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Working Paper

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Counterparty Credit Risk Management in Industrial Corporates

Abstract

Ever since the financial crisis of the banking system of 2008 - 2010 the paradigm that deposits or other exposures towards major banks are safe has been fundamentally questioned. This put industrial corporates, who to support their business usually need to manage significant cash holdings or incur counterparty credit risk via derivatives, in the situation to develop or extend their resources for counterparty credit risk management. This paper provides a comprehensive overview over the practical issues into the subject benefitting largely from the findings of an interview series conducted with the respective heads of counterparty and customer credit risk management in the time period April - September 2011 of 25 large european enterprises with a large subset being members of the German DAX Index.

Keywords: Financial Risk Management, Credit Risk, Counterparty Credit Risk, CCR Management, Organisation, Financial Controlling, Financial Institutions

1 Introduction

This paper is the first in a series of three working papers concerning corporate credit risk management. Subsequent papers will be addressing general customer credit risk management and risk mitigation focussing on the credit insurance market.

As a convention we will summarize the function which is in charge of the management of counterparty credit risk towards financial institutions as CCRFI(M). This is a long title and probably longer than necessary with other descriptions being bank management, bank risk management, financial institutions risk management and similars. However in several of these cases other tasks such as bank relationship management or issues of operative cash management sometimes are involved as well, which we will disregard to a great degree, so we believe this to be the precise definition of the function we wish to describe. At the base of this paper lies in addition to the usual literature research an interview series with the credit risk responsables of 25 European (predominantly German) large corporates (90 pc with more than 5 bn EUR Revenue, including more than 12 DAX companies). The interviews covered the ground of general corporate credit risk management. Whilst based on a structured interview guideline, it turned out to be much more natural to concentrate on the overall setup of the CCR function in the company as well as the methods employed in its management and conduct the interview more akin to a general discussion as opposed to keeping strict to the question sequence of a qualitative or quantitative survey. This produces the opportunity of describing quite well the various management models for the CCR function, but comes at a cost of being only to a limited degree able to assert actual percentages of counterparties adhering to hard defined market practices. As confidentiality was also assured, certain caution needs to be exercised with specific information given on market practices which are not commonly shared and which could identify a competitive advantage.

The paper does not only address an exclusively academic audience, but also the professionals currently working in a CCRFI context. For this reason particular attention has been paid not only to the economic theory underpinning this function but to the equally important practical issues (Organizational, IT, Legal, ...) faced in the daily work.

1.1 Definition of CCR in a corporate

In the context of financial institutions CCR is usually faced with three subtypes of overall credit risk - default risk, credit spread risk and downgrade risk. The overwhelming majority of corporates interviewed confirmed that they are only concerned with the actual default risk. Complex credit value adjustments to long running derivative contracts are not widely spread in the corporate world, partially as positions with maturities of 1 years or more are relatively infrequent (except for commodity contexts). Furthermore P & L impact of corporate risks is much more relevant than balance sheet impact, as investment analysts primarily try to understand the drivers of earnings volatility. Thus we will in the subsequent text consider

Company Name	Industry	Exposures 2010	Exposures 2009	Position
BASF	Chemicals	1.5+0.4	1.8+0.3	Cash + Der
Daimler	Automobile	10.9 + 3	9.8 + 3	Cash + Der
E.ON	Energy	6.1	4.2	Cash
Lufthansa	Airline	1 + 4.4	1+ 3.4	Cash + ST Sec
RWE	Energy	2.5 + 7.2	3 10.4	Cash + Der
SAP	Software	3.5	1.9	Cash

Table 1: *Cash, short term securities and derivatives of DAX companies*

the prime task of the CCRFI function to manage default risk stemming from exposures with financial institutions.

1.2 Motivation of research

The significance of the CCRFI function within the corporated is motivated by three factors:

1. the absolute volume managed
2. the economic risk incurred to the position
3. the significance of this risk to the overall wellbeing of the company.

We start by illustrating the size of the positions managed by this function using some examples of German DAX and other international corporates¹ in table 1 using data from the published annual reports of 2010. Large European corporates hold different size cash deposits depending on their corporate strategy and risk management policy, and more specifically their financing and liquidity strategy. In particular corporates subject to unpredictable shocks such as the airline industry usually hold significant cash holdings, but also the energy, car and chemical industry in Germany maintain sizable positions. Whilst short-term FX hedging is unlikely to result in major derivative exposure, long term FX/IR hedges as well as commodity hedging or indeed active trading (energy companies) can also contribute to significant counterparty exposures. In other industries, in particular retail or significantly indebted corporations, only very limited cash holdings are operated, depending on credit lines for liquidity.

The economic risk incurred to the position is when looked at over longer periods of time principle remarkably low (cf. following paragraph), with all financial institutions being subjected to both national regulation including capital adequacy requirements, and the history of failures of large and semi-large financial institutions with losses to depositors being so far at best anecdotal of nature, and the function mostly being associated with cash management restricting exposure to local banks with limited critical size and transparency in 2nd and 3rd world countries.

The key factor for the relevance of this function comes when putting it in context to the overall corporate risk management, observing that the risks of losing cash materialize most likely in precisely the worst moments to do so, in the midst of a financial crisis such as recently witnessed.

¹Cash = cash and cash equivalents, Der = Positive market values of derivatives, ST Sec = short term securities

And thus several interviewees described CCRFIM historically perceived to be a function in which not much can be gained by genuinely creating value for the company (certainly in a year-on-year manner), but in which a small set of bad decisions can destroy significant value. Put as a business case, the decision is to invest an annual 200-500 TEUR² vs. the hope to avoid or mitigate that 100- 500 mn EUR loss in the occurrence of a (very unlikely) crisis potentially occurring if no risk mitigation measures had been undertaken.

The perception of such a crisis being beyond standard economic reality shifted slightly with the Bear Stearns fire sale to JP Morgan in March 2008 and completely changed overnight with the 15th September 2008. Slogans such as 'Return-of-Investment instead of Return-on-Investment' became standard vocabulary of corporate treasurers. German DAX companies were also subjects to losses from the Lehman Brothers insolvency³. The case of the KfW 300 mn EUR transaction with Lehman⁴ due to a miscommunication in cash management was widely discussed in Treasury circles. Internal reflections on whether internal processes had been or would have been capable of avoiding a similar scenario were undertaken in corporate treasuries, with few counterparts confirming the effective exclusion of an analogous scenario at the time.

The focus switched at that point from a general monitoring of the traditionally large number of small institutions used in cash management in developing countries to avoiding a large single loss at one of the key counterparties. In several cases an acceptance of a loss of a limited amount from a bank insolvency in a development country was now explicitly stated, with the preservation and availability of strategic liquidity being at the focus of CCRFI. Overall risk aversion increased significantly with the demise of rates offered on wholesale deposits and similar transactions. As the Euribor entered a corridor of 1 - 2 % p.a. and is likely to be kept in there by the availability of cheap liquidity from the ECB and FED, the weight of risk associated with these transaction has gotten much higher than the weight of return considered when making investment decisions.

In addition to the relevance of the CCRFI function to overall company wellbeing, considerations of the potential impact of an even hypothetical event of significant and avoidable cash losses on the medium term job security of corporate officers (CFO, Head of Finance, Corporate treasurer) can also be taken as strongly supportive incentivisation for the allocation of sufficient resources to the CCRFI function. To conclude it can be said certainly since Lehman if not before that the CCRFI function enjoys a significant visibility with senior financial management of corporate industrials and the continual improvement of employed risk methodology is thus a subject worthy of research.

²Total cost in corporate group, assuming base salary of 50 - 100 TEUR, a total corporate cost factor of 1.5 - 2, as well as additional system and interfacing costs, data reporting costs in subsidiaries (time expenditure in backoffice) and external data packages, ...

³According to the Sueddeutsche, amongst others Volkswagen had an exposure of 152 mn EUR, Siemens 95 mn EUR and E.ON 43 mn EUR, with Lufthansa, RWE, Telekom, Post, Linde and BMW following with significantly smaller exposures <http://www.sueddeutsche.de/wirtschaft/schaden-in-milliardenhoehe-dax-elite-im-lehman-strudel-1.139645>

⁴<http://www.faz.net/artikel/C31151/320-millionen-fuer-lehman-die-beruehmteste-ueberweisung-30021188.html>

2 Organisation of CCRFI

The overwhelming majority of interview partners confirmed as suspected to have the CCRFI function situated as part of the overall global treasury function. In case of the existence of a quantitatively driven and sufficiently staffed general corporate risk management function the CCRFI measurement part or indeed both measurement and management would be placed in this context. The individual potential tasks to be performed by the CCRFI function are as follows:

1. Risk Measurement : Exposure measurement on group level
2. Back office : Limit compliance of trading units and other subsidiaries
3. Limit management : Central coordination of Limits and distribution to different limit recipients within corporate family (cf. section 7.2)
4. Limit management : Limit appraisals and decision support for senior management
5. Limit management : Limit decisions up to predefined limit depending on degree of delegated governance
6. Risk Measurement : Credit Data procurement and generation
7. Methodology : Guideline writing and negotiation (depending on the composition of corporate guidelines, the CCRFI function usually impacts the cash / investment management policy, derivatives policy, the general credit policy)
8. Optional: IT Governance : Formulation of requirements for exposure calculations and reporting standards in systems
9. Optional: Bank Relationship Management: Data aggregation across the corporate

2.1 Corporate Treasury

Corporate Treasury usually involves the functions Financing, Asset Management, Trading and Cash management⁵. It generally encompasses both global governance tasks as well as operative tasks both on a group as well as regional level⁶. The management of relationships with the banks is usually also centrally coordinated by corporate treasury. An alternative organizational structure chosen in particular within the smaller treasury departments is that of a front and backoffice with the middle office tasks being split in between the two.

⁵A general reference on getting a good practical overview of Treasury management is [Steitz and Seethaler \(2007\)](#)

⁶This paper is written from a perspective of Europe-based multinationals. Where these corporates have significant dealings in other regions such as NAFTA or APAC, the European treasury HQ usually not only exercised the governance but also took care of European i.e. regional tasks at hand

2.2 Financial Controlling

In some corporates a share of the tasks usually concentrated in corporate treasury are split off and bundled with some of the tasks usually associated more with the general controlling function. In particular the operative and financial planning processes are more integrated as well as greater control over the reporting systems is exercised. Financial risk management with its strong reliance on the reporting systems as well as integration into planning processes can then be allocated in this department.

2.3 Function resources

Where insight into staffing and resourcing was granted, the following practices seemed to be standard (with exceptions existing in some cases due to business model specifics).

- If liquid assets (non-trapped cash, marketable securities) or derivative exposures in excess of 2 bn EUR were held this usually involved the allocation of one FTE to the function CCRFI. In addition another half FTE was required to support, with vacation substitution and IT support being the two roles quoted. Some degree of delegated governance and reporting duties to regional treasury functions or trading entities also involved about 10-25 pc FTE at each of these locations. The preparedness to pay for extra data services (beyond the Bloomberg / Reuters terminal standard in corporate treasuries) varied greatly, however some degree usually was there if a true value added to the terminal could be argued. Detailed coverage of news and a continuous enhancement of methodology are expected in addition to the daily operative work.
- In case of liquid assets and derivative exposures between 2 bn EUR and 500 mn EUR usually a 50 pc FTE is allocated. Focus here usually is the coverage of the main positions and an effective and lean risk management, with little scope for RM projects and developing capabilities.
- In case of exposure of less than 500 mn EUR only in rare cases significant FTE time was allocated. If this was the case, it was usually in the context of a well-developed overall enterprise risk or financial risk management function.

This however only concerns the analyst level and financial resources allocated to the function. Most companies had established a reporting with regular meetings (biweekly up to monthly, the frequency usually not formally set but more determined by the stress level on the capital markets and implied perceived risk to the portfolio), at which developments were discussed with management and the trading function as well as the strategy for exposure management for the subsequent time period formulated. Likewise several interview counterparts reported a significant and continual interest in the matter by senior management on board level ever since the Lehman failure, in this case both necessitating as well as justifying also a slight increase in resource allocation either as project base to improve reporting infrastructure or as continual resource to extend overall function capabilities from the traditional limit compliance and coordination to a proactive risk management role with enhanced analysis and reporting

competencies. What however differed was the involvement of senior management in the meetings, with some companies emphasising the specific involvement of e.g. the head treasurer and others emphasising the working nature keeping meeting attendants normally as the affected team heads and analysts and only forwarding protocols where deemed worthy of notice.

The major issue of resource allocation is the volatility of the work at hand in such a function. One interviewee described it such: 'For 90 % of the annual time you are just reading the newspaper, issuing the weekly or monthly reports and maybe running an IT project in the Treasury or similar. Workload on the whole is comfortable and you get cross-functional assignments to help colleagues. Then the markets get a cold and suddenly you are one of the three most 'popular' people in the department, trying to keep yourself informed, writing memos to and for anyone and everyone, reducing and reallocating limits and praying nothing goes wrong in a major way - in short you have sufficient work to keep 3 people busy. But then - after a few weeks or months, the buzz goes off and things look pretty normal again.' The key issue here however is that value added of the function is generated practically only in those weeks or months of distress, and a structural understaffing can substantially endanger that. To use a metaphor - the quality of a yacht is tested not while sunbathing on the deck enjoying a slight breeze, but when the breeze turns into an unexpected unpleasant storm and one is making for the harbour. On the other hand a not uncommon view held by interviewees was that financial crises like the 2008 Lehman debacle were expected to reoccur - in different shapes - now with increasing frequency and regularity, and the value of a continual monitoring and the in that process achieved acquaintance with the key figures, indicators and functioning of the banking system was very much perceived and appreciated.

Two key learnings can be deduced:

- The good times should be used to prepare for the bad ones in particular with a focus on efficiency and reliability of information processes.
- The function should be set in an organizational context ideally close to another in crisis times non-critical function with suitably competent personel to be available with short notice hitting the ground running.

3 IT foundation for CCRFI

3.1 Overview over the CCRFI Datamodel

The foundational criterion to running a successful CCRFI function was consistently confirmed to be effective data management, both by interview partners who were in the fortunate position to have in the past undertaken efforts to establish that as well as by interview partners who described this to be the major task at hand for the coming months or years. Thus in the process of examining the issues of CCRFI we will follow the items of the data model relatively closely, and only in the final part turn to the

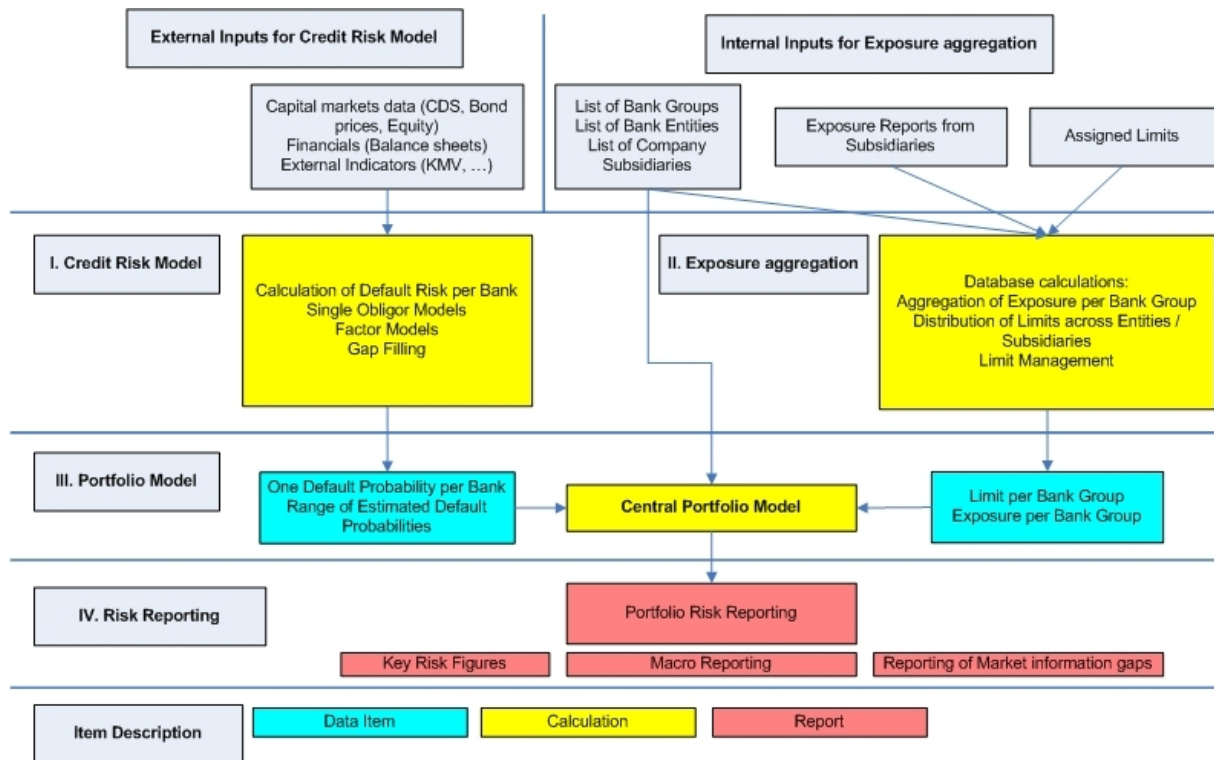


Figure 1: CCRFI Datamodel

resulting risk management issues. As can be seen in the figure 1, three major tasks are undertaken to produce the databasis required for a state of the art risk management.

1. Exposure aggregation: This task involves the collection of all (significant) exposure data across the corporate group and then aggregating the data both on entity as well as counterparty group level
2. Credit assessment: This task entails the choice of suitable data sources on which to base the credit assessment process, collecting that data in an efficient (cost of process) and speedy (time difference of publication at source level and integration in information system) manner and then aggregating it to reach either via calculations to reach automatic PD estimates per counterparty or to provide a database for an analyst to use the data in making a credit assessment resulting in a PD estimate.
3. Calculation of risk position: This task involves the matching of credit assessments with aggregated exposures to generate both counterparty individual risk assessments as well as the calculation of the overall portfolio risk position and risk statistics according to a credit portfolio model deemed suitable.

4 Exposure aggregation

The ERP and financial IT system strategy is the foundation of any effective exposure collection and aggregation concept. Not all interview partners gave details regarding their exact IT system setup. Of

those that did, the majority were on some type of SAP system in their treasury⁷. Other system providers were Sungard Data Systems (with Quantum and Adaptiv) and Wallstreet Systems (With Trema and Wallstreet Suite). The energy companies interviewed mostly used the credit functionality of the trading system operated by their trading subsidiaries as well as additional systems. However a legacy 'MS Excel/Access suite' or the setup of management of counterparty risks in other legacy systems mainly designed for a different purpose (such as general accounting or trading) were also mentioned. One key factor mentioned was the overall IT 'diversity' of the financial and operational functions. Whilst most companies (but not all) either voiced the desire for or their satisfaction having achieved one unified global financial system, only few had actually achieved such a state. Those that did usually had 1. a reasonably simple corporate structure (at least for the significant financial functions) with a strong regional focus 2. no major history of major mergers and acquisitions, 3. only standard treasury operations and 4. a strong governance function either exercised by the central finance or central IT enforcing the structure. On the contrary complexity driving factors included items such as:

1. Non-standard treasury operations which can only be partially entered into the (potentially not entirely up to date) treasury system or where the valuation needs to be done outside the treasury system: Examples include commodity or exotic derivatives, complex financing structures with significant tax components. In particular physically settled commodity derivatives until recently were not part of treasury system packages.
2. a decentralized corporate IT policy - either by different parts of the business (where substantially different corporate divisions were not only in control of their own business but also finance function, this on occasion being the result of large mergers⁸) or by regional functions (e.g. split into time zone regions such as EMEA, NAFTA and APAC).
3. Integration model of Corporate Treasury : Only few corporates run on a single truly global ERP system, with most companies operating on a mix of different ERP systems (not necessarily of different vendors). The reasons for this can be manifold - e.g. in the chemical industry vastly different complexities are necessary in the customizing of ERP systems capable of capturing the full production and logistics process at production units vs. only capturing import, storage and sales processes for sales units.

4.1 Exposure Data

(Canabarro and Duffie, 2004, p.122) define counterparty exposure to be 'the larger of zero and the market value of the portfolio of derivative positions with a counterparty that would be lost if the counterparty were to default and there were zero recovery.' All interview partner, where an exact exposure definition

⁷The range of the version used however differed significantly, some corporates still operating on the old version 4.6B with others ensuring continuous updating and keeping abreast of all developments

⁸The generally quoted exclusion to this is the Linde Group, where the BOC Treasury including all systems had been effectively dissolved only 6 months after the acquisition- cf. presentation by Wehlen at the SLG Forum 2007

was given, included cash deposits and positive current market values of derivatives as part of their exposure definition, taking an interpretation of this in literature usually defined as 'current exposure value'. Critical points which usually also incited discussions in the interview, was the decision for or against the inclusion of the following items:

- Mitigating netting effects of derivatives with negative market values: Whilst ISDA contracts specifically intend this possibility, several issues remain. One item are complexities regarding the legal structure both of the corporate in question as well as the financial institution which is the counterparty to a set of transactions. ISDA contracts and their credit annexes are almost exclusively bilateral entity-to-entity contracts. Most corporates however aggregate the exposure with the counterparty to the level of the corporate family. Only two interview partners specifically emphasised risk management (and limit assignment) at the individual counterparty legal entity, with a differentiated view of credit quality at different levels in the counterparty's legal structure. Several interview partner also voiced concerns regarding the effectiveness of the credit annexes (cf. section on risk management). Thus on the whole netting effects were usually excluded both due to monitoring complexity as well as questions of legal effectiveness.
- Daily incoming cash at settlement banks: This risk addresses both the traditional Herstatt Risk when collection banks or settlement banks for commercial paper, security or FX transactions are concerned as well as the general cash management banks where customers and other classical counterparties pay their dues to the corporate. Whilst it is seen that even in a financial crisis the payment system would be under special protection of the national institutions, corporate treasurers are aware that this is fundamentally just an assumption as any other one regarding systemic support for a bank group. In most cases this was not considered within actual exposure calculations, however born in mind when allocating limits in order to avoid major concentrations.
- Positions taken by pension funds: Due to public regulation, the administration and risk management strategy of the pension fund usually is operated at some distance to the corporate functions. On the other hand, with most pension funds having defined benefit liabilities (with the corporate ultimately still guaranteeing for the meeting of all liabilities) vs. the now more popular defined contribution liabilities (where the corporate only has to prove to have made contributions sufficient to meet the liabilities existent at a point in time, but is no longer responsible for the actual investment value of the vehicle), corporate treasury functions are quite aware that any major financial losses incurred by the pension fund may ultimately backfire on the corporate, and thus need to be still monitored as part of the CCRFI function.
- Physical deposits at financial institutions: in particular in the precious metal trading, but also in other commodity classes such as agricultural products where storage close to the major trading centres is essential, industrial corporates rely on the storage services provided by the investment banks and commodity exchanges. Whilst the deposit contracts in theory allow a separation of

deposited items of third parties from property of the financial institution, interview partners voiced concerns of whether in the actual case of an unorderly insolvency the legal right to withdraw the deposited physical items would be effective. Of similar category, however much smaller time periods of being active, are collection /trustee accounts for payment agents in bond emissions.

- Inclusion of money market funds: The opinions on the treatment of money market funds differ quite widely. It is accepted that the monitoring of positions in mandated money market funds is quite difficult in operational terms (i.e. getting position data from the managers). Whether money market funds serve as perfect diversification is questioned both within academia (cf. Pan (2008)) as well as by several interview partners, but the overall diversification effect is beyond doubt. Most corporates with significant strategic liquidity reserves confirmed the use of money market funds to avoid major single name exposure concentrations.
- Potential Future Exposures are in our view just that, and thus should in principle be kept separate in the reporting (cf. section 4.3 for treatment of PFE)

In addition IT restrictions were sometimes also hindering an effective exposure reporting. Exposure sources can be varied, and an altogether decentral and diversified Treasury and ERP system landscape lead to a variety of different automatic, semi-automatic and manual reporting lines. The general practice is that by utilizing the traditional quarterly financial reporting figures it is intended to have exposure figures being updated at least every three month.

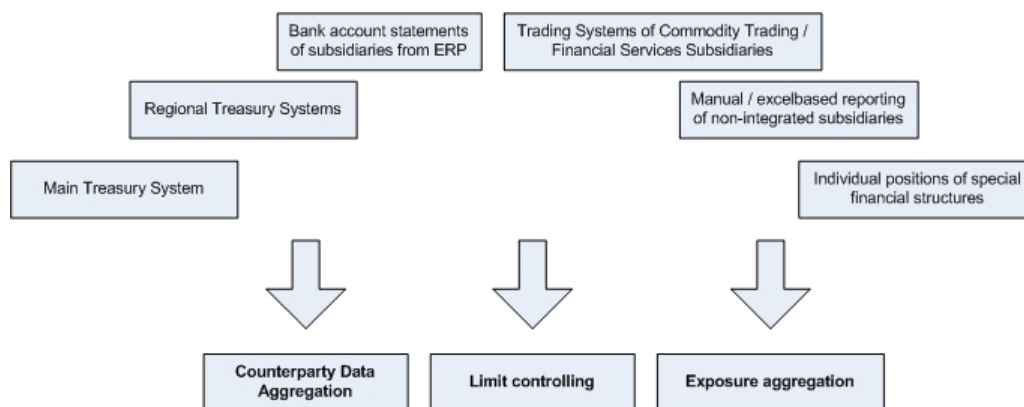


Figure 2: Exposure collection

Up to four categories of exposure measurement are usually utilized in the limit and exposure reporting:

1. Reported and included in exposure and subject to limit decisions
2. Reported and included in exposure, but not subject to central limit decisions
3. Reported for information only to complement limit and exposure reporting
4. Not reported, either due to immateriality or due to IT complexity

4.2 Masterdata Exposure section

In order to meaningfully aggregate the various exposures one needs to maintain records regarding both the individual legal entities with whom the corporate treasury, the trading units and the various subsidiaries are dealing with as well as maintaining an overview of the corporate structures into which these counterparties are integrated. Usually in view to a potentially later intended integration various policies regarding the naming of counterparties are usually informally used by the IT experts. Where this was discussed in interviews the SWIFT Corporate groups (the first 4 letters) were generally used somewhere in coding counterparty codes in treasury or trading systems. Problematic generally is agreeing on naming conventions in a mixed context of corporate and financial institution entities in one trading system, as happens usually in commodity trading systems. Thinking however at an early stage (usually a system migration offers itself as a natural point to rethink naming conventions) about these issues and reaching a corporate wide naming policy (both for corporates as well as financial institutions) can however reap great rewards later.

Several companies are providing counterparty master data for financial institutions. The level of detail required however is usually significantly different than e.g. the master data required for cash management purpose. Usually to connect market data from various sources a table with master data keys of the various systems needs to be maintained. This data needs not only be maintained per corporate family, but if differentiation is applied between different legal entities within a corporate family, then individual master data needs to be maintained there.

The second item of master data are the parent - subsidiary relationships. These can be automatically managed (e.g. by utilizing cash management information such as that supplied by the Vendor Accuity with a few algorithms to matchmake name strings or field combinations) or manually managed. Given the importance of correct configuration of parent-subsidiary relationships for accurate exposure aggregation a certain manual configuration and quality checking process cannot be avoided. Usually only two-tier data structures (parent - subsidiary) are maintained, although some interview partner acknowledged the potential to configure 3 levels or more. In addition to the subsidiary ownership reports usually supplied with annual financial reports of the respective banks⁹ also professional vendors for this information exist. Of particular popularity is the vendor Bankers Almanac¹⁰ which offers various products. Whilst the general financial database product is relatively new, and the reliability of both financial data as well as ratings is perceived as sceptical amongst the interview partners, given the relatively moderate pricing and good accessibility the website product still enjoys relatively widespread popularity as a source for parent-subsidiary relationship data maintenance. It should be noted that parent-subsidiary relationship information usually needs to be entered and maintained in every system used for back office functionality (limit compliance) for a trading unit, not just at the central coordination function. Having a central database maintaining a single point of truth with the possibility to issue reports concerning changes in

⁹Anteilsbesitzliste

¹⁰www.bankersalmanac.com

counterparty groups to trading units situated in subsidiaries can save time and immensely help with data consistency in an industrial corporate with separate treasury or commodity trading operations.

4.3 Exposure volatility and scenarios

In addition to establishing an efficient process, a simplified scenario / stress testing overview of the exposures in the corporation should be established. Whilst amongst the interviewees in particular the energy companies and the commodity traders had already developed or were developing sophisticated PFE (potential future exposure) concepts to include stressed exposures in their exposure reporting, the other interviewees had not yet seen a business necessity to do so.

In practice however it is important to have a rough awareness of how volatile the exposure of positions both pre- and post contract conclusion can be:

- Term deposits: the trader here is in control, a (domestic currency) term deposit will not change significantly in value during the time of its investment, even in case of substantial interest rate changes. On the other hand limits available for depositing may be fully loaded from one day to the other unless size restrictions on transactions are in place ¹¹.
- Short-term derivatives (FX, short-term commodity trades) : usually the value of a contract at time of contract start is zero or close to zero. Short term changes in the underlying exchange rate or the commodity price can lead to rising exposure. Assuming continuous FX trading¹² and given the short maturity and a certain buffer in the limit this in most cases is not critical, as new deals with zero market values replace old deals with potentially positive market values.
- Long-term positions (interest rate derivatives, long term commodity trading - both derivatives as well as physical deposit positions): long-term derivatives or physical deposits are usually not trading positions but positions to be maintained over a long term, such as hedges for a financing instrument, or buy side natural gas derivatives to hedge long-ranging customer contracts. Structural market price shifts will change the exposure incurred by these positions until their (potentially quite distant) maturity.

The possibility of contracts changing in exposure outside the control of the trader or the risk manager lead rise to the concept of potential future exposure (PFE). (Canabarro and Duffie, 2004, p.122) define PFE as 'the maximum amount of exposure expected to occur on a future date with a high degree of statistical confidence'¹³.

¹¹Whereas the risk manager might prefer some degree of diversification, the trader responsible for placing the deposit is usually incentivised to optimise return with the constraint of keeping to assigned limits. Thus he will traditionally - unless specifically to do otherwise -load up the available limits starting with the counterparty offering the best conditions. Aggravating this is that also banks slightly improve conditions for larger single-transaction deposit volumes

¹²Meaning that there is a steady rate of transaction being concluded

¹³'For example, the 95 % PFE is the level of potential exposure that is exceeded with only 5 % probability'. They continue defining a curve of PFE(t) varying over time

We believe that PFEs should be monitored and reported separately from actual current exposures, and should not lead to a 1-1 utilization of limits. A building up of PFEs with particular counterparties might induce the CCR analyst to start blocking some further limit with that counterparty, or contact the relevant traders encouraging them to temporarily exclude the counterparty from new business. But a direct 1-1 inclusion of PFEs in the exposure reporting might trigger limit breaches without or with comparatively small current exposure existent. Especially in combination of automatic triggering of messages or regular exposure reports being sent to middle and higher management this can lead to an undermining of the entire issue of limit compliance if PFEs are officially treated as exposure contribution but implicitly only as 2nd tier to current exposures (cf. section 7.4).

An analysis of the position volatility should also look at special events in the past or potential plausible scenarios and how they might change a potential exposure profile:

- Increasing the strategic liquidity in anticipation of economically challenging times.
- Emission of a bond and temporary extension of liquidity until actual funds are needed for investment projects
- Cash collection for payment of dividend
- M&A scenario
- Market price shifts: USD/EUR rate, interest rate (+-100 bp), oil/gas price +-10/20 USD

This data provides a valuable information basis both for in the formulation of a CCR management guideline as well as the general limit allocation process.

5 The credit assessment process

The credit assessment process is designed to assign an internal rating or equivalently a PD estimate to every counterparty the corporate has business with in order to facilitate limit setting. This can be done via a mix of various methods (both quantitative/statistical as well as qualitative) based on a variety of different data sources. After a minor digression on preparing counterparty master data for the credit assessment process, thus continuing the thread from section 4.2, we will start with the more anecdotal overview of the major cases of bank failure, then give an extensive overview of commercial data sources and single-obligor and macro-economic indicators from which the CCRFI function can choose from to base the credit assessment on. Then we continue to the model based rating assessments finishing with qualitative adjustments and general gap filling.

5.1 Counterparty Master Data

The first step of the credit assessment process is establishing which counterparties exist to be rated. Outside the situation of starting a new company a project to set up a CCRFI function or to enhance it one can assume that in the environment of an industrial corporate a wealth of different business relations with financial institutions exist. The best start is an overview of all exposures existing and (major) bank accounts held. We have described the need for maintaining a master table for parent-subsidiary relationships in section 4.2. The general practice is then to first decide which categories of partners are to exist. If the task of bank relationship management is not coinciding with the CCRFI function, then their input should be sought and ideally a uniform categorisation be reached. Categorization criteria can include size (total assets), selection of the bank as a core-bank within a bank relationship management framework, issuer rating by a particular rating agency, degree of global and regional coverage, number and average exposure of business transactions and other items.

Important at this stage is the decision which financial institutions will be monitored as corporate groups to which group limits will apply, and the decision which entity will serve as the main counterparty. The first part is easy as it is generally clear which corporate groups exist (i.e. a subset of the top 100 largest banks, with whom dealings exist) versus the financial institutions which are only active in a particular country. The second part is much more significant, as different legal entities within a corporate group can have very different credit qualities. On the other hand performing separate credit assessments for different entities within a corporate group and monitoring relevant developments means a high and often both manual effort for somewhat errorprone results. Thus standard practice for most CCRFI functions in corporate industrials was the choice of one key counterparty per corporate group. Whilst within Europe via guarantees and other regulatory requirements the connections between parents and their subsidiaries are quite tight ¹⁴, this does not hold in particular for the American financial institutions with their corporate structure often involving a holding as well as a banking corporation ¹⁵. In these cases an exposure concentration analysis should be performed to define the key counterparty serving as representative corporate group parent. In case of wide divergence of ratings within a single corporate group the building of subgroups can be advised ¹⁶ with separate limits distributed and reported accordingly.

Once a set of corporate groups with their chosen representatives entities as well as the complementary set of counterparties not contained within the major corporate groups has been defined, it is possible to setup the master key table recording the various data keys of data sources chosen to utilize in the data selection process. Whilst this can be extended as needed it is our recommendation to design a single source of truth table to manage this data within the corporate ¹⁷. Whilst most companies probably will

¹⁴A good indication is the consistency in public ratings of corporate families of European banks

¹⁵Standard examples are the Bank of America, with BofA Corp (and thus also Countrywide and Merrill Lynch) being rated (A, Baa1, A+) vs. BofA N.A (A+, A2, A+) or Citigroup (A, A3, A+) vs. Citibank N.A. (A, A1, A+) as of 1st Oct 2011.

¹⁶Such as Bank of America Corp and covered subsidiaries (Baa1), Bank of America N.A. and guaranteed subsidiaries (A2), and development country based subsidiaries (limited by country ceiling at Ba1 or below)

¹⁷Adding dates for each item when last entered, modified or verified can also aid ongoing master data maintenance

start with an Excel sheet containing the Bloomberg IDs or Reuters IDs to download current ratings and CDS into Excel we add a few items which might be also included in preparation to extending the data integration facilities.

1. Bloomberg IDs and Equity IDs / Reuters IDs: Whilst Bloomberg IDs are quoted by many as being the best available - indeed several corporates base risk management applications on Data procured from the Bloomberg Terminal
2. CDS Tickers (CMA, MarkIt and Fitch being the most prominent ones). Markit operates the RED database which serves as main reference database in the industry.
3. CUSIPs, ISINs or other type of Bond IDs where available
4. Org Codes assigned by credit rating agencies for use with their data delivery products

Having discussed the preparation of the credit assessment processes, in particular the selection of the set of counterparties to be assessed, we now turn to the task of credit assessment itself and the data available suitable for supporting credit assessment, starting with an anecdotal overview of the historic evidence.

5.2 History of Bank Failures affecting the European markets and their analysis

Failures of financial institutions are far less frequent than failures of industrial corporates, due to the stricter regulation and the contagious nature of a bank run and the subsequent willingness both of national institutions as well as other banks to prevent it in order to prevent its spilling over onto other market participants. Conceptualising a financial institutions counterparty risk management strategy it helps however to have studied the causes of previous bank failures and the lessons learned from it. (Heffernan, 2004, p.351) devotes an entire chapter to the issues surrounding bank failures. Whilst in the European history insolvencies of banks have been only very infrequent, their occurrence does play a prominent role in the national German and European financial history. We will concentrate here on the cases of major banks with (potential) effects on corporates and not so much on the crises involving the failures of a number of small institutes (thus e.g. cutting out such classic cases such as the US Thrifts institutions or the Argentinian or Mexican crises).

The first prominent case is the demise of the Danat bank in 1931, where the insolvency including fraud of balance sheets of a large German corporate (Nordwolle) left the institute significantly undercapitalised. When this happened on the background of a recent banking crisis in Austria earlier that year and unwilling cooperation of the large corporate banks in Germany, as well as a national bank restricted in its actions by the still active reparations treaties following WWI (Young Plan) it arguably triggered a new wave in continental Europe of the Great Depression originating in 1929. The lessons learned from this case were formulated by a banking commission in 1933 resulting in a revised financial regulatory framework (Reichsgesetz über das Kreditwesen, 5. Dec 1934), including a stronger monitoring and reporting of concentration risk.

The German Bank Herstatt failed after rogue trading in FX markets lead to about 450 - 500 mn DM losses. After the bail-out plan proposed by German Bank Supervisory Authorities and the Gerling Insurance company is rejected by the three major german banking groups, the officials order the closure of the bank. It is now in hindsight seen as evidenced (82 pc recovery rate, even higher for private depositor) that the closure of the bank was unnecessary but welcomed by the corporate banks due to prospects of taking over the good corporate banking operations in the region. Due to good communication the Chase Manhattan Bank manages to freeze US deposits of the bank and thus avoid losses, whilst other US Banks have their receivables drawn into the legal proceedings of the insolvency. Lessons learned included the formation of the deposit guarantee fund in Germany (Einlagensicherungsfonds) two years later as well as the assigning of increased power and responsibilities to the financial supervisory authorities (BaFin). The Bank of Credit and Commerce International is fully described in (Heffernan, 2004, p.377), but interesting for two reasons. The first being the relatively long time of bad press documented (systematic accounts of money laundering documented since 1987) and the second the globally uncoordinated closure of the bank leading to bank runs and thus those with information being better of than those without.

The Lehman crisis (and in part including also the Bear Stearns forced sale to JP Morgan) is different as it occurred as part of a global financial crisis, and detailed analyses have been written and are being written. Key items noted in its demise (both in newspapers as well as by interviewpartners) were the hovering of the CDS for a significant time around the 300 bp mark, the high gearing (30-60 depending which point in time is chosen), the creative accounting (the repo 105 transaction) as well as substantial market rumours on the sustainability of the business model and the risk involved (cf. David Einhorn's publications in GARP magazine). Finally a lack of government support and limited perception of the systemic significance of the bank leading to the decision of the US Government to let Lehman file for Chapter 11 rather than to offer more incentive for another bank to merge with it is also important to bear in mind when considering the context of Lehman's failure.

In addition to the above anecdotal data several econometric studies usually involving logit models have been performed to study the factors for bank failures. (Heffernan, 2004, p.406) summarizes them. The key point to note however that most of them (except Heffernan (2003)) are performed on the US market involving data from 1970 - 1990 and thus are likely to comprise the failing behaviour of small or regional banks and not the potential failures of large financial institutions, for which only case study data is really available due to their relative scarceness.

Heffernan confirms the (intuitively clear) significance of falling profitability, capital adequacy and liquidity and rising loan losses, as well as the significance of inflation, exchange rate and GDP growth rates. We will discuss these items in the section on risk indicators. Summarizing it can be said that unlike for the general corporate credit assessment, for which a whole range of large and medium-scale

insolvencies is available to study case-by-case or with statistical methods, the potential lessons to be learned from the past until Lehman 2008 are rather short in supply.

5.3 Ratings

One of the key data when judging the credit quality of a financial counterparty is the rating provided by one of the three major rating agencies. (Standard & Poor's, 2010, p.3) define that 'Credit ratings are opinions about credit risk. Standard & Poor's ratings express the agency's opinion about the ability and willingness of an issuer, such as a corporation or state or city government, to meet its financial obligations in full and on time'. Additionally (Standard & Poor's, 2010, 4) also point out, that their 'ratings opinions are not intended as guarantees of credit quality or as exact measures of the probability that a particular issuer or particular debt issue will default. Instead, ratings express relative opinions about the creditworthiness of an issuer or credit quality of an individual debt issue, from strongest to weakest, within a universe of credit risk.'. Likewise 'Moody's ratings should change only when *relative* fundamental creditworthiness changes.'((Cantor and Mann, 2003, p.3). The emphasis of the relative nature implies in particular that whilst a mapping of Ratings to PDs using historical default tables / rating migration matrices is tacitly encouraged by their demonstrated stability in the Default Studies (such as Emery et al. (2010) and Vazza et al. (2010)), the rating definitions formally discourage its use as PD equivalents, in particular in times trouble¹⁸. However it might be pointed out that this relative characteristic might also be the very attribute corporate treasurers would be interested in, having to deal with an externally determined amount of cash and having to find a least-risk (vs. a no-risk) strategy to deposit it (cf. section 7.2).

According to Handelsblatt research the market shares are 40pc for each S&P and Moody's with a further 15 pc held by Fitch.¹⁹ These figures also take into account ratings of structured finance issues and the whole corporate universe. Focussing just on financial institutions, the overall perception is that they are all equally covered by the three rating agencies. A detailed discussion of the differences in methodology would be a separate item of research, but based on the interviews and anecdotal evidence the following observations are offered:

1. Moody's is chosen as reference rating typically for its transparency between the bank's own strength and a very thorough analysis of potential systemic support, to which it allocates a higher weight than the other two institutions.

¹⁸cf. (Cantor and Mann, 2003, p.7): 'The combination of Moodys through-the-cycle rating approach and the long-term stability of the economy implies that future long-horizon expected loss rates are likely to be similar to historical loss rates for specific rating categories' and 'Some investors, however, are very concerned with the expected default rates associated with corporate ratings over short horizons, particularly in the high-yield sector. To meet these investors' needs, Moody's provides a model-based, monthly forecast of the one-year-ahead speculative-grade default rate. This model, and models like it, can be used by investors to translate Moody's relative rating system into a cardinal rating system.'

¹⁹<http://www.handelsblatt.com/unternehmen/handel-dienstleister/die-maechtigen-ratingagenturen-im-ueberblick/4404776.html>

Product	Agency	Delivery	Ratings	Opinions	Portfolio	Downloads	Analytics
Ratings Interactive	Moody's	Website	Yes	No	No	Yes	No
Electronic Opinion Services	Moody's	Website	Yes	Yes	Yes	No	No
Rating Feed	Moody's	FTP	Yes	No	No	Yes	No
Global Credit Portal	S&P	Website	Yes	Yes	Yes	Yes	No
RatingsXpress	S&P	FTP	Yes	No	No	Yes	No
Fitch Research	Fitch	Website	Yes	Yes	Yes	No	No
Integrated Data Service	Fitch	FTP	Yes	No	No	Yes	No

Table 2: Products by Advisories of Rating Agencies

2. Standard & Poor's has the reputation of being the strictest of the three agencies when it comes to financial institutions and sovereigns
3. Fitch's reputation is based on its perceived focus specialising on financial institutions (both banks and insurances). Indeed its ratings are often supplied by financial institutions as supplementary information to one of the larger agencies ratings.

Having decided which methodology is perceived as preferable or suitable for use to supplement an internal credit process, the second task in deciding on a potential data vendor is to verify the coverage of the counterparties. For this purpose the list of current and potentially active counterparties compiled above should be compared to a list of entities currently rated by the agencies²⁰.

As mentioned before it is at this point particular important to pay attention to which legal entity is the effective parent company. Whereas in Europe the ultimate parent is usually also the main transaction partner (last but not least by ubiquitous profit-and-loss transfer agreements between the parent and the relevant subsidiary leading to an almost unlimited guarantee) in the United States the existence of (unregulated or less regulated) holding structures leads to significantly different rated holding and bank entities.

Once preferred methodology and coverage has been established, also the service requested (and the budget available) for procuring rating services needs to be established. To aid with this process, we have provided an overview of the most common data products available in this context in Table 2: Opinions means that access to credit opinions written by analysts is included, Portfolio means that a portfolio can be setup in relation to which services can be defined (such as an email rating alert), Download means that the technical option to download data into Text, CSV or Excel is given and the license granted without additional charge to process this data within the context of a desktop based Excel or Access application excluding the sharing of the data with the entire department, analytics implies that additional credit risk services such as portfolio modelling, financial modelling or peer analysis are available.

²⁰It is standard practice to request as part of a tender a list of all rated financial institutions without the actual ratings from the sales person of the risk advisory business unit of the rating agency

5.4 CDS

Credit Default swaps are contracts traded traditionally in an OTC framework, which allow credit risk to be transferred from the protection buyer to the protection seller in exchange for a premium. All contracts specify exercise conditions in terms of certain credit events, that trigger the contingent payment being due (this can take the form of a net cash payment or of a par cash payment with an obligation of the protection buyer to deliver the defaulted credit obligation). More complex versions are basket constructions referring to credit indices, tailor made baskets and structured payments depending on sequence of defaults within the basket. Whilst CDS contracts are OTC contracts, most market participants have agreements with one or more data corporations to provide information on the market making side (i.e. giving bid-ask quotations at which prices they are willing to purchase or sell protection for a limited number of corporations) as well as actual trade side (book of records end-of-day). The data vendor can then via a data-cleaning algorithm of their design consolidate the data into a consensus composite price. Most corporates within the sample confirmed sufficiency of CDS indicators within the Bloomberg and Reuters systems. Whilst the 30 international banks traditionally included in a core bank set all have international bonds and liquid CDS quotations, two groups of counterparties usually were quoted to be problematic for a primarily CDS based approach - 1. the German Landesbank institutions and 2. the emerging market (in particular Russia, Brazil and India) banks which dominate local markets. In addition several interview partners as well as recent academic research voiced concern regarding the information content of the cds prices. Unlike almost perfectly liquid stock markets, the CDS markets are remarkably illiquid. In particular the study of [Chen et al. \(2011\)](#) provided the most comprehensive view on the utility of the CDS markets in price discovery and thus use as credit risk indicator. One important finding was the dominance of the G14 Dealers, being responsible for 78 pc on the protection buyer and 85 pc on the protection seller side. Another finding was the predominant trading in the 5 year contract (47pc of all trades, compared to only on average 10 pc in the tenors 1-4 and virtual no trading in the tenors >12m and 6+y). For index trading the dominance of the 5 year tenor even reached 84pc. Jumping ahead to implications for risk management, this places doubts on basing credit assessments or limit calculations on 1y CDS quotes. On the other hand the results of the study can also be used to confirm the functionality of the CDS market as an indicator at least for the context of the major financial institutions, as 48 pc of all CDS trades referenced a financial sector entity, the top 48 institutions trading on average 10 times daily and the consecutive 211 entities trading on average 4 times daily, thus covering many (but not all) financial institutions of global significance. On the other hand given the average volume of only 5mn EUR on average per trade, even for the most actively traded institutions the total daily trade volume is almost insignificant when compared to the volumes of credit involved on money markets. Thus some doubt remains whether CDS on their own offer sufficient information for making credit assessments (see also table 6).

In addition to the underlying issue of general discomfort regarding the intransparency of the CDS market, the lack of a clear industry data standard is often voiced. Both Bloomberg and Reuters (as well as smaller

competitors such as VWD market data solutions) serve as data providers as well as technical data router, and it is not clear for which function which licensing applies. In particular there is at times a significant difference between on-screen CDS Data (which includes data from CMA Vision) and off-screen CDS Data (Data downloaded into Excel via the Bloomberg API, where data from CMA Vision is excluded unless individual contracts exist and this functionality has been unlocked).

Professional Data Vendors include Markit, CMA Vision and Fitch Solutions. According to third party information²¹ Markit is owned by a consortium of global banks as well as a few asset managers and company employees, whilst Markit itself publicises only the absence of an anchor investor. Investigations of market mispractices and antitrust both by the US Justice Department (starting in 2009) and the European Commission in April 2011²² into the credit derivatives clearing and information markets both included the dominating position of Markit as one of the issues of concern. Specifically the charge of barring competitors from obtaining information about sizable segments of the OTC CDS market was mentioned, which - if working - might however be an indication of the superior quality of Markit's data. Markit's approach is that of collecting actual trade information (i.e. suitable excerpts from book of records) from the main market-making institutions, emphasising the resulting reliability of the data as representing the market. It also in a separate process follows the quote scraping process for intraday trading. CMA Vision, their main competitor, has been owned by the CME (Chicago Mercantile Exchange) since 2008 and is following the aggregation of bid-ask offer data from market makers and other major trading institutions. Since 2006 it is cooperating with Bloomberg for data distribution. Of final relevance when investigating the credit derivative data market is the building of strategic alliances, with the data vendors being strongly linked to the clearing exchanges (ICE and LCH.Clearnet SA being provided prices by Markit, the CME by CMA and Fitch Solutions) and any future comparative purchasing analysis will need to bear in mind the relative shift in market shares of these blocks.

On the majorly traded reference entities the difference is minute, as corporate internal research demonstrated as well as [Mayordomo et al. \(2010\)](#)²³. The major difference arises when it comes to referenced entities which only are traded irregularly. Four factors impact the availability and reliability of data from a particular data provider (and indeed for each data product):

1. The number and relative significance of data providers (market makers, clearing houses, buy side firms, ...)
2. The method (book-of-records yielding less data than consensus data from indicative pricing)
3. The degree of outlier elimination (typos, test messages, ...)
4. The degree of modelling applied vs. provision of raw data only

²¹<http://news.yahoo.com/eu-targets-16-major-banks-swaps-market-probe-094830044.html>; <http://dealbook.nytimes.com/2009/07/14/us-said-to-investigate-credit-swap-market/>

²²Reference IP/11/509, Brussels 29 April 2011

²³[Mayordomo et al. \(2010\)](#) report a slight lead of CMA's data.

Product	Company	Delivery	Source	Analysis	Liquidity	Download	RI
Markit CDS EOD	Markit	F E B WS WP	Markit	Free	AddCost	Yes	Av
Datavision	CMA	F E B	CMA	No	AddCost	Yes	No
IDS	FitchSol.	F E	Fitch	No	AddCost	Yes	F+
Risk Performance	FitchSol.	WP	Fitch	Yes	AddCost	No	F+
CDS Portal	Moody's	WP	Markit	Yes	No	No	M+
MDS	S&P	WP	CMA	Yes	No	No	S+

Table 3: CDS Dataproducts

Whereas the Rating agencies Standard & Poors as well as Moody's have decided to cooperate with the two main data providers CMA and Markit for providing CDS based risk tools, Fitch Ratings has been building their own proprietary database after acquiring the CDS Company Value Spread in 1998 building on books of records (i.e. actual trade data) of a group of market-making institutions. Whilst within an internal assessment the Databases of CMA and Markit seemed to have a better significantly better coverage, in the medium term it will be interesting to see whether the synergies potentially offered by an integrated credit risk assessment product offering to corporates as the Bank Credit Model described below.

For making additional CDS data procurement it is necessary to decide on the preferred methodology (bid-ask quotes vs. actual trades / consolidated book of records), the coverage of active or potential counterparties as well as the budget available and additional information services requested. All providers of CDS data pride themselves in their multitude of sources as well as thorough cleaning and analytical processes, and it can be assumed that all providers including the smaller ones not analysed have developed these processes that it does not provide a competitive edge.

In Table 3 we have provided an overview of the main CDS Data products as we are aware ²⁴: The delivery mechanisms are FD (FTP or similar download), E (Email), BR (Bloomberg/Reuters), WS (Website Download), WP (Full Web Portal), Analysis refers to whether this is a data only product or a substantial research offering is part of the product, liquidity refers to whether liquidity figures are available and whether they cost additionally or are provided free of charge, download refers to the option of being able to download tables in text, csv or excel format and whether a limited processing (e.g. in a desktop-based Excel or Access application, not distribution to an entire department) is licensed, RI refers to the integration of ratings supplied by at least one of the rating agencies (S,M,P for S&P, Moody's and Fitch without additional cost, S+, M+, F+ if additional cost via a necessary separate product is incurred, Av. signifies the average of three ratings)²⁵.

5.5 Offered rates for wholesale deposits

The premia offered for wholesale deposits on top of current EURIBOR/LIBOR rates are used by some corporates as systematic single-obligor credit risk indicators. Applying the traditional market model

²⁴This is based on website information of the various data providers as well as information gathered during a corporate internal tender offer, no assurance on timeliness and accuracy at time of reading can be given by the author, comments are welcome

²⁵EOD End of Day, MDS = Market Derived Signal

to the deposit rates the premia offered can be interpreted as the premia the banks have to offer at a point in time to convince a sufficient number of investors to place their money overnight or in term deposits with this bank in order to meet liquidity needs. Significant deviations from the average spread are taken as an indicator that the financial institution has trouble gaining investors' confidence. Whilst in times of almost unlimited liquidity provided by central banks the indicator's utility can be doubted, the indicator - in particular if deposit relationships are established to a sizeable set of financial institutions - can provide useful pointers.

5.6 Financials

This section deals with the procurement of financials such as balance sheet information or income statements. The data is available from a variety of sources. The first source are the actual annual reports of the respective financial institutions. Whilst such data is publicly available by virtue of the internet, most interview partners referred to the cumbersome nature of collecting the data individually (i.e. by downloading the report and manually entering the data into some form). On the other hand, available database / information provider options were usually described as having a catch to it. BvDs Bankscope Database in terms of reputation²⁶ is clearly the market leader and where financials (beyond the simple set of book equity and total assets) are procured from an information provider and actively used in limit setting is usually quoted as the data provider of choice. The Bankscope Database has a harmonized global format and offers a variety of ratios both for individual as well as peer analysis. Using Bankscope for financial credit analysis is extensively described in (Fight, 2004, ch. 5 - Bankscope and Comparative Techniques).

Other potential sources are the data providers Bloomberg and Reuters. Here Reuters has the upper hand, at least by perception, as several interview partners, who had evaluated Bloomberg's accounting data (usually in the context of M&A related projects) reported inaccuracies at least until 2008 leading to a general distrust of the accuracy of accounting data still continuing today. Reuters Banker One Platform had significant higher reputation regarding accuracy of financial statements.

Of particular interest are usually simply the book equity and total assets as well as the various capital ratios. Also liquidity ratios were considered. In particular, debate arose whether accounting-based or market valuation-based capital ratios were better bankruptcy predictors. The complexity of the financial reports was generally criticised with little trust in the comparability of calculations and the rigidity of asset valuation standards.

5.7 Proprietary Assessment

Only one interview partner confirmed performing full bank financial analyses, and the necessity to maintain a full team of qualified people for this. All other interview partners with at least one full FTE

²⁶Both commercially as well as academically

covering the function referred to an internal debate/decision that full credit analysis of the financials of the bank were both in terms of time necessary as well as competencies required beyond resources currently allocated to the function. Secondly they doubted whether actual new information could be generated, which was not already reflected in the markets, specifically in share prices and CDS levels. In order to evaluate the setting up of an internal full rating process, the book by [Fight \(2004\)](#) is a good starting point describing both at detail the issues of the financial ratio analysis as well as the qualitative and regulatory evaluation. Whilst the active regular credit assessment of financial was ruled out, several interview partners stressed the importance of however understanding the fundamentals of the process in order to interpret the credit opinions supplied by rating agencies. The most understandable framework is the CAMEL approach (cf. ([Fight, 2004](#), p. 57)). It proposes the assessment of the five elements Capital adequacy, Asset quality (diversification and adequate risk compensation), Management (experience and corporate culture), Earnings (Stability of income, both historically as well as structurally) and Liability Management (Matching of maturities of assets and liabilities as well as good liquidity basis). Other approaches exist, and can in particular be found in the methodology guides to rating financial institutions issued by the rating agencies.

5.8 Model Risk indicators

Given the temporary illiquidity (and thus implied unreliability) or indeed general inavailability of CDS on a range of counterparties a different model-based approach has enjoyed increasing popularity in the past decade. The so-called structural models founded on the seminal work of [Black and Scholes \(1973\)](#) and [Merton \(1974\)](#), who established an option-based link between the equity and credit market by observing that the market value of equity is the value of a call option on the market value of the entire firms assets with the strike price being the nominal debt on the firm. Three different models currently are suitable for inclusion in the credit risk assessment process for financial institutions in a corporate CCRFI function- the publicly available CreditGrades model with its various adaptations, the commercial Moody's KMV model with its proprietary database, and CreditSuisse's internal CUSP model provided to clients of CreditSuisse's Investment Banking division.

CreditGrades

The CreditGrades Model was a joint effort by modelers from the institutions Deutsche Bank, Goldman Sachs, JPMorgan and the RiskMetrics group ([Finger \(2002\)](#)) to provide an open structural model to set a standard in credit risk modeling.

The model is formulated in such a way that all necessary input can be procured from Bloomberg (cf. Appendix B of the technical document) although it might be recommendable to look into sourcing the accounting data from a different data provider such as Bankscope (cf. section 5.6) [Veraart \(2004\)](#) however points to issues of approximation assumptions in the modelling of the formula, which don't have a major

impact in case of normal corporates but does lead to significantly different PD estimates in case of highly leveraged institutions, such as a bank.

Moody's KMV

Moody's KMV model is a Merton based model estimating a single-obligor specific measure of default called the EDF - expected default frequency. The details of the model are best set out in chapter 3 of [Bohn and Stein \(2009\)](#). The KMV model-based credit information service started as a private company founded by Kealhofer, McQuown and Vasicek. After years of academic discussion about the relative value of analyst opinion based credit ratings (as supplied by the rating agencies) vs. the model based quantitative approach, Moody's Analytic Services purchased the company from its founders in 2002 and integrated it into their own product suite. The approach is based on the two publications [Kealhofer \(2003a\)](#) and [Kealhofer \(2003b\)](#), but the comparative predictive power of the model is not so much based on the conceptual ingenuity and novelty of the model but the testing and calibration on one of the best databases available. Accordingly [Berndt et al. \(2008\)](#) cite information from Moody's that 40 out of 50 of the world's largest financial institutions subscribe to that data set.

CUSP

CUSP®(Credit Underlying Securities Pricing, cf. [Martin et al. \(2007\)](#)) is a proprietary model of Credit Suisse Quantitative Credit Strategy and is like Credit Grades and Moody's KMV an extension of the Merton based approach of estimating credit indicators. Different to Merton and KMV, CUSP is designed to estimate equity-implied CDS prices (i.e. risk-neutral PDs, not physical/historic PDs). Of particular relevance in the context of modelling the counterparty credit risk is also the higher transparency of the balance sheet modelling. CUSP eliminates the rather stable deposits from the balance sheet.

On the other hand the calibration to CDS prices brings with it also the restriction to those entities, whose CDS are reasonably liquidly traded (about 800 names) or at least have been traded at some times in the recent past (about 2200 entities classified as entities with illiquid trading). Unlike Moody's KMV it thus only complements and enhances the information on entities already reasonably well covered by the capital markets but does not extend coverage.

The tool (essentially an access database with an incorporated FTP agent) and the data subscription is relatively easy to use, however some issues have been reported setting up the tool inside especially secured IT environments (firewalls).

Information only Indicator

In particular in an environment where such indicators are only used to complement risk information rather than as a decision base for active portfolio management the provision of the three input variables can be sufficiently informative. Thus market capitalisation of equity, a reasonably robust measure of leverage (using the last reported total assets) and a measure of equity volatility (historic or option implied)

can be included both as absolute values as well as changes over a specified period (e.g. 1month or 1year). To transform the change of market capitalisation into a relative context one interview partner used a moving one-year time-series of equity market caps per counterparty (where available) and calculated the quantile of the current value to derive an equity driven credit risk indicator.

5.9 Comparison of risk indicators

The key difference between ratings on the one side and capital market indicators on the other side is the difference between through-the-cycle credit assessments and the point in time philosophy.

For structural models the key issue is the definition of the positions affecting the leverage factor and its impact on transforming equity volatility into asset volatility. Whilst in terms of absolute values the models might and will lead to differing results, on the whole they should lead to similar results in relative terms.

A suitable framework of assessing the functionality of credit risk indicators is proposed by [Cantor and Mann \(2003\)](#). Whilst accuracy is generally described by the cumulative accuracy and the accuracy ratio, other statistics can also be of use, in particular the investment-grade default rates as well as the average rating prior to default statistic. Moody's measures the stability of ratings by the frequency of rating changes, the frequency of large rating changes (3 notches) and the frequency of rating reversals. In a subsequent comment [Cantor and Mann \(2006\)](#) point to the trade off between rating accuracy and stability: 'A relative credit rating is by design more stable than an ordinal system, since macro fluctuations in credit risk will not necessarily be reflected through rating changes'.

Moody's published two studies comparing its ratings to bond implied ratings ([Cantor and Mann \(2003\)](#)) and Moody's KMV EDFs ([Cantor and Mann \(2006\)](#)). We quoted here from the first the stability comparisons showing vast differences in estimated stability. The second study goes to greater details analyzing the trade-off between accuracy and stability of credit assessment by imposing notch based hurdles ²⁷ on the EDF rating change and compares it to Moody's current rating practice. It can be seen that gains in accuracy improving on the Moody's rating come at a high cost of reduced stability.

These elaborations are but a starting point of a thorough analysis of the effectiveness of the various credit indicators in predicting default and entire journal volumes have been written to deliver verdict on this question. For now we have however provided an overview of the different potential credit indicators and their perceived properties in table 5 ²⁸.

As mentioned above, along with accuracy and stability a third key factor is the coverage of risk indicators. Unfortunately not complete data was available to the author for all of the above indicators, but for S&P, Moody's and Fitch complete universes were available. Furthermore the [DTCC \(2011\)](#) publishes on their

²⁷The graph describes accuracy and stability achieved in different rating regimes with regime-specific figure b being the distance of the currently implied EDF rating to the originally assigned rating necessary to effect a rating action

²⁸ PiT vs. TtC meaning Point-in-Time vs. Through-the-Cycle Credit Assessment, Access signifying the technical delivery (Ter=Terminal (Bloomberg, Reuters), WS= Website) and the final column signifying what type of PDs are generally deduced from the data: Hist= Historical Data based PDs, RN = risk neutral PDs)

	Moody's	Bond Implied Ratings
Rating Changes	25 %	91 %
Large Rating Changes	7 %	43 %
Rating Reversals	1 %	76 %

Table 4: Cantor Mann 2003: rating volatility

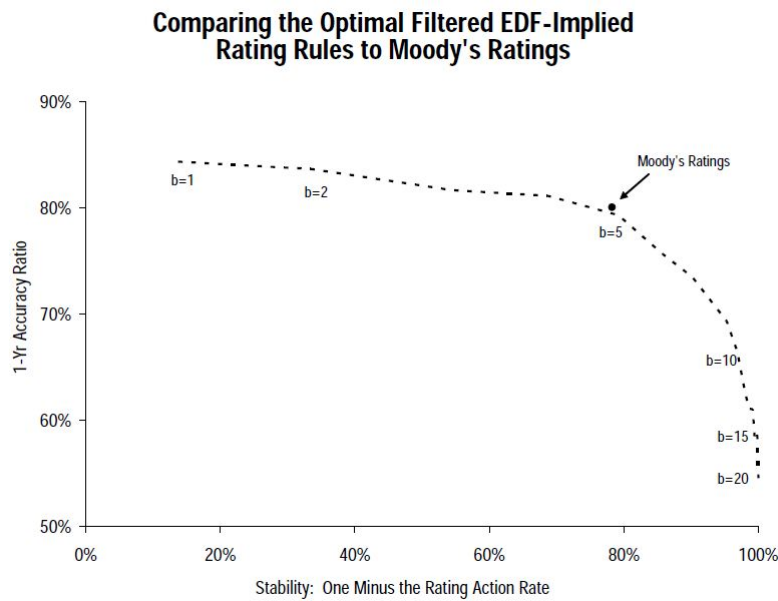


Figure 3: Cantor Mann 2006 Ratings vs. EDF

Data	PiT vs. TtC	Reaction	Coverage	Access	RN vs Hist
LT Issuer Rating	TtC	slow	large	Ter,FTP, WS	Hist
Rating + Outlook adj.	PiT	fast	large	Ter,FTP, WS	Hist
BFSR	TtC	slow	large	Ter,FTP, WS	Hist
Proprietary Analysis	Any	medium	costly	internal	Hist
Financials	Any	quarterly	very large	Ter,FTP, WS	Hist
CDS	PiT	fast	medium	Ter,FTP, WS	RN
KMV	PiT	fast	equity only	FTP, WS	Hist
Credit Grades	PiT	fast	equity only	internal	RN
CUSP	PiT	fast	equity +CDS only	FTP	RN
Spread on Deposits	PiT	medium	small	internal	RN

Table 5: Available credit data on chosen institutions

	Large	Medium	Small
Total	26	31	121
S & P	25	29	93
Moody's	25	31	110
Fitch	25	29	99
CDS	21	15	39

Table 6: *Credit Risk Indicator Coverage*

website statistics regarding the Top1000 traded single name references. As the cutoff is at 2 trades per week, this Top 1000 can be regarded as the Universe of reasonably liquid entities. We thus manually compiled a coverage table, using as base the 178 banks (excluding supranationals and central banks) with Total Assets larger than 100 bn USD at the end of 2010 as reported by [Almanac \(2011\)](#) and Bloomberg. The results are shown in Table 6. The categories used are Large for banks with assets of more than 1000bn USD, medium for banks with assets between 1000bn and 500 bn USD and small for banks with assets between 500bn and 100 bn USD. The difference between S&P, Fitch and Moody's is relatively small with both agencies providing almost complete coverage over the counterparties. Drilling a bit further down it seems that each agency has their specialisation (e.g. US Banks, European Banks or Emerging Markets Banks), so a truly dominating coverage does not exist. It is in our view however remarkable that in contrast to ratings for five of the largest financial institutions no liquid CDS was recorded, with only about half of the medium sized and a third of the small institutes being covered by CDS. To answer the issue of finding risk indicators consistently evaluating counterparty credit risk across the whole counterparty universe Fitch very recently (4th Oct 2011) launched a product called the Bank Credit Model to extend the coverage of credit information to banks not covered by official ratings or CDS. From Financials and other information they produce both a Rating-equivalent score as well as a predicted CDS. Internal tests show good results (high accuracy ratios, good forecasting of actual ratings or CDS where existent), however a full model test by an academic third party is still outstanding. If the test is passed, this model could provide a consistent basis for corporate counterparty risk management obsoleting the need for elaborate piecing together of various sources and only requiring addition of rating or CDS data for information-enhancing analytical purposes.

5.10 Data providers, corporate IT environments and legal frameworks

In the decision on which data to procure, corporates usually only analyse the actual data provided. Not of equal importance but bearing some weight is also the transmission mechanism. Website offerings²⁹ are great for information of the analyst to gather information, but of little use for driving systematic risk management tools.

The contract designs of the data providers are usually person-linked, in the hope of managing to sell several individual licenses to the corporate. Large corporates slowly manage to motivate some

²⁹Such as the Rating Agencies credit portals (Moody's Electronic Opinion Service, S&P's RatingsDirect Platform) or the Person-linked Browser-based Terminal solutions of Bloomberg, Reuters or VWD (e.g. Bloomberg Anywhere)

	Type	Cost p.a.	Licensing	Rating	Financial	CDS
Bloomberg	Terminal	12T	User or Term	LSO	Yes (0)	Yes (SO+, 0)
Reuters X3000	Terminal	12T	User or Term	LSO	Yes (+)	Yes (+)
Reuters Banker One	Website	12T	User	LSO	Yes	Yes (0)
VWD	WS	RFI	User	Yes (-)	No	Yes (0)
Fitch BCM	FTP	RFI	RFI	Yes(*)	Yes(*)	Yes(*)
Markit Desktop	Terminal	15T	User	SO	No	Yes (++)

Table 7: General Credit Data Providers

adjustments in contract design, especially when applications are to be used. A frequent re-occurring theme when discussing the internal use of data and one of the actual hindrances to utilize data packages more effectively was the compliance with unnecessarily tight contract restrictions. A related theme - voiced not quite so often but when voiced with substantial displeasure - was the poor reliability and availability due to technology trying to enforce single-user access only (such as locking the use of a product to a single named IP address) and due to conflicts with the general corporate IT policy and infrastructure resulting in frequent unavailability and (unnecessary) hassle trying to reset the setup.

Thus whilst treasury systems such as Wall Street or SAP have Credit Risk modules which are at least in principle capable to deal with Ratings, CDS or PDs (with different degrees of customization required) no case was revealed where this functionality was enabled due to the difficulty of licensing data for the use in such a system. The customization / programming efforts necessary to limit data and resulting report availability only to a select few for whom this data was licensed was in most cases prohibitive for any budget assigned to making this operational.

Whilst Reuters and Bloomberg offer data services (such as the Bloomberg Data license) the contracts usually encompass only actual information owned by Reuters and Bloomberg. Procuring credit relevant information such as ratings from the rating agencies or CDS prices from the forementioned data providers commands separate provider contracts. Here the contractual frameworks offered by the data providers also still leave much room for improvement containing several items which effectively work as business stop cases³⁰. One such item is the restriction of licensing of data to just one transmission mechanism (such as the utilization of an FTP service, Bloombergs Data license service or a webservice data download). We have provided an overview³¹ of the Terminal or Desktop Solutions in table 7.

5.11 Single name PD calculation

With most corporate exposures being on the short term side, often with tenors in the 3m region, but on the other hand most external credit indicators (CDS and LT Ratings) assessing long term credit risk, discussions arose on the best way to calculate short-term PDs. In most cases - pointing to the

³⁰A creative solution reported by an interview partner to remain fully compliant with the legal framework as well as having good information fast at hand was the utilization of the Bloomberg Launchpad, which offers great flexibility in integrating data and can be printed as a credit report.

³¹Term = Terminal license with free access for several users but linked to specific computer, prices in Euros, LSO License for screen only, SO screen only, (*) in Fitch Bank Credit Model to reflect the modelled nature of the data,

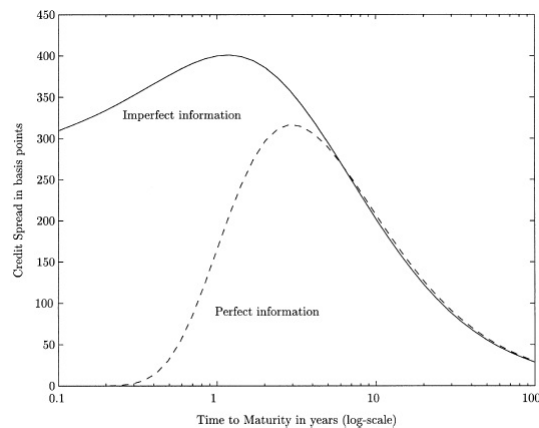


FIGURE 1.—Credit spreads under perfect and imperfect information.

Figure 4: *Duffie and Lando - Term structure of credit spreads*

approximately exponential character of the PDs given by the historical default tables³² an exponential approach was chosen to interpolate PDs for the 1y or the 3m buckets from the 5year CDS. On the other hand [Duffie and Lando \(2001\)](#) (cf. figure 4) proposes a hump shaped curve for PD estimates given the uncertainty of accuracy of financials (i.e. imperfect information relating to the health of the firm).

Secondly whilst in academia the distinction between actuarial/historic PDs and risk-neutral PDs are clear, in practice - especially when less the pure academic theory-consistency and more a practical working approach is sought, the applicability of the different items to a particular situation becomes less than clear cut.

Furthermore the comparability of the PD assessments of structural models and of ratings is not given. The criterion for default of the structural model is that of the market value of equity crossing the zero boundary and thus the entity declaring insolvency and as such being put into possession of the creditors. In case of industrial corporates this indeed corresponds to the classical default also implied by the corporate ratings. Ratings of financial institutions however are much more driven by the value of state guarantees, and thus the market value of the equity becoming zero can simply effect the taking over by the state by injecting capital. This can either happen shortly before insolvency³³ or at the point of insolvency³⁴. However ratings measuring the pre-state involvement PDs are also published - the bank financial strength ratings and should be utilized when trying to compare or even integrate indicators generated from structural models as well as the ratings.

5.12 Single name PD inter- and extrapolation

In above paragraphs we discussed the issue of limited information availability. Thus for some large financial institutions an almost perfect information set is available, comprising of a few ratings, a liquidly

³²Rating migration matrices

³³i.e. with the distance to default still being positive - see the capital injections at the height of the 2008 crisis

³⁴Effective disappropriation of former owners by acknowledging the ceteris paribus imminent insolvency of the entity and state assuming complete ownership of the financial institution. This happened in the case of the Hypo Real Estate

Systemic	Deutsche Bank	Bank of America	DZ Bank	NordLB	Bradesco
Rating Moody's Equity level	Yes	Yes	Nationally	No	Nationally
Rating Moody's Bank entity	Aa3	Baa1	Aa3	Aa2	Baa1
BFSR Moody's Equity level	Aa3	A2	Aa3	Aa2	Baa1
BFSR Moody's Bank entity	C+	N.A.	C-		B-
Rating S&P Equity level	C+	C-	C-		B-
Rating S&P Bank entity	A+	A	A+	NR	BBB
Moody's KMV Equity level	A+	A+	A+	NR	BBB
CUSP Equity level	5.22	5.36	N.A.	N.A.	0.22
CDS Bloomberg	110	464	N.A.	N.A.	90
	176	408	ill.	215	ill.

Table 8: Available credit data on chosen institutions on Sep 30, 2011

traded CDS, quotes on equity traded of the institution and publicised and reliable financials. However this is rarely the case. In table 8 we provide a few illustrative examples of banks which quite perceptibly might be significant counterparties to a german corporate ³⁵.

We can see that for each of these financial institutions the situation is slightly different as different availability of credit indicators prevent a uniform aggregation approach:

1. For the Deutsche Bank the definition of the Deutsche Bank AG as main counterparty is unquestioned and all indicators refer essentially to the same entity. Much apparent is the strong difference of the MKMV EDF from the CUSP model indicator³⁶, benign ratings and CDS levels.
2. Because of the holding structure two natural candidates as choice for representative entities (Bank of America Corporation and Bank of America N.A.) exist. Whereas the exposure concentration will most likely lie with the N.A. entity, the market driven risk indicators are mostly focused on the Corporation (CDS liquidity on Corp better than on the N.A.). Here the question arises how strongly the equity implied credit risk indicators also impact the BofA N.A. creditworthiness. Different to Deutsche Bank, CDS, EDF, CUSP and ratings are all in line.
3. DZ Bank is not a public bank but is owned by the association of german cooperative banks, and functions as their central bank. Given the large market share of the cooperative banks in basic banking services in Germany, it can be considered as nationally systemic. It does not possess equity derived indicators or liquid CDS but holds only ratings. A credit assessment thus needs to be made without any short-term point in time
4. NordLB is functioning as a central bank for the savings banks in the three german regions Lower Saxony, Saxony Anhalt and Mecklenburg-Western Pomerania. It is owned 50pc by the german regional government and 50pc by the association of the savings banks of the covered region, all of whom are public sector institutions.

³⁵Table to be filled subject to approvals of data providers, Reference day 30th Sep 2011

³⁶This however is not a 'big Bank' phenomenon, as others such as Citi, JP Morgan or Credit Suisse have EDFs below 1pc on that day

5. Bradesco's Ratings are limited by country ceilings, with the National Rating being Aaa.br and brAAA by Moody's and S&P respectively. Bradesco is one of the three large Brazilian Bank conglomerates (the other two being Banco do Brasil and Itau-Unibanco) and can be considered as nationally systemic. Its strong capitalisation leads to very low structural PD estimates both in the KMV as well as the CUSP context.

The interest of the corporate is ultimately to reach a functional algorithm, that distills from all these items where available a single estimate of a (usually one-year) PD on which further decisions can be based - using as much information as possible in an economically consistent and intuitively intellegible fashion.

5.13 Qualitative information collection and risk measurement

We have now passed over the process of reaching uniform credit assessments for each counterparty in a structural and quantitative way based on economic and financial mathematical principles. Interview partners however also emphasised the importance of the irregular, unstructured and infrequent information channels ³⁷ with important information leading to information adjustments of the structurally / methodologically obtained credit assessments. On the other hand whilst good information was available occasionally, most interview partners admitted that it was insufficient to rely on such information and referred to time costs of the acquisition of it. In particular the discipline of daily reading of the finance section of one (or two) major newspaper(s) was considered as essential to the job as the daily checking of limit and exposure lists and the BANK screen on Bloomberg. This was particular confirmed by people who had maintained such a discipline for some time before 2008, who - whilst like most other people felt a bit daunted by the speed and size of shifts to previous economic certainties - still felt better grounded and being able to place news into the overall context.

Summarizing it was generally agreed that the general setup was a semi-automatic information collection process regarding the quantitative risk indicators enabling the CCR analyst to focus his effort on gathering subsequent qualitative data to support adhoc analyses regarding individual counterparties or on active risk management measures (cf. section 7.4)

³⁷In particular the following sources were suggested:

1. Relationship meetings with banks, making a quick status update of the balance sheet and general position of the bank part of the procedure, ideally then getting them also to comment on competitors or the general current situation of the financial
2. Critical Opinion contributions considering individual institutions , in particular in the Financial Times (Lex), the Financial Times Deutschland (Das Kapital), Handelsblatt, the Economist or the Wall Street Journal
3. Comments of economists in various fora, such as the project syndicate, regarding the overall macro situation for the financial markets.

6 Portfolio Reporting and Risk Measurement

6.1 Credit portfolio reporting

All of the interviewed corporates with some degree of cash held confirmed the existence of a report giving an overview of limits distributed, cash and derivatives exposures (sometimes subdivided into exposures existent at the major subsidiaries) and a collection of credit indicators (mostly ratings from the two major rating agencies as well as a CDS quote). Such a plain overview could be maintained in a simple Excel format with the credit indicators being downloaded from Reuters or Bloomberg and exposure either copied with a VBA macro from automatically generated limit utilization reports or manually entered into the excel sheet. The overview could be printed off easily as well as printed to PDF and distributed via Email ³⁸.

In case of a restriction to 20 counterparties and only casual use, this model works well. We have included an example of such a reporting in figure 5, also with a visual bubble chart representation usually chosen to support the tuple Exposure, Risk Assessment, Weighted Risk. Once the number of counterparty as well as data sources to be covered increases, automatised solutions for management of master data of exposure aggregation and credit indicator data rise in value. The first level of sophistication is an MS Access solutions, the second level is a utilization of corporate middle ware. In particular All-SAP Shops can use the SAP XI Netweaver infrastructure and the Business Warehouse for exposure aggregation. Given contractual data restrictions the last mile of key figure calculations are still however Desktop + Excel based. Common Key figures short of model based portfolio credit metrics are the following:

1. Total Limit and Exposure distributed
2. Concentration figures (e.g. Top 3/5/10 positions in percentage of Limits or Exposure)
3. Expected Loss of position (historical PDs)
4. Key risk positions (e.g. all positions above a predefined CDS or Rating level with more than 5m EUR exposure)
5. Price of Risk of Position (risk-neutral PDs)
6. Exposure / Limit weighted average CDS of portfolio
7. Information coverage (percentage of portfolio covered by Ratings, CDS or other credit indicators)

In addition to acquaintance with the general risk literature the key success factor in establishing a good reporting satisfying the requirements of senior management is starting with limited effort with a

³⁸Emailing of the actual sheet being both technically infeasible as the automatic links to the Bloomberg/Reuters API would be rendered unfunctional (and thus the entire sheet) as well as not covered by the terminal license, which prohibits the (systematic/regular) distribution of electronically processable data.

CCRFI Reporting							
Name	Limit	Exposure	Exp. Subs A	Exp. Subs B	Rating	CDS	MarketCap
Deutsche Bank	200	170	130	10	Aa3	120	50
Bank of America N.A.	50	20	0	10	A2	250	30
DZ Bank	100	99	90	0	Aa3	N.A.	N.A.
NordLB	100	50	50	0	Aa2	120	N.A.
Bradesco	30	14	0	14	Baa1	200	20

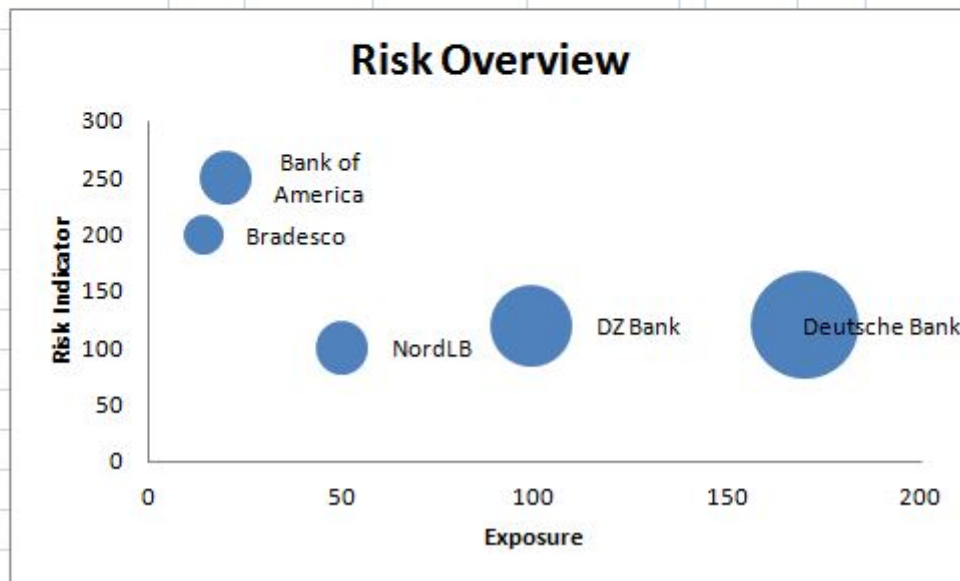


Figure 5: CCRFI Reporting

reasonably compact reporting suite and documenting over a 6 to 12 month period all questions raised by senior management or colleagues when discussing issues in context to the CCRFI function before starting the 2nd and decisive development phase to establish a professional risk reporting. If this is not possible, even though management time is costly and senior management is generally under tight time constraints, a close integration of senior management into the development process, e.g. by presenting updates of CCR tool/reporting prototypes and discussing it, will pay off later in reliable and robust management buy-in. As was frequently confirmed in interviews, a risk management reporting that isn't trusted and/or understood by senior management will have very short half-life periods in times of crisis and thus need not be undertaken in the first place. Thus acquaintance with the risk reporting is business-critical and the responsible CCR analyst needs to pay close attention to any indication of this not being the case. In particular if over a sizeable period of time management consistently ignores aspects of the reporting (which may happen for many a good reason, trust in the figures or unfamiliarity with the theory being two of them) then the issue should be addressed resulting either in a changed attention to these report items or an adjustment in report content.

6.2 Portfolio Models

Only a small minority of the large companies interviewed developed full portfolio metrics with an underlying model to a greater degree, a few further ones were evaluating projects leading up to the implementation.

Of the companies that implemented portfolio models to calculate portfolio metrics most stressed the importance of having an intuitively understandable solution. In most cases the development of a portfolio model was conditional both on the management view that the implementation of a model would in the medium term enhance the risk management capabilities both within the CCRFI function as well as the supervising management as well as the availability of a suitable analyst with quantitative skills. In particular the energy companies with the quantitative expertise in their trading units are leading the way here in corporate Germany. Whilst the availability of such an analyst was one limiting factor, it was also demanded that the model once implemented should not depend on such a person but be self-contained and fit to be both operated as well as supported by other suitable people in the company.

The time effort of the implementation projects where undertaken ranged from estimates of 3 months up to a year of dedicated FTE resource, depending on complexity of the application (mathematical complexity as well as integration with other topics such as market risks) and the availability of quantitative skills (most energy companies maintain sizeable quant teams in their trading divisions). A two-step development path was often considered suitable: first envisage a very simple portfolio model (such as a plain independent defaults cross-twin model or a one-factor model), which did not have to conform to the highest academic standards, but can be used to develop a reporting of the major portfolio risk figures. Developing and then operating this model with limited in the full knowledge of its comparative limitations, in particular the limited accuracy of VaR figures, is of high preparatory value for a later full implementation.

We will not review the various portfolio models at this point, as other publications have done so with great detail, in particular we recommend the consultation of [Crouhy et al. \(2000\)](#), which is probably the most comprehensive article, as well as chapter 8 of [Embrechts et al. \(2005\)](#). Portfolios which have been named as having been either evaluated or even implemented included:

1. Plain independent Monte-Carlo simulation
2. Bernoulli Mixture Models (including single factor model)
3. CreditRisk+

We will however include a few observations on which criteria a potential portfolio model suited for use within an industrial corporate might seek to be compliant with:

1. The CCRFI function usually has a fairly concentrated portfolio. Most corporates have 10 - 30 core banks, at which the major exposures are held (up to 90 pc), as well as a further set of regional banks

(20 - 200) which only serve as local cash management banks with limited exposures, potentially also including a few hedge-funds or other other commodity trading companies more akin to financial institutions than producing industrials. Thus the modelling of the individual counterparty PD including potential factor impacts is more important than asymptotic behaviour.

2. Given the short maturity of most contracts mostly just the short term risk is of interest. Generally only the 1 year horizon is of interest, with a subdivide into four quarters being an added bonus.
3. An inclusion of intuitive/plausible economic factors would be helpful: options are regional states of the economy or global financial indicators. The importance of the model being intuitively understood cannot be underestimated in the context of a corporate, as only a reasonably understood and trusted model will serve as a solid foundations in time of crisis and prevent senior management to revert to 'safer' heuristics.
4. In particular a portfolio model with an integrated asset-based single obligor model could be of great illustrative use.

6.3 Implementing commercial solutions

For corporates not wishing to expend major efforts in building and testing their own CreditVaR model the PortfolioRisk+ Model ³⁹ of Credit Suisse Quantitative Credit Strategy is probably one of the best solutions available. Programmed in Excel it can be robustly installed on a desktop. Given its reference list of being used in credit trading contexts and good documentation it can be assumed to be both soundly programmed covering even recent progresses in credit risk management. Whilst the integration with CUSP is an added bonus (cf. section 5.8.3), it thus shares the weakness of insufficient coverage on a single obligor basis. Whilst the option to enter credit data manually for additional counterparties is given, this is an additional source of effort necessary to utilize the model in a corporate environment.

Whilst the technical offering is on the whole excellent, the major obstacle to procurement is the quid-pro-quo valuation of the provision of this service in the context of bank relationship management. Whilst the model is provided with a price tag to hedge funds and other credit trading entities, the provision of this model to corporates is treated as an element of customer relationship management, a service provided with the expectation to ideally gain an edge in obtaining business in the future. Thus whilst corporates treasuries who maintain a ceteris paribus sufficiently active business relationship with Credit Suisse thus might request for Credit Suisse to provide the service within this business relationship, other corporate treasuries with only limited business potential for investment banking or asset management mandates might shy away for fear of being restrained by a sense of obligation in future tender offers.

Potential improvements to the tool for incorporation into a corporate treasury risk management framework might include scripts to import exposures (Script + Matching table of system counterparty codes to

³⁹ https://www.credit-suisse.com/investment.banking/research/en/portfolio_risk.jsp

PortfolioRisk counterparty codes) as well as a standardized interface to Bloomberg and/or Reuters to supplement data not provided in the service.

Moody's Analytics Risk Frontier is a full fledged Basel II application and whilst most likely capable of fulfilling the requirements of any corporate treasury to perform the calculations, questions arise whether it truly serves the purpose. The product is designed essentially to assist the financial institution in identifying the best/worst positions based on a risk-return calculation. It can deal with very complex loan and other exposure structures, but as such is thus not really suited towards the need of a corporate dealing mostly with plain-vanilla deposits and a few derivative based exposures.

Regarding implementation of portfolio metrics within the standardized treasury systems in operation feedback was limited. In addition to the data issue that treasury systems have regarding credit data, the predominantly used SAP CFM solution only includes limit controlling in the module credit risk analyzer⁴⁰, with the calculation of credit portfolio metrics currently not supported both by the data interfacing structure as well as within standard programming. Wall Street System's WS Suite advertises a credit module with potential interfaces to rating data feeds⁴¹ as well as an interface to Credit Metrics.⁴² Whilst Sungard's Avantgard software just like SAP's CFM essentially only offers Limit management functionality, the Sungard Adaptiv Suite offers a full credit module⁴³. It remains to be seen whether and which portfolio models the major treasury system providers SAP, Sungard and Wall Street Systems will consider as suitable and develop as part of their product suites. As a further comment, whilst the IT oriented debate considers ASP solutions and data repository in the cloud, we feel that it is going to take considerable time until this service model gets fully accepted by the CCR function. Cash and Exposure figures are amongst the most confidential data of corporate treasury, and a webservice based solution requiring to entrust this data to an external service provider would find it at least difficult to convince both the corporate treasurer as well as IT governance of its merits and security assurances.

6.4 Interpreting credit portfolio risk metrics

Whilst the absolute values of risk metrics such as economic capital are of regulatory significance in the context of financial institutions, for corporates portfolio metrics where known only serve as a control variable. Thus not the absolute value is of importance but the value of it relative to a base case and the drivers behind potential changes. Thus the model serves as a thought framework in whose context the significance of certain developments on the capital markets (downgrades, spread changes) or changes in portfolio composition can be understood and consistently quantified. Thus overviews such as the development of these risk metrics over time as well as the estimation of scenario effects are usually much more interesting pieces of information than a 100 pc academically satisfying implementation with assured accuracy. One interview partner specifically stated that a 20 pc scaling inaccuracy would be

⁴⁰cf. Jarre et al. (2007) on SAP Treasury

⁴¹Overview <http://www.wallstreetsystems.com/documents/Wallstreet-Suite-for-Corporates-Diagram.pdf>

⁴²Risk Management fact sheet at http://www.wallstreetsystems.com/documents/Wallstreet_Suite_Risk_Management_Fact_Sheet.pdf

⁴³<http://www.sungard.com/financialsystems/products/adaptivcreditrisk.aspx>

perfectly acceptable as long as it was robust and not in a major way subject to capital market changes (e.g. under a scenario such as a spread widening with constant ratings). Thus contrary to academic belief the choice of risk metrics here is not the main issue.

6.5 Macroview oriented risk measurement

Since the crisis surrounding the uncertainties of the European periphery a new paradigm is being considered in CCRFI. Whilst in Q2 and Q3 2011 (i.e. at the time of writing this paper) in particular the European banks seem adequately capitalised to manage even a substantial recession in several European countries, the [IMF \(2011\)](#) voiced worries about the impact potential sovereign bankruptcies might have on the European banks capitalization. And while a European or international joint and coordinated effort is publicly invoked, limitations placed upon politicians by already dissatisfied electorates make a scenario where nation states care for their own quite possible. Whilst the individual scenarios are one as unlikely as the other, the deliberations show that the key driver of counterparty risk in the financial sector is not the inherent systemic risk of the financial sector but impact of political risk stemming from heavily indebted sovereign entities (in particular the European periphery as well as US municipalities) and a perceivedly slow decision process of the democratic national and international institutions.

Three transmission mechanisms of political risk into risks to a regional and/or global financial system are considered in practice:

1. Value of State guarantee on the credit rating of the financial institution - credit rating of state and systemic relevance and thus implicit or explicit state guarantee
2. Sovereign Bonds held by bank subject to downgrade in case of payment difficulties potentially necessitating write-offs (cf. interview with Lagarde on)
3. Bonds held by or Loans extended by bank to corporates and retail customers in state subject to shock effects in case of a (partial) sovereign default

Obtaining reliable and current data from a corporate's perspective is difficult if not bordering on impossible. Information of the value of state guarantees can be determined in particular from the rating spreads between BFSR and LT issuer Ratings. As the 2010 stress test results were published, some data of category II could be retrieved. No suitable source for micro-level data for Category III is known to the author. Using data of type II or III if gathered from annual reports however makes the unlikely assumption that the banks risk management has hardly reacted to a year of developments within the financial crisis. The trouble with such deliberations are that comparable situations (global financial crisis, fully integrated global economy, fast trading and information dispersion) hardly ever happened before on such a scale. ([Stulz, 2008](#), p.10) states that when a 'known risk has not manifested itself in the past ... risk measurement cannot be done by simply using historical data ... With such a case, statistical risk measurement reaches its limits and risk management goes from science to art. ... Probability assessments

[reached in this context] have a significant element of subjectivity. Different risk managers can reach very different conclusions'⁴⁴. Both the financial crisis (essentially facing the financial system directly) of 2008 as well as of 2011 (essentially facing the sovereign states and by secondary effects impacting the financial system only) are arguably without precedents. We wish to point out however that this statement might be taken to mean 'without precedent in recent financial history for which good and consistent data is available to serve the general econometric toolbox'. Reinhart and Rogoff (2009) go the other way working themselves in detailed case-by-case studies through the various financial crises of the last 800 years. The acquaintance with this material regarding the macro-perspective should be just as mandatory for the CCRFI analyst as the acquaintance with the more statistical models regarding the micro-level mechanisms of credit risk of individual financial institutions.

7 Risk Management

The key of financial risk management in a corporate is not the accuracy of the risk figures using the latest state of the art methodology, but the meaningful communication of the financial risk to higher management. Most of the risk methodology (in particular regarding concepts like Economic capital) is developed for corporates where financial risk management is one of the key success factors (banks and insurances) and where acquaintance of related concepts is very high right up to board level. In industrial corporates concepts such as Value at Risk are known, and usually employed in areas such as market risk management (FX, commodities), but inherently difficult to set in context to the predominant P&L planning approach.

Stulz (2008) in an excellently practical illustrative paper cites six types of risk management failures: 1. Mismeasurement of known risks, 2. Failure to take risks into account, 3. Failure in communicating the risks to top management, 4. Failure in monitoring risks, 5. Failure in managing risks, 6. Failure to use the appropriate risk metrics'.

We have so far addressed the points of 1. (Uptodateness of exposure data collection, setup of the credit assessment process), 2. (Incompleteness of exposure data collection), 3. (Organizational setup and Reporting), 4. (Functional reporting, cf. also following section on operational risks) and 6. (Risk Metrics section 6.4).

Thus after a short section on application-induced operational risks we will then turn to item 5. - the actual risk management issues of the CCRFI function.

7.1 Operational Risk Management

In the early technological stage of CCRFIM most adequately characterised by an (or several) Excel application(s) operational risks consisted of manual errors transferring or entering data, missing documentation as well as intransparency regarding uptodateness. A high and slow manual effort ensued once data sets

⁴⁴Entries in square brackets are editorial additions to original text

got larger or needed to be updated with higher frequency (as was often the corporate experience in the months surrounding the Lehman Crisis).

However an automatization of exposure and credit data processing does not only eliminate manual and tedious labour, the higher level of technical sophistication introduces additional potential points of failure which need to be monitored in order to ensure functionality of the risk measurement application. In our view the most important issues are the following

1. Technical availability of external datasources providing credit data: the typical point of failure are unannounced changes in the company's security policy ⁴⁵
2. Functionality of internal interfaces needs to be monitored : Whereas most corporates have now a central interface platform with a dedicated job monitoring system (and alerts if a job does not run as planned), in particular the more local solutions (Windows jobs transferring data or operating VBA scripts) often lack an activities log.
3. Functionality of applications developed: Once an application stands it is often used for years without a full reprogramming effort or a time-consuming programming audit with at best apparent bugs being fixed or additional reporting functionality added. At least every two years however the responsible analysts that they are still familiar with technological base as much as they need to be in order to be able to have the confidence to perform 1st level error correction or minor adjustments to application programming or reporting.
4. Reliance on key personel acquainted with IT structure and processes - the CCRFI is a classical specialist function and care needs to be taken that colleagues can also substitute in case of unavailability (vacations, sick-leave).
5. Need for regular (at least annual) review of documentation to ensure that any adhoc changes to data sourcing, scripting necessary for running the standard operations as well as reporting interpretation guidance has been reflected.

7.2 Limit management

Limit management usually comprises three tasks :

1. Definition of which positions are subject to limits (cf. section 4.1)
2. Decision making on global limits being set
3. Administration and allocation of limits between the various competing subsidiaries.

⁴⁵To address this issue Bloomberg and Reuters Terminals often are configured with dedicated DSL Lines and routers operated separately from the corporate IT network

In the interview series limits were usually produced by combinations of a set of four factors : 1. the average or strategic liquidity held by the corporate (plus average/stressed exposures due to derivatives) 2. the rating 3. the CDS (one year or five year) and 4. financial key figures (usually equity or total assets for scaling or capital ratios for credit quality). In some cases further additional limiting factors such as country based limits ensure overall restrictions to portfolio concentration.

It is our view that a universally true optimal limit setting regime based on a small selection of simple rules does not exist, or has not yet been found. Business situations are too different to warrant this. However it is quite possible to formulate a set of questions which all should have been considered and essentially answered when devising limit rules (cf. section 8). Additionally we propose a limit system that should serve requirements of reasonable transparency and risk aversion.

One important issue is the definition of global limit need. The definition is a governance task and should be coordinated with and approved by higher management (such as CFO or Head of Finance), as it is probably the most important single variable shaping the global CCR profile of the company. This activity is best combined with an actual dedicated meeting during which a review of the past year including a history of major limit adjustments (and the reasoning behind them) as well as the limit usage by major subsidiaries or the current limit - exposure - risk profile can be presented. In particular such a meeting should then also be used to remind the Head of Finance of the current limit setting and risk management policy employed by CCR function and get his/her approval or request for adjustments. In case of having a semi-rigid limit proposal system and separate approval process for exceptions then major structural exceptions should be addressed in this meeting as well. The starting point of formulating a proposal for global limit need should be the exposure volatility analysis (described in section 4.3) including potential stress tests. The CCR function should also be in such tight communication with the trading functions as well as the liquidity planning to be aware of any structural changes to global exposure being decided. Thus a significant extension of global exposure should be accompanied by proactively increasing limits, especially where this process involves the approval of senior management. Likewise a planned reduction of global exposure should be addressed by potentially implementing an internal hair-cut on all distributed limits in order to maintain a desirable level of diversification and prevent exposure concentrations, especially effected by cash deposits.

In the pursuit of a formula describing limit setting a first necessary decision is the required stability of limits. Regardless of whether the formula below is used or whether a different formula is found a choice is needed whether limits are changed automatically based upon a formula involving external or internal data or to what degree a process involving a human decision is needed. Of associated significance is the question of definition of limit classes and criteria of class changes or whether a continuously changing limit system is better.

Whilst in several cases the equity was chosen to be the scaling factor, we believe that total assets are the better choice as a scale factor for size of the institution. Equity is much more volatile, and if strength of the bank is what is required, then there is better data for that (such as BFSR ratings). Thus we propose

the limit setting to be a multiplicative formula based on total limit need, the respective counterparty's assets (for global diversification of assets) and an internal credit rating factor (ICRF). Of course up to a degree size is implicitly contained in ratings and PD assessments, given an automatic diversification effect and implicit state support for institutions of greater systemic importance.

$$Limit_i = LimitNeed * \frac{TotalAssets_i * ICRF_i}{\sum(TotalAssets_j * ICRF_j)}$$

An alternative version is plain entity diversification without regard to the size of the bank:

$$Limit_i = LimitNeed * \frac{ICRF_i}{\sum ICRF_j}$$

This alternative offers itself more in case of a simpler class-based limit system. The most practical version of such a regime is the assigning of permissible limits on publicised long-term issuer credit ratings.

The ICRF can (and probably should) be directly deduced from the internal credit assessment. Alternatively a two step decision process can be chosen: A slowly reacting ICRF based on long term through-the-cycle methodology and data and a controlling trigger process by a second short-term point-in-time indicator leading to discussion and documented decisions based on individual qualitative analyses regarding the pro and con of a limit reduction / extension relative to the long-term base limit. Such an additional short-term point-in-time indicator can also be used in the actual decision process of cash deposit allocation in the trading unit, either in a risk-return or a point-in-time risk minimisation strategy. Most counterparties interviewed employ such a system, usually at present based on Ratings for base limits and CDS for temporary limit reductions either automatically or after a discussion when certain trigger points are reached. Most importantly given their limited availability even for large banks CDS are not the panacea to the slowness of the rating information and can thus serve a complementary function where available. What is however still outstanding is a full analysis of the properties of various limit regimes given market conditions in the period 2007-2010. This however requires an almost complete dataset of the various data sources (Ratings, CDS, Models) for this time period to do a series of simulations of limit allocations.

The final part is the general limit allocation process to functions and subsidiaries. The key decision for this process part is the liberty of the CCRFI function to hold back limits for eventualities or whether a business-first policy applies with all overall approved limits being granted where requested. A too restrictive policy implies costs incurred due to foregone business or comparatively worse quotations when set against the base case of all limits being made fully available. Distributing all limits however increases the likelihood of difficulties of accommodating new functions or adhoc business arising elsewhere. Corporates with more than three trading functions utilizing limits in significant ways usually tried to keep 10 to 20 pc of globally approved limits as reserves for flexibility to address unexpected adhoc business and smaller subsidiaries.

7.3 Risk Communication

One of the least costly and most effective - if designed well- measures of risk management is a good risk communication process. There are different philosophies which can be adopted here.

1. An extensive reporting giving management the opportunity to have the information when they want to look at it. This can take the form of a daily reporting sent out to everyone in the hierarchy. Especially if it is sent out to a group of people in management, the problem arises that in times of trouble when time is of essence, nobody actually pays serious attention to it trusting others to do so.
2. A regular (e.g. biweekly or monthly) reporting with comments on developments and positions. In case of a regular meeting on middle management this reporting can be used to also relay decisions taken in this meeting to higher management.
3. An escalation-only reporting with senior management only being notified if important decisions (ad hoc (significant limit breaches) or regular (limit allocation for the next period)) are required.

In addition the general risk position reporting the definition of a strict limit breach reporting and addressing process is one of the key risk communication tasks. Whilst in a corporate context it usually makes sense to 24h for issue clarification (i.e. for the analyst to investigate the background for the limit breach - accidental, IT/valuation error, unexpected large market price shifts, ..., and whether the breach can be reversed within a defined period of time (usually 24 or 48h)), the consequences of an actually intentional or negligent avoidable limit breach must be clearly spelled out. Already the knowledge of which level gets notified at which level of seriousness of limit breach can have a strong disciplining effect on the traders actions.

In classical risk management books limit breaches are seen as the ultimate evil, and in times of trading scandals both at the Societe Generale as well as UBS one might be inclined to agree, but in general - at least in corporate practice - such a strict line is usually not pursued. Here it is more important to ensure cooperation, transparency of errors and a generally predominant culture of risk aversion or at least avoidance of excessive risk taking. In this context it is however important to define a boundary⁴⁶ at which issues are classified as serious with sufficiently high management both being notified and being expected to take action themselves.

In case PFEs or similar 2nd tier exposure items (such as secured physical deposits) are included we propose a separation of the items from the actual current exposures and propose a separate escalation process for a limit breach by current exposure and PFEs. A joint formal process treating the issues as equal will only perform its incentivisation and disciplining function if the expected consequences of

⁴⁶This can include cases such as investment with a bank was granted or a foreseeable and avoidable breach of limits with an prespecified exceeding euro amount

a limit breach (including the option to incur losses due to unwinding a position) can in principle be expected to be the same.

7.4 Risk Mitigation Measures

Describing concrete risk mitigation is even more dependent on the actual setup of the company than the risk measurement issues. Thus a 'one-size-fits-all' risk mitigation concept is unlikely to be devised, but again a few successful instruments can be identified.

The primary instrument of risk management is the pro-active limit allocation and re-allocation after certain trigger events. An alternative idea to a continuous limit adjustment process⁴⁷ is to provide the CCR function with access to the front office with possibility to enter temporary limit blocking transactions ('virtual deposits'). These can be useful in particular of a global system where everyone is just trading against one limit per counterparty group or legal entity counterparty. These instruments can also be used to prepare available limits in anticipation of larger transactions as well as blocking available limit in the status of observation how a situation evolves.

A question to be decided with cash management is the amount of accounts setup suitable for taking in deposits. Due to regulations regarding money laundering, taxes and internal processes setting up wholesale accounts can be a lengthy process, taking up to a month until everything is set up. Thus in the context of tight limits relative to a sizeable strategic liquidity it is important to have sufficient failover options in order to have maneuverability to reduce risks on individual counterparties when the need to do so arises.

In the time before the Lehman bankruptcy one of the major criteria for limit approval was the inclusion of the financial institution in the respective national deposit insurance scheme ('Einlagensicherungsfond'). Also actual deposits were preferredly placed within its range, unless tax issues promised higher benefits. The relatively size of the fond however to even medium sized banks and the comparison to the asset volumes involved in the context of the dissolution of the Lehman liabilities lead to a wide rethinking on the effectiveness of the statement made therein. However many interview partners still consider the inclusion as a valuable information, stating that whilst the capital of the fund itself is only of little value in the case of a significantly sized insolvency, both explicit (general deposit insurance) as well as implicit state guarantees are likely to be functional for banks covered by it.

A risk mitigation instrument suitable for times of significant crisis levels are continuous linked settlements (CLS) for major transactions beyond a certain threshold. Whilst being very effective to mitigate transaction related counterparty risk, they also involve a significant manual effort and are thus not always seemed desirable for inclusion in standard processes.

⁴⁷Which is only suitable in a global trading/treasury system context given the documentation trail necessary to document limit adjustments in such systems and the communication with traders who are trading against limits

Credit annexes (CSA) to the ISDA contracts were also referred to occasionally. Whilst ISDA - partially also due to regulatory requirements as well as common market practice - were standard requirements for any dealing with financial institutions, actual credit annexes were reported to have been specifically concluded only by a minority of interview partners. One of the reasons quoted was the lack of trust of effectiveness in case of need, as any divergence from standard market practices might be questioned by an insolvency administrator ex-post with legally unpredictable outcome. The other reason quoted is the symmetry of the CSAs reducing credit risk on the one hand but also leading to liquidity requests if markets turn against the company.

The use of Triparty Repo agreements was so far very limited amongst the corporates questioned, however where employed, overall good experiences were made. In addition to enhancing the security of deposits, even if the collateral made is itself of secondary quality, it also serves as a useful tool to get a feeling for the type of securities held by various banks. Furthermore the yield offered is usually higher than on plain-vanilla deposits.

A further strategy is the concentration of major exposures on systemic institutions⁴⁸ and relying on the assumption that national states and international agencies would do their utmost to prevent any of them failing to prevent a similar or greater reaction of the financial markets as after the insolvency of Lehman Brothers. On the other hand the trouble with these selected systemic institutions is that whilst they are deemed globally systemic they usually also perform roles and have operations that puts them at significant risk. Illustrative is the case of JP Morgan being the clearing agent for Lehman and thus extending credit for collateral to the tune of \$100 bn (equating to a sixth of Lehman's balance sheet!)⁴⁹.

8 Evaluation of a specific CCRFI concept

We hope that the above discussions have been informative as to the best practices in CCR measurement and management. In order to enable you to reflect on your own practices we propose the following set of questions as a starting point:

1. How do I want to communicate with senior management? What do they wish to know and how often? Which decisions do they want to take and which do they want the function to take?
2. What amount of resources do I allocate in total to the function? Do I have a backup plan for short-term resource addition in times of crisis? (cf. section 2.3)
3. How rigid do I want to construct the limit system? This means do I explicitly wish to have a strict algorithmic limit formula or do I allow for some human judgement? How far down the hierarchy should what type of limit decisions be permitted?

⁴⁸FSB produced a list of banks judged as systemic: Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, Royal Bank of Canada, Barclays, HSBC, Royal Bank of Scotland, Standard Chartered, Credit Suisse, UBS AG, BNP Paribas, Societe Generale, BBVA, Santander, Mitsubishi UFJ, Mizuho Financial Group, Nomura, Sumitomo Mitsui, Banca Intesa, Unicredit, Deutsche Bank, ING Group, Aegon, Allianz, Aviva, Axa, Swiss Re, Zurich

⁴⁹The Deal of the Century, by Tom Junod, Esquire, September 11, 2009.

4. What amount of resources do I want to allocate to master data maintenance, FTE and budget for external data sources?
5. How fast do I want my credit risk indicators to change ? Do I want all information when it happens (i.e. current point-in-time assessments) or do I prefer more through-the-cycle methodology?
6. How fast do I want my limits to react ? How do I weigh stability (with the potential of adjusting too late to a potentially critical situation) vs. a proactive risk-averse strategy with the potential of foregoing business opportunities and higher transaction costs by reducing limits at very early stages?
7. How much do I wish to allocate my limits based on the strength of the banks vs. the value of explicit or implicit national guarantees
8. Do I want to diversify amongst counterparties overall or do I want to diversify with a weight based on assets or equity?
9. To what degree am I willing to invest resources (both FTE as well as data/IT budget) to avoid operational risks?
10. How much do I want to integrate my CCRFI function with the bank relationship management, if the tasks are not executed by the same team?

9 Outlook

9.1 Academic Outlook

The major round of interviews has now been concluded and an overview of the practices of a sizable number of European LargeCaps (with a strong focus on the German energy, chemical and manufacturing industry as well as European commodity traders) has been provided. It will be interesting to continue the discussion and interview LargeCap corporates from other economic areas, such as South America and Asia. Furthermore the development and further maturing of methodology is in full progress. Most interviewees (at least where some substantial degree of cash holdings was present) expressed a dedicated interest into further improving the methodology currently applied (without significantly increasing FTE requirements to run the function). The formulation of an soundly academically grounded best practice thus is a goal still to be achieved.

The issue of coverage of the counterparty universe of the various risk indicators is also still open to analysis, and currently I am (manually) preparing an overview over the 1000 largest companies (by asset and market capitalisation) in order to provide hard data regarding the utility of the various indicators. For this paper a subset was used (cf. table 6) where information was available. Later versions of the working paper may contain extended overviews of data coverage as other data providers also grant

access to their data for coverage analysis. Given the various levels of coverage and differences in risk indicators it is intended to evaluate the performance of potential rule-based limit regimes during the period 2007-2010, for which we are currently procuring data.

9.2 Practitioner Outlook

Whilst this interview series was not intended as a market research study for potential product offerings to CCRFI functions, a wish list of issues can nevertheless be offered and it may be of interest to discuss this list with companies currently offering data services to corporates in order to enable them to improve their product offerings.

1. Masterdata: a professional service provider offering master data services harmonizing key codes of various data providers with definite quality assurance. This could take the form of a list of the top 200 financial institutions and their respective codes in the different data vendor systems. Alternatively an ordered list could be defined and the data vendors agreeing to provide the correct keys (and guarantee for their correctness) upon bilateral request.
2. Harmonised data formats necessary to upload credit data into ERP systems or MS Office desktop solutions.
3. Adequate data provision contracts - CCRFI is a specialist function. Usually only one FTE is dedicated to the task with potential access to the data being granted to a colleague for filling in during vacation or other type of absence periods, the immediate supervisor for general information (although rarely actively used) and IT personnel responsible for functioning of IT infrastructure such as interfaces and databases. Contracts should be designed in a way that the use only within a small team serving a rather limited function scope is emphasised vs. the named user concept currently enforced by most US originating data vendors.
4. Detailed pricing and product survey regarding the data products offered by the data vendors to corporate treasuries: whilst in principle there is a certain preparedness to pay, given restrictive contract conditions and integration difficulties often the actual value added relative to already pre-existent functionality at given costs is difficult to argue.

In the medium term a standardized open-source solution can be envisaged providing a general data model with an MS-Access or SQL based database for the CCRFI function.

Whilst the general IT strategy moves towards the ever increasing integration of systems, the mission-critical availability of the risk information and thus implied risk-aversion to operational risk gives scope for a separate IT Tool run locally based on simple but reliable technology. A standardized data model could also facilitate technical and legal standards for credit data delivery from the various professional data vendors. It will be interesting to see whether one of the many service provider or treasury consulting companies picks up the pointer to develop on this business opportunity.

9.3 Conclusion

To conclude we would like to invite both practitioners and academics to comment on issues raised and look forward to further discussions researching further into both the academic theory as well as the options for practical implementation in the context of the corporate credit risk management function.

Appendix

References

- Almanac, B. (2011). Bankersalmanac.com. <http://www.bankersalmanac.com/>.
- Berndt, A., Douglas, R., Duffie, D., Ferguson, M., and Schranz, D. (2008). Measuring default risk premia from default swap rates and edfs. Technical report, Tepper School of Business, Carnegie Mellon University.
- Black, F. and Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3):637–654.
- Bohn, J. R. and Stein, R. M. (2009). *Active Credit Portfolio Management in Practice*. Wiley Finance.
- Canabarro, E. and Duffie, D. (2004). *Asset Liability Management of Financial Institutions*, chapter Measuring and marking counterparty risk, pages 122–134. Euromoney Books.
- Cantor, R. and Mann, C. (2003). Measuring the performance of corporate bond ratings. Technical report, Moody's Investor Service, Global Credit Research.
- Cantor, R. and Mann, C. (2006). Analyzing the tradeoff between ratings accuracy and stability. Technical report, Moody's Investor Service, Global Credit Research.
- Chen, K., Fleming, M., Jackson, J., Li, A., and Sarkar, A. (2011). An analysis of cds transactions: Implications for public reporting. Technical report, Federal Reserve Bank of New York: Staff Reports; No 517.
- Crouhy, M., Galai, D., and Mark, R. (2000). A comparative analysis of current credit risk models. *Journal of Banking and Finance*, 24:59–117.
- DTCC (2011). Top 1000 single names: Aggregated transaction data by reference entity. <http://dtcc.com/products/derivserv/data/index.php> and http://dtcc.com/products/derivserv/data-table_snap0006.php.
- Duffie, D. and Lando, D. (2001). Term structures of credit spreads with incomplete accounting information. *Econometrica*, 69 (3):633–664.
- Embrechts, P., Frey, R., and McNeil, A. (2005). *Quantitative Risk Management: Concepts, Techniques and Tools*. Princeton University Press.
- Emery, K., Ou, S., and Tennant, J. (2010). Corporate default and recovery rates, 1920 - 2009. Technical report, Moody's Investor Service.
- Fight, A. (2004). *Understanding International Bank Risk*. Wiley Finance.
- Finger, C. (2002). Credit grades technical documentation. Technical report, Risk Metrics Group.
- Heffernan, S. (2003). *Handbook of International Banking*, chapter The Causes of Bank Failures, page /. Cheltenham: Edward Elgar.
- Heffernan, S. (2004). *Modern Banking*. John Wiley and Sons.

- IMF, I. M. F. (2011). Global financial stability report: Grappling with crisis legacies. Technical report, International Monetary Fund, Washington.
- Jarre, S., Lvenich, R., Martin, A., and Mller, K. (2007). *SAP Treasury and Risk Management*. SAP Press, Walldorf, Germany.
- Kealhofer, S. (2003a). Quantifying credit risk i: Default prediction. *Financial Analysts Journal*, 59 no.1:30–44.
- Kealhofer, S. (2003b). Quantifying credit risk ii: Debt valuation. *Financial Analysts Journal*, 59 no. 3:78–92.
- Martin, R., Xu, Koch, and Guo (2007). Cusp technical description. Technical report, Credit Suisse, https://www.credit-suisse.com/investment_banking/research/doc/cusp_2007_technical_descr.pdf.
- Mayordomo, S., Pena, J., and Schwartz, E. (2010). Are all credit default swap databases equal. Technical report, Working Paper.
- Merton, R. (1974). On the pricing of corporate debt: The risk structure of interest rates. *Journal of Finance*, 29:449–470.
- Pan, L. (2008). How safe are money market funds ? risk assessment and selection criteria. *Journal of Corporate Treasury Management*, 2 (1):20–26.
- Reinhart, C. and Rogoff, K. (2009). *This time it's different: Eight centuries of Financial Folly*. Princeton University Press.
- Standard & Poor's, C. (2010). Guide to credit rating essentials. Technical report, Standard & Poor's Financial Services LLC.
- Steitz, M. and Seethaler, P., editors (2007). *Praxishandbuch Treasury Management*. Gabler Verlag.
- Stulz, R. M. (2008). Risk management failures: What are they and when do they happen. Technical report, Department of Finance, The Ohio State University.
- Vazza, D., Aurora, D., and Kraemer, N. (2010). Default, transition and recovery - 2009 annual corporate default study and rating transitions. Technical report, Standard and Poors.
- Veraart, L. (2004). Asset-based estimates for default probabilities for commercial banks. Technical report, University of Ulm.