechanism for associating collateral default scenarios with the likelihood of each scenario (a default distribution) and a cash flow component that relates each collateral default scenario to the cash flows that the rated liability receives in that scenario. The default distribution is applied to the cash flow model, and the EL for each rated tranche is estimated. The final step involves comparing the EL for each tranche to the Moody's Idealized Expected Loss Rates.

Chapter 6: Qualitative Credit Risk Analysis and Management

Legal Credit Risk Analysis and Management

This chapter discusses the main legal documents and legal considerations for credit risk analysis and management. It follows from the previous chapter and focuses on securitization types of transactions. However, the principles can be applied to other types of transactions, since the documents discussed, such as the offering circular, loan agreement, security related documents etc. are commonly used in the capital markets. Understanding the requirements for the appropriate legal documentation and further understanding and becoming familiar with the documents allows professionals to have an independent opinion of how transactions are structured and what the risk involved are. The most state of the art model will not be able to capture risks that could jeopardize a transaction and potentially an institution if the legal documents have been drafted poorly or do not express the commercial thought and intention of originators or the understanding of the credit risk managers and credit risk committees. When things go wrong quantitative models will not “save” a transaction, but well-drafted appropriate provisions in the legal documents may do! Therefore, it is very important that the intended commercial decision is expressed in the legal documents and, for this to occur, someone needs to review drafts, make comments, raise questions, work and liaise with lawyers, negotiate with other parties and make sure that the appropriate provisions, covenants, representations and warranties, and undertakings—among other things—protect their side of the transaction and their institution. Sound credit risk management starts while the transaction is being originated and negotiated;

after closing the only thing that can be done is to monitor it. It is actually the terms that have been negotiated and are part of the binding legal documents that allow more flexibility to better manage the transaction after closing!

Securitization Documents

Offering Circular

The Offering Circular (OC) is the main marketing document for securitizations. The term OC applies to any document which is used to offer securities, including both shares and bonds. Other than the OC, the terms listing particulars and prospectus are often used interchangeably. The “pink” pre-marketing OC is one of the first drafts to disclose the transaction’s risks. A draft final OC is the “red-herring” (or “red” OC), which is the preliminary OC commonly used in roadshows to potential investors with comprehensive information on the issue of securities and the issuer, but usually does not include information on the size and pricing. The “black” OC is the final document that contains the size of the issue and pricing and is approved by the relevant exchange.

Typically, the cover page of the OC will include the name of the issuer and where it is incorporated (e.g. “...Incorporated with limited liability in England and Wales with registration number x...”; the date of the offering circular, list of the type/short description, title and amount of securities offered, their interest rate (e.g. LIBOR plus a margin) and rating. The margin is determined at the time and based on market dynamics. Example 1 below shows that there is a “split class”; Class B is not rated by Moody’s, only rated by S&P and Fitch. However, the S&P and Fitch ratings are different (AAA for S&P and AA for Fitch). This is an example of a CMBS transaction (Opera Finance (MEPC) plc) that closed in November 2005.

Example 1

Class	Initial principal amount	Margin (%)	Moody’s	S&P	Fitch
Class A	£373,500,000	0.24	Aaa	AAA	AAA
Class B	£36,500,000	0.34	N/A	AAA	AA
Class C	£37,500,000	0.40	N/A	AA	AA
Class D	£22,500,000	0.60	N/A	AA	A+

The cover page of the OC also lists the name of the arranger, lead manager/bookrunner etc. There is also a reference to the risk factors section: “See *“Risk Factors”* for a discussion of certain factors which should be considered by prospective investors in connection with an investment... ”

Further depending on the type of transaction and the parties involved it will typically include a disclaimer of the following or similar form: “*THE NOTES AND INTEREST THEREON WILL BE OBLIGATIONS OF THE ISSUER ONLY. THE NOTES WILL NOT BE OBLIGATIONS OR RESPONSIBILITIES OF, NOR WILL THEY BE GUARANTEED BY, THE (ARRANGER/LENDER) (IN ANY CAPACITY), BY THE JOINT BOOKRUNNERS, THE SERVICER, THE SPECIAL SERVICER, THE TRUSTEE, THE CORPORATE SERVICES PROVIDER, THE SHARE TRUSTEE, THE PAYING AGENTS, THE AGENT BANK, THE LIQUIDITY BANK, THE HEDGE COUNTERPARTIES OR THE ACCOUNT BANK (AS EACH TERM IS DEFINED IN THIS OFFERING CIRCULAR) OR ANY COMPANY IN THE SAME GROUP OF COMPANIES AS ANY OF THEM...*”

The OC key sections typically cover the following:

Transaction Summary: the transaction summary references all the main sections and provides a summarized version of all key information, such as sale of the loan(s), loan security, notes security, notes terms and conditions, priority of payments at all levels, the ratings information and also a disclaimer to read the entire document carefully and not to rely only on the summary. Furthermore, it lists the main parties that include the issuer, borrower, trustees, principal paying agent and agent bank, account bank, liquidity bank and hedge counterparties.

Risk Factors: the risk factor section lists a summary of certain risk issues of which prospective noteholders should be aware before making a decision whether or not to invest in notes of any class; as well the common disclaimer that this section is not intended to be exhaustive and that prospective noteholders should also read the detailed information in the OC and form their own views before making any investment decisions. This section includes matters for specific considerations by investors and may include items in relation to the notes, such as limited recourse provisions and issuer liability, limited liquidity and absence of secondary market, ranking and priority amongst the notes, conflict of interests between classes of noteholders, as well as prepayment and ratings of the notes. Other considerations may be Special Purpose Vehicle (SPV) related and security related, such as commingling risks and priority claims on security. Furthermore, it may also be related to a specialist party, such as the trustee and servicer and

special servicer. Other investment considerations may be collateral related, such as in relation to the environmental issues, lease, insurance and asset management risks. Other risks may relate to the prepayment and refinancing risk of the loan(s); and in relation to other legal considerations such as stamp duties and other forms of taxation, including withholding tax, bankruptcy laws and conflicts of laws. Other considerations may also include the effect of excluding risks from this section such as potential issuer and arranger liability.

Issuer: this section discusses the issuer, its place and date of incorporation, its directors, principal activities, capitalization and indebtedness, and financial information.

Typically this section will refer to the total loan capital (i.e. the sum of the issuing securities/notes)—see Example 2.

Example 2

<i>...Loan Capital</i>	
<i>Class A Commercial Mortgage Backed Floating Rate Notes due 2014</i>	
.....	£373,500,000
<i>Class B Commercial Mortgage Backed Floating Rate Notes due 2014</i>
	£36,500,000
<i>Class C Commercial Mortgage Backed Floating Rate Notes due 2014</i>
	£37,500,000
<i>Class D Commercial Mortgage Backed Floating Rate Notes due 2014</i>
	£22,500,000
<i>Total Loan Capital</i>
	£470,000,000

Usually there will be a wording like: *Except as set out above, the Issuer has no outstanding loan capital, borrowings, indebtedness or contingent liabilities and the Issuer has not created any mortgages or charges nor has it given any guarantees as at the date of this Offering Circular.* It is critical that the issuer is and remains solvent.

Borrower(s): this section discusses the borrower of the underlying loans and if applicable any other group related parties, their principal activities, capitalization and indebtedness, and their financial position.

Credit Structure: the credit structure section summarizes the transaction structure and will vary depending on the type of the securitization. For a Commercial Mortgage Backed Security (CMBS) transaction it summarizes the principal documentation entered into by the underlying borrowers and the original lender (originator) in relation to the loans. This comprises the credit agreement, the associated security documents and any hedging

arrangements, if applicable. This section mentions the loan amount, the interest and amortization payments/repayments; and the account that all net rental income and receivables in respect of each relevant property and all amounts payable to the relevant borrower under any hedging arrangements are paid into, as well as the priorities in the loan waterfall. In addition, it mentions any hedging obligations, if applicable, that each borrower is required to maintain, such as interest rate hedging arrangements to protect against the risk that the interest rate payable by each borrower under its loan may increase to high levels. The representations, warranties and undertakings of the obligors/borrowers are also mentioned. A common example of an undertaking is an interest cover percentage or ratio (e.g. the borrower needs to maintain quarterly net rental income as a percentage of quarterly finance costs of at least 115 % or any other key figure amount set appropriately) and any remedies for this breach. Another common covenant is the loan to value financial ratio that aims to limit the leverage and identify any change in the value of the collateral, i.e. the property value if updated property valuations are incorporated in the structure of the transaction. An example of a loan to value financial ratio can be defined as on any relevant date, the ratio (%) of $(L-C)/MV$. Where L is an amount equal to the aggregate amount of the loans; C is any amount standing to the credit of the property account and/or invested in eligible investments on that relevant date; and MV is an amount equal to the total market value of the obligors' interests in the properties based in the then most recent property valuation on that relevant date.

The credit agreement contains usual events of default entitling the issuer to accelerate the loans and/or enforce the loan security, including, among other things: failure to pay on the due date any amount due under the documents; breach of other specified obligations under documents; and any representation or warranty that was incorrect in any material respect at the date it was given, unless the circumstances are capable of remedy and are remedied within a certain amount of days (say 21 days).

In transactions that allow certain flexibility such as significant flexibility to the borrowers to change collateral composition, then typically a number of portfolio flexibility criteria and covenants must be met and these are summarized in the credit structure section. These may include allowing borrowers to have the ability to acquire properties in the portfolio up to a maximum of a certain percentage of the pool value. The criteria are set in

order to prevent the borrowers from decreasing the collateral quality. These criteria typically consist of general tests, such as no default or note default has occurred which is outstanding at the relevant property transaction. Other tests more suitable for a CMBS transaction can include property tests. Property diversity test examples include a floor on the total number of properties in the transaction, the market value of any single property or a number of properties not to account for more than a certain percentage of the portfolio market value. There are generally further tests on the types of property based on the transaction. Geographic tests are common to avoid geographic concentration as well as tests based on the unexpired lease profile, tenant quality and vacancy tests. For example the weighted average outstanding unexpired lease term must not at any time be less than the number of years then remaining until the date falling at certain years (e.g. six years) after the expected maturity. The net rental income from tenants within the same corporate group is not a certain percentage (e.g. 10 %) of the portfolio net rental income if the group has a long-term rating of at least Baa/BBB. The expected rental value of any unlet properties to the portfolio expected rental value is not more than a certain percentage (e.g. 6 %).

This credit structure section also summarizes the consequences, if applicable, on prepayment of the whole or part of a loan. The borrowers may, for example, be required to pay to the issuer, on the date of prepayment, a prepayment fee equal to one year's servicing fees that would have been payable to the servicer in accordance with the servicing agreement for the year following the prepayment. Typically any repayment or prepayment under the credit agreement is made together with, among other things, accrued interest on the amount prepaid, the prepayment fee (if applicable) and a payment by way of an ongoing facility fee in an amount equal to the amounts due and payable by the issuer to a swap counterparty (if there is hedging in place) as a result of the termination of all or any part of any interest rate swap or/and any foreign exchange agreement in connection with a repayment or prepayment under the credit agreement.

The loan security is also mentioned and the creation of security according to which the relevant security agreement grants in favour of the facility agent a first ranking charge by way of legal mortgage over the relevant property to each obligor/borrower. This is a first fixed charge over, among other things, any plant and machinery belonging to each obligor, the rent account and any other account, the benefit of any insurance policy relating to the

relevant property, and each obligor's rights under the hedging arrangements and under each occupational lease in respect of the relevant property. Another key element in the credit structure is the loan sale document since, pursuant to its terms, the original lender (originator) sells and the issuer purchases, the loans together with the original lender's interest in the loan security. Consequently, as and from the closing date, the issuer becomes the sole lender under the credit agreement. Typically, the purchase amount payable by the issuer to the original lender is equal to the aggregate of the principal amount of the loans on the closing date of the transaction. The issuer transaction account is mentioned. Pursuant to a bank account agreement, a creditworthy account bank maintains an account into which all amounts of principal and interest and other amounts received in connection with the loans or their respective loan security are required to be paid. Another key feature of any structure is the liquidity facility that mitigates the risk that available issuer income becomes insufficient to cover an income deficiency: thus the issuer enters into a liquidity facility agreement with a creditworthy liquidity bank and the trustee. The purpose of this is to provide liquidity, not credit support, and typically the liquidity bank receives interest and repayments of principal on drawings made under the liquidity facility agreement in priority to payments to be made to noteholders (which would ultimately reduce the amount available for distribution to noteholders). Key cash flow information in relation to payments paid out of the issuer transaction account/priority amounts is discussed. These are detailed for pre-enforcement of the issuer security and in the case of post-enforcement of the issuer security but pre-acceleration of the notes, post-acceleration of the notes.

Summary of transaction documents: the OC provides a short summary of the main agreements in the transaction, such as servicing, cash management, liquidity, bank account and hedging related agreements.

The issuer and the trustee appoint a creditworthy servicer under the terms of a servicing agreement as the initial servicer of the loans and to have responsibility for, among other things, the investment and application of funds as per the relevant priority of payments under the deed of charge. The servicer performs the day-to-day servicing of the loans. Servicing procedures include monitoring compliance with and administering the options available to the borrowers under the terms and conditions of the credit agreement. The servicer and the special servicer typically agree to service the loans in the best interests of and for the benefit of all of the noteholders.

The issuer and the trustee typically also appoint the servicer to be their agent to provide certain cash management services in relation to the issuer accounts. The servicer typically acknowledges in the servicing agreement that after enforcement of the issuer security it will be acting as agent for the trustee (and not the issuer) in providing its services.

Pursuant to the bank agreement, a creditworthy account bank maintains the issuer transaction account in the name of the issuer. The account bank typically complies with direction of the servicer or the issuer (prior to enforcement of the issuer security) or the servicer or trustee (after enforcement of the issuer security) to effect payments from the issuer transaction account.

A short reference to the liquidity facility provider (highly creditworthy provider) and the amount available is made. The issuer, subject to certain conditions, is entitled to make drawings under the liquidity facility agreement from time to time to cover shortfalls in the amount of funds available. The liquidity facility is a 364-day facility and renewable by the issuer with the consent of the liquidity facility provider. It is worth noting that the terms of this facility, including the fee, have to be set realistically should there be a need to find another liquidity facility provider.

Furthermore, when reviewing the liquidity facility agreement under the events of default, care should be taken that the liquidity facility events of default need to be very limited (i.e. non-payment of senior liquidity amounts, acceleration of notes). For a CMBS, a loan event of default should not constitute a liquidity facility event of default because then the transaction could be left without liquidity. Breach of issuer representations and warranties should not be an event of default.

Another short reference is made to the hedge agreements, if any, and the hedge counterparty as well as what the actions to mitigate the issuer's credit exposure if the hedge counterparty gets downgraded are.

Assets description: this section summarizes the assets of the transaction and any possible concentrations, such as geographic concentration: for example, concentrations in excess of 10 % or any other relevant key figure appropriate for the transaction in question. Asset due diligence and property valuations (for real estate transactions such as CMBS) can be included in the asset

description. In the property valuations the location, address, age, description, competition, tenure (e.g. freehold), property use (e.g. office, retail), terms of existing tenancies, weighted average lease expiry in years when measured to the earlier of lease break or expiry, estimated current contracted net rent, estimated annual rent, and market value and vacant possession value will be mentioned.

Use of proceeds: briefly mentions the total amount of proceeds from the issue of the notes. Based on Examples 1 and 2 it is £470,000,000. The sum is applied by the issuer towards acquiring the loans and the related interests in the loan security from the original lender (originator) on the closing date of the transaction pursuant to the terms of the loan sale agreement. Fees and expenses in connection with the issue of the notes are met by the borrowers and the arranger.

Terms and conditions of the notes: this section will typically include the description of the notes; their status, security and the relationship between the different classes of notes/priority of payments in the transaction. The interest rate that each note bears is mentioned as well as the interest payment dates and interest periods. The agent bank, on each interest payment date, determines the rate of interest applicable and calculates the amount of interest payable on each of the notes. There is reference to the fact that the notes are constituted by a trust deed made between the issuer and the trustee and that the security for the notes is granted or created pursuant to a deed of charge under the applicable law, for example English law or Dutch law. Furthermore, that the noteholders are entitled to the benefit of, are bound by, and are deemed to have notice of, all the provisions of the trust deed, deed of charge and agency agreement applicable to them and all the provisions of the other transaction documents, such as the bank, servicing, liquidity facility and credit agreement, the loan sale documents, corporate services agreements and security agreements amongst other documents as applicable to each individual transaction as well as the master definitions schedule. Typically the statements in the terms and conditions include summaries and are subject to detailed provisions of the trust deed, the agency agreement, the deed of charge and the other transaction documents applicable to them.

This section also mentions briefly covenants with respect to the issuer, such as the “negative pledge” and “restriction of its activities”. In short, the *negative pledge* means that the issuer, shall not so long as any of the notes remains outstanding (save for the issuer security) create or permit any mortgage, standard security, charge, assignment, assignation, pledge, lien or any other

security interest whatsoever over any of its property, assets, undertakings, etc.; or use, invest, sell or grant any security interest, or right to acquire any such property, assets or undertaking, present or future.

The other main covenant deals with restricting the issuer's activities, such as restricting in engaging in any activity whatsoever which is not, or is not reasonably incidental to, any of the activities in which the transaction documents envisage, have any subsidiaries, own or lease any premises or have any employees; amend, supplement or otherwise modify its memorandum and articles of association; issue any further shares; incur or permit to subsist any other indebtedness in respect of borrowed money whatsoever, except in respect of the notes; or give any guarantee or indemnity in respect of any indebtedness or of any other obligation of any person; or consolidate or merge with any other person.

This section also summarizes any early redemption of the notes, for tax reasons or clean-up call; the prior to default and post default, prior to default but after acceleration payments; the notes' events of default; their types and consequences; and the trustee's role in indemnification and exoneration and noteholders' involvement. Examples of notes' event of default include but are not limited to a default being made for a period of certain days (say five days) in the payment of any interest on any note, an order being made or an effective resolution being passed for the winding-up of the issuer, and proceedings being initiated against the issuer under any applicable liquidation, insolvency, composition, re-organization or other similar laws.

Furthermore, this section will also refer to meetings of noteholders and resolutions; and to amendments to terms and conditions of the notes.

Taxation of noteholders: this section applies only to persons who are the beneficial owners of the notes and is a summary of the issuer's understanding of current (as of the closing date) tax law. For example if the transaction is in the UK, then UK tax law shall prevail.

It should be noted that this section is not a comprehensive analysis of the tax consequences arising in respect of notes and persons who may be subject to tax in a jurisdiction other than the jurisdiction of the transaction should explore their tax consequences further. This section mentions whether withholding tax on payments of interest on the notes is applicable. If certain requirements are satisfied (and these may differ) from jurisdiction to jurisdiction then interest on the notes may be paid without withholding or deduction on account of tax. If these requirements are not satisfied, and in other cases, an amount must generally be withheld from payments of

interest on the notes, or at a lower tax rate, or in other cases perspective noteholders may want to pursue an applicable double tax treaty that provides for a lower rate of withholding tax (or for no tax to be withheld) in relation to them. In this section the stamp duty, stamp duty reserve tax and EU Savings Directive is also briefly mentioned. For example it is mentioned if stamp duty and stamp duty reserve tax is payable on the issue or transfer by delivery of the notes.

Subscription and sale: this section summarizes the subscription agreement. According to which, the joint bookrunners/lead manager pursuant to a subscription between them, the issuer and the note arranger agree to subscribe and pay, for the classes of notes, the initial note principal amount. Typically the issuer agrees to reimburse the joint bookrunners/lead manager for certain of their expenses in connection with the issue of the notes. Furthermore, the issuer agrees to indemnify the joint bookrunners/lead manager against certain liabilities in connection with the offer and sale of the notes. In addition, the borrowers, under an arrangement fee letter dated on or before the closing date of the transaction, have to pay an arrangement fee to the note arranger. This section also includes the restrictions on the subscription/offer/sale of notes to certain jurisdictions. The restrictions depend on the transaction in question.

General information: confirms that the issue of the notes was authorized by resolution of the board of directors of the issuer; that the issuer is not, and has not been, involved in any legal, governmental or arbitration proceedings that may have, or have had, since the date of its incorporation, a significant effect on the issuer's financial position. Overall, there has been no material adverse change in the financial position or prospects of the issuer and no significant change in the trading or financial position of the issuer. Furthermore, since the date of its incorporation, the issuer has not entered into any material contracts or arrangements other than as disclosed in the OC.

This section also provides some general information that depending on the transaction may include information about the listing of the notes on a stock exchange. If applicable to the transaction in question, there is a reference, for example, that the notes have been accepted for clearance through Euroclear and Clearstream and provide the common code and International Securities Identification Number (ISIN). In relation to due diligence, typically it is mentioned that copies of the transaction documents may be physically inspected during usual business hours at the offices of the issuer.

Securitization Primary and Secondary Key Documents

The Securitization Primary Key documents can typically include the following documents.

The following may be more suited for a CMBS type securitization:

- Asset Sale/Purchase Agreement or Secured Loan Agreement
- Subordinated Loan, if applicable
- Deed of Charge/Security Trust Deed
- Note Trust Deed (including global notes): the Notes are constituted by a trust deed
- Subscription Agreement, executed at signing
- Liquidity Facility Agreement
- Servicing Agreement
- Cash Management Agreement
- Hedging Related Agreements
- Agency Agreement
- Legal Opinions.

Securitization Secondary Key documents can typically include the following:

- Memorandum and Articles of Issuer
- Board Minutes and Shareholder Resolutions
- Solvency Certificates
- Due Diligence Reports.

Review of the Offering Circular (OC)

The OC is a very important document in the sense that it is the first document circulated to potential investors by the arranger summarizing relevant information about the securities that the investors would like to subscribe for. This is typically the only document available during the timing of assigning the provisional ratings. However, this is not a contractually binding document and it is the underlying transaction documents (see primary documents etc. such as servicing agreement, note trust deed etc.) that are binding (i.e. easier for investors to sue for a potential liability). The list of issues to look for when reviewing the OC can be endless and dependent on the type of the securitization transaction (i.e. RMBS, CMBS, CLO etc.) and the particular considerations someone is more interested in. The following list is by no means exhaustive but provides a good starting summary of how to review an

OC, especially for a CMBS transaction. This is for the purpose of qualitative/legal credit analysis.

Starting the review by going through the transaction summary provides a good source for a quick transaction overview, identifying the issuer and any other relevant parties both at the transaction level and the commercial loan level, and obtaining an overview of the terms and conditions of the notes that contain all features and characteristics of the notes. On the transaction level it is critical to ensure that the issuer is a “clean” and newly established SPV.

Other issues worth paying attention to are the provisions in the documents, for example in relation to replacement of the issuer/change of the issuer jurisdiction, issuing additional debt, unscheduled reduction of liquidity facility, downgrade of key parties in the transaction like the swap counterparty, account bank, servicer, replacement of servicer etc. As explained in Chap. 5 the success of any securitization transaction is dependent upon viable and competent parties, such as the liquidity facility provider, swap counterparty, account bank, principal paying agent, servicer, trustee etc, being able to fulfil their obligations. Therefore the documents should make provisions for replacing them if there is a need and having back-ups, such as a back servicer etc.

The Cut-Off Date (COD) should be checked to assess how current the information provided is, i.e. property valuations, tenancy schedule. The Expected Maturity Date (EMD) (loan term) vs. Final Maturity Date (FMD) (as this takes into consideration potential enforcement periods) should also be checked, as should the Interest Payment Date in order to assess the payment procedure under the loans and under the notes and its timely coordination, including liquidity facility drawings.

The Terms and Conditions of the Notes (TCON)—always cross-checked with provisions of the Note Trust Deed (NTD)—should be reviewed to assess the status and relationship between the noteholders. The covenants, representations and warranties also have to be reviewed as well as the negative pledge. The interest deferral and Available Funds Cap (AFC) needs to be reviewed in order to check which classes of notes are affected. Note that the interest deferral with accruing interests and AFC should typically be applied for junior ranked classes only.

The *Interest Deferral* refers to the later funds collection/payment.

- Example of Interest Deferral:

“...If there is a shortfall in the required amount of Available Interests Collection on a Payment Date then certain amount of interests due on the Class B and Class C shall be deferred and such interests shall not be due and payable until the next Payment Date on which the Issuer has sufficient funds to pay such amounts...”

AFC refers to the fact that there are no funds in due time and as a consequence payment will not take place at all.

- Example of AFC:

“...In the event that there are insufficient Available Funds for the Subsequent Interest Payments (...) the obligation of the Issuer to pay such amount shall be extinguished and the relevant Noteholders shall have no further claims in respect of such amount...”

Events of Default (EOD) should be carefully assessed. Generally a loan event of default should not be a note event of default. This is not exactly the case for a single loan transaction. If a loan EOD triggers a note EOD, the provisions in the documents should be looked into, such as the cure period and the ability for remedy.

The risk factors section is very important as it will list the risk factors which may be different or not entirely complete for everyone! The asset description section is also very important. It summarizes the security and mortgage registration process, ownership and leasing status of the properties and any environmental/contamination issues. Reviewing this section can be different from different perspectives. For example, a rating agency analyst will read it and will try to identify whether it matches his/her understanding of the loans and properties based on the data provided. That forms the key assumptions for loan underwriting analysis.

Summary of main transaction documents provides a quick review of the legal documents that should match the corresponding documents.

Loan Sale Agreement. Its main aim is to transfer/assign the loans to the issuer and some of the most important parts are (i) the representations and warranties provided by the originator in respect of the loans (“good standing” of acquired loans), (ii) no waive language in place, implying that in the originator representations there is no material default that the originator has waived, and (iii) the cure and repurchase/indemnification obligations of the originator, in case the representations and warranties are not correct.

Servicing Agreement. The servicer has a key role as he/she monitors the performance of the assets, so what is the information provided? The termination clause should firstly allow having another servicer in place. The servicer standards should be very high and they are usually set as the highest of (i) the care of a diligent business person and (ii) the same care, if it were the

owner, *and* (iii) always with the purpose of maximization of the recovery on the loans available to the issuer on a net present value basis. This implies taking into consideration the likelihood of recovery amounts due from the borrower, the timing of such recovery and the recovery costs;

Issuer Deed of Charge. Care should be taken that all transaction parties need to participate, especially the liquidity facility provider and swap counterparty. This is a key document as it creates the security for the benefit of the trustee/ noteholders and secured parties. So first of all, fixed and floating security recognition and enforceability under local law should be checked. Typically only the security trustee is entitled to start any enforcement action. The issuer deed of charge will also include the payment priority/waterfall.

Key concepts for the success of a securitization consist of:

non-petition, which means that no steps can be taken against the issuer for the purpose of recovery, including filing for winding up or liquidation;

limited recourse, which means that the issuer obligations are limited in recourse to the issuer's charged properties/assets only.

- Example of non-petition language or no enforcement by Issuer Secured Parties:

“Each of the Issuer Secured Parties agrees with the Issuer that (...):

(a) only the Issuer Security Trustee may enforce the security created by the Issuer

(b) it shall not take any steps for the purpose of recovering any of the Issuer Secured Liabilities (...) or enforcing any rights arising out of the Transaction Documents (...) or procuring the winding up, administration or liquidation of the Issuer (...).”

- Example of the limited recourse language:

“Each of the Issuer Secured Parties agrees that (...) all obligations of the Issuer to each of such Parties are limited in recourse to the Issuer Charged Assets and (...) after enforcement of Issuer Security the Issuer Secured Parties shall have no further claim against the Issuer in respect of any amounts owing to them which remain unpaid and such unpaid amounts shall be deemed to be discharged in full...”

Note Trust Deed. This constitutes the notes. Some of the most important parts worth reviewing are the terms and conditions of the notes. This is the contractual binding basis of all notes' features and characteristics. In the OC the notes are described in the transaction summary and in more details in a separate section under the headline “Terms and Conditions of the Notes”. It

is always wise to check that the descriptions of the notes in the OC match the provisions of the note trust deed.

The section on certain matters of relevant local laws should also be reviewed as special requirements of local laws could modify existing securitization standards. This section will mention the governing law, for example in the UK the standard is English law. Issues to look out for are the impact of local law, as an enforcement, if need be, will mainly take place under local law, where the properties are located; and the loan transfer and security assignment requirements and bankruptcy remoteness criteria/uphold of relevant agreements such as the intercreditor agreement and subordination agreement in insolvency.

Attention should also be paid to the rating language in order to understand what the ratings represent. For example, for a Moody's rating does it state that "The Moody's rating reflects the expected loss posed to investors by the legal final maturity"?

The Role of the Trustee

The role of the trustee is critical in all structured finance transactions. The trustee acts in the investors' interests and its actions and inactions can have a significant influence on losses since trustees are at the centre of structured finance transactions. The trust deed is typically a central legal document. However, the trustee will act in accordance with the trust deed. Therefore if this has been poorly drafted and leaves room for many ambiguities it can have a negative impact and increase potential losses for investors. The trust deed should be clear and address the needs of the transaction.

The trustee's core functions include representation, as it holds rights on behalf of beneficiaries, so the Trustee can "speak" on their behalf and should be given power to do so. The security interests are very important and the trustee can appoint an administration receiver. Noteholders rely on the enforcement and distribution function of the trustee to reduce losses if things do not work out.

The monitoring function of the trustee is collecting information should the trustee need to act. He/she could be equipped to do so or it could be that another party needs to be appointed. The trustee for monitoring is relying on the servicer to provide the information.

The trustee's role is critical, particularly when things go wrong, in replacing service providers and other counterparties and protecting collateral value. The trustee must have adequate resources and the legal ability to protect investors' interests. In addition, the trustee should be able to act in time: if the trust deed is vague, precious time can be wasted in deciding what to do. Time is

of the essence as collateral can deteriorate and interest payment and maturity dates can pass.

In terms of the time to act, the trustee may be able to act upon an Event of Default (EOD) or based on Material Prejudice. The EOD can be set on an objective basis, such as insolvency tests. These can be “technical” and “actual” events, observable events (e.g. ratings) or asset performance. EOD can be subjective, such as relying on others (servicer, agents) or “Material Prejudice”. However a requirement for “Material Prejudice” can cause delay and loss for investors. Examples include:

... “shall have certified that such event is materially prejudicial to the interests of the bondholders”

... “materially prejudicial” may mean that a detailed investigation and report has to be conducted to determine material financial prejudice to the bondholders.

The paradox can be that a requirement for Material Prejudice can cause Material Prejudice! Trustees are just trustees. The trust deed can reduce problems by being explicit. In terms of decision making the trust deed can set out procedures. With regards to powers for trustees in transactions it is critical to carefully consider what discretions the trustee should have, and whether they are defined precisely in the manner and circumstances in which they must be used.

Trustee Standard of Care—Exclusion Clauses: not every trust deed is the same and not every trust deed has a clause limiting the trustee’s liability. The standard of care can be set at that of a reasonable person, or excluding liability except for negligence. These typically require a high standard of care by the trustee.

Cash Commingling Risk

The risk of cash commingling is relevant in true sale securitization transactions and can arise in the event that the originator, who is also employed as a servicer, becomes insolvent. This can happen when the underlying debtor payments are collected by the servicer and deposited in a collection account in its name rather than remitted directly to the SPV/issuer’s account. There is no risk of commingling if collections are held in an account in the issuer’s name.

There are two types or risk that can arise from cash being commingled with the originator/servicer. One of them is mainly liquidity related. This may arise if funds that belong to the securitization are trapped for some time by an insolvency court. Although these funds are simply trapped, and at some point

in time will return to the SPV/issuer, the concern is that the transaction will have no liquidity, i.e. no funds to make timely payment of debt service and expenses. In that case a liquidity cover is needed to avoid default on coupon payments etc.

The other type or risk is of a credit nature where the transaction funds are simply lost as they are deemed to be part of the insolvency estate of the originator and ultimately the issuer will have a secured or unsecured claim against such an insolvency estate of the originator/servicer.

Typically, in most securitization transactions, there are provisions that provide that in the event the originator becomes insolvent, the debtors will be asked to redirect their payments to an issuer account or to the newly appointed servicer's account. As a result, the future collections that pay to the redirected account will not be subject to commingling risk on that occasion.

Commingling risk varies depending on the jurisdiction of the transaction and the applicable law. Under English law, to avoid commingling risk and in order to ensure that the collections are excluded from the originator's estate, the issuer must have a "proprietary" interest in them. A proprietary interest may arise in three ways: (i) with the true sale of the receivables (the "tracing" remedy), (ii) with a security interest in the collection account and (iii) with a declaration of trust over the collection account. Generally, if there is a true sale of receivables, collections are automatically excluded from the originator's insolvent estate. The issuer is the beneficial owner and can trace its cash. However, tracing can become difficult in the case of mixed funds. This is the situation where the originator's own cash is mixed with the issuer's collections. Through the security interest way, the originator may grant security over the collection account to secure its contractual obligation to transfer collections to the issuer. However, there could be a possible moratorium on enforcement likely to be characterized as a floating security. With the declaration of trust method, a trust is the most common mitigant for commingling risk under English law. The originator declares that it holds the collection account on behalf of the issuer. The originator remains the legal account holder but the issuer is the beneficial account holder, so the account is excluded from the originator's insolvent estate. A declaration of trust can be used for mixed fund accounts, in the sense that the issuer and the originator are beneficiaries under the trust to the extent of their respective shares. However, they must accurately define the beneficial shares: it should be a single trust over the whole account rather than separate trusts for each beneficiary. It is better that the originator holds the account on trust for the issuer (for the issuer's share) and the originator (for the originator's share) as tenants in common, rather than the originator holding the issuer's share in the account on trust for the issuer

and holding the originator's share on trust for the originator. It is very important that declarations of trust need to be carefully reviewed, particularly if the securitized collections are mixed with funds belonging to the originator. It is also important that a trust is declared over the entire account, and not only part of it. Bad drafting can potentially invalidate the trust.

Under the declaration of trust in terms of liquidity risk, there are two possible routes for the issuer to access the collections: with the release of the funds by the administrator and direct payment by the account bank. However, the release of funds by the administrator could possibly entail delays as it takes time for the administrator to acknowledge that there is a valid trust, although this should be relatively quick. It also takes time for the administrator to acknowledge the proportion of a mixed fund that belongs to the issuer, which is dependent on the quality of the originator's systems, and this may actually take several months. In this case the liquidity facility should be sized to cover coupon payments. With direct payment by the account bank, there could be possible delays in convincing the account bank to make payment at the direction of the issuer, as the originator is the "legal" owner of the account. In an ideal world the originator should grant an irrevocable security power of attorney that allows the issuer to act in the name of the originator and, with immediate effect, give withdrawal instructions to the account bank. However, the risk of moratorium among other legal considerations still applies.

Commingling risk will vary from jurisdiction to jurisdiction as well and for different types of transactions. The legal definition of insolvency in each country, the overall efficiency of the courts and their knowledge of securitization as well as the complexity and innovation in the transaction may impact the length of "potential stay". The level of commingling risk varies also with the originator's creditworthiness. A highly rated originator has less risk of becoming insolvent. Furthermore, the originator's sophistication in terms of systems, procedures, invoice tracking and cash reconciliation, as well as the method of payment used by debtors and the consequences in their credit score if they do not keep up with payments, can impact commingling risk.

In Europe the following mitigants may be used to limit commingling risk. Immediate sweeps at the end of each business day from the servicer collection account into the SPV's account can limit commingling risk especially for servicer's that are not highly rated. Frequent/immediate sweeps can reduce the amount of funds that will be caught in the insolvent estate of the originator. However, this mitigant may be not effective with respect to collections that are received post insolvency. If the servicer is insolvent, the collection account may be frozen, either because of a statutory moratorium or because the servicer's liquidator or administrator actions.

Another mitigant is ensuring that in the transaction documents it is contemplated that if the creditworthiness of the originators/servicer deteriorates below a certain level (i.e. rating) or another trigger reflecting the financial condition of the originator (i.e. before originator's insolvency), then underlying debtors will be notified and instructed to redirect their payments to the issuer's or back-up servicer's bank account. The effectiveness of this mitigant servicer replacement and payment redirection prebankruptcy will depend on how effective the trigger is set so that action is taken before an originator's insolvency, the length of the notification process and how many debtors are likely to redirect their payments immediately.

If a transaction is at risk of commingling and there are no mitigants in place then having a position in the waterfall that has plenty of credit enhancements—all things being equal—can mitigate the risk, provided that increased credit enhancement is sufficient with reference to the frequency of sweep of funds, the time it takes to have a back-up servicer in place and the time to achieve redirection of payments.

The increased frequency of sweeps, increased credit enhancement and redirection of payments can mitigate the risk of commingling. However, there is a risk that the issuer cannot access its cash for a period of time. This may be the case even in the event that the insolvency officer does not contest the issuer's SPV's proprietary right to commingled cash. A possible delay may arise if the liquidator or administrator needs time to review the documentation or the delay may arise as a result of the administrator/liquidator asking the court for directions. Therefore although the risk is more of timing, nevertheless it is critical that it has to be addressed. A cash reserve or committed liquidity facility from a creditworthy provider should be provisioned in the transaction documentation to cover an amount equal to a certain number of months' senior fees and interest coverage to keep payments current on the notes. The number of months will vary from transaction to transaction but Residential Mortgage Backed Security (RMBS) and Asset Backed Security (ABS) transactions with very high ratings outstanding may have anything from three to 12 months.

Set-Off Risk

Set-off under English law refers to a situation where a debtor has a cross-claim against a creditor, to the reduction or extinguishment of the creditor's claim by the amount of its cross-claim. Obligors can set off deposits held with an insolvent originator against payments that they owe under securitized receivables. For example, a borrower of a loan may have a right of set-off against

the bank as a lender if the borrower also holds deposits with that bank. The deposits may be held in a current account/deposit account unconnected with the loan account or/and also in a current account/deposit account or other relationships connected with the loan account (i.e. off-setting mortgage).

As a result, this is a concern for securitization transactions. The set-off risk will vary from jurisdiction to jurisdiction based on the applicable laws in each country. In the UK, the issuer's exposure to set-off can be reduced where obligors are entitled to compensation under the Financial Services Compensation Scheme (FSCS). However the maximum amount that can be compensated by the FSCS is £75,000. Thus, in the event that an obligor is not fully compensated, then it may set off the uncompensated portion of its deposits against the issuer. In addition, obligors that are not entitled to full compensation may choose not to claim any compensation at all. The reason for this lies in the FSCS's discretion to require a claimant to assign to the FSCS its entire deposit claims, those exceeding the compensation claim, in order to be compensated. Therefore some obligors with deposits over the FSCS limit may choose to set off their entire deposits against the issuer.

There are different types of set-off, such as mandatory set-off (upon insolvency), equitable set-off (for related transactions), independent/common law set-off (also called statutory or legal set-off) (for unconnected transactions) and contractual set-off. The type of set-off that applies to the situation whereby obligors in respect of securitized receivables hold deposits with the originator is known as independent set-off and may be asserted by an obligor as a defence in legal proceedings brought by the issuer with regards to amounts that have become due and payable. Notice of assignment "crystallizes" the potential amount of independent set-off. In the UK, for most true sale securitization and covered bonds transactions, receivables are assigned when the transaction closes without giving notice of assignment to obligors. The notice of assignment can be provided to obligors at a later time so as to perfect the transfer of legal title. Based on legal opinions the amount capable of set-off by the borrower/obligor is equal to the lowest account balance between the date of notice of assignment and the time of set-off. However, most obligors would attempt to set off whatever deposits they hold at the time the originator becomes insolvent and possibly over-state their legal right to set-off. The issuer, given the large scale of obligors, would probably find it difficult to assess how many obligors have over-stated their right to set-off. In any case, as these issues are quite complex the best method is always to review a clear legal opinion for that particular issue of the transaction in question.

Credit enhancement can be used as a mitigant for set-off. In some transactions, credit enhancement for set-off risk varies over time as it increases and

decreases over time based on obligors' deposits. In other transactions, credit enhancement is fixed at closing. Credit enhancement can be provided with a cash reserve and committed loan facilities etc.

True Sale Challenge

“True sale” is a term that originated from the USA, where securitization also began. The principle implies that following a “true sale” assets cease to be the assets of the originator and therefore do not form part of the originator's insolvency estate. True sale in most jurisdictions is the simplest and most effective way whereby the insolvency risk of the originator is typically removed from the transaction structure. The objectives for a legal “true sale” consist of: validity and enforceability against the solvent originator and therefore against third party creditors of the originator whilst the originator is solvent; validity and enforceability against the insolvency officer, either the administrator or liquidator in an insolvency of the originator; and validity and enforceability against the borrower/obligor, so as proceedings against them can be taken. The transfer mechanisms under English law include novation, declarations of trust and assignments. The transfers of assets are typically carried out by way of an “assignment” under English law. There are two forms of assignment: legal assignment and equitable assignment. The true sale concept has its challenges. Under English law, for example, an assignment can be “challenged” if it is classed as a “sham” transaction (it may be classed as a “sham” if the written agreement does not properly reflect the actual agreement between parties).

Chapter 7: Credit Risk Transfer and Mitigation

Credit Risk Transfer and Mitigation

Financial institutions have throughout time developed several different methods to mitigate and transfer credit risk. These include letters of credit and guarantees, covenants, marking to market, netting central counterparty clearing, collateralization and over-collateralization, syndication, early transaction termination, credit derivatives and securitization. Credit derivatives and securitization are the most sophisticated, flexible and can separate and redistribute credit risk to a very broad class of financial institutions. Securitization and credit derivatives have received a lot of criticism following the 2007 financial crisis. However, these are very powerful tools for credit risk transfer and mitigation. They should be understood before they are used, and used not in excess but with care and caution. If they are used appropriately they can effectively assist in credit risk transfer, mitigation and management, but if they are abused and their dynamics not understood they can have a devastating impact on the economy.

Letter of Credit (LOC) and Guarantees

A Letter of Credit (LOC) is a contract from a bank that guarantees that a seller receives full payment as long as certain delivery conditions are met. LOCs are often used in international transactions to ensure that payment is made as the seller is exposed to the credit risk of the buyer and on top of that to legal risk as a result of different laws applicable in various jurisdictions. In

commercial transactions sellers may often require buyers to provide a LOC prior to them shipping goods, to ensure payment. The advantage to the buyer is that a LOC shows that they are solvent and may allow them to reduce or eliminate an initial payment. LOCs can be used in everyday domestic business. The LOC is issued at the request of the buyer, who is the applicant for the credit in favour of the seller, who is the beneficiary of the credit.

For example, the buyer under the contract which provides for payment by a LOC, will have a LOC with its bank; the issuing bank. After shipment, the seller will present the documents to the issuing bank. Typically, the main document will be the commercial invoice providing the details of the goods and a breakdown of the price. Other documents may consist of a certificate of origin in relation to the goods and transport and insurance related documents. The LOC issuing bank, upon checking that the documents meet the requirements of the credit, will pay the seller and then deliver the documents to the buyer to get reimbursed. Then the buyer can claim the goods from the carrier.

After the 2007 financial crisis the traditional financial guarantee insurance industry has disappeared: Ambac and FGIC filed for bankruptcy, MBIA reorganized itself and FSA was acquired by a smaller monoline, Assured Guarantee. Some of this market nowadays has been captured by large banks that provide guarantees and LOCs. A guarantee or LOC from an entity of higher credit quality than the counterparty can reduce credit risk exposure.

Netting

Netting is an important risk mitigation technique. It is a reconciliation and payment technique according to which counterparties' gross obligations are offset against each other and considered for payment purposes as a single obligation. Netting allows negative and positive payment obligations to be aggregated and converted into a single claim. In this way, the counterparty owing the greater aggregate amount makes a net payment to the counterparty owing the lesser aggregate amount.

Payment netting refers to netting cash flows occurring on the same day and this typically relates to settlement risk. Close-out netting allows the termination of all contracts between the insolvent and solvent counterparty and the netting of all transaction values. This relates to counterparty risk. Upon counterparty default, close-out gives the right to terminate transactions with the defaulted counterparty and to stop making any payments. Netting allows the counterparty to offset amounts it owes against the amount it is owed and

to arrive at a net amount/net exposure. Netting reduces exposure to counterparty credit risk and transaction costs. A reduction in transaction costs can be achieved by a reduction in level of margin cover for net exposures, and by a reduction in the processing costs of transferring a single amount on net settlement compared to the higher costs of processing all the transactions separately. Some forms of netting can also reduce counterparty's capital adequacy costs. For example, expressing credit risk exposure on a net basis may reduce an institution's capital adequacy costs in relation to funded credit protection exposures subject to certain conditions.

International Swaps and Derivatives Association (ISDA) Master Agreement, Schedule and Credit Support Annex (CSA)

The International Swaps and Derivatives Association (ISDA) Master Agreement is typically used between counterparties when negotiating a derivative trade. There are two basic forms of the Master Agreement: single jurisdiction/currency and multiple jurisdiction/currency. The Master Agreement is generally combined with a Schedule in order to define the basic terms between the counterparties; a subsequent trade is then recorded in a confirmation that references the Master Agreement and its Schedule. The terms of the Schedule are often negotiated between the counterparties. ISDA also produces a Credit Support Annex (CSA), a very important document that further allows parties to an ISDA Master Agreement to mitigate their credit risk by requiring the party which is out-of-the-money to post collateral (typically cash, government securities) corresponding to the amount which would be payable by that party if all the outstanding transactions under the relevant ISDA Master Agreement were terminated. The ISDA Master Agreement was first published in 1992, and a second edition was published in 2002. In 2009, ISDA introduced further compulsory modifications to address the concerns stemming from the 2007 financial crisis. The ISDA master agreement, its Schedule and especially the CSA are key documents that can make uniform the more common and liquid derivative trade documentation. One of the most useful applications of the ISDA Master Agreement in relation to counterparty risk is the provision of close-out netting. The enforceability of the close-out netting provisions is very important. These close-out provisions allow, upon termination of the outstanding transactions under the ISDA Master Agreement, transactions to be assessed and settled. The settlement amounts are added up and then a single amount is payable.

The CSA is a key document as it determines the collateral with respect to the valuation process, calculation method and timing, the types of eligible collateral and permitted collateral substitutions and, if applicable, any haircuts, the interest rate paid on collateral and any triggers that update the collateral requirements. A rating downgrade may lead to an increased collateral requirement as the credit risk has increased. Cash collateral has no haircuts, but haircuts are applied to other forms of collateral to take into account that the value of collateral may decline over time. Furthermore, the CSA defines the threshold. Threshold is the level of mark-to-market above which collateral is posted. If the exposure exceeds the threshold then we have under-collateralization and the incremental exposure must be collateralized. ISDA has legal opinions throughout a number of jurisdictions of the enforceability of provisions in relation to netting and provisions within the CSA.

Centralized Counterparty Clearing and Margin Collateral

Marking to market allows the market value of a transaction to be estimated and can reduce and even in certain circumstances eliminate credit risk, if the marked-to-market positions of the counterparties under a cleared contract, for example a swap, is calculated daily or in some cases intra-day. Then if a loss is incurred, the clearing firm debits its client's margin account and makes a payment to the clearinghouse. On the other hand, if a gain is realized, the clearing house transfers the amount of the increase to the clearing firm, which credits its client's margin account. If a clearing firm is out of funds upon the transaction's settlement, the other clearing firm then retains this posted variation margin collateral and/or makes a collateral call for any deficiency. A clearing house is a financial institution that provides clearing and settlement services for derivatives and securities transactions. These transactions can be carried out on a future, securities exchange or over-the-counter. A clearing house stands between the two clearing firms so as to reduce the risk of a clearing firm's failure to honour its trade settlement obligations. A clearing house can reduce this risk by requiring collateral/margin, netting transactions of various counterparties, providing an independent valuation of trades and collateral and monitoring the credit standing of its clearing firms, in many cases by providing a fund that can be used to cover losses that exceed a defaulting clearing firm's collateral/margin. Basically, after a trade has been executed either on an exchange or OTC, the trade is with the clearing house, which steps between the two clearing firms and assumes the legal counterparty risk for the trade.

The recent financial crisis is an example that lack of transparency over large bilateral positions between counterparties combined with potentially insufficient collateral, and the effect of a significant reduction in market liquidity, contributed to the collapse of Lehman Brothers and near-collapse of AIG in 2008. Both Lehman and AIG were major participants in the OTC derivatives markets, including the CDS market.

In September 2009, the G20 leaders agreed that all standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, and cleared through Central Counterparties (CCPs). The Financial Stability Board reported in April 2013 that, as at the end of February 2013, approximately US\$158 trillion of interest rate swaps and over US\$2.6 trillion of OTC credit derivatives were centrally cleared, representing only 41 % and 12 % respectively of total outstanding notional amounts. These amounts and the products that can be centrally cleared are anticipated to increase as mandatory clearing takes place and higher capital requirements are applied on non-centrally cleared OTC derivatives.

In addition to the mandatory central clearing of standard OTC derivatives and the higher capital requirements for non-cleared transactions, G20 leaders decided in 2011 to add bilateral collateral requirements for non-cleared OTC transactions. These collateral requirements include both initial and variation margin. These rules will apply to financial institutions and systemic important financial institutions, but will not apply to sovereigns, central banks, the Bank of International Settlements and multilateral development banks. Further, certain products are also exempt from these requirements, such as FX forwards and swaps, repos and security lending transactions. These requirements have attracted some criticism due to the fact that initial margin will be costly; under stressed conditions initial margin would increase dramatically, a fact that may force banks to find other ways of funding or simply leave the OTC market. As a result, the criticism has mainly been that these margin collateral requirements may actually cause funding liquidity risk.

Central Counterparties as clearing houses go back to the late nineteenth century as they were used to net payments in commodities futures markets. Later, clearing via CCPs increased through exchange-traded products such as bonds, equities, futures and options contracts. After the financial crisis, clearing became equally important for OTC products as well as those traded on exchanges. The main function and benefit of central clearing is the multilateral netting of transactions between market participants that simplifies outstanding exposures compared with a number of bilateral trades. The most important function of a CCP though is the management role that it plays in

the event of counterparty default. As a clearing house, it is very important to be well-capitalized in order to survive and be able to provide its services upon a clearing firm's default or even upon a market crash.

CCPs should also be able to address issues in relation to liquidity and have sufficient liquidity resources. A CCP should impose requirements upon its members, such as members' creditworthiness and solvency, their ability to meet margin calls within short periods and operational reliability. Firms that are not members of CCPs, however, can benefit from central clearing as clients of clearing members.

Upon counterparty default, the CCP can use the collateral/initial margin that was posted to the CCP to cover any losses or obligations incurred. Furthermore, the variation margin payments would have already limited the build-up of exposures arising from changes in market prices over the life of the contract, because the CCP calculates the gains and losses on each client member's portfolio on a daily basis or intra daily. CCPs charge higher margins on instruments with more volatile prices and on less liquid instruments that are expected to take a CCP longer to auction to or close out in the event of a default. Ideally the initial margin should cover all losses faced by the CCP if a member defaults.

If the collateral posted by the defaulted counterparty to the CCP is not sufficient to meet the amount owed, the CCP can then draw on the defaulting party's contribution to the CCP's default fund. Typically, all members have to contribute to this fund in advance of using a CCP. Prior to using the default fund contributions of surviving members, the CCP may contribute some of its own equity resources towards the loss. If these resources are also exhausted, many CCPs may call on surviving members to contribute a further amount, usually up to a predetermined limit. Then the CCP's remaining equity becomes the last resource to absorb any further losses, though this is often a small amount when compared to the initial margin and the default fund. If losses exceed this remaining CCP equity then the CCP can become insolvent!

In the past, there have been a few rare cases of CCPs failing. In 1974, the Caisse de Liquidation failed due to high volatility in the sugar market, leading to large margin calls that participants were unable to meet. The Kuala Lumpur Commodity Clearing House failed in 1983 after large defaults on palm oil contracts. The Hong Kong Futures Guarantee Corporation failed after the stock market crash of 1987 which led to the closure of stock and futures exchanges in Hong Kong for four days.

So CCPs are not a panacea as they do entail risks themselves. CCPs themselves become crucial links in the financial markets, in particular when an individual CCP is the only or dominant CCP for a given market. A CCP

operating across multiple jurisdictions and currencies can provide efficiencies and reduce risk through multilateral netting of exposures across counterparties in different jurisdictions. On the other hand, fragmentation of business across multiple CCPs may lead to greater costs and greater liquidity demands. CCPs reduce systemic risk by mitigating the impact of a counterparty default but they can also increase systemic risk. This may happen by exacerbating other stresses in the financial system. A CCP will typically adjust initial margin requirements in response to changes in market conditions. However, if these margin calls are very large they can de-stabilize the position of CCPs' members by having to liquidate positions to meet these margin calls.

CCPs play a very important role by providing a foundation for centralized risk management that incorporates multilateral netting, collateralization and loss mutualization amongst members as well as data processing operations and reporting. However it should be noted that a CCP is not immune to risk.

Collateralization and Over-collateralization

Holding collateral or even over-collateralization (for example some securitization transactions are over-collateralized, i.e. have more assets on the portfolio to provide credit enhancement versus the amount of notes issued/outstanding) can mitigate credit risk as this collateral can be used to cover losses.

Some general principles apply to collateral in order to be as efficient as possible in the event that it has to be liquidated to cover losses. The entity holding the collateral must have a perfected security interest in the collateral. Basically, the entity that holds the collateral should have the right to own and liquidate it upon default. Ideally, the more liquid the collateral the better it is. Upon counterparty default, the easier and faster the collateral can be liquidated/sold the better, as recoveries can be maximized. In addition, highly liquid collateral is more straightforward to value and assists in the sale process. Other than the collateral being as liquid as possible, the higher the credit quality the better it mitigates credit risk. If the collateral is not of high credit quality then it has counterparty credit risk as well. Furthermore, the price of the collateral should be relatively stable. If the collateral has a lot of volatility then a haircut should be applied to it. Ideally, the collateral should be uncorrelated with the transaction. The best collateral is the one that has no correlation with the counterparty or with the underlying product. If the collateral has a strong positive correlation with the counterparty or asset this means that there is a risk that upon default of the counterparty or underlying asset, the collateral value will also decline as the credit exposure increases. In cases where

the collateral is not cash and there are concerns of it deteriorating over time then appropriate haircuts should be applied to it. These haircuts should take into consideration its liquidity, maturity and volatility of the forces driving its value, the default risk and the relationship between the counterparty and the collateral value.

Collateral is a very useful method of mitigating credit risk in various transactions, such as real estate, securitizations and counterparty credit risk. However, it cannot completely eliminate risk. There may be legal risk associated with it, for example the process to enforce a property, or the terms of a CSA may be upheld depending on the jurisdiction. As discussed, the collateral may also deteriorate, for example the property value may have experienced significant market value declines and its proceeds cannot repay the loan and any accrued interest. Other risks relate to any unhedged foreign exchange risk (i.e. collateral proceeds received in a different currency to the obligation) or operational risk, such as failure to deliver collateral under a CSA due to a missed collateral call, computer error, etc.

Covenants and Event of Default

A covenant is a promise to do or refrain from a specific action. With a covenant the covenantor, for example a borrower, makes a promise to the covenantee/a lender to do or to refrain from specific actions. Affirmative covenants are covenants that specify actions that the covenantor/borrower must abide with, whereas negative covenant are covenants that forbid the covenantor/borrower from doing certain actions. Affirmative covenants include actions that a borrower should do to maintain its business in good standing and provide financial information to its lenders. Negative covenants include restrictions on the borrower to sell assets, take on more debt, merge etc. Financial covenants typically require borrowers to maintain a minimum coverage ratio (e.g. debt to service coverage ratio) and leverage (e.g. loan to value ratio). Tight covenants can contribute in maintaining a borrower's creditworthiness at the same level as when the loan was originated. If, however, the borrower's credit quality and overall risk profile deteriorates beyond the risk threshold assumed by the lender, then typically a loan event of default occurs and the loan can become due. Covenants assist lenders to be informed of a possible deterioration of the borrower and enable them to take action before things get much worse. In practice, breaching covenants does not translate into a forced default. It is up to the discretion of the lender to assess the situation and waive them to provide more time, demand more collateral or take any action deemed appropriate. Events of default are very important; what actually constitutes

an event of default, its grace period and any cross-default provisions must be fully understood and negotiated. With an event of default any sums owed to a lender become immediately due and this may maximize recoveries.

Syndication

A syndicate is a group of financial institutions formed temporarily for the purpose of handling a large transaction, for example a leverage loan, that would be difficult for the financial institutions involved to handle individually. Syndication allows financial institutions to pool their resources and share the risk. The lead manager of the transaction typically has the largest share in the syndicate and as a result bears the greatest risk as well as earns the largest share of fee income. A syndicate can make a firm commitment and “underwrite” the transaction. For example, for a leverage loan the borrower obtains the full loan amount. Or the syndicate can provide its services on a “best efforts basis”. This means that the syndicate does not guarantee that the full loan amount will be provided. The syndicated loans are structured based on the risk/return profile of the banks in the syndicate, the borrower’s profile and the investor’s needs. Syndicated loans can be traded in the secondary market.

Excess Spread and Reserve Fund

Securitizations transactions can be enhanced with excess spread capturing mechanisms and cash reserve funds that are in place. Typically, when the securitization is initiated the income received from the underlying assets/borrowers (i.e. the weighted average interest rate on the asset pool) is higher than the weighted average interest (coupons) paid to the investors. So effectively the positive difference is the excess spread. In some transactions this can leak back to the originator, but in transactions where this is trapped it builds up a reserve fund. This reserve fund can be used, if in the future the transaction experiences unexpected defaults, in order to make payment under the notes. However typically, the excess spread is designed to build up to a certain level of reserve fund, after this has been filled the remaining cash flows go back to the lowest tranche/equity investor in the transaction.

Early Termination and Amortization

A provision of an early termination in the legal documentation allows the lender to terminate the transaction on the occurrence of a pre-agreed event

such as a credit downgrade. Early amortization triggers in a securitization can accelerate the repayment of principal upon the occurrence of certain events, usually ones that would ultimately signal deterioration of the transaction's performance. These triggers can lead to early amortization if, for example, a much higher level of default has been reported, or a breach of over-collateralization, a breach of the acceptable minimum level of excess spread, financial distress of the sponsor or a major party in the transaction, like the servicer, that cannot be replaced, occurs. The concept behind the early amortization triggers is that investors are repaid earlier in order to protect their interest before the transactions deteriorate any further.

Subordination

Investors with low risk appetite can select senior tranches of debt that benefit from credit enhancement provided from the subordinated tranches of debt. If there are any losses in the transaction these will be first absorbed by the most junior tranche. Thus investors can mitigate their risk by investing in senior debt that will however provide a much lower return.

Credit Derivatives

Credit derivatives are financial instruments that transfer credit risk related to an underlying entity or a portfolio of underlying entities from one party to another without transferring the underlying(s). Credit derivatives are structured or embedded in note, option or swap form. Typically, they have a tenor shorter than their underlying instrument maturity. Credit derivatives are financial instruments whose payoff is contingent on the credit quality or/and performance of an entity.

Credit derivatives can be funded or unfunded. Unfunded credit derivatives are bilateral, privately negotiated, credit derivative contracts. With unfunded credit derivatives the seller makes no upfront payment to cover its potential future liabilities. In an unfunded credit derivative the seller makes a payment only if the conditions to settlement are met. As a result, the buyer takes on the counterparty credit risk of the seller of being able to pay any physical settlement or cash settlement amount. A credit default swap is an example of an unfunded credit derivative, as the credit protection seller does not make any upfront payment to the protection buyer. A funded credit derivative involves the issue of a debt obligation by a SPV or a financial institution funded/purchased by the effective seller, i.e. the noteholders.

Credit derivatives have many uses. They can assist banks to manage their loan portfolio risk profile. They can also allow banks to change their loan portfolio risk/return trade-off without having to sell or remove loans from the balance sheet. In addition, banks can achieve this and at the same time avoid an adverse customer relationship effect. Furthermore, banks can reduce their credit risk concentrations and have more flexibility to manage their overall risk. Credit derivatives can also help corporates to hedge their trade receivables, hedge sovereign credit related transaction risk and manage their exposures to their customer and suppliers. These instruments can further provide investors with better diversification in their investments as they have access to otherwise unavailable markets, such as loans and foreign investments; they can borrow against a bank's balance sheet without having to fund or service the bank's assets; they provide the opportunity to enhance their yield with or without leverage; and assist them to manage and reduce their credit risk.

Credit derivatives can be used to take advantage of differences in pricing between the bond and loan market for the same underlying or any pricing/mispricing of corporate credit spreads. These products, apart from transferring credit risk, create exposure to the creditworthiness of the counterparty of the credit derivative. Users of credit derivatives should not forget the lessons of the 2007 financial crisis: these instruments can be effective provided that their dynamics are fully understood, they are used appropriately and not in excess, they are priced properly and the counterparty credit risk is taken into consideration.

Credit derivatives are useful tools provided they are not misused and abused.

Total Return Swap (TRS)

A Total Return Swap (TRS) is an instrument that transfers the total economic exposure of both market and credit risk of the underlying reference asset(s)/security. A TRS actually mirrors the return on the underlying reference instrument(s). The reference asset(s)/security can include indices, bonds (such as sovereign, corporate, emerging market), mortgage-backed securities, loans, equities, lease receivables, real estate receivables and commodities, etc. A TRS is a bilateral financial contract between a total return payer and a total return receiver. The total return payer pays the total return of a reference asset/security and receives a payment from the receiver of the total rate of return. The payment is usually a floating rate payment, such as a spread to LIBOR. The difference with a CDS is that indeed both market and credit risk is transferred from the seller to the buyer. Thus, the payer of a TRS can remove all the market and credit exposure of the reference asset without being

forced to sell it. On the other hand, the receiver of a TRS can have the exposure, get all the cash flows of that asset, without having to buy the asset. The TRS payer remains as the legal owner of the reference asset and holds it on its balance sheet. However, the TRS receiver bears the market risk of the asset, so if there is any decline in reference asset's price, it must pay this to the TRS payer at the end of the TRS, or any other prearranged period. On the other hand, if the reference asset appreciates, the TRS receiver, who effectively has a synthetic long position, benefits from the difference (mark-to-market). The TRS receiver makes ongoing payments to the TRS payer. During the TRS transaction period the TRS payer has a synthetic short position both in terms of market risk and market value decline, and in terms of credit risk, from the deterioration of the creditworthiness of the reference asset.

For example, assume that a bank has provided a £500 million loan to a telecommunication company with a fixed annual rate of 8 %. If the telecommunication company's credit risk increases over the life of the loan, the loan market value will fall. If the bank wants to hedge an unexpected increase in the telecommunication company's credit risk it can enter into a TRS with a counterparty that wants to take that exposure. The bank pays the total return on the asset which is equal to the promised interest and fees on the loan, plus the capital gains or losses on the market value of the loan over the life of the swap. On the other hand, the bank receives a payment based on the variable interest rate plus a spread.

In another example, a bank with a portfolio of loans to a particular industry may want to reduce its economic exposure to that portfolio of loans while keeping its relationship with the borrowers. The bank can enter into a TRS with a counterparty that wants to gain economic exposure to that loan market.

Diagram 1 shows a basic TRS transaction.

The TRS payer effectively sells the TRS and with this the credit risk of the underlying asset to the TRS receiver that is purchasing the TRS and the credit risk of the underlying asset. The TRS payer/seller of the TRS creates a short

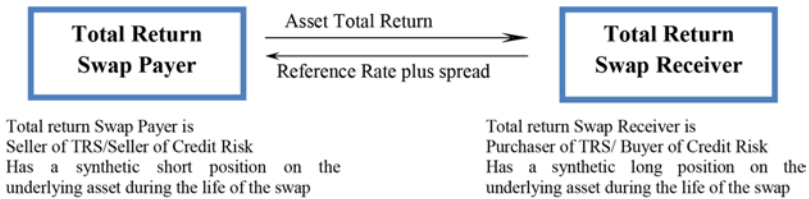


Diagram 1 Basic TRS transaction

position in the underlying asset during the life of the swap. The TRS receiver is purchaser of the TRS/buyer of credit risk and has a synthetic long position on the underlying asset during the life of the swap; it benefits if the value of the underlying asset increases and pay losses if the value of the underlying asset falls.

At the maturity of the transaction, the TRS receiver may buy the underlying asset based on the market price at the time, but there is no obligation to do so. If the underlying asset defaults during the life of the TRS, the TRS usually terminates. In the event of default the TRS receiver compensates the TRS payer both in terms of market and credit risk of the underlying asset. The TRS receiver can make a net payment of the difference between the price of the underlying asset at the beginning of the transaction and its price at the time of default. Alternatively, the TRS receiver may take delivery of the defaulted underlying asset and pay to the TRS payer the initial price of the underlying asset.

TRS can be employed for different reasons, such as financing, balance sheet and portfolio management, hedge fund leverage, and asset swap maturity manipulation. Investors have access to new assets, choose the asset maturity, obtain exposure to assets otherwise not available to them (such as syndicated loans) or receive the total return on an index and reduce their costs through off balance sheet purchases compared to buying loans on balance sheet. However, a huge motivation for a TRS receiver to enter into a TRS is that it can take advantage of leverage. A hedge fund is an example of a typical TRS receiver as its motive is to take advantage of leverage. For a creditworthy TRS receiver no upfront collateral may be required and there is no need to make any initial cash payment. So a TRS allows unlimited leverage and unlimited upside but also downside potential! Provided that the TRS payer/TRS seller has the underlying asset (i.e. has a synthetic short position through the TRS but holds the underlying asset), then the TRS payer is only exposed to the risk of default of the TRS receiver/TRS buyer. This risk depends on how leveraged the TRS transaction is.

There are many motivations for an institution to take the position of a payer in a TRS. An investor that cannot short securities may be able to hedge a long position by being the payer in a TRS. Furthermore, a long-term investor may take the view that the underlying asset may widen in spread in the short-term, but then expect to recover. That investor can enter into a TRS that has a shorter maturity of that of the underlying asset. Similarly, an investor with an unrecognized loss in a bond can defer the loss short-term without risking further losses on the asset. A huge motive for a TRS payer is to book income and report high earnings. Theoretically, with a TRS the risk can be

laid off from the TRS payer's perspective provided that the TRS receiver is able to fulfil its obligations under the TRS. Therefore, who the TRS receiver is, is very important. The TRS payer, typically a bank, may be eager to book income and lend income to TRS receivers such as hedge funds. Hedge funds will typically pay more to enter into these transactions compared to what other high-creditworthy banks and insurance companies, etc. would be willing to pay. The concern is that upon default of the underlying asset will the TRS receiver be able to pay? How leveraged is the transaction? How leveraged is the TRS receiver? Even if the TRS receiver has provided upfront collateral, is this sufficient to cover the loss in the TRS? How about mark-to-market and any cure periods incorporated in the TRS? These are issues that credit managers should consider. Furthermore, is the enhanced income that certain TRS receivers willing to pay as a funding cost sufficient to compensate the TRS payer for the credit risk involved (i.e. the risk of default of the TRS receiver)? TRS can be useful when used appropriately but can involve huge leverage.

Credit Default Swap (CDS)

Total return swaps can be used to hedge credit risk, but they contain, apart from credit risk, market risk. In contrast a CDS does not entail market risk. Chapter 5 also provides a discussion of CDS, specifically sovereign CDS and corporate CDS in relation to sovereign and corporate credit risk respectively.

A plain vanilla CDS consists of a payment by one party in exchange for a credit default protection payment only if a credit default event on a reference asset takes place. The payment consists of the difference between the original price of the reference asset and its recovery value. The protection payment to the CDS protection buyer is only made if a credit event takes place. If it does not the CDS protection seller has no obligation.

For example, in a traditional loan CDS the protection buyer/seller of credit risk pays, every period, a fee, the swap premium, to the CDS protection seller/buyer of credit risk. If the loan does not default, the CDS protection buyer will not receive any payment. However, if the loan defaults, the CDS protection seller is obliged to cover the loss by paying an amount equal to the par value of the original loan minus the secondary market value of the defaulted loan. So the CDS protection seller pays out par minus the recovery value of the loan in the event of default. This form of payment tends to be quite common. However, the payment can be negotiated and arranged by agreement of the parties in the CDS. Although this product is called a "swap", unlike other swaps there is no exchange of payments between the CDS parties. Effectively this product is similar to buying credit insurance. The value of a CDS depends

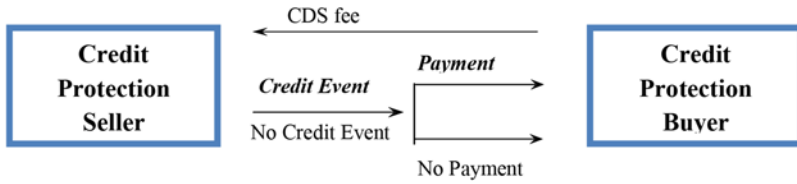


Diagram 2 Basic CDS transaction

not only on the credit quality of the underlying reference entity but also on the credit quality of the CDS protection seller. If the CDS protection seller defaults, the CDS protection buyer will not receive any payment if a credit event occurs.

Diagram 2 shows a basic CDS transaction.

A CDS has a number of key terms that have to be determined. The definition of the reference asset, such as its notional value, maturity and the credit spread (typically over LIBOR), is required, and the definition of a credit event is critical. A payment is only made upon a credit event so this has to be clearly defined to avoid litigation. Typical credit events can include bankruptcy, insolvency, default, downgrade in the rating of the issuer or the underlying asset, repudiation/moratorium and restructuring. Furthermore, the definition of what constitutes a credit event and therefore triggers a termination payment under the term of the CDS is negotiable as CDS are flexible agreements and can be tailor made according to the needs of the two parties in the transaction. The credit event may be defined as a spread widening or a decline in the price of debt, or any event that the two parties agree upon.

The credit events are agreed by the parties and typically consist of a combination of the following:

- *Failure to pay*: refers to the reference entity's failure in making a payment of interest or principal on a reference obligation when due.
- *Bankruptcy*: refers to the reference entity being subject to a winding up, receivership, administration or similar insolvency proceeding.
- *Obligation Acceleration*: a reference obligation is accelerated as a result of an event of default.
- *Obligation Default*: the reference entity defaults on one of its reference obligations.
- *Repudiation/Moratorium*: refers to the event where the reference entity repudiates or a moratorium is declared over some or all of its debts.
- *Restructuring*: refers to the event that the reference entity arranges for some or all of its debts to be restructured and there is a material adverse change in their creditworthiness.

- *Governmental Intervention*: the event where a reference entity's debt is written down under a government initiated bailin. Governmental Intervention is the seventh category of risk that was introduced in September 2014 under reforms published by ISDA. This new credit event is one of a series of new features introduced by the 2014 ISDA Credit Derivatives Definitions.

If a credit event takes place the buyer has the right, but not the obligation, to trigger a credit event. In order to trigger the credit event, the notifying party must satisfy the conditions to settlement, such as delivery of a credit event notice and, for a physically settled transaction, a notice of physical settlement. The credit event notice determines that a credit event has taken place providing the facts in relation to that determination.

The payment that the protection seller is obliged to pay should be clearly defined. The payment is also negotiable. It may be at a fixed amount, based on the recovery value of a reference asset or any other acceptable agreement between the two parties. Furthermore, the type of settlement should be defined, whether this will be a physical settlement (i.e. delivery of the reference asset) or a cash settlement.

Until April 2009, physical settlement was the most common settlement in the CDS market. Since then cash settlement, through auction settlement, is a more common means of settling CDS transactions referencing commonly traded reference entities. This was as a result of the introduction by ISDA of the 2009 ISDA Credit Derivatives Determinations Committee and Auction Settlement CDS that improved the cash settlement provisions of the 2003 Definitions.

With cash-settled transactions, the calculation agent determines the market value of the reference obligation as on the valuation date and notifies the parties of that value. The transaction is then settled an agreed number of days later. The cash settlement amount paid by the seller is the transaction's notional amount less the market value of the reference obligation determined by the calculation agent. The method the calculation agent used to make that determination is specified in the transaction confirmation and usually decided by market practice. Typically, calculation agents have discretion in the performance of their duties although counterparties can agree in the transaction confirmation that the calculation agent should act in a commercially reasonable manner by considering the interests of both buyer and seller.

An auction settlement involves a cash settlement and, in certain circumstances, physical settlement. The settlement price is then determined by an

auction process for the relevant obligation. In 2009, ISDA introduced a generic auction settlement process. Holders of these obligations/credit protection buyers deliver these obligations into the auction through market making banks. They are bought by distressed assets' bidders. Through the auction a final price for each obligation is determined, and this is price for each CDS transaction.

With a physical settlement the buyer will typically serve a notice of physical settlement. This notice sets out the actual deliverable obligations of the reference entity that the buyer will deliver to the seller on the physical settlement date. On the physical settlement date, the buyer will deliver the deliverable obligations to the seller and the seller will pay an amount equal to the notional amount of the CDS.

The entity that has the role of the credit protection seller is very important. As a credit protection buyer which entity would someone ideally select to enter into a CDS? An AAA/Aaa rated credit protection seller that has zero correlation with the reference asset that the credit protection buyer wants to hedge against would be the best choice. However, a credit protection seller with these features would probably require a much higher fee to enter into the CDS. The premium paid depends not only on the rating/creditworthiness of the credit protection seller but also on the correlation between the credit protection seller and the reference asset in the CDS. Assume that as a credit protection buyer you have a choice between credit protection seller 1 rated BBB+/Baa1 that has zero correlation with the reference asset and credit protection seller 2 rated A/A2 but with a 95 % correlation with the reference asset. Who would you choose to buy credit from? The joint probability of default between the reference asset and the BBB+/Baa1 counterparty provides a higher implied credit rating for the credit default protected asset compared to the combination of the 95 % correlated A/A2 rated counterparty and reference asset. Thus it is better to obtain credit protection from an uncorrelated, slightly lower-rated, credit protection seller than from one that has high correlation with the reference asset. Thus the CDS value depends on the counterparty default probability, the default probability of the reference asset/entity and the correlation between them. The CDS premium/spread/fee is usually quoted as an annual percentage in basis points of the contract's notional value, but is usually paid quarterly. Another point to note is that if a credit protection buyer has all its hedging with the same credit protection seller it runs the risk that if it needs to be paid, and if that particular protection seller is in trouble, it may find itself unhedged for all its positions. Furthermore, CDS can often be sold and resold among the same parties and if a major counterparty (like AIG) fails it leaves a large number of market

participants un-hedged and exposed to losses and can have a domino effect that can lead to mistrust and a market freeze up. For example, AIG sold billions in unhedged and relatively under-margined (i.e. with no collateral), due to its AAA status. During the summer of 2007, as write-downs grew (and asset prices lowered), AIG's counterparties demanded collateral. Eventually, margin calls increased and by September AIG had to seek government bailout as it simply did not have the short-term liquidity to meet margin calls. The industry and regulators' initiative toward central counterparty clearing is likely to reduce counterparty risks.

Like other credit derivative transactions, CDS protection buyers can remove risky assets from their balance sheets without physically having to sell them. CDS can efficiently assist institutions in reducing risk and freeing up capital. CDS can also provide significant benefits in risk sharing and price discovery. CDS protection sellers can obtain higher returns from investments or diversify their portfolios by entering markets that are otherwise difficult to obtain access to that particular credit risk. CDS are useful and can be used to enhance credit risk management as institutions can shed credit risk more easily than by selling loans. They can bring liquidity in the marketplace as entities other than banks can enter that market.

CDS are flexible products and some types are as follows:

- *CDS on single entities*: is the most common type of CDS. Single-name corporate CDS, Sovereign CDS.
- *CDS on indices*: is a portfolio of single-entity CDS. It can be viewed as an extension of a CDS on a single-entity to a portfolio of entities. A major benefit of index CDS over single-name CDS is that they are attractive and accessible to a wider range of potential market participants than those wanting to exchange risks on a single name. More market participants tend to promote better liquidity, which in turn enhances their attractiveness for risk shifting and price discovery. Typical examples of standardized CDS are the CDX index and the ITRAXX index.
- *CDS on baskets of entities*: a basket CDS is similar to a single entity default swap except that the underlying is a basket of entities rather than one single entity.
- *CDS contracts on securitized tranches*.
- *First-to-default or an nth-to-default CDS*: a first-to-default CDS protects/compensates its buyer only for the loss from the first credit event, or an nth-to-default CDS protects/compensates its buyer from losses from the nth default or the first n defaults are compensated. For example, if a bank has a portfolio of three loans with a very small default correlation between

them, it may buy a first-to-default CDS, according to which the credit event is defined as the first default of any of the three loans. The credit protection seller will only compensate the bank upon the default of the first loan that defaults; if another loan defaults there will be no payment.

- *First-Loss and Tranche-Loss CDS*: protects its buyer from losses of a reference pool as a result of credit events of the reference assets up to a certain portion of the total notional amount of the asset pool.

Credit Linked Note (CLN)

A Credit Linked Note (CLN) is a fixed or floating rate note where the principal and/or coupon payments are referenced to a credit or a basket of credits. A CLN embeds a default swap and transfers a specific credit risk to its investors. If there is no credit event in relation to the reference credit(s), all the coupons and principals will be paid in full. On the other hand, if there is a credit event, the payments on the note will be reduced to that of the recovery value achieved. So, effectively, a CLN is a debt obligation with a coupon and redemption tied to the performance of, for example, a bond, loan or any other debt, such as government debt etc. that its issuer is not obligated to repay if a specified event occurs. It is an on balance sheet item and there is no legal exchange of the underlying asset. Quite often a CLN is a bond that has been issued using a Medium Term Note (MTN) programme.

A loan portfolio issued against CLN is common. There is variety of these products, but the main difference between them is in relation to the way the credit risk is transferred from the bank that has originated or bought the portfolio of loans to the CLN investor. The return and risk of the CLN investors can vary depending on the structure. Some CLN promise a high yield based on the performance of the underlying loan portfolio in return for bearing all the loan portfolio default risk; while others promise a lower yield in return for a partial default protection that is a shared credit risk with the bank.

Assume that Bank A obtains at a cost of LIBOR a portfolio of sub-investment grade loans of £100 million with a weighted average rating of BB/Ba2 that yield LIBOR plus 300 bps. The loan portfolio is in a trust. This trust issues an asset backed note of, say, £20 million; the proceeds are then invested in government securities with a yield of 6 % and partly collateralize the portfolio of loans. The collateral is only 20 % of the loan portfolio (i.e. £20/£100 million = 20 %) which represents a 5 times leverage. Bank A pays the investor 170 bps on a notional amount of £100 million and 6 % on the collateral notional amount of £20 million. The investor also bears any change

in the value of the loan portfolio. The investor has an exposure of a £100 million sub-investment portfolio of loans with an investment of only £20 million and a 5 times leverage. Bank A receives 130 bps on a notional of £100 million for bearing the risk of default exceeding the £20 million collateral. If the loan portfolio loses more than £20 million in value then this loss is borne by Bank A.

In another example, Bank B is a protection seller in a CDS based on a reference entity, say a bond issuer, which means that Bank B receives regular income from its CDS counterparty. Bank B issues the CLN. In this example, we assume that the CLN has the same principal amount and maturity as the CDS and the terms of the CLN mirror the terms in the CDS transaction. The CLN investor pays to buy the CLN. Bank B pays the CLN investor regular interest until the maturity of the CLN. If there is no credit event of the reference entity the CLN investor receives the principal investment at the maturity of the note.

In the event of a credit loss of the reference entity the CLN investor will also bear a loss. Upon a credit event of the reference entity, the CDS of which Bank B is the protection seller is then triggered. Assume that the settlement of the CDS is carried out by Bank B paying to the CDS counterparty the principal amount of the CDS and Bank B receiving in return a bond that is issued by the defaulted reference entity. The CLN is also then triggered. As a result, the CLN investor does not receive its principal; instead Bank B delivers the defaulted bond. Thus the CLN investor bears the loss and that depends on the market value of the delivered bond.

Securitization

The various securitization transactions, such as CMBS, RMBS, ABS, CLOs etc. can be employed to transfer credit risk and have been discussed in Chap. 5. Securitization allows the repackaging of risk and the creation of various tranches of notes that have different seniorities, risk profiles and returns. A pool of assets such as leveraged loans, mortgages, auto loans, student loans and credit cards are sold or assigned to an SPV that funds the purchase of these assets through the issuance of various tranches of notes to investors. Securitization transfers the risk of the underlying pool of assets that would have been difficult or impossible to transfer to a variety of investors. Various tranches of notes are created based on the risk profile of investors.

Chapter 8: Regulation

Regulation

Banks are regulated by different local regulatory bodies according to their jurisdiction. Although there are international regulation standards, these are implemented by local regulators. International banks operate in various jurisdictions, and are subject to supervision by their home regulatory supervisor as well as by the local/host regulatory supervisor in countries where they have operations. The new Basel Accords require close practical cooperation of the home and host regulatory supervisors in order to reduce the supervisory burden on international banks.

After 2007 some countries, in response to the impact of the financial crisis, implemented their own legislations to ensure the stability of their financial systems. As a result, domestic as well as international frameworks have been implemented simultaneously. Any difference in regulation is very likely to be exploited and lead to regulatory arbitrage.

The Basel Committee, the European Capital Requirements Directive (CRD) IV package of reforms as well as the Dodd-Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act) are discussed in this chapter. These affect not only domestic banks but also international financial institutions that have operations in the USA and EU.

Basel Committee

The Basel Committee on Banking Supervision (BCBS) develops minimum international standards on bank capital adequacy. After the 2007 financial crisis, the Basel Committee reviewed its capital adequacy standards and made several enhancements. Basel III is the result of that review. The BCBS is based at the headquarters of the Bank for International Settlements (BIS) in Basel, Switzerland. Its members come from Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong SAR, India, Indonesia, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, the UK and the USA.

Basel III is the latest reform, while Basel II reforms were intended to refine the 1988 Basel Capital Accord also known as Basel I that focused on the definition of capital and risk weighting in terms of credit risk. The Basel 2.5 reforms relate to issues in the trading book, resecuritizations, disclosure of securitization risk, and additional Pillar 2 supervisory guidance. The specific quantitative aspects of Basel I, II, 2.5 and III are discussed in Chap. 2.

Basel II's requirements were grouped into three main areas, known as pillars:

- *Pillar 1—minimum capital requirements.* Pillar 1 sets out how banks should calculate their minimum capital requirements in order to cover credit risk, market risk and operational risk. The minimum banks' capital is determined in relation to the riskiness of the assets, with a minimum capital ratio of not less than 8 % of a bank's Risk Weighted Averages (RWAs).
- *Pillar 2—supervisory review process.* Pillar 2 set out a supervisory review process in order to enable supervisors to confirm that banks have adequate resources, and furthermore to encourage banks to develop and use better risk management techniques.
- *Pillar 3—market discipline.* Pillar 3 enhanced market discipline with a set of disclosure requirements for bank capital adequacy, based on the Pillar 1 framework with the purpose of allowing market participants to assess key information on capital, risk exposures and risk assessment processes.

Basel III has made the following enhancements:

- *Pillar 1—capital, risk coverage and containing leverage enhancements*
 - *Capital:* there is more focus on common equity. The minimum is raised to 4.5 % of risk weighted assets, after deductions. Contractual terms of debt capital instruments will include a clause that permits—subject to regulatory approval—write-off or conversion to common

shares if the bank is judged to be non-viable. This principle encourages the private sector to resolve future banking crises and reduces moral hazard. A capital conservation buffer and a countercyclical buffer are put in place (discussed in Chap. 2).

- *Risk coverage*: it enhances the capital treatment for certain complex securitizations and requires banks to carry out more rigorous credit analysis of externally rated securitization exposures. There is significantly higher capital for trading, derivatives activities and complex securitizations held in the trading book. A stressed Value At Risk (VAR) is introduced to help mitigate procyclicality and a capital charge imposed for incremental risk that estimates the default and migration risks of unsecuritized credit products and accounts for liquidity. There are capital incentives for banks to use central counterparties for derivatives; and higher capital for inter-financial sector exposures. Furthermore, a non-risk-based leverage ratio that includes off balance sheet exposures serves as a backstop to the risk based capital requirement (discussed in Chap. 2).
- *Pillar 2—risk management and supervision enhancements*

The supplemental Pillar 2 requirements address firm-wide governance and risk management. This is in relation to taking into account the risk of off-balance sheet exposures, securitization activities and managing risk concentrations. Furthermore, banks are incentivized to better manage risk and returns over the long term with certain compensation and valuation practices, stress tests, corporate governance etc.

- *Pillar 3—market discipline enhancements*

The revised Pillar 3 disclosure requirements relate to securitization exposures and sponsorship of off balance sheet vehicles. Enhanced disclosures of regulatory capital, their components and their reconciliation to the reported accounts are needed, as well as a comprehensive explanation of how a bank calculates its regulatory capital ratios.

The Basel III rules and regulations have to be formally formulated and implemented by each relevant jurisdiction. In the USA, this typically occurs through the rule making process by the federal banking regulators under the Administrative Procedures Act and through harmonization of certain aspects of Basel III rules with the relevant provisions of the Dodd-Frank Act.

The European Commission implements Basel III primarily through the CRD IV package of reforms that replaced the old CRD with a new directive,

the CRD IV Directive, and a new regulation, the Capital Requirements Regulation (CRR), as well as delegated legislation made under the CRD IV and the CRR.

Not all countries have reached the same stage of implementing Basel III and this may provide opportunities for regulatory arbitrage.

European Union (EU) Capital Requirements Regulation and Directive (CRR-CRD) IV

The EU CRR-CRD IV package that transposes via a regulation and a directive the new global standards on bank capital (the Basel III agreement) into EU law entered into force in July 2013. The new rules, which applied from 1 January 2014, aim to tackle some of the vulnerabilities of banks during the crisis, such as insufficient capital, both in terms of its quantity and its quality, that resulted in the need for support from national authorities. The new framework aims to make EU banks more solid and strengthen their capacity to manage the risks linked to their activities as well as absorb their losses. CRD IV is about access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, and CRR is about prudential requirements for credit institutions and investment firms. A directive provides EU countries with discretion with regards to implementation of EU requirements. A regulation is applicable and mandatory to all banks in the EU.

BCBS develops minimum international standards on bank capital adequacy and after the financial crisis several enhancements were made with Basel III. The European Commission, the European Banking Authority (EBA) and the European Central Bank (ECB) are observers.

The EU has contributed to developing the new capital, liquidity and leverage standards in the BCBS while taking into account the features of the European banking sector and the legal environment. Basel III applies internationally and thus it cannot simply be copied into EU legislation. Furthermore, Basel III is not a law itself, but the latest configuration of an evolving set of internationally agreed standards developed by supervisors and central banks. The Basel capital adequacy agreements apply in the EU to all banks as well as investment firms. This is deemed necessary as in the EU banks authorized in one member state can provide their services across the EU's single market and in this way they are more likely to engage in cross-border business. Therefore the EU took into consideration the unique features of its market while transposing Basel III requirements into EU and applicable national laws in order to ensure uniform application and limit regulatory arbitrage.

The EU, in addition to Basel III implementation, introduced a number of important changes to the banking regulatory framework.

In the Directive the main additions are:

- *Remuneration*: in order to address excessive risk taking the remuneration framework caps bonus/variables to up to 100 % of the salary/fixed component of the total remuneration of material risk takers. However, in some exceptional circumstances, shareholders can increase this to 200 %.
- *Corporate governance*: CRD IV strengthens corporate governance arrangements and introduces new rules to enhance the effectiveness of Boards' risk oversight, improve the risk management function status and ensure effective monitoring by supervisors.
- *Diversity*: diversity in board composition, including gender, is required as this provides for a broader range of views and opinions and in order to improve risk oversight.
- *Transparency*: CRD IV improves transparency as banks and investment funds have to disclose more information regarding their activities and subsidiaries in different jurisdictions, and with regards to their profits and taxes.
- *Systemic Risk Buffer of Common Equity Tier 1*: each member state may introduce a Systemic Risk Buffer of Common Equity Tier 1 for the financial sector or one or more sub-sets of the sector, in order to prevent and mitigate long-term non-cyclical systemic or macro-prudential risks to the economy. From 2015 onwards, and for buffer rates between 3 % and 5 %, the member states setting the buffer will have to notify the Commission, the EBA and the European Systemic Risk Board (ESRB). The Commission will provide an opinion and if this opinion is negative, the member states will have to "comply or explain". Buffer rates above 5 % will need to be authorized by the Commission through an implementing act, taking into account the opinions provided by the ESRB and the EBA.
- *Other systemically important institutions buffer*: CRD IV provides for a buffer on Other Systemically Important Institutions (OSIIs). This includes domestic as well as EU important institutions. So national supervisors, in order to prevent adverse financial impacts, have criteria that can be used to identify OSIIs, a notification/justification procedure and an upper limit to the size of the buffer of 2 % of RWAs.
- *Reliance on credit ratings*: reliance by credit institutions on external credit ratings is reduced to the extent possible by requiring that all banks' investment decisions are based not only on ratings but also on their own internal credit opinion and that banks with a significant number of exposures in a

portfolio develop internal ratings for that portfolio rather than relying on external ratings for the capital requirements estimation.

In the Regulation the main additions are:

- *A Single Rule Book*: a single set of harmonized prudential rules is formed throughout the EU that all banks must respect. This should ensure uniform application of Basel III in all member states. Furthermore, the new rules take away a large number of national options and discretions and allows member states to apply stricter requirements only in cases justified by specific national circumstances, which are deemed necessary on financial stability grounds or due to a bank's specific risk profile.

The Dodd–Frank Wall Street Reform and Consumer Protection Act

The Dodd–Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act) was signed into federal law in July 2010 and has brought about the most significant changes in financial regulation in the USA since the regulatory reform that followed the Great Depression.

The Banking Act of 1933 (Glass-Steagall Act) established the Federal Deposit Insurance Corporation (FDIC) and several regulations, including those preventing deposit taking commercial banks from speculating on stocks. In 1934 the Securities and Exchange Commission (SEC) was created to regulate securities trading. However, the Glass-Steagall Act began to erode in the 1960s and finally the Gramm-Leach-Bliley Act of 1999 was signed, which effectively erased the barrier between commercial and investment banks.

Since then financial innovation in derivatives accelerated while the regulatory status of several of them was uncertain. The Commodity Futures Modernization Act of 2000 allowed most Over The Counter (OTC) derivatives to be unregulated, at least at the contract level, although their dealers were subject to regulations at the firm level. Financial institutions preferred OTC to exchange traded derivatives as they could customize them to fit client needs and they were often more profitable because of lack of competition and price transparency.

After the global financial crisis of 2007 there was a lot of attention on perceived regulatory failures that had not employed the right practices and rules to restrain excessive risk taking. Following the financial crisis, the purpose of the Dodd-Frank Act has been to restructure the financial regulatory system

in order to restore public confidence and to prevent another financial crisis from happening.

The Dodd-Frank Act introduced changes that affect the oversight and supervision of financial institutions, provide for a new resolution procedure for large financial companies, create a new regulatory agency responsible for implementing and enforcing compliance, introduce more stringent regulatory capital requirements, impose changes in the regulation of OTC derivatives, reform the regulation of credit rating agencies, incorporate the Volcker Rule, require registration of advisers to certain private funds, and introduce significant changes in the securitization market.

The Dodd-Frank Act created the Financial Stability Oversight Council (FSOC) to oversee financial institutions. The main purposes of the Council is to: identify risks to US financial stability arising from ongoing activities of large interconnected financial companies; promote market discipline with regards to elimination of expectations of government bailouts; provide an annual report and testimony before Congress regarding financial stability; recommend high standards for non-bank financial companies and large inter-connected bank holding companies supervised by the Federal Reserve; recommend to regulatory agencies new or high standards and safeguards for activities that increase significantly the liquidity, credit or other risks spreading among various institutions; and identify systemically important financial clearing and settlement activities, and require these to be subject to standards established by the Federal Reserve.

Furthermore, it transpired that in the past various government agencies regulating the financial industry with various rules led to some entities either not being regulated at all or with some others subject to less oversight. The Dodd-Frank Act overhauls the existing agency oversight system by creating in addition to the FSOC, the Office of Financial Research within the Treasury to support the FSOC, an independent Bureau of Consumer Financial Protection within the Federal Reserve, the Office of National Insurance within the Treasury and the Office of Credit Rating Agencies within the SEC. Some of the main changes in government agency oversight include that the Federal Reserve will regulate and have all rule making authority on thrift holding companies and their subsidiaries while continuing to regulate state member banks. The SEC will require registration of hedge funds that manage over \$100 million as investment advisers. The SEC will also require registration of municipal financial advisers, swap advisers and investment brokers. Finally, Municipal Securities Rulemaking Board rules are to be enforced by the SEC.

One of the major elements of reform with regards to *securitizations* is that a certain percentage of credit risk (5 %) should be retained by the securitiser.

Risk retention also applies to collateralized debt obligations and similar instruments. The risk retention types and amounts for commercial mortgages are to be determined by regulators. Furthermore, the percentage retained can be lowered based on underwriting standards used and exemptions could be made at the regulators' discretion.

In addition, the credit rating agencies should explain in reports accompanying credit ratings, representations, warranties and enforcement mechanisms available to investors, how they differ from representations, warranties and enforcement mechanisms in similar issuances of debt.

Credit rating agencies must be registered with the SEC and submit reports. There are a number of requirements that credit rating agencies must fulfil, some of which include disclosure of qualitative and quantitative methodologies and assumptions used in ratings, and historical rating performance data over multiple years. The SEC is to promulgate rules separating the rating activities from sales and marketing activities within credit rating agencies. Furthermore, credit rating agencies must submit an annual report to the SEC, including their internal controls report along with a CEO attestation. A SEC Office of Credit Ratings is established and its director reports to the SEC Chairperson. The SEC establishes fines and penalties that can be applied to credit rating agencies, as well as administering SEC rules applicable to them. The SEC will also carry out an annual inspection of each credit rating agency.

The Dodd-Frank Act imposes more stringent regulatory capital requirements on financial institutions. It requires that the Council make recommendations to the Federal Reserve regarding the establishment of heightened prudential standards for risk-based capital, leverage, liquidity and contingent capital.

Title VII of the the Dodd-Frank Act addresses certain perceived flaws in the OTC derivatives markets. The primary goals of Title VII are to minimize systemic risk of derivatives trading and create transparency in derivatives markets. There is a provision for not providing any advance to any swaps entity (i.e. swap dealers and non-bank major swap participants) from any Federal Reserve credit facility that is not part of a broad-based eligibility programme, FDIC insurance or guarantees. This does not apply to insured depository institutions that limit their swap activities to hedging and engaging in swaps involving rates or reference assets that are permissible for investment by national banks (CDS is permissible only if cleared). The prohibition only applies to swaps entered into after the end of the transition period. Furthermore, there are clearing requirements that basically force clearing if the regulator determines that a swap should be cleared and a clearing organization accepts the swap for clearing. Swap dealers and major swap participants

must register and be subject to a regulatory regime that will be defined by rule making. Registration is mandatory with an applicable regulator regardless of whether the entity is registered with another applicable regulator or is a depository institution. The regulators for non-banks and the Federal Bank regulators for banks will set the minimum capital requirements as well as the initial and variation margin requirements for swap dealers and major swap participants.

In January 2010, the Volcker Rule was endorsed. The Volcker Rule was a late addition to the Dodd-Frank legislation. Although the statutory version of the Volcker Rule was passed in July 2010, and banking entities had a general idea of its requirements since then, final rules implementing the Volcker Rule were not adopted until December 2013.

The Volcker Rule generally prohibits, subject to exceptions, banks (this term includes banks, their holding companies, foreign banks treated as bank holding companies and their affiliates) from engaging in proprietary trading and acquiring or retaining ownership interests in, or acting as sponsors to, certain hedge funds and private equity funds. Certain trading and fund activity is permitted, such as underwriting activities, market making related activities and risk-mitigating hedging activities. In addition, the Volcker Rule has special application to Foreign Banking Organizations (FBOs). The Volcker Rule legislation left issues open to regulatory interpretation. The Final Rule is complex in scope and has attracted significant commentary and questions from the banking industry.

The true implications of the Dodd-Frank Act for financial institutions and the financial markets will take some time to be understood. The changes due to legislation and regulation can often manifest themselves in economic conditions sometimes different from those prevailing when the legislation is passed.

What the true effect of the Dodd-Frank Act will be on banking entities, their clients and the financial markets is yet to be seen in the coming years.

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