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Lehman Brothers

ICAAP
Supporting Document:

Credit Risk Management Overview

May 2008

LEHMAN BROTHERS

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1. Credit Risk Management

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1 Credit Risk Management

1.1 Counterparty credit risk framework.

Credit risk represents the possibility that counterparty or an issuer of securities or other financial instruments held by the Firm will be unable to honour its contractual obligations to Lehman Brothers. Credit risk management is therefore an integral component of the Firm's overall risk management framework. The Credit Risk Management Department has global responsibility for implementing the overall credit risk management framework. The Global Credit Policy Manual brings together a series of policy statements used in managing the Firm's counterparty credit risk, and promoting a risk management culture and process which balances risk and return consistent with the Firm's risk appetite. The Global Credit Policy Manual is reviewed and approved by the Credit Risk Management Committee ("CRMC") and the Firm's CRO.

The Global Credit Policy Manual is supplemented by various Global Credit Guidelines & Procedures, which provide more detailed guidance to CRM staff for implementing and conducting particular aspects of the Global Credit Policy Manual. A suite of IT applications has been built in house to enable CRM to fulfil its remit through appropriate credit control, exposure measurement, and risk reporting tools. These are provided to all levels of staff within CRM. The CRMC is responsible for ensuring that the procedures documents and IT applications are suitable and performing appropriately. CRM provides appropriate training to staff to ensure that all policies, procedures and IT applications are understood, adhered to and used properly, and the CRMC has instituted formal reporting procedures to ensure that this remains the case. Due to the nature of the business, occasional counterparty credit risk losses are to be expected and Lehman Brothers does not apply a zero credit loss underwriting standard. However, the Firm does expect each extension of credit to be the result of a deliberate decision: properly approved, backed by good judgment, appropriately analyzed and documented. CRM staff are expected to work closely with the relevant business units to produce structures with appropriate risk/return trade-offs, while also protecting the capital and reputation of the Firm from inappropriate or excessive credit risk. CRM works closely with colleagues in QRM, MRM, RCA, the other risk management and Support and Control departments across the Firm, as well as Sales/Trading and Treasury to ensure that credit risks are properly identified, understood and managed according to the Firm's policies, procedures and limits.

1.2 Board

The Chairman of LBHI Board, who is also the global Chief Executive, is the Chairman of Lehman Brothers' global Risk Committee. The boards of the European Lehman Brothers operating entities have delegated authority to the ERC to provide oversight of the Firm's day-to-day management of risk, including, inter alia, review of risk reporting, stress and scenario analysis, large exposures and positions as well as setting limits and agreeing exceptions to those risk limits. The ERC is the "designated committee" as defined by FSA.

1.3 Audit Committee

The Audit Committee assists the Board of Directors in fulfilling its oversight of the quality and integrity of the Firm's financial statements and the Firm's compliance with legal and regulatory requirements. The Audit Committee is responsible for retaining (subject to stockholder ratification) and, as necessary, terminating, the

independent auditors, annually reviewing the qualifications, performance and independence of the independent auditors and the audit plan, fees and audit results, and pre-approving audit and non-audit services to be performed by the auditors and related fees. The Audit Committee also oversees the performance of the Firm's Corporate Audit and Compliance functions. The Committee is comprised of three or more members of the Board of Directors and complies with the "independent director" requirements under the rules of the New York Stock Exchange (the "NYSE"), the federal securities laws and the rules of the SEC. The Committee meets at least quarterly, or more frequently as circumstances dictate. It periodically meets separately with management, the head of Corporate Audit, the head of Compliance and the independent auditors to discuss any matters that the Audit Committee or any of these persons or groups believes would be appropriate to discuss privately. In addition, the Audit Committee meets with the Corporation's independent auditors, Corporate Audit and management quarterly to review the Corporation's financial statements. The Audit Committee has global oversight, with reporting covering the European Region and incorporating the activities of Corporate Audit and Compliance. In Europe these functions also periodically report to the Operating Exposures Committee – Europe.

1.4 Risk Committee

The global Risk Committee, chaired by the Chairman of the Firm comprises the global Executive Committee, the Chief Risk Officer and the Chief Financial Officer and meets on a weekly basis to review all material risk exposures, position concentrations and risk taking activities. The Firm's overall risk management policy is established by the Executive Committee. The Risk Committee reviews all risks on a granular basis including, Risk Appetite usage versus limits; VaR; counterparty credit exposures by region, product, sector and ratings, top investment grade and non-investment grade names; large exposures: investment grade; non investment grade; principal transactions; workout; equities; pipeline (mandated, contingent, conditional); Firm relationship loans that are new or significant; Firm relationship loans coming up for renewal; and other topics of interest as identified by the Chief Risk Officer.

1.5 Chief Risk Officer

The CRO reports to the Chief Administrative Officer who ultimately reports to the Board of Directors of the Firm. The Firm's Chief Risk Officer is responsible for Firm-wide Market, Credit, Sovereign, Investment Management, Operational and Quantitative Risk, with staff in New York, London, Hong Kong, Tokyo, Seoul, Mumbai and Singapore. The Chief Risk Officer is responsible for establishing and implementing risk management policies and procedures; developing and implementing risk analytics and metrics; model validation and testing of all pricing models; evaluation and approval of new products and trading strategies with consideration of their impact on the Firm's risk profile; evaluation and approval of Firm commitments and investments; establishing credit and country limits; and, in conjunction with the Executive Committee, setting and allocating Firm-wide risk appetite, trading limits and required equity capital. The Chief Risk Officer is a member of several Firm committees including the Firm's Management; Risk; Commitments; Investments; Bridge Loan; New Products; and Operating Exposures Committees and is an integral member of the senior group tasked with engaging with regulators, rating agencies, equity analysts, investors, liquidity providers and the Board of Directors.

1.6 European Risk Committee

The European Risk Committee (“ERC”) is mandated by the relevant European Lehman Brothers operating companies’ boards. It serves as a forum for the senior business and risk managers of the Firm in Europe to identify, understand, review and control all material risk exposures associated with the business. Its membership includes the heads of the businesses taking significant market, credit and other risks and the Corporate divisions responsible for oversight and independent control of these risks and meets on a weekly basis or on an as-needed basis. The ERC has also been delegated the responsibility for reviewing and approving models that are material with respect to measurement and management of Counterparty Credit Risk for Lehman Brothers UK consolidated group. If, in the view of the Committee, global models are deemed appropriate and acceptable for the region, the Committee has the authority to adopt all CRM models for use within LBIE and the Lehman Brothers UK consolidated group for local management and reporting purposes. The ERC has a “general understanding” of these models, including:

- knowledge of the materiality, nature, strengths and weaknesses of the rating and exposure modelling systems;
- an appreciation of the roles and responsibilities of the different functions in the counterparty credit risk management processes; and
- an understanding of the review and validation processes of the counterparty credit risk management systems.

1.7 Credit Risk Management Committee

The main purpose of the Credit Risk Management Committee is to ensure that “senior management” (as defined by FSA) within CRM and RCA form and maintain a “good understanding” of the design, implementation, performance and results of counterparty credit risk governance, measurement and reporting tools used by the Firm. The Firm defines this as:

- knowledge of the materiality, nature, strengths and weaknesses of the rating and modelling systems;
- an appreciation of the roles and responsibilities of the different functions in the counterparty credit risk management process;
- an understanding of the review and validation processes of the counterparty credit risk management systems;
- an understanding of the design and operation of the credit process;
- an understanding of the process and metrics through which the rating and modelling systems are monitored to ensure that they are operating properly on an ongoing basis; and
- an understanding of the key drivers of risk affecting PD, LGD and EAD.

The CRMC has been established by the CRO with a remit to review, monitor, evaluate, discuss, approve and, where necessary, escalate, inter alia:

- the Global Credit Policy Manual and associated Guidelines & Procedures;
- strategic projects impacting CRM;
- the functioning of the internal ratings system;
- exposure measurement methodologies, models and systems;
- individual counterparties and concentrations of counterparty credit risk;
- stress testing results across the counterparty credit risk portfolio;

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- the efficiency of the trade approval process;
 - the credit watch list and developments with non-performing counterparties; and
 - Business Requirement Documents for major IT projects prior to formal submission to Risk IT.

Within its remit, the CRMC is responsible for setting its own agenda, specifying the level of information required, and requiring follow up where necessary. The CRMC identifies and investigates weaknesses and deficiencies, and makes recommendations to the CRO. In particular the CRMC will escalate material changes to counterparty credit risk models for CRO approval. In order to carry out its responsibilities, the CRMC will draw on information and analysis supplied by Credit Risk Control, Credit Risk Reporting and credit analysts. CRMC observes high corporate governance standards. Meetings are usually held weekly, but may also be called on an ad-hoc basis at the discretion of the Chairperson. CRMC membership is determined by the Chairperson and members attend in person or by phone. CRMC membership includes the Global Head of Credit, the three regional Heads of Credit, Global Head of Risk Control & Analysis, Head of Credit Risk Control and the Head of Credit Risk Reporting. CRMC members may invite guests to present or participate in discussions. In order to promote global consistency and completeness of both content and format the CRMC has published a series of Presentation Guidelines, each of which has been approved by the CRMC as a Guidelines & Procedures document. The CRMC operates a website on LehmanLive on which the charter, minutes and presentations are maintained and made available to authorized users.

1.8 Credit Risk Management

CRM has global responsibility for implementing the Firm's overall credit risk management framework. CRM is a globally integrated organization with teams located in the regional trading centres. The Global Head of CRM ("GHC") reports into the CRO. Regional Credit Managers ("RCM") are located in the three regional headquarters and report to the GHC. CRM performs its responsibilities by allocating each active counterparty relationship to an analyst ensuring that a designated analyst is responsible for every active counterparty. Each analyst is a member of a credit team headed by a credit manager, and each credit manager reports to an RCM. Credit teams are usually responsible for portfolios of counterparties in industry sectors or smaller geographic groups. The assigned analyst has primary responsibility for managing the counterparty credit risk relationship. Credit managers are responsible for counterparties assigned to the credit analysts within their credit teams, as well as their own allocated counterparties. CRM fulfils its remit, as specified in the Global Credit Policy Manual and the accompanying Guidelines & Procedures documents through the following processes:

- analysing counterparties, assigning and maintaining appropriate internal ratings;
- proposing and tracking credit risk mitigants such as guarantees, collateral and other documentary protection including master netting agreements and additional termination events;
- establishing appropriate credit limits, monitoring utilization and following up on excesses;
- preparing written credit reviews to support the extension of credit limits; and
- approval of incremental credit bearing trades by releasing pre-approved limits or issuing credit approval numbers, and monitoring trading activity to ensure appropriate approval was obtained.

Analysts are expected to be familiar with the Global Credit Policy Manual and Guidelines & Procedures documents. These documents are made available on line to authorized users.

Analysts are individually assigned a credit authority level between L1 (highest authority) and L7 (nil authority). Authority levels are used to determine who may approve credit limits and assign ratings and to whom certain types of documentation and margin issues must be escalated. Within each authority level, approval authorities vary according to the internal credit rating of the counterparty and the tenor of the exposure.

CRM is responsible for the continuous monitoring of counterparties' internal ratings, credit limits and exposures to ensure they remain appropriate in light of market events and each counterparty's financial condition. CRM expects analysts to proactively manage their portfolios and anticipate credit issues. Analysts are required to assign internal credit ratings through the credit cycle and act conservatively, especially if the counterparty is not fully transparent in its financial disclosure. CRM uses automated calendar functionality to track each counterparty, ensure that internal credit ratings and credit reviews are performed and maintain credit limits according to regular frequencies.

Analysts are able to use the full suite of CRM Applications on the credit portal to monitor various aspects of their portfolios i.e. "pull" functionality. CRM has also developed analyst dashboard functionality to "push" items to analysts that require their attention. There are two main types of items listed on the dashboard: (i) those that allow the analyst to manage by exception, e.g. past due refreshes, past due reviews, limit excesses, and (ii) those that require the analyst to approve an item for another analyst e.g. limit increase, ratings event.

CRM is also responsible for identifying and monitoring concentrations and correlations in counterparty credit risk exposures across counterparties, families (based on common ownership e.g. parent/child relationships, management e.g. fund families, or similarly strong connection), industries (according to CWS industry), products, and countries. This is undertaken in conjunction with CRR, QRM and SRM. CRM works closely with QRM for stress testing counterparty exposures in response to changes in internal ratings and external market factors, and for recommending valuation adjustments where appropriate. SRM, working with CRM, is responsible for assigning internal ratings to countries.

CRM is independent from the Firm's business areas that are responsible for originating and executing transactions. CRM personnel are not remunerated by reference to the approval, utilization or profitability of credit limits.

1.9 Credit Risk Control Unit

The Credit Risk Control unit ("CRC") is part of the Risk Control & Analysis department within the GRMD. CRC has a wide remit to manage the overall credit risk management prudential control infrastructure including policies, procedures, and associated IT applications:

- supervising the Global Credit Policy Manual, proposing the overall credit risk management framework in line with the Firm wide approach to risk management, and ensuring cohesion and internal consistency both within and outside of CRM;
- augmenting the Global Credit Policy Manual with Guidelines & Procedures documents to elucidate the policy requirements, implementation details and processes;
- ensuring that IT applications are designed and developed to fulfil policy and procedural requirements;
- maintaining policies, procedures and IT applications up to date and responsive to business developments and industry best practice;

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- training CRM and other authorized users in CRM policies, procedures and IT applications; and
 - administering the CRMC process including running the agenda, proposing, establishing and maintaining presentation guidelines and standards, making and/or coordinating presentations to CRMC, recording minutes, tracking follow up items, and ensuring the CRMC meets internal governance standards.

CRC has particular responsibility for:

- managing the internal ratings system including the design and implementation of the system components: policy, procedures, rating models, risk parameters, and reporting and analytical functionality; CRC is responsible for ensuring that the system is fully documented, being used appropriately, performing satisfactorily, and for communicating its findings to the CRMC; CRC works closely with QRM when reviewing the risk parameter analytics, and will work closely with the Model Validation Group during the initial design and ongoing validation of rating models; for the purposes of the IRB approach, CRC fills the role defined in BIPRU 4.3.15;
- managing the credit limit system including the design, implementation and use of limit control structures, ensuring appropriate credit authorities are invoked when limits are assigned, and the reporting and tracking of limit excesses;
- managing the Trade Approvals system including the pre-approved process and communicating credit limits to authorized users outside of CRM, the use of credit numbers, and the credit handshake process to ensure correct authorization was obtained ahead of trading;
- enhancing prudential credit controls across the Firm e.g. increase CRM integration with Transaction Management, Global Margin, Treasury, Sales & Trading, Customer Account Services etc.;
- identifying & solving credit control gaps;
- coordinating Corporate Audit control enhancements; and
- driving strategic CRM projects.

CRC reports directly to the Global Head of Risk Control & Analysis. CRC is, therefore, independent of the users of the internal ratings system and other prudential controls. The Risk Control & Analysis department has no direct contact with sales/trading areas and does not manage any counterparty relationships.

1.10 Credit Risk Reporting

Credit Risk Reporting (“CRR”) is a global team with staff based in London, New York and Mumbai. CRR is responsible for preparing and distributing reports of counterparty credit risk exposures. It is part of the Credit Risk Management department within the GRMD. Much of the internal day-to-day CRM exposure reporting for both current and potential exposure used by credit analysts is automated. CRR have a key role to play in supplementary exposure reporting including, inter alia:

- ensuring trade and exposure data accuracy and completeness;
- participating in the Firm’s reconciliations between CRM and Finance;
- ensuring a full suite of client and account information is imported from GARM/EAM and reflected in CRM systems, and investigating and resolving exceptions;
- creating new counterparty records for the Firm as part of the enterprise account management and customer account services processes;

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- assigning active counterparties to credit analysts to ensure appropriate coverage;
 - preparing and performing daily variance analysis and exposure feed verification, in conjunction with QRM and Credit IT;
 - preparing and distributing routine and ad hoc exposure reports for both CRM and non-CRM users including CRMC, CRO, Risk Committee and other senior management users;
 - preparing the counterparty credit risk contributions for regulatory capital reporting to the SEC and FSA, including those computations based on IMM and IRB waiver permissions, and transmitting the information to Finance for aggregation; and
 - performing and coordinating user acceptance testing for changes in IT processes pertaining to exposure computations and methodologies as part of the overall Credit IT governance process.

CRR reports directly to the GHC and RCM. CRR is, therefore, independent of the group that generates much of the exposure information (QRM), but works closely with both QRM and the core users within the CRM to ensure full data integrity.

1.11 Credit Risk Technology

Credit IT are part of Risk IT and are responsible for the in-house design, build, deployment and maintenance of credit IT applications used by CRM, CRC, CRR and QRM, and the associated data storage. Certain exposure calculations based on historical simulation use applications owned by Market Risk IT which is also part of Risk IT.

CRMC has implemented a Guidelines & Procedures document to govern the IT process for projects covering both trade exposure measurement (e.g. potential exposure) and static data (e.g. internal ratings) systems, which:

- requires all major IT projects to be recorded via a Business Requirements Document (“BRD”) or JIRA ticket (a small enhancement tracking tool); BRDs are written by the user group, for example CRM, and used for projects deemed material from an IT resourcing perspective; once completed by the user, scoped by Credit IT and an effort estimate produced, the CRMC reviews the BRD to authorize the project; JIRA tickets are used for smaller IT projects such as bug fixes and minor enhancements;
- tracks the progress of projects through the weekly Credit IT meeting forum to ensure that all project issues are aired;
- defines the user acceptance testing (“UAT”) process to ensure that the appropriate IT and business users have tested the functionality and signed-off on the changes; UAT for exposure measurement changes is coordinated by CRR and UAT for static data changes is coordinated by CRC, and any changes that are deemed to have a material impact on CRM are routed via CRMC for approval ahead of release; and
- requires all releases to be accompanied by a release ticket with the appropriate signatories and by release notes.

Additional controls are implemented by the Model Validation Group for projects requiring change in exposure measurement analytics.

The Risk IT department adheres to Lehman Brothers’ standards for day-to-day systems and data governance including, inter alia, access rights, data management, data security and business continuity planning. With

the exception of making use of offshore consultants during the build phase of IT Applications, Lehman Brothers does not outsource any of its credit risk functions.

1.12 Credit Risk Analytics

Credit Risk Analytics is part of Quantitative Risk Management. Credit Risk Analytics is responsible for the development, implementation and ongoing monitoring and maintenance of the Firm's credit exposure methodologies and systems. Methodologies are developed in consultation with Credit Risk Management, and systems are implemented & maintained in partnership with Credit Risk Technology. Methodologies include the assessment of potential future exposures and exposure stress testing. The main responsibilities are:

- research & specification of new exposure methodologies;
- user acceptance testing of new exposure analytics;
- maintenance and enhancement of the existing exposure models and their associated parameters and calibrations;
- ongoing monitoring of the performance of the exposure models;
- exposure model documentation;
- application of the models to calculate potential credit exposures used as inputs to the credit approval, reporting, CVA and capital calculation processes; and
- providing real time quantitative supports to credit risk managers on portfolio risk analysis, new trade approval, and new product reviews.

1.13 Sovereign Risk Management overview

Sovereign Risk Management (“SRM”) is responsible for monitoring the Firm’s exposure to crisis events and substantial market shocks in emerging markets and selected developed market countries and regions. The Firm is subject to country risk – the possibility that political, economic and social conditions and events in a foreign country might adversely affect the Firm’s interests or reputation – as a result of major market fluctuations, and to four primary types of risk: default, currency inconvertibility and transfer risk, currency devaluation, and expropriation of assets. The Global Risk Management Division reports on and monitors the risks related to these and the markets’ reaction to these events. SRM works closely with the other risk departments to determine country risk exposure, appetite and internal country ratings. SRM acts in an advisory capacity to senior management and business heads regarding the Firm’s strategies in emerging market economies.

1.14 Corporate Audit Department

Corporate Audit provides senior management and the Audit Committee of the Board of Directors with an independent assessment of Lehman Brothers’ internal control environment. This is accomplished by performing audit reviews on a cyclical and risk basis across all global businesses and products and supporting infrastructure.

The Firm’s General Auditor and Corporate Audit Department have an independent reporting line to the Audit Committee of the Board of Directors, and the day-to-day operations of the department come under the

supervision of the General Counsel of the Firm. The functions and activities of Corporate Audit are determined by the General Auditor and approved by the Audit Committee. The Committee meets at least quarterly and Corporate Audit formally presents its plan, status and results to it three times during the year. Regionally Corporate Audit presents its plan, status and results to the Operating Exposures Committee Europe.

In Europe the head of International Corporate Audit and the European Corporate Audit Department have an independent reporting line to the General Auditor, and the day-to-day operations of the department come under the supervision of the European Legal, Compliance and Audit Division. The European Corporate Audit department also provides regular updates on its plan, status and results to the Operating Exposures Committee Europe. This is as part of the committee's mandate to ensure appropriate controls exist to identify and mitigate risk, anticipate those areas and issues that may leave the region vulnerable, and sponsor appropriate measures to deal with them. Corporate Audit achieves its mandate by: conducting comprehensive assessment and audit reviews of high risk areas of the Firm; ensuring Firm compliance with Sarbanes-Oxley 404(a); completing audit coverage of other mandatory areas; participating in the evaluation and implementation of key new initiatives; driving global consistency in audit approach; ensuring strong relationships and visibility with business managers throughout the Firm; staffing and developing the global department to be commensurate with the mission. Risk Management is included in Corporate Audit's scope. Regular cycle or risk based reviews are performed across the Risk Management Division covering governance, operating procedures, completeness and accuracy of data capture, model methodology, management reporting and rating systems. In its reviews of the Firm's rating systems and exposure models, Corporate Audit assesses (BIPRU 4.3.38):

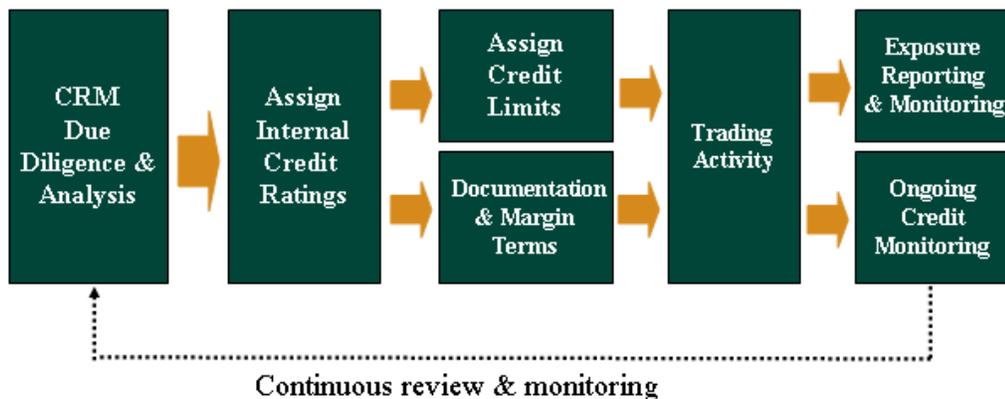
- completeness, accuracy and accessibility of documentation relating to the design and operational details of the rating systems used;
- adequacy of credit system technology, including logical access and change management controls;
- model development, validation and usage; and
- model governance, including day to day supervision, policy enforcement and the roles of CRMC, CRR and CRC.

2. Credit Risk Management

2 Credit Risk Measurement

2.1 Overview of risk measurement

CRM has implemented the Credit Risk Management Process to manage the counterparty credit risk arising from trading activities and liquidity management operations.



2.1.1 CRM Due Diligence and Analysis

As a precursor to assigning internal credit ratings to individual counterparties Analysts will conduct a thorough due diligence to ensure the counterparty is an eligible counterparty with whom to trade. The analysts will consider appropriateness of counterparties business, conduct research of adverse press/publicity, systemic risks faced in the industry, idiosyncratic risks associated with the client/geographic region. In addition, a detailed investigation of financial statements and calculation of financial ratios is undertaken.

2.1.2 Assign Internal Credit Ratings

Analysts are responsible for assigning and maintaining internal ratings. CRM's approach to assessing and assigning internal ratings reflects industry best practice as well as Lehman Brothers' client base and limited loss experience. Internal ratings are critical components of Lehman Brothers approach to managing counterparty credit risk and are used as key inputs in, inter alia,

- Establishing the amount of counterparty credit risk that Lehman Brothers is willing to take to an individual or group of connected counterparties (setting credit limits)
- Determining the frequency of credit reviews (renewing credit limits)
- Approval authority levels for establishing credit limits and issuing trade approvals
- Reporting counterparty credit risk to Senior Management within Lehman Brothers
- Reporting counterparty credit risk to stakeholders outside of Lehman Brothers

It is the responsibility of all members of CRM to ensure that the internal ratings system is performing appropriately, consistently and accurately at all times. Senior Credit Managers are expected to routinely review the relevant management reports with their Credit Teams in order to ensure that ratings are accurate, appropriate and consistent, and to provide appropriate and timely feedback to CRC over the functioning of the ratings system. CRC is responsible for the design and performance of the Internal Rating System. The CRMC is used as the formal venue to monitor and discuss the functioning of the Internal Ratings System performance at a senior level within the department and to escalate issues to the GHRM for further discussion if deemed necessary by the CRMC

2.1.3 Assign Credit Limits

Credit limits are expressions of how much possible credit exposure CRM has approved. Credit limits are expressed in USD and all non-USD exposures are converted to USD for tracking against limits. CRM is responsible for ensuring that credit limits are approved at the correct level of Approval Authority and via the appropriate approval chain. CRC is responsible for ensuring the appropriateness, integrity, internal consistency and completeness of credit limit structures.

The main purpose of credit limits is to reduce the risk of inappropriate or excessive counterparty credit risk concentrations. The main purpose of Product/Business Level credit limits is to enable CRM to provide limits to Business Units for pre-approved trading. The appropriate level of credit limits for any particular counterparty is primarily driven by the counterparty's internal ratings, the level of credit risk mitigation available, and the risk/reward characteristics of the counterparty relationship with Lehman Brothers. CRM do not usually set credit limits at the maximum possible level for each counterparty, but rather work with the relevant Business Unit(s) to establish a credit limit that is justified by both the counterparty's credit standing and the level of likely future business. Therefore if the need for an increase arises the analyst is entitled to propose an increase in the credit limits if comfortable to do so. Alternatively, if the analyst is not comfortable to accommodate the required increase, the analyst will communicate credit concerns to the Business Unit, obtain more information over the future of the counterparty relationship, and discuss options for managing the concentration risk.

Credit limits are classified between Settlement, Pre-Settlement and Treasury Risks, and may be expressed in notional/principal or risk-based terms. Credit limit classes and levels are combined into limit types to reflect and accommodate particular exposure types. Credit limits may be established manually by analysts or automatically by CWS. Credit limits also vary by client role and may be identified as pre-approved or non-pre-approved.

All credit limits are non-advised and non-committed unless otherwise noted. Neither CRM, Business Unit, nor any other Lehman personnel divulge the level of credit limits to counterparties and any such requests from counterparties are escalated internally.

2.1.4 Documentation and Margin Terms

Analysts seek to optimize the balance between risk and return. Clearly this must be accomplished via a close working relationship with the Business Units and with a clear goal to protect the capital and reputation of the Firm. Credit risk mitigation is often required to accomplish this balance. Credit risk mitigation refers to actions taken by Lehman to:

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- Reduce the probability that the counterparty will default to Lehman Brothers (e.g. requesting a performance guarantee, keep-well agreement or maintenance of ownership undertaking from related Group members)
 - Enable CRM to adjust Lehman's relationship with the counterparty before the counterparty defaults to Lehman (e.g. by terminating the relationship or taking additional collateral)
 - Reduce the potential exposure of the relationship with the counterparty (e.g. via netting agreements, entering off-setting positions with the counterparty, or taking collateral)
 - Increase the recovery rate in the event that Lehman is subject to a default event (e.g. ability to claim termination payments from an unrelated third party, or entering into off-setting positions with third parties i.e. credit hedging)
 - Encourage willingness to pay by documenting the relationship in a clear and legally enforceable agreement

The absence of credit risk mitigation features does not necessarily prevent credit limits being implemented, but it may influence the size and availability of those credit limits. Similarly, introducing credit risk mitigants may increase limit availability either by enabling higher credit limits to be approved or by reducing existing utilization. In limited cases credit risk mitigation may influence internal ratings.

While credit risk mitigation is particularly helpful with weaker counterparties, analysts also consider proposing these tools with stronger counterparties. Professional counterparties, even (or especially) those with the best credit ratings, are usually quite willing to agree to standard protective clauses such as collateral thresholds or maintenance of investment grade provisions. Having effective credit risk mitigation in place, even with strong counterparties, puts the Firm in a much better position to conduct significant business with that counterparty.

2.1.5 Trading Activity

CRM issues approvals for incremental Credit Bearing Trades in one of three ways

- ◆ CRM has established a suitable pre-approved limit which accommodates the incremental trade, and the transaction is a pre-approved trade type. Pre-approved limits are communicated to Business Units and enable the Business to book pre-approved trade types without contacting CRM on a trade-by-trade basis.
- ◆ CRM and MRM has authorized the CVA Desk to manage CVA Eligible counterparties transacting CVA Eligible Products
- ◆ CRM reviews and approves the trade before the trade is concluded, and which is evidenced by the analyst issuing a Credit Approval Number to the Business for inclusion on the trade ticket.

2.1.6 Exposure Reporting and Monitoring

Routine monitoring of credit exposures is central to the Credit Risk Management Process. CRM is responsible for monitoring exposures at two key levels

- Early Warning and Exception based reporting flagged to analysts
- Portfolio based reporting reviewed at CRMC

Successful monitoring of exposures is grounded in accurate and complete exposure data

- Risk Control is responsible for the accuracy and completeness of trade population data
- QRM is responsible for modeling pre-settlement risk exposure profiles
- CRR and CRT are jointly responsible for ensuring that exposures are correctly mapped to limit sets and reported to analysts and other users in a timely manner.

2.1.7 Ongoing Credit Monitoring

CRM policy is to measure and monitor exposures on a daily basis. CRR and QRM are jointly responsible for generating accurate and complete credit exposure information. CRR is responsible for mapping the exposures to correct Product/Business Limits and counterparties, and for identifying the Client Role for the exposure information. Analysts are responsible for monitoring utilization and taking action to resolve excesses. Analysts, CRR and QRM have joint responsibility for identifying and resolving errors in the exposure figures

2.2 Exposure measurement

2.2.1 Background/Purpose

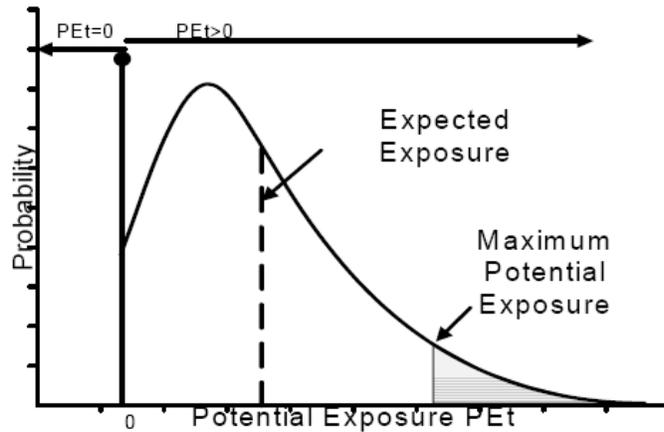
This section sets out a high level summary of the Firm's global methodology for the calculation and aggregation of counterparty credit risk on trading positions and is designed to give a high level summary across all product lines (business units) and for all counterparty types. There may be regional exceptions to this methodology and not all product lines or counterparty types are present in every legal entity.

A set of detailed methodology papers further expands upon various aspects of this methodology. Current versions of this document and the more detailed methodology documents are available through the Credit Risk Analytics Home Page on LehmanLive.

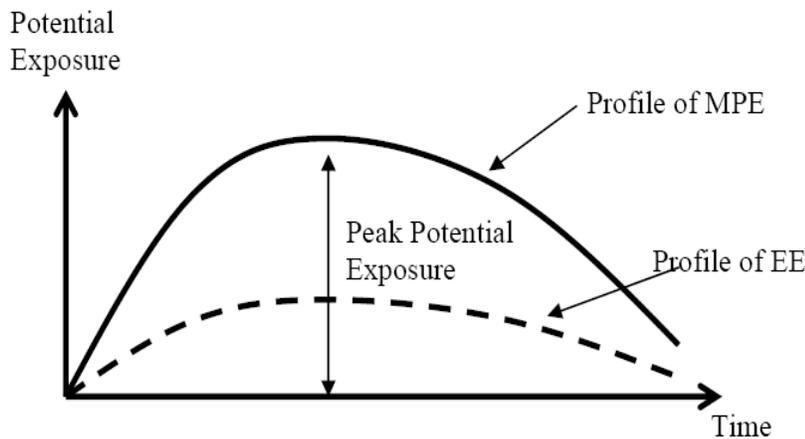
2.2.2 Introduction

Potential Exposure ("PE") is an estimate of the present value of the credit exposure of a given counterparty portfolio at a future point in time under an assumed market scenario. It is essentially one possible future value of the current exposure. It is customary to model many market scenarios, according to statistical principles, so as to generate a distribution of PE values. The Maximum Potential Exposure ("MPE") of a counterparty at any time point in the future is defined as an upper percentile limit of the distribution of the PEs of the portfolio held by the counterparty at that time. Lehman Brothers use a 95th percentile as the level for the MPE. The Expected Exposure ("EE") is defined as the mean of the distribution of potential exposures at a given future time.

Figure 1 below depicts a typical distribution of PEs, with both the expected exposure and the MPE indicated. (The curtailing of the graph at zero is reflective of the definition of credit exposure as having a minimum value of zero.)



Calculations of MPE and EE are performed for each portfolio of trades with a given counterparty using defined netting, collateral and aggregation criteria. The calculations are repeated at future time points over the life of the counterparty's portfolio, creating a time profile of MPE and EE:



These EE profiles are used as inputs to the credit valuation adjustment, the internal capital model and the regulatory capital model. The 95% confidence MPE profiles form the basis for the Firm's internal measurement and management of credit exposures, including credit approvals, management reporting and the firm-wide risk appetite and return-on-equity calculations.

The correct measurement of potential exposures should account for market, trade and counterparty specific factors, such as:

- Volatilities and correlations of underlying market variables
- Aging of trades, including rolling off of cash flows, path dependency & exercise of options
- Revaluation of the aged trades under future market scenarios

-
- Offsetting of longs and shorts
 - Legal netting
 - Legal margin provisions
 - Aggregation across products, legal entities and counterparty hierarchies

2.2.3 Methodologies

The Firm employs two primary modelling techniques for estimating PE: Monte Carlo simulation and Historical Simulation.

Monte Carlo simulation allows the modelling over long periods of time the risk factors driving the PE estimates. The models incorporate rich patterns of term structures of interest rates, correlations amongst rates, future expectations of interest rates and FX rates and the long run mean reversion of interest rates. They also account for the portfolio aging, path dependency and effects of netting and margin provisions. As such, Monte Carlo models are particularly suited to measuring risk in long dated derivatives portfolios.

Historical Simulation applies the realised time series of historical returns to the current portfolio to estimate scenarios of future PE. This technique can be used for estimating PE over short intervals and is therefore appropriate for margined portfolios (that are active or short dated) where the risk is over the next close out period. Historical Simulation allows for a granular estimate of PE that implicitly includes correlation between the underlying time series of returns for a portfolio at the netting set level. The Firm's historical simulation models capture more than 25,000 individual securities.

The Firm's core simulation models are supplemented with approximate modelling techniques for a small portion of the business where full simulation is not justified on a cost-benefit basis or would prove intractable due to computational inefficiencies involved in the pricing. The approximation techniques in use at the Firm are:

- Alternative Processing Simulation - mapping to a set of benchmark trades that are then conservatively handled under the full simulation methodology
- Analytical Approximation – an analytically derived projection of the potential exposure at the requisite confidence level
- Risk Factor add-ons – a pre-calculated risk factor expressed as a percentage of notional based on trade characteristics

2.2.4 MPE Model Overview

2.2.4.1 Overview

This section provides an overview of the current methodologies used for measuring MPE by product class.

- Fixed Income Derivatives (“FID”), Foreign Exchange Derivatives (“FX”) and Credit Derivatives (“CRD”) use Monte Carlo simulation over the life of the portfolios;

-
- Securities Financing activities use historical simulation over the relevant close out period; and
 - The MPE platform comprises:
 - global system with standardised reports and methodologies
 - updates to MPE calculations for all counterparties globally on a daily basis
 - coverage for more than 40 currencies

A summary of model coverage by business line is presented in Table 1

Summary of MPE Coverage by Product/Business

Business	MPE Process	Coverage
Fixed Income Derivatives Portfolio-based Monte Carlo simulation	<ul style="list-style-type: none"> ◆ Calibrated to market yield curves and implied volatility surfaces ◆ Historical correlations ◆ Mean reverting model with present valuing of exposures ◆ Captures aging of portfolio, trade expirations and option exercises ◆ Exposure calculation reflects legal netting and CSA provisions ◆ Major exotics classes simulated; remainder by Alternative Processing Simulation; Bond options by analytical MPE Updated daily	Total number of trades: 291,166 Total number of simulated trades: 274,220 % full simulation: 94.2%
FX forwards/options Portfolio-based Monte Carlo simulation:	<ul style="list-style-type: none"> ◆ Calibrated to market yield curves and implied volatility surfaces ◆ Historical correlations ◆ Mean reverting drift with present valuing of exposures ◆ Captures aging of portfolio, trade expirations and option exercises ◆ Exposure calculation reflects legal netting and CSA provisions ◆ Major exotics classes simulated; remainder by Alternative Processing Simulation Updated daily	Total number of trades: 352,368 Total number of simulated trades: 350,561 % full simulation: 99.5%
Credit Derivatives Portfolio-based Monte Carlo simulation:	<ul style="list-style-type: none"> ◆ Includes spread risk, ratings migration and events of default ◆ Portfolio approach includes sector correlations, netting of longs / shorts and portfolio aging ◆ Exposure calculation reflects legal netting and collateral provisions ◆ CDS, CDO simulated; remainder by analytical approximations and risk factor add-ons Updated daily	Total number of trades: 305,070 Total number of simulated trades: 302,250 % full simulation: 99.1%
Fixed-Income Financing Portfolio-based historical simulation Equity Financing Portfolio-based historical simulation	<ul style="list-style-type: none"> ◆ Historical time series of returns is used to determine exposure scenarios over the close out period ◆ Models individual securities & their realised correlations for > 25,000 individual time series ◆ Risk factor add-on's are used for trades not captured by the historical simulation engine Updated daily	Total trade legs: 469,763 Total simulated legs: 454,883 % full simulation: 97%

Note: coverage statistics are representative figures observed as COB 30 April 2007. The section for equity derivatives has been excluded for this copy of the document as equity derivatives are not in the scope of the IMM model coverage.

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2.2.4.2 Fixed Income Derivatives & Foreign Exchange

The global FID and FX businesses are substantially covered by the Monte Carlo simulation models:

- all material risk factors are simulated using a full Monte Carlo process;
- the majority of trades are fully re-priced along simulation paths;
- portfolio approach includes FX correlations, interest rate correlations & offsetting of longs & shorts;
- exposures are aggregated taking into account netting and collateral agreements;
- global coverage; and
- portfolios are re-valued daily (t+1).

The system updates all counterparty MPE's daily using a highly efficient compute farm to calculate the MPE simulations. The simulation is based on a mean reverting two factor interest rate model calibrated to market yield curves and implied volatility surfaces. Foreign exchange rates are also calibrated to the market. Basis curves and implied volatilities of options are simulated based on observed historical volatility estimates. Correlations between foreign exchange rates are modelled, as are correlations amongst interest rates. Spot exchange rates are assumed to be uncorrelated with interest rates.

The MPE model incorporates standard valuation models for major product types such as swaps, caps/floors, swaptions, FX forwards, FX options plus a range of structured trades and exotic options. The majority of transactions – approximately 99% of FX and 94% of FID - are simulated by the system. The MPE system sources transaction and market data from front and middle office systems across the Firm and links to counterparty data from Credit Work Station (“CWS”) / Entity Account Master plus collateral & netting data from Cameo and Entity Master. It simulates 1,000 paths of market scenarios for over 40 currencies at over 50 future time steps covering 30 years. Time steps vary from weekly for the first month, monthly up to the first year, semi-annually to year 10 and annually thereafter. Graduating time steps in this manner allows for capturing short-term price changes for short-dated trades, whilst being computationally efficient at more distant points when less frequent sampling is needed. At each price point an adjacent repricing 10 business days apart is performed for the purposes of estimating close out risk on margined accounts.

Trades are re-valued at each time step on each path/scenario. The process therefore captures the natural aging/expiration/exercise of transactions over time. For path dependent options, the realised path along each scenario is accounted for in future revaluations. Once all trade values for a given counterparty portfolio have been re-valued, they are then aggregated according to documented netting criteria (if such criteria exist). Variation and upfront margining logic is then applied, if appropriate, to determine the margined portfolio exposure at each time point along the 1,000 scenario paths. Finally, the 1,000 values at each time point are sorted to form a (ranked) distribution of potential credit exposures. The EE is the unweighted mean of the positive exposures. The MPE at each time point is the upper 95th percentile point in the distribution. The Peak Potential Exposure (PPE) is the maximum MPE value reached across all time points.

In common with market practice, certain trade types are not fully repriced under the Monte Carlo simulation due either to computational inefficiency (e.g. options that require pricing by Monte Carlo simulation) or due to the cost-benefit of modelling certain infrequent trade types. Such cases (approximately 3% by volume) are modelled using Analytical Approximations or Alternative Pricing Simulation. Details of the former are

provided in the MPE methodology documents for each business line. The Alternative Pricing Simulation involves mapping to a set of benchmark trades that are then conservatively handled under the full revaluation simulation model.

2.2.4.3 Credit Derivatives

The Credit Derivatives MPE engine utilises the same modelling principles as the FID and FX product classes:

- all material risk factors are simulated using a full Monte Carlo process;
- the majority (99%) of trades are fully re-priced along simulation paths;
- portfolio approach includes sector correlations, netting of longs / shorts and portfolio aging;
- exposures are aggregated taking into account netting and collateral agreements;
- global coverage; and
- portfolios are revalued daily (t+2).

The Monte Carlo model for credit derivatives simulates correlated rating migrations, events of default and spread risk based on a risk neutral transition matrix, calibrated to observed credit spreads & volatilities. These processes are stationary and Markovian. Each specific issuer is mapped to one of 22 generic rating buckets based on the rating implied by its credit spread. For each issuer, 1,000 rating simulation paths are generated for a horizon up to 30 years. The model uses the same time intervals as for the FID/FX Monte Carlo simulation, including the generation of 10 day apart price points for the purposes of evaluating MPE on margined accounts.

Correlation between issuers is handled by a factor model. Each issuer is mapped to five different orthogonal factors that drive the correlation structure. Factors include region, industry and product sectors, plus a macro-economic factor shared by all issuers and an issuer specific factor contribution. The correlation between a pair of issuers is the sum product of their common systematic factor weights; the square of the factor weight signifies the fraction of the total variance explained by that factor. The FX conversion rates applied to non-dollar credit derivatives are based on the same set of simulation paths used in the Foreign Exchange Monte Carlo model. Individual FX rates are thus inter-correlated, but are assumed to be uncorrelated to the credit spread states. Discounting is done using static interest rate curves.

At each time step, under each simulation path, trades are valued based on the survival curve associated with the simulated implied rating of each issuer, combined with an issuer specific spread volatility term. The process captures the natural aging of transactions over time, including the amortisation of tranche notionals for Collateralised Debt Obligations (“CDO”) products as defaults occur in the issuer pool. The model incorporates standard valuation models for Credit Default Swaps (“CDS”) and uses an efficient large homogeneous portfolio pricing approximation for CDO products. Exotics, which together form ~1% of the global book, are analytically approximated - the analytic MPE profile is used along each path in place of a stochastic simulation. Once there is an analytic price for each path (albeit identical among all paths), this is then aggregated with the fully simulated trades according to the relevant netting & margining criteria of the counterparty.

Once all leg values for a given counterparty portfolio have been re-valued, they are then aggregated according to documented netting criteria. Variation and upfront margining logic is then applied, if appropriate, to determine the margined portfolio exposure at each time point along the 1,000 scenario paths. Finally, the 1,000 values at each time point are sorted to form a (ranked) distribution of potential credit exposures, from which the EE and MPE are calculated.

2.2.4.4 Securities Financing & Margin Lending Business

The securities financing and margin lending business consists of the prime brokerage, stock borrow/loan operation and the fixed income central funding group. Transactions in these business lines are typically margined daily and have short tenors. The securities financing MPE model uses Historical Simulation for the calculation of the 5-day close out risk in this business. The close out risk is determined from a distribution of potential credit exposures. This distribution is created by estimating a potential change in market value of the collateral portfolio over the close out period for each observation in the historical simulation; the equity in the counterparty's account less the potential market value change of the collateral portfolio results in the credit exposure distribution. This methodology is applicable to all financing transactions, involving government bonds, corporate bonds, mortgage backed securities, equities (cash and synthetics) and convertible bonds covered under repurchase agreements.

The potential counterparty exposure calculations are updated on a daily basis, with individual securities being simulated over approximately 4 years of historical time series. The simulation covers approximately 97% (based on number of trading legs) of the combined equity and fixed income financing business globally; the remainder being handled with risk factor add-ons. The products covered by risk factors include some new products for which there are either inadequate time series or for which the potential exposure methodology is being developed.

Major risk factors taken into account in the Historical Simulation model include:

- the level, shape, and implied volatility of the yield curves in different currencies;
- a variety of basis risks such as spread between treasury off-the-runs and on-the-runs, treasury futures vs. cash;
- corporate credit spreads by currency, rating, sector and maturity;
- high yield bond prices;
- mortgage and option adjusted spreads;
- foreign exchange rates and implied volatilities;
- equity prices and implied volatilities; and
- correlations between all the risk factors.

The model captures both linear and nonlinear risk for convertible bonds. The linear component is estimated based on the sensitivities of the portfolio to the risk factors; the non-linear component is estimated using second-order (gamma) approximation.

The Historical Simulation model has a high degree of granularity in risk factors - the simulation engine has access to approximately 6,500 fixed-income time series and 20,000 specific equity time series, capturing a large number of general and specific risk factors.

For each risk factor underlying a counterparty's portfolio, the model calculates the daily changes of historical time series and applies them to the current market levels to generate scenarios of the one-day distribution of market factors driving the mark-to-market of the portfolio.

For each scenario, the potential one day change in market value of the portfolio is calculated; it is scaled to the 5-day close out period and then subtracted from the equity in the account. The distribution of potential 5-day exposure is formed for each counterparty netting set. Calculations reflect the documented netting provisions. The EE and MPE are calculated as the mean and 95th percentile upper limit from the positive exposure distribution.

2.2.4.5 Equity Derivatives

Equity derivatives credit exposures for regulatory capital are measured under standardised rules. A Monte Carlo based methodology and IMM waiver application will be completed in due course.

2.2.5 Modelling the Effect of Credit Provisions on MPE

2.2.5.1 Introduction

Credit provisions are established to safeguard, to varying degrees, against risk of counterparty failure. MPE calculations incorporate the most common categories of credit provisions i.e. netting, variation margining and independent amounts. The following sections summarize the characteristics and handling of netting and margining agreements.

2.2.5.2 Netting

2.2.5.2.1 Overview

Netting is the process whereby positive and negative transaction mark to market values are netted to produce a residual positive or negative portfolio mark to market. Having the legal right to net implies that in the event of default a single net payment would be made to or claimed from the counterparty. Without such right, and in the case that a counterparty defaults, the Firm would have to make settlement payments to the counterparty on all trades with a negative value and would have only a claim on the trades with positive values. Therefore, the right to net trades can considerably reduce the potential exposure of a portfolio.

If legal netting is not enforceable, a trade whose mark to market is negative – from the Firm's viewpoint – is deemed to contribute no offset to total portfolio exposure. Therefore, trades can only add to exposure, as will happen when the mark to market is positive. The portfolio potential exposure will be the greater of zero or the sum of all the positive exposure contributions from individual trades. When legal netting is enforceable, exposure mitigation occurs when trades exist in the counterparty portfolio that have opposing values for the same market scenario. The potential exposure will be the greater of zero or the net of positive and negative values. Thus the MPE will typically be reduced under an enforceable netting agreement.

For a portfolio of $i=1$ to N trades with mark-to-market values $V_i(s,t)$ at scenario s and time t the following formulas apply for a portfolio's potential exposure (PE):

Without legal netting:

$$\text{Potential Exposure}(s,t) = \sum_{i=1}^N \text{Max}(0, V_i(s,t)) \quad [1]$$

With legal netting provision

$$\text{Potential Exposure}(s,t) = \text{Max}\left(0, \sum_{i=1}^N V_i(s,t)\right) \quad [2]$$

The Firm's MPE engines perform calculations at the netting set (master agreement) level based on the existence of a signed, executed master netting agreement between the counterparty entity and the specific Lehman legal entity. The relevant master agreements (ISDA's, GMRA's etc.) are sourced from the Firm's legal systems.

In general, the Firm trades through a number of its own entities with a variety of counterparty entities/subsidiaries and under a number of distinct legal agreements. This can produce a complex web of netting and non-netting possibilities. The calculation of MPE involves mixtures of the above rules as applicable under the available legal documents.

2.2.5.2.2 Legal enforceability of netting

The presence of a signed legal netting document is not in itself sufficient to ensure legal netting is enforceable under the relevant legal jurisdiction. The legal enforceability of the master netting document is a function of the legal jurisdiction, document type, entity type and product type under consideration. These factors are accounted for by the Firm's Netting Enforceability Service ("NES"). The MPE calculations reflect netting benefits only if the NES determines the agreement is fully enforceable in a court of law.

2.2.5.2.3 Cross Margin Netting Agreements ("CMNA")

CMNA refer to cross-margining agreements that allow netting of exposures and margin requirements across individual base agreements such as GMRA, Futures Agreement and ISDA. CMNA are only recognised for exposure purposes in the daily margining & reporting process for hedge fund clients. For internal capital and regulatory capital, no benefit is accorded to CMNA at this time for any counterparty class.

2.2.5.3 Collateral & Margining

2.2.5.3.1 Introduction

In many instances, the Firm's transactions with counterparties are subject to one or more forms of collateral (or margin) agreement. Under such provisions, the Firm, the counterparty, or both parties are required to

pledge an amount of cash or qualified securities in order to guarantee or secure one or both party's performance on the obligations arising from transactions. For example, in the case of an interest rate swap whose market value has become positive from Lehman's perspective, the counterparty might be required to post collateral equal to the mark to market to insure Lehman against default by the counterparty. Margin agreements can substantially mitigate potential exposure.

Margin provisions are legally evidenced via several forms of documentation depending on the product class. For fixed income and credit derivatives, an addendum to the ISDA Master Agreement called a Credit Support Annex ("CSA") specifies the types and terms of collateral to be transferred between the counterparty and the specific Lehman entity. For foreign exchange transactions, a CSA is used when a signed ISDA is in place or the margin requirements are embodied in a Terms and Conditions document. Repurchase and Reverse Repurchase Agreements automatically provide for margining – known in this business area as haircuts - and typically allow for a trade-by-trade determination of the actual percentage haircut.

The MPE models reflect two types of margin provision: independent amounts and variation margin.

2.2.5.3.2 Independent Amount Margin

An independent or initial amount might be pledged either on a trade-specific basis or as a good-faith deposit against any and all obligations in the portfolio. Portfolio independent amounts are modelled as constant levels of risk mitigation. Trade-based independent amounts are usually calculated as a percentage of the notional and represent a constant requirement throughout the life of the trade. Trade-specific independent requirements need to be tracked and "returned" as the respective transactions mature. The MPE models for Fixed Income Derivatives, Foreign Exchange and Credit Derivatives incorporate trade specific margin and reflect the return of collateral tagged to individual trades as they roll off over time. The models reflect the mitigation of exposure where independent margin is posted by the counterparty to the Firm and the increase in potential exposure resulting from the posting of initial margin by the Firm to the counterparty.

2.2.5.3.3 Variation Margin

Variation margin is collateral that is posted in response to periodic – usually daily – re-marking of a portfolio of trades. Commonly referred to as pledge agreements, such variation margin arrangements can be bilateral or unilateral. Bi-lateral agreements apply to both parties, requiring the posting of collateral from one counterparty to the other when the mark to market is in the favour of the opposing counterparty. Uni-lateral agreements apply in favour of one counterparty only. The MPE calculations for derivatives products reflect the effects of margin provisions based on legal provisions (CSA's) sourced from the Firm's legal documentation system (Entity Master). The following CSA terms are reflected in the calculations:

- subject parties: bilateral or unilateral;
- frequency of margin calls (typically daily);
- margin delivery requirements (usually by next business day after the call);
- Unsecured Threshold: mark to market value above which collateral posting is required (ratings-based thresholds are adjusted according to the current rating of the relevant party); and

-
- Minimum Transfer Amount: minimum change in mark to market required for a collateral call (so as to avoid frequent “nuisance” calls for small amounts)

The derivatives MPE simulations model the receipt and posting of collateral along each scenario path according to the terms of the agreement. The collateral balance is used to offset or increment the potential exposure accordingly.

Due to legal provisions in the various margining agreements, such as the ISDA documents that govern derivatives, there can be an effective delay between the time a “collateral call” is first made and the point at which it becomes clear that the “posting counterparty” is going to fail to deliver. During this time period the mark of a portfolio or transaction may have further increased. Ultimately a failed delivery may lead to the liquidation, over a number of additional days, of the portfolio (and associated hedges) at a significant loss to the affected counterparty. For these reasons, the MPE models assume a minimum close out period of ten business days for the purposes of the margin modelling. The minimum 10 day close out applies only for the tightest margin agreements that procure daily margin calls, with next day collateral delivery. For other agreements, the close out period is adjusted upwards by the incremental number of business days allowed under the call frequency and collateral delivery terms. For securities financing and margin lending business, a 5 day close-out is used to reflect the daily margining in these businesses.

2.2.5.4 Other Credit Provisions

Mutual put (break clause provisions) are not modelled in the MPE engines.

2.2.6 Aggregation

Once all MPE calculations have been performed at the netting set level, the process of aggregation is applied to calculate MPEs, rolling up across netting sets within a given counterparty and subsequently across legal family groups. The aggregation takes account of all master agreement possibilities in the underlying hierarchy (which may involve a number of distinct netting and margining arrangements). Netting is not allowed across master agreements, but rather the exposures are grossed up, giving no benefit for diversification.

Output from the MPE engines is used at different levels of aggregation in order to suit the downstream application:

- daily exposure reporting makes use of the netting set level and counterparty level aggregations;
- for capital and Credit Valuation Adjustment purposes, the exposures remain calculated at the individual netting set level applicable to the counterparty and Lehman Brothers entity; and
- time bucketed credit MPE limits are set and monitored against the aggregate exposures at the counterparty and family group level.

2.2.7 Systems Architecture and Technology Overview

2.2.7.1 Introduction

There are two major engines for MPE, one is the Monte Carlo simulation engine which performs simulation & full repricing for OTC products of Fixed Income Derivatives (FID), Foreign Exchange (FX) and Credit Derivatives (CRD), the other is the LehmanRisk engine which employs Historical Simulation for the Securities Financing & Margin Lending business. A complete systems architecture is shown in Figure 1 below.

2.2.7.2 Monte Carlo Simulation Platform

The key features of the Monte Carlo simulation system design are:

- central database, which acts as the unified repository of global counterparty and deal population information:
 - interfaces from back office systems for:
 - counterparty group hierarchy;
 - counterparty ratings;
 - legal netting;
 - margin agreements;
 - upfront collateral requirements; and
 - industry and geographic sector identifiers.
 - deal data captured from multiple front & middle office systems in various geographic locations:
- parallel processing across a powerful farm of CPU's;
- capture of in-house spot and historical market data;
- global access via secure intranet;
- risk calculation on entire counterparty portfolio of FID, FX and CRD trades;
- daily revaluation of all portfolios using latest position data;
- on demand marginal processing of new trades with a given counterparty; and
- disaster recovery capability from inbuilt systems redundancy.

The MPE platform consists of several distinct components:

- data sourcing:
 - trade, client, legal & collateral data from various front office, middle office, books and records systems send their feeds to the Monte Carlo platform; these feeds are processed and represented in a standard format for further processing.

-
- Monte Carlo scenario path generation:
 - market data, including yield curves, FX rates, implied volatility surfaces, historical correlations and volatilities are sourced from relevant systems; after calibration to a set of calibrating instruments, the model then generates the 1,000 Monte Carlo paths over a 30 year simulation horizon for all risk factors; the path generation process is updated weekly; these simulation paths are stored in files to be uploaded into the memory for re-pricing at a later stage of the process
 - trade re-pricing against Monte Carlo path:
 - trades are re-priced along each simulation path taking into account the aging of the trade, path dependency and option expiry; for FX, front office pricing libraries are used to re-price the trades; for FID and CRD, optimised pricing libraries developed by Credit Analytics are used; alternative Pricing Simulation, Analytical Approximations & Risk Factor add-ons are applied for the small percentage of exotics not handled by full re-pricing; these results are stored in files to be used for aggregation at a later stage of the process.
 - aggregation and reporting of counterparty portfolios:
 - the Monte Carlo price files of trades of a counterparty are aggregated, taking account of the legally documented netting and collateral provisions; the profiles of 95% MPE and EE are produced for downstream reporting and capital calculations

The Monte Carlo system architecture is a distributed platform, with more than 200 engines simultaneously processing the most time consuming calculations. Simulation paths of risk fare first loaded in each engine. Pricing requests of trades are dispatched through the driver to each engine, which in turn stores the results in files. The driver then collects and aggregates the output from all engines to produce the final MPE output files. Several front end tools allow the user to interact with this platform, to perform marginal analysis and validate the overnight batch processing. Multiple environments allow for comparison of overnight, weekly and month-end batch processing.

2.2.7.3 Lehman Risk Historical Simulation Platform

The key features of the LehmanRisk platform are:

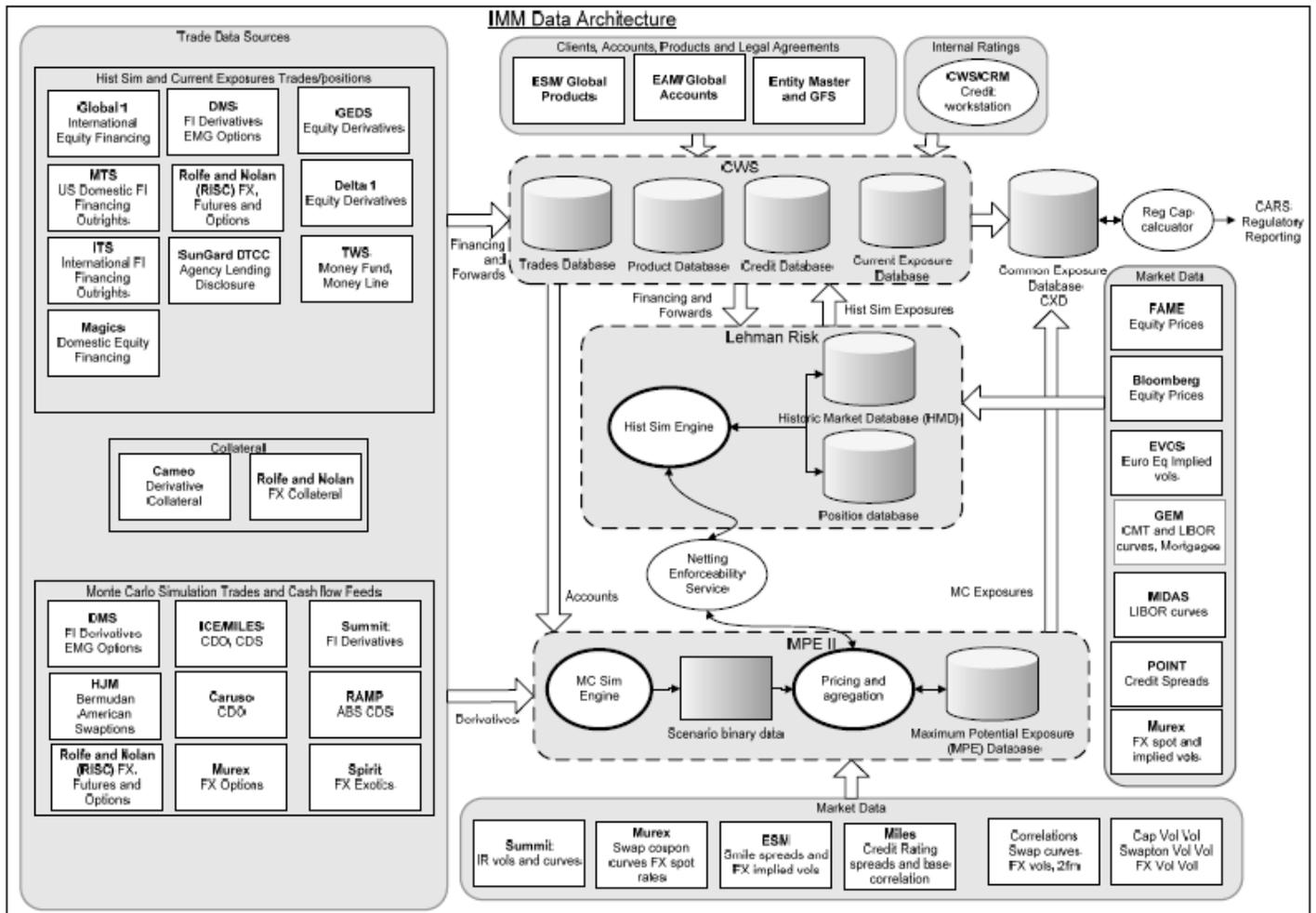
- Data sourcing
 - positions: LehmanRisk receives position / trade level data from the Credit Workstation System (CWS); the data is enriched by looking up indicative data for securities from the Firm's Enterprise Security Master system; the indicative data examples include uniform security identifiers (e.g. SEDOLs needed for equity historical data mapping), rating, sector, issuer, country of risk (for corporate and sovereign bonds) and underlying security identifiers for listed derivatives
 - sensitivities : sensitivities/Greeks are computed in LehmanRisk by using the APIs provided by the front office systems
- Market Data
 - LehmanRisk obtains historical market data from various external vendors (FAME, Bloomberg, Reuters etc.) or in house (Fixed Income analytics) systems; the non equity market data is stored in the

LehmanRisk historical market data database; reports are also generated for daily price changes beyond specified limits – these are monitored by risk managers

- Mapping
 - the position sensitivities are mapped to the risk factors based on LehmanRisk Historical Simulation methodology; all risk factors have historical market data associated with them
- Aggregation and Reporting
 - LehmanRisk has a flexible reporting mechanism to group positions by various attributes and report MPE on the sub groups; various cuts by Counterparty, BPM etc. are produced and fed to the MPE engine for further aggregation; the relevant netting rules are respected in the aggregation stage.

IMM Systems Architecture

The following diagram shows the main components of the IMM systems architecture and the data sources used in the process:



2.3 Internal Credit Ratings

CRM uses a single internal rating system defined and implemented through the Global Credit Policy Manual, associated procedures documents, and the Ratings Maintenance (RM) application. The system contains eleven Internal Credit Rating Models used to assess the creditworthiness of different types of counterparty. RM is accessed through a secure web portal on LehmanLive, the Firm's intranet system. RM contains the following Internal Credit Rating Models grouped by model materiality/significance to LBIE's portfolio.

Material

- Bank
- Hedge Fund
- Broker/Dealer
- Sovereign
- Insurance
- Collective Investment Schemes

Less Material

- Lehman Special Purpose Vehicle
- Corporate
- Special Purpose Vehicle
- Pension Fund
- Municipal
- Not-for-Profit

Internal Credit Rating Process

All of the above Internal Credit Rating Models are characterized as constrained expert judgment. For each model the credit analyst assesses the counterparty on a six point scale, Excellent, Strong, Good, Fair, Marginal and Weak, for each rating driver in the model by matching the counterparty's characteristics to the closest matching pre-defined rating definition. The rating system assigns each driver assessment a numeric value, and using each rating driver's pre-defined weight the application calculates a Rating Driver Based ICR score. The Rating Driver Based ICR score is then mapped to the ICR scale where a Rating Driver Based ICR is produced. Where necessary, the rating system applies a sovereign cap to each individual counterparty in order to capture Currency Transfer Risk (CTR, the risk that the counterparty may not be able to physically acquire the foreign currency it requires in order to meet its obligations) to generate the Proposed ICR (Capped by Sovereign). The sovereign cap is applied based on the counterparty's country of physical residence. Each sovereign cap is automatically sourced from the Sovereign Model ensuring complete data integrity across models within the rating system.

At the end of the rating process the analyst manually enters the Final ICR to either positively concur with the Proposed ICR (Capped by Sovereign) or enable the analyst to perform a Rating Override. The analyst may choose to override the output in cases where credit features of the counterparty are not fully or appropriately captured by the drivers or where the CTR assignment is inappropriate. Credit analysts are required to record a comment in all cases where they applied a Rating Override.

Each ICR is assigned a Probability of Default in accordance with the table below.

ICR PD

iAAA	0.03%
iAA	0.03%
iA+	0.03%
iA	0.03%
iA-	0.04%
iBBB+	0.17%
iBBB	0.24%
iBBB-	0.34%
iBB+	0.75%
iBB	1.25%
iBB-	2.07%
iB+	3.22%
iB	5.46%
iB-	10.46%
iCCC	20.98%
iD	100.00%

The PD's used by CRM are based on the 1 year issuer-weighted global default rates published by Moody's.

Global Implementation of Models

A single version of each model is implemented consistently throughout the Firm for use by trained credit analysts to evaluate the creditworthiness of individual obligors; no specific tailoring has been made to individual models for different geographic regions. The use of a single centralized model in RM ensures that all credit analysts use current and globally consistent rating models.

Interaction with Local Regulators

The rating system and its operation have been discussed with the Securities and Exchange Commission in the US. Since 2005, Lehman Brothers has elected to be supervised by the Securities and Exchange Commission ("SEC") as a consolidated supervised entity ("CSE"). In support of this election, the Firm submitted an application to the SEC for authorization to use a risk-based capital computation that is based on the use of internal models for credit ratings and credit exposure measurement in accordance with the Basel II capital framework. The SEC approved the Firm's application in November 2005. In connection with the CSE application process, the SEC obtained extensive documentation relating to the Firm's internal rating system and audited the system's implementation and use. On an ongoing basis, the SEC continues to receive regular updates on the further development and implementation of the Firm's internal rating system.

Lehman Brothers UK consolidated group obtained approval for the Foundation Internal Ratings Based Approach and hence the Firm is using the prescribed parameters for LGD and EAD in the calculation of Risk Weighted Assets. The Firm has also gained approval for the Internal Models Method for computing counterparty exposures.

LEHMAN BROTHERS

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2.4 Internal Facility Ratings

2.4.1 Introduction

A counterparty's IFR reflects the value of the expected recoveries that will pertain to a Facility less the expected costs of realizing those recoveries, assuming that default has taken place at some point during the period (the cycle) over which the ICR has been assessed, and expressed in present value terms:

- the Recovery Rate is the net present value of the claim that is recovered expressed as percentage of the outstanding claim; and
- the Loss Given Default is $1 - \text{Recovery Rate}$.

2.4.2 Recovery Rate Drivers

For counterparties that have low PDs, the Recovery Rate is estimated via systematic drivers classified between three levels: External Environment, Counterparty, and Facility.

2.4.2.1 External Environment

The Recovery Rate is likely to be lower in high aggregate default rate environments. In situations where there are a large number of defaults taking place (a) demand for defaulted assets will be lower because the value of those assets will be naturally lower (e.g. if the counterparty defaulted because its assets started to generate inadequate profits) and (b) there is the potential for excess supply which depresses clearing prices still further. CRM assume a high aggregate default rate environment commensurate with a downturn when assigning IFRs, although recessionary scenarios / stressed downturns are considered during stress testing procedures. The Recovery Rate is also likely to be lower if the workout jurisdiction has a legal regime that is considered debtor friendly rather than creditor friendly.

2.4.2.2 Counterparty Level

In any given situation a higher Recovery Rate will be a function of high asset disposal values and fewer competing claims on the proceeds (the monetary size and number of creditors). Asset disposal proceeds are likely to be lower if the counterparty's industry is in distress, the counterparty's assets have little other uses, and the counterparty was unable to generate profits from those assets in the period leading up to default. If the counterparty is a holding company ("holdco") its assets might primarily consist of equity holdings in a subsidiary operating company ("opco") where the real asset value lies. If there are other external claims at the level of the opco then those opco creditors are considered structurally senior compared to holdco creditors (holdco creditors are therefore considered structurally subordinated). The complexity of the workout process, which in large part might be driven by the nature and structure of the counterparty and its wider family group, will also incur higher time and legal costs thus reducing the Recovery Rate.

2.4.2.3 Facility Level

Creditors' claims against an individual counterparty are generally ranked according to priority levels established by reference to the applicable legal regime and by reference to the documentation under which

the creditors contracted with the counterparty. The ranking is referred to as legal seniority – the more senior the facility the higher the anticipated recovery rate compared to a lower ranking creditor, provided that the expected priorities and rankings are respected during the workout process. A facility will generally expect higher recovery rates if contract specific security has been taken for two main reasons (a) relevant asset disposals will primarily accrue to the secured party rather than being spread more widely in the general creditor pool and (b) the secured party is likely to have greater influence over the asset disposal process and thus obtain better treatment for itself than if the decisions were taken by third parties (e.g. the courts or the insolvency practitioner). Any Eligible Financial Collateral held by Lehman, which is defined as cash and/or securities taken as collateral under a master netting agreement such as an ISDA/CSA, GMRA, OSLA, MRA etc., is netted against exposure rather than considered part of the Recovery Rate analysis and therefore should be disregarded when computing recovery rates.

2.4.2.4 Default Path

For counterparties with High PDs, and for those counterparties already defaulted, the above drivers are augmented or superseded by information over the idiosyncratic Default Path:

- cause of default – the counterparty may default because of, inter alia, funding reasons (e.g. excessive leverage or a liquidity event), business reasons (e.g. falling demand for the counterparty’s goods and services) and/or other types of event risk such as litigation; inappropriate funding may be easier to workout than a poorly performing or fundamentally weak business model;
- nature of default – the counterparty may default by failure to pay (missing an interest payment, missing a principal payment) or by entering bankruptcy; a missed interest payment may imply a worse credit condition than a missed bullet principal repayment; and
- work out process – the work out can take several forms including full or partial liquidation, refinancing, or trade sale; the incumbent management may stay in place or may be replaced, depending on the procedure followed and the legal regime.

2.4.3 IFR Approach

Prior to a default and ultimate workout the net present value of the recovery cannot be observed. The approach taken by CRM is to divide the Recovery Rate continuum into a series of distinct and coterminous Recovery Rate ranges (“bands”), and the IFR scale is the set of sequential labels assigned to each band in turn. Facilities are allocated the most appropriate IFR based on a case-by-case assessment of the pre-defined systematic Recovery Rate drivers (referred to as a Rating Driver Based Assignment), or based on industry membership (referred to as a Pooled Assignment). Both the Rating Driver Based Assignment and the Pooled Assignment are referred to as IFR Modelling approaches.

The Ratings Driver Based Approach to IFR Assignment is used when CRM believe that there are, ex ante, identifiable and measurable systematic recovery rate drivers that can be used to estimate and differentiate the expected Recovery Rate per individual counterparty. The Ratings Driver Based Approach takes three main forms:

- the Corporate Form (which serves as the basis for Corporates and Not-For-Profits);
- the Financial Institutions Form (which serves as the basis for Banks, Broker Dealers, Insurance Companies and Pension Funds); and
- the Fund Form (which serves as the basis for SPVs, Lehman SPVs and Collective Investment Schemes).

The Ratings Driver Based Approach to IFR Assignment is founded on the analyst adjusting a standard Base Reference Recovery Rate (“BRRR”) by assessing, per counterparty, the cumulative impact of the pre-defined Recovery Rate Drivers. Each Driver has its own independently assessed marginal impact which may increase or decrease the BRRR. In contrast to the ICR Approach, the Rating Driver Based Approach to IFRs directly computes an expected recovery rate; each driver score is directly expressed as an incremental impact to the BRRR and the overall computation is a linear summation adjusted by the complexity scalar factor.

The Pooled Approach to IFR Assignment is equivalent to an industry wide recovery rate and is used when CRM believe that, ex ante, there are no identifiable and measurable systematic drivers that can be used to estimate and differentiate an individual counterparty’s recovery rate. In these circumstances exposures for all counterparties in the industry are deemed to merit the same IFR. The Pooled Approach is used for Hedge Funds, Sovereigns and Municipalities.

The scorecard selected by the analyst (e.g. Bank Scorecard) will display the required IFR Model (e.g. Rating Driver Based Assignment, Financial Institutions Form). The analyst is unable to change the default IFR Model (e.g. to Pooled Assignment) that is displayed on the selected scorecard.

The analyst has a more complete set of information to utilize for counterparties at or close to default e.g. the Default Path and the then-ruling external environment will be known. In these situations a Facility specific analysis can be undertaken based on contemporaneous, idiosyncratic features rather than using an IFR Model; the analyst is therefore expected to use the scorecard’s override feature to assign the appropriate IFR more frequently for poorly rated and defaulted counterparties than for well rated counterparties. For example, in these situations a balance sheet break up analysis may be appropriate and meaningful, the state of the industry and likelihood of a trade sale known, or a regulatory response may already be in motion. The nature of the Default Path often has implications for the expected recovery rate e.g. failure to service debt is likely to be accompanied by lower recoveries than a failure to repay bullet principal. For non-defaulted facilities there are a large number of unknowns, especially if the counterparty has a very low PD and the Recovery Rate is therefore an expectation derived from the relevant IFR Model.

2.4.4 Corporate Form

Recovery Drivers under the Corporate Form are categorized into three levels: External Environment, Counterparty and Facility.

2.4.4.1 External Environment

The External Environment Level assesses the recovery rate based on exogenous features that apply to all counterparties operating in same environment.

Aggregate Default Rate Environment – the Base Reference Recovery Rate (“BRRR”) reflects a typical recovery rate for senior unsecured issuers in aggregate default rate environment commensurate with a downturn. This Recovery Rate Driver is set at 35% and is then adjusted up or down as a result of the remaining drivers.

Jurisdiction Adjustment – captures the impact on the Recovery Rate of the relative Debtor or Creditor friendliness of the counterparty’s jurisdiction based on the physical residence classification of that counterparty. These adjustments are automatically implemented by CRM based on the legal residence of the counterparty.

2.4.4.2 Counterparty Level

The Counterparty Level incorporates characteristics of the counterparty that impact all creditors into the Recovery Rate.

Asset Evaluation – captures the impact of the likely residual value in the counterparty’s assets at the point of default; reflects the fact that counterparties carry various types of assets that may retain more or less value in the event of a default:

- Industry Distress – if the industry is in distress then recoveries are negatively impacted and this influence is automatically incorporated by CRM by reference to the “Industry Risk & Operating Environment” score in the ICR section; the Scorecard is conservative and does not increase recovery rates for counterparties in low risk industries;
- Asset Profitability – unprofitable assets are unlikely to be attractive to buyers in the event of a bankruptcy; this effect is automatically incorporated by RM by reference to the “Profitability” score in the ICR section; the Scorecard is conservative and does not increase recovery rates for highly profitable counterparties; and
- Asset Protection – assets without alternative uses are unlikely to be attractive to buyers in the event of bankruptcy; on the other hand, assets that have alternative uses are more likely to be useful to other owners/operators regardless of how profitable those assets performed for the current owner/operator.

Complexity Adjustment – the more complicated the workout process the more delayed the recoveries and the higher the costs of the workout, and therefore the lower the present value of the recoveries.

2.4.4.3 Facility Level

The Facility Level assesses the ranking of facilities made available by Lehman against the counterparty’s assets and relative to other creditors. This consists of three interlinked items:

- the seniority of Lehman’s claims;
- the security against Lehman’s claims; and
- the relative level of subordinated creditors providing the cushion against Lehman’s claim.

Seniority and security often go hand-in-hand i.e. the more senior the creditor the more security – and better quality security – the creditor is likely to enjoy. The model defaults to senior unsecured as this is the typical level for capital market products, but other seniority/security levels are available. The Cushion evaluates the amount of creditors – including equity – behind Lehman’s claim in the order of payments: the greater the cushion the larger the expected recovery. There is no default setting and the analyst must select the most appropriate score.

In practice the vast majority of Lehman’s trading relationships with any one individual counterparty are conducted at the same level of legal seniority, usually senior unsecured. In these situations the analyst has

the ability to simultaneously assign the IFR to “All Facilities” belonging to a single counterparty which is, in effect, the same thing as fixing the contract level variable and then applying an IFR at the counterparty level.

However since these three items can vary per facility, and each counterparty could have more than one facility, the scorecard functionality is complicated: the scorecard enables the analyst to select and separately assess each facility across these three dimensions.

For the purposes of defining a facility against which an IFR should be assigned, scorecards using a Ratings Driver Based Approach enable analysts to:

- assign separate facility ratings to each ISDA Master Agreement per Lehman Legal Entity;
- assign separate facility ratings to each individual FX account not associated with an ISDA or other Master Netting Agreement; and/or
- assign a single facility rating to all other facilities such as financing trades and cash forwards.

2.4.4.4 Final IFR Section

The calculation of the Proposed IFR combines the External and Counterparty Level Driver scores for each Facility Level and then applies the complexity adjustment as a scaling factor. For example, for a counterparty located in the US with one secured facility the Proposed IFRs are computed as follows:

	Counterparty A		
	Facility 1	All Other Facilities	
BRRR	35%	35%	} Same for each Facility
Jurisdiction Adjustment	0%	0%	
Industry Distress	0%	0%	
Asset Profitability	0%	0%	
Asset Protection	0%	0%	
Seniority & Security	30%	0%	Facility Specific
Cushion	5%	0%	Facility Specific
Sub-Total	70%	35%	
Complexity Adjustment	95%	95%	Same for each Facility
Calculated RR	67%	33%	=Sub-Total x Complexity
Proposed IFR	i3	i7	Lookup to Conversion Table

In this example the Reference IFR will also be proposed as i7.

The analyst is required to select the Final IFR. If the analyst does not agree with the Proposed IFR a mandatory comment is required. This comment should be brief and explain why the IFR Model failed calculate the IFR that the analyst deems appropriate e.g. missing drivers, inappropriate incremental impact.

2.4.5 Financial Institution Form

The BRRR, Jurisdiction Adjustment and Cushion Drivers are identical across the Corporate Form and the Financial Institutions Form. The Complexity Adjustment is similar in both cases although the marginal impacts are different as CRM assumes Financial Institutions are typically more complex workouts than Corporate workouts.

The key differences between the Corporate Form and the Financial Institutions Form are:

1. the analysis of residual Asset Values: the Corporate Form separately assesses Profitability (sale in situ) and Protection (value in break up), whereas the Financial Institutions Form combines these factors as Financial Assets are expected to have the same residual value in situ or in break up;
2. making allowance for the likely Regulatory Response: the Corporate Form does not include any consideration of Regulatory Response because any such response is likely to be politically motivated and hence circumstance specific, whereas the Financial Institutions Form does make a small allowance based on the empirical observation that authorities are likely to assist, in a variety of direct or indirect ways (e.g. making lines of credit available, relaxing the regulatory burden, forcing healthy institutions to take over all or part of the business, or assuming central responsibility for the work out process rather than relying on the local courts system), those Financial Institutions whose unassisted distress would jeopardize the functioning of the financial system; and
3. the Corporate Form includes the possibility of taking Security, whereas the Financial Institutions Form does not include that option: it is extremely rare to take non-eligible collateral (i.e. collateral outside of an ISDA or repo-style document) when dealing with Financial Institutions and any such situation should be individually dealt with via an override.

2.4.6 Fund Form

The Fund Form of the Ratings Driver Based Approach starts with the following proposition:

- if the counterparty triggers an unwind whilst value still remains in the asset pool, and
- if Lehman Brothers ranks towards the top of the waterfall.

then CRM expects to recover a greater proportion of Lehman Brothers exposure at default and will assign a higher IFR than if these conditions are not met. CRM believes that in situations where Lehman is senior to other creditors then recoveries from trading with these entities should be towards the upper end of the recovery rating scale. On the other hand, subordinated positions are likely to result in limited to negligible recoveries.

This approach is implemented by adjusting full (i.e. 100%) recovery downwards based on:

1. consideration of the Fund's asset construct, liabilities and structural features to determine whether there is likely to be value in the structure at the point of default; and
2. consideration of Lehman's priority of claim.

For SPVs, unwind procedures are often spelt out in deal documentation, and CRM believes that SPV workouts are unlikely to face legal uncertainty and that procedures would be carried out promptly, primarily driven by the ability to obtain creditor consensus (where required) and liquidate the assets.

2.4.7 IFR Conversion Table

The computed Recovery Rate is cross referenced to a common IFR Conversion Table to establish the Proposed IFR.

IFR	Expected Recovery Rate %		Assigned LGD %
	>	<=	
i1	85	100	10
i2	75	85	20
i3	65	75	30
i4	55	65	40
i5	45	55	50
i6	35	45	60
i7	25	35	70
i8	15	25	80
i9	5	15	90
i10	0	5	100
iNRR	N/A	N/A	100

2.4.8 Recovery Rate Assumption

All IFRs are established on two key assumptions:

- the governing documentation ensures that Lehman Brothers can net, terminate and close out in a timely manner following a default; contract enforceability is handled via the Netting Enforceability Service and factored into the exposure profiles; however if, for example, Failure to Pay is not a termination event, or there is a meaningful danger of “Cherry Picking” (close out netting proving ineffective and the insolvency administrator selects which trades to close out at which point), a preliminary Internal Facility Rating may be ascertained using the relevant approach but should then be revised downwards as an override to conservatively recognize the shortcomings in the governing documentation; it is the responsibility of the assigned analyst to be familiar with the documentation under which counterparties transact; and
- the Absolute Priority Rule (“APR”) holds; where incorporated into the analysis, the Jurisdiction Adjustment considers the general debtor or creditor friendliness of the legal regime including a high level consideration of APR; but in all cases the APR is of such importance that if the analyst has any significant concerns that absolute priority may fail (e.g. nominally subordinated creditors are treated equal to or senior to nominal senior creditors) or Lehman Brothers’ exposure may be re-characterized disadvantageously e.g. from senior unsecured to subordinated, then again the preliminary IFR should be revised downwards to conservatively recognize these risks.

2.5 Use Test Issues – Exposure

2.5.1 Overview

The expected exposures used in the Firm’s regulatory capital calculation are calculated from the same distribution used to drive the Firm’s internal risk management measures. Specifically, the same methodologies, platforms and data sources are used, and all elements are subject to the same internal controls.

The accuracy, robustness and timeliness of expected exposure data used for internal risk measurement purposes extends to the data used for regulatory purposes. This also means that the regulatory capital calculations automatically benefit from the Firm’s ongoing programme of improvements to the internal potential exposure calculation platforms.

2.5.2 Potential Exposure Track Record

The Firm has significant experience in the application of potential credit exposure modelling for the purposes of risk management, strategic decision making and capital allocation. Potential exposure models have been in use at the Firm for a number of years. The models and platforms that form the basis of the Firm’s IMM waiver application have been in general use within the Firm for over one year and form the basis for both internal risk management and the CSE capital computation at the holding company level. The ongoing programme of model and system enhancements serves to fine tune the accuracy, timeliness and robustness of all of these calculations.

The potential exposure models cover the Firm’s global derivative businesses, securities financing businesses and forward cash trading activities. The same platforms, models and monitoring are applied across all geographic regions and to all legal entities, including LBIE.

These potential exposure models are in broad use across the Firm and are well understood by Risk Management, Senior Management and relevant business personnel. The potential exposure measures are used as inputs to the following:

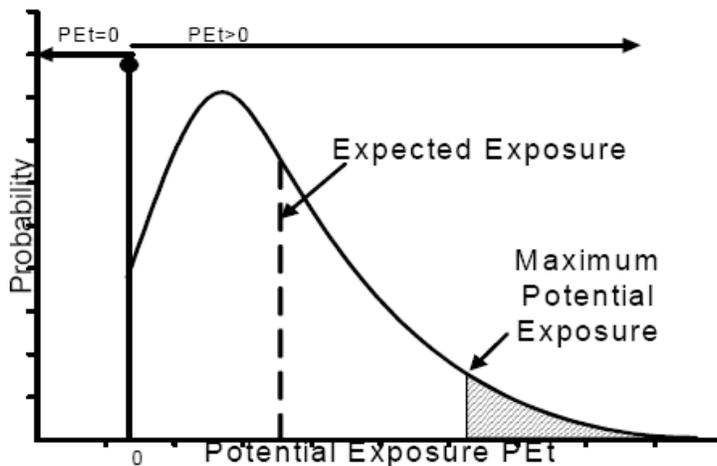
- credit approval process;
- credit limit setting/monitoring;
- credit risk reporting;
- management reporting & strategic planning;
- credit valuation adjustment;
- Risk Appetite;
- Risk Equity;
- CSE regulatory capital reporting; and
- LBIE regulatory capital reporting (this waiver application).

2.5.3 MPE and EE Consistency, and Satisfying the Use Test

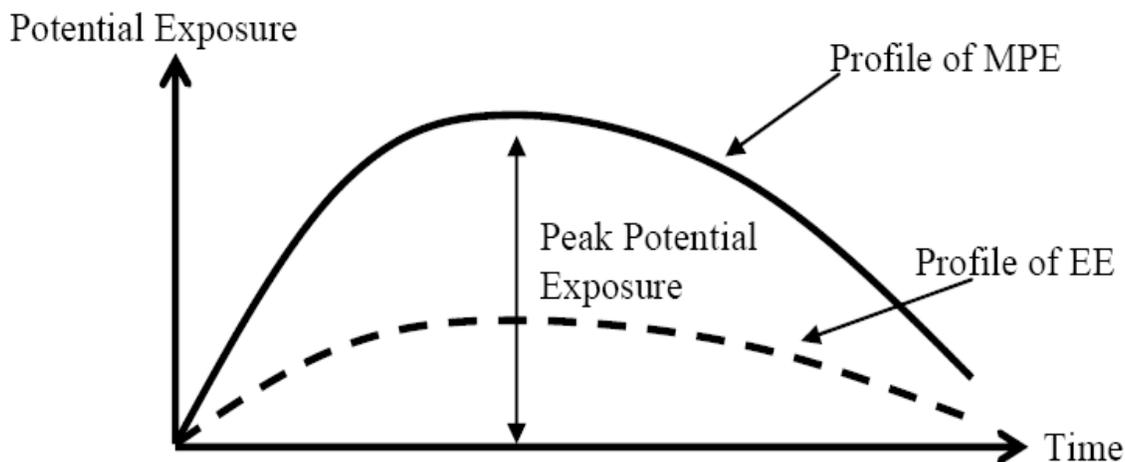
The potential exposure models generate a distribution of potential credit exposures PE (t) at a set of future dates t . For each time t the Maximum Potential Exposure (MPE) and Expected Exposure (EE) are defined as:

MPE(t): the upper 95th percentile of the distribution of positive credit exposures PE(t)

EE(t): the average of the distribution of positive credit exposures PE(t).



Calculations of MPE and EE are performed for each portfolio of trades with a given counterparty using the same netting, collateral and aggregation criteria as described in the accompanying methodology submissions. The calculations are repeated at future time points over the life of the counterparty's portfolio, creating a time profile of MPE and EE:



The EE profiles are used as inputs to the credit valuation adjustment and the regulatory capital model. The 95% confidence MPE profiles form the basis for the Firm's internal measurement and management of credit exposures, including credit approvals, the internal capital model and management reporting. The application of EE and MPE measures within the Firm is detailed in the following sections.

2.5.4 Setting and Monitoring Credit Limits

As an integral part of its credit risk control process the Firm measures and monitors Maximum Potential Exposure utilisation against limits on a daily basis. The time bucket profile of MPE forms the basis for the setting of credit limits, and the ongoing monitoring and management of the counterparty risks in these businesses. Limits are set at the parent and counterparty levels for the MPE in each of 10 time buckets:

D03, M01, M03, M06, Y01, Y03, Y05, Y10, Y20, Y20+

Limits for Hedge Funds counterparties are set at the D03 level only reflecting the short term and active nature of their portfolios.

The nomenclature indicates the bucket tenor, using a D, M or Y prefix to indicate day, month or year. For example bucket Y01 covers the 6 month to 1 year portion of the MPE curve. Y03 covers the MPE curve above 1 year, up to 3 years.

The utilisation of credit limits is monitored daily, comparing the calculated MPE in each bucket against the credit limit in that time bucket. Utilisations are calculated at the product level before being aggregated to the counterparty level and then the legal family group level. The product level calculations reflect documented netting and collateral provisions. The counterparty and family level aggregations are the gross arithmetic sum of the component product MPEs.

A utilisation report is published in the Credit Risk Management portal for all counterparties globally; this report is available online to the global credit analyst and manager community. Excesses against set credit lines are reported using the Limit Excesses Module, which lists all the MPE-based credit limit violations on counterparty level and family group level. Analysts review their limit excesses daily; their respective line managers are automatically notified of these excesses. MPE limit breaches that are unresolved after a ten day period are automatically escalated to the regional head of Credit.

The MPE utilisations used in this process derive from the same distribution of potential exposures used to calculate EE for regulatory capital purposes. For hedge fund counterparties the internal capital, CVA and regulatory capital models use a full time profile of exposure; however, daily limit monitoring & risk reporting is conducted at the D03 level using calculations that reflect the cross-netting and portfolio margining benefits of this daily margined business.

2.5.5 The Credit Approval Process

MPE measures are used as the basis for the credit approval of new derivatives business. Credit officers reference the daily updated credit MPE profiles for the existing potential exposure risk to their clients. New trades are assessed in the context of the marginal additional MPE presented by the new trade versus the available time bucket MPE lines. This may be done conservatively, referencing pre-computed tables of risk

factors that indicate the peak MPE contribution as a percentage of notional for standard flow trades, or using a full portfolio calculation that gives benefit to potential netting and diversification effects. Both the full portfolio calculations and the pre-computed risk factors are generated using the same models used for daily MPE exposure monitoring and for the regulatory capital EE calculations. This ensures consistency of the approval process with the Firm's risk monitoring and regulatory processes.

2.5.6 Credit Risk Reporting

The Firm monitors and reports credit exposures on a MPE and Current Credit Exposure ("CCE") basis. CCE is the current exposure net of collateral, accounting for legal portfolio netting. MPE reports use the same models and platforms as the EE curves used in the LBIE regulatory capital calculation. Net mark to market, collateral and notional values on a portfolio level are generated and reported on a daily basis, although the main measures used to monitor exposure are CCE and MPE.

The reports are an integral part of the Firm's credit risk management process:

- MPE and CCE are the basis for daily reporting and monitoring of credit exposures by analysts; and
- MPE and CCE are the key metrics used for credit risk reporting to Senior Management.

The continual process of scrutiny and review of these reports at all levels within the Firm satisfies a key element of the use test and ensures accurate and timely data for both the regulatory capital calculation and internal risk monitoring.

2.5.7 Credit Valuation Adjustment

Credit Valuation Adjustment ("CVA") is the process of fair market valuing the Firm's portfolio of outstanding transactions taking into consideration credit spread movements of Lehman Brothers and its trading partners (i.e. counterparties). Each month, a CVA analysis is performed for the global business activities that generate counterparty credit exposure. The CVA analysis computes the fair market value of the Firm's assets and liabilities based on Lehman Brothers and counterparty EE curves, recovery estimates and implied default probability curves from credit spreads. This analysis covers performing and nonperforming counterparts as of the valuation date for each report. The CVA analysis is distributed to the Chief Risk Officer, Chief Financial Officer, Legal Counsel and Financial Reporting on a quarterly basis.

The CVA and LBIE regulatory capital calculation use the same counterparty EE curves for their respective computation processes.

2.5.8 Risk Appetite

The Firm's Risk Appetite model calculates the 95th percentile internal economic capital required to support the business over a one year holding period. Model inputs include counterparty credit risk, market risk and event risk. The credit risk capital input to this model is based on the same potential exposure models used to generate regulatory capital. Risk Appetite follows a daily production process with a monthly update of the credit risk component. System and process enhancements will allow for a more frequent cycle in the future.

Risk Appetite results are reviewed by Senior Risk, Finance and Business Managers for risk monitoring and strategic decision making purposes; the distribution includes the Firm's Chief Risk Officer and Chief Financial Officer. The output of this model is used as a basis for key business investment and planning decisions by the Firm's Senior Management.

2.5.9 Risk Equity

The Firm's Risk Equity model calculates the 99.5th percentile internal economic capital required to support the business over a one year holding period. Model inputs include counterparty credit risk, market risk, event risk and an operational risk component. The credit risk capital input to this model is based on the same potential exposure models used to generate regulatory capital. Risk Equity follows a monthly production process. System and process enhancements will allow for a more frequent cycle in the future.

Risk Equity results are reviewed by Senior Risk, Finance and Business Managers for strategic decision making purposes; the distribution includes the Firm's Chief Risk Officer and Chief Financial Officer. Senior Management use Risk Equity results to ensure the Firm has adequate capital to support its ongoing business activities whilst maintaining additional capital for regulatory and leverage concerns should these requirements exceed the internal economic capital measure.

2.5.10 CSE Regulatory Capital Reporting

The Firm calculates its consolidated regulatory capital requirement at the holding company level LBHI according to its CSE approval from the SEC. This calculation uses EE inputs to the credit component of the capital charge. The EE inputs are calculated according to the definition in section 2.5.3 and are based on the same model used for daily monitoring and management of MPE, as well as the LBIE regulatory capital inputs under IMM. The EE curves are used to derive the EAD and maturity M inputs to the capital charge.

2.5.11 LBIE Regulatory Capital Reporting

The CCR calculation for the UK consolidated group uses the EE inputs defined in section 2.5.3 to derive the EAD component of the Firm's capital charge. These EE inputs are based on the same model used for daily monitoring and management of MPE, as well as the CSE regulatory capital charge. The EE curves are used to derive the EAD and maturity (M) inputs to the capital charge.

2.5.12 Management Reporting

The output of the IMM models is integral to the Firm's management reporting of Credit Risk. The MPE and/or EE outputs are used in the following management reports:

- European Risk Snapshot;
- LBIE Snapshot;
- Chief Risk Officer Dashboard;
- CRMC Summary Exposure Review;
- CCE/MPE Report;
- MPE Limit Utilization report;
- Limit Excesses tool;

-
- CSE Schedules;
 - Credit Valuation Adjustment;
 - Risk Appetite; and
 - Risk Equity.

The content, frequency of circulation and audience of these reports is itemised Section 2.6.1.3, with the exception of the following:

CRMC Summary Exposure Review – Quarterly

The CRMC Summary Exposure Review is a report prepared quarterly for the Credit Risk Management Committee (“CRMC”). It contains summary management information regarding current credit exposure and maximum potential exposure, including risk concentrations. It is used by CRMC to monitor overall exposure levels and risk concentrations and to provide comfort that the Credit engines are performing as intended.

Credit Valuation Adjustment

This analysis covers performing and non-performing counterparts as of the valuation date for each report. The CVA analysis is distributed to the Chief Risk Officer, Chief Financial Officer, Legal Counsel and Financial Reporting at every fiscal quarter end.

Risk Appetite – Monthly

Risk Appetite results are reviewed by Senior Risk, Finance and Business Managers for risk monitoring and strategic decision making purposes; the distribution includes the Firm’s Chief Risk Officer and Chief Financial Officer. The output of this model is used as a basis for key business investment and planning decisions by the Firm’s Senior Management.

Risk Equity – Monthly

Risk Equity results are reviewed by Senior Risk, Finance and Business Managers for strategic decision making purposes; the distribution includes the Firm’s Chief Risk Officer and Chief Financial Officer. Senior Management uses Risk Equity results to ensure the Firm has adequate capital to support its ongoing business activities whilst maintaining additional capital for regulatory and leverage concerns should these requirements exceed the internal economic capital measure.

2.5.13 Other Management Information

Concentration Risk Reporting

The Firm’s concentration risk reporting is embedded in the following management reports:

- European Risk Snapshot
- LBIE Snapshot
- Chief Risk Officer Dashboard
- CRMC Summary Exposure Review – quarterly

Wrong Way Risk – Daily

A daily alert is distributed within Credit Risk Management detailing credit derivative and financing/cash forward trades for which there may be an element of wrong way risk. Alerts are generated on a daily basis and distributed to key members of Credit Risk Management and Quantitative Analytics.

Stress Testing Snapshot

The Stress Test Snapshot report is generated on a quarterly cycle and is distributed to relevant risk managers, CRMC, and senior management (ERC). It provides a summary of key stress testing results, including sector, country and rating concentrations.

2.6 Use Test Issues – PD

2.6.1.1 Credit approval

The CRO has authorized certain CRM personnel to approve the extension of credit limits and approve transactions on behalf of Lehman Brothers. All analysts joining the department are assigned to Level 7 authority which enables systems access to propose ratings and limits but entails no authority to approve limits and transactions (i.e. nil monetary authority). Reallocations of analysts to Level 3 – 6 require approval by the CRMC as authorized by the CRO via Global Credit Policy Manual; reallocations to Level 1 or Level 2 require the approval of the CRO.

The credit authority vested in each Level is expressed in terms of USD values in a grid or matrix by internal credit rating and exposure type. For pre-settlement exposure the credit authority is further refined by tenor interval. The authority grids are contained within the **Global Credit Policy Manual, 8.5 Approval Authority Grids**, and replicated into the Limit Management application for routing credit limit proposals to the required authority level. Therefore the internal credit rating directly drives credit approvals. The authority grid for Level 1 is shown here as an example.

Level 1 (MPE Equivalents in USD Millions)					
ICR	Treasury	Settlement	Pre-Settlement Risk by Tenor		
	Risk	Risk	≤1 yr.	≤10 yrs.	>10 yrs.
iAAA	1,000	1,000	1,000	750	500
iAA	1,000	1,000	800	600	400
iA	900	900	600	450	300
iBBB	500	500	400	300	150
iBB	200	200	200	150	75
iB	-	100	100	75	50
iCCC	-	50	50	40	25
iD	-	25	25	20	15

2.6.1.2 Individual and portfolio limit setting

A counterparty's internal credit ratings is one of the key factors considered in decisions on approving and sizing credit limits. All other things being equal, the better the rating, the higher the limit. Other inputs to the risk element of the limit decision include, inter alia, the size of the counterparty, the potential for ratings volatility or event risk, recovery rates, and documentary protection e.g. covenants or other early termination rights. Under IMM, eligible financial collateral is netted against exposure, and therefore it affects limit utilization rather than limit size.

Counterparty limits are implemented via the Limit Management application. This application reports internal ratings (pulled in from Ratings Maintenance) against the counterparty records (pulled in from GARM). Limit excesses are reported in the Limit Excess module which also includes ratings information – see below.

Limits are supported by written credit reviews; see **Global Credit Policy Manual, 6.0 Credit Reviews**. Limits and review dates are electronically signed-off using the Limit Management application. The originating analyst signs the recommendation and passes it to the relevant Credit Manager. If the limit is above the Credit Manager’s authority, then it will be passed to the Regional Credit Manager for approval and further discussed with the Chief Risk Officer as necessary. Credit review templates contain a static data section in which the rating is displayed and a section for the counterparty credit assessment which is consistent with, and additive to, the associated scorecard. The result of this sign-off process is that the internal ratings supporting progressively larger limit requests, and hence potential exposures (MPEs), are reviewed by progressively higher levels of senior management. The reviewer/approver therefore has the opportunity to review the scorecard used, rating method, driver scores and the written commentary.

If a reviewer does not concur with the rating assignment then it is discussed with the originator and any prior reviewers, and if a ratings change is deemed appropriate then (i) if the associated scorecard is “pending” it is passed back to the originator for revision, or (ii) if there is no pending scorecard the originator will be required to generate and submit a scorecard reflecting the revised analysis. **Global Credit Policy Manual, 8.3 Using Approval Authority for Credit Limits** clearly explains how the process works with reference back to authority grids based on ratings.

2.6.1.3 Reporting of credit risk information

Internal Ratings are an integral part of the Firm’s counterparty credit risk reporting. Exposure reports commonly include breakdowns by internal ratings. Certain reports, such as Risk Appetite, Risk Equity and CVA use internal ratings as an input into the computations but the resulting reporting does not display any internal ratings and therefore these reports are not listed here. Among the many reports that include rating information are the following:

European Risk Snapshot

This weekly report provides a summary level view of key European credit and market risk exposures including counterparty credit exposures by internal credit ratings, market risk VaR, risk appetite, loan commitments categorized by sector, region and business unit. The report is presented to the European Risk Committee each week to facilitate the review of material risk exposures, position concentrations and risk taking activities. The report is also circulated to relevant managers within Risk Management and Finance.

LBIE Snapshot

This report provides a summary level view of key LBIE credit and market risk limits and exposures including market risk VaR by business unit, top credit risk exposures by current, potential and total exposure and internal credit ratings, and exposure concentrations by sector, region and business line. LBIE’s capital base is included for reference. The report is presented to the European Risk Committee each week allowing the monitoring of market and credit risk exposures the Firm is running in the LBIE entity. The report is also

circulated to relevant managers within Risk Management and Finance. Additionally it is presented to the FSA on a monthly basis.

Chief Risk Officer Dashboard

This report is a daily package provided to the Chief Risk Officer including exposures, markets and sector commentary.

CCE/MPE Report

The main feature of this report is that it consolidates CCE and MPE by counterparty and allows users – primarily analysts – to drill down into portfolio level credit and potential exposures providing a more detailed view of the portfolio composition including internal credit rating, notional outstanding, collateral, MTM and MPE. The report is generated by CRR and posted to the credit portal.

Limit Utilization report

The Limit Utilization application reports current and historic credit limit utilization on product, counterparty and family levels, and each counterparty record is accompanied by the associated internal ratings. The reporting is automatically generated and delivered by the credit portal.

Limit Excesses report

The Limit Excess application reports current and historic excesses at counterparty and family level and allows users to action those excesses. Excesses are time stamped, tracked and automatically copied to credit managers and escalated to regional credit managers after 10 days. Resolved excess information is stored and accessible. The reporting includes the internal ratings.

CSE Schedules

Routine monthly reports are provided to the SEC as part of the Firm's CSE status. These are also circulated to senior management within Risk Management and Regulatory Control. The first schedule is a combination of large funded balances on loans and large derivative CCE. The second schedule is the top ten loan commitments and any funded amount related to the commitment. Additional reports detail the top MPEs generated by the credit engines and list the top 15 counterparties by MPE. The schedule also includes the total amount of CCE and MPE for all counterparties in our Credit systems. The final report details the top ten countries by CCE. Counterparty ratings are included in the schedule.

Past Due Refreshes

Past due refresh information is reported in two ways:

- the search functionality in the Ratings Maintenance application enables the user to bring back the past due population and filter by exposure pulled in from the Limit Utilization application; the (existing) ratings information is displayed against each counterparty record; the Analyst dashboard also automatically displays by Analyst on their individual MyCWS page past due refreshes requiring action;

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- each Credit Analyst is responsible for taking action to reduce their past due listing, and Credit Managers are responsible for the overall status of their Credit Team's past dues; and
- Ratings maintenance contains daily, global management information providing tabulated summaries of past due refreshes. Information is presented per analyst, per region, by time bucket, showing past due reviews by both counterparty count and percentage of exposures.

Unrated Counterparties

Unrated counterparty information is reported in two ways:

- the search functionality in the Ratings Maintenance application enables the user to bring back the population of counterparties without one or both of the internal ratings; the Analyst dashboard also automatically extracts the counterparty count information and displays by user on the MyCWS access page; and
- a complete listing of missing ratings is generated each month by CRR based on RM data and is circulated and followed-up in advance of completing the regulatory capital calculations; each Credit Analyst is responsible for taking action to reduce their listing of Unrated Counterparties, and Credit Managers are responsible for the overall status of their Credit Team's unrated population.

CRMC Summary Internal Rating System Performance Review

CRC is responsible for preparing and presenting summary management information regarding the high level performance of the ratings system to the CRMC on a quarterly basis. Summary reporting augments, and is more timely than, the associated comprehensive individual scorecard reporting. This high level reporting is a direct consequence of rolling out the IRB approach and is intended to help management maintain a good understanding of the overall system performance and to provide comfort that the system is performing as intended. The **Guidelines for Preparing & Presenting to the CRMC: Internal Ratings System – Ongoing Performance Review** is listed as a supporting document in C16. Ongoing performance reviews have been produced on a quarterly basis since first commenced in Q1 2007. The less frequent and heavier comprehensive validation documents are not considered “reporting” but all models have been validated in accordance with the **Guidelines and Procedures for Validating an Internal Credit Rating Model**.

Low Default Portfolio Modelling Results

CRC is responsible for preparing and presenting management information to the CRMC regarding the ongoing suitability of the PD master-scale and the calibration of the individual scorecards to the master-scale as a direct consequence of rolling out the IRB approach. CRC conducts the master scale review annually and the individual scorecards are reviewed:

- annually during the master-scale review; if the results indicate that an individual scorecard is performing inadequately then the CRMC will consider whether the next scheduled comprehensive internal credit rating (“ICR”) validation for that particular model should be accelerated or whether there are mitigating factors; and
- during the validation of the accompanying ICR Model; performing the assessment at this point enables the CRC to factor in any recalibration requirements for the individual scorecard.

Guidelines & Procedures for Validating & Revising Probabilities of Default were approved by CRMC in August 07. CRC conducted the annual master-scale review in accordance with these guidelines. The results of the study were reviewed and approved by CRMC.

2.6.1.4 Provisioning

At the end of each quarter CRM, QRM, Litigation and Finance coordinate to ensure completeness of the defaulted counterparty population. Specific provisioning decisions for defaulted counterparties are the result of discussions between CRM, Litigation and the business. Finance has responsibility for recording the provisioning decisions into the general ledger if not already specifically addressed by the business, while RCA monitor the progress and resolution of each credit event. A summary of the current quarter's defaulted counterparties list, along with the credit valuation adjustment, is provided to the Chief Risk Officer, which is then distributed to the General Counsel and Chief Financial Officer.

2.6.1.5 Economic Capital

The Firm's Internal Equity model calculates the 99.5th percentile economic capital required to support the business over a one year holding period (two year period for real estate investments). Model inputs include components for counterparty credit risk, market risk, event risk, operational risk and "other assets" (including intangible assets, such as Goodwill and deferred tax assets). At the Firm-wide level, Risk Equity is the greater of Internal Equity, Regulatory Capital and Leverage Capital.

The credit risk capital input to this model is based on the same potential exposure models used to generate regulatory capital. Risk Equity follows a monthly production process. In the Risk Equity model, the counterparty credit risk data feed is a business oriented (i.e. BPM) allocation of counterparty credit risk. Counterparty credit risk is a function of potential exposure profiles, internal credit ratings, internal facility ratings, historical derived probability of defaults including a 3 basis point minimum floor, and other counterparty descriptive information.

Risk Equity results are reviewed by Senior Risk, Finance and Business Managers for strategic decision making purposes; the distribution includes the Firm's Chief Risk Officer and Chief Financial Officer. Senior Management use Risk Equity results to ensure the Firm has adequate capital to support its ongoing business activities whilst maintaining additional capital for regulatory and leverage concerns should these requirements exceed the internal economic capital measure.

The Firm's Risk Appetite model is an aggregate measure of the risk arising from market, event and counterparty credit exposure over a one year holding period, calculated at the 95th percentile level. The credit risk capital input to this model is based on the same potential exposure models used to generate regulatory capital. Risk Appetite follows a daily production process with a monthly update of the credit risk component.

In the Risk Appetite model, the counterparty credit risk data feed is a business oriented (i.e. BPM) allocation of counterparty credit risk. Counterparty credit risk is a function of potential exposure profiles, internal credit rating, internal facility ratings, historical derived probability of defaults including a 3 basis point minimum floor, and other counterparty descriptive information.

Risk Appetite results are reviewed by Senior Risk, Finance and Business Managers for risk monitoring and strategic decision making purposes; the distribution includes the Firm's Chief Risk Officer, the Chief Financial Officer and the Firm's Executive Committee, which reviews the results at the weekly meetings of the Risk Committee. The output of this model is used as a basis for key business investment and planning decisions by the Firm's Senior Management.

2.6.1.6 Total regulatory credit risk capital requirements

At the holding company (i.e. Lehman Brothers Holding Inc. "LBHI"), the Consolidated Supervised Entity ("CSE") regulatory capital computations share the same primary data inputs (i.e. counterparty exposure profiles, internal credit ratings, internal facility ratings and probability of default matrix) for computing counterparty credit risk capital charges that the Firm's other regulated entities will use for their regulatory capital computations.

2.6.1.7 Strategy and acquisitions

Lehman Brothers may evaluate the portfolio risk (i.e. counterparty credit risk) of prospective acquisition targets or compute the potential impact upon the Firm's regulatory capital requirements. These evaluations will leverage existing internal credit ratings and internal facility ratings for those counterparties that exist in both portfolios. The Firm is aware of the requirement for acquisitions to be migrated to the Firm's credit control and internal ratings infrastructure within 3 years.

2.6.1.8 Profitability and performance

As of December 2006, Lehman Brothers has adopted FASB Statement No. 157, Fair Value Measurements (FAS 157), for financial disclosure purposes under generally accepted accounting principles ("GAAP"). A bilateral Credit Valuation Adjustment ("CVA") is the Firm's mechanism for adjusting the mid-market portfolio valuation of counterparty transactions to a market based fair value measurement (FASB 157) that reflects the credit risk both counterparties have to each other. While the CVA process uses market-implied (rather than historically-derived) probability of default curves, it uses the same potential exposure profiles as those used for regulatory purposes.

2.6.1.9 Performance related-remuneration

Lehman Brothers remuneration policy is highly competitive and is designed to instill in the Firm's employees a culture of ownership and value-creation over the long term. For this reason, employees are remunerated in any given year according to the Firm's performance, divisional performance and individual performance based on a level of total compensation which contains a significant portion of Lehman Brothers equity, which vests over a time period which is relatively long by industry standards. Collectively, the Firm's employees own around 30% of the company's total common equity outstanding.

A credit analyst's skills and demonstrated knowledge of the Firm's credit process, including aspects of the internal rating framework, are assessed as part of the performance review process and, thus, indirectly influences compensation.

2.7 Model Validation and Robustness of Outputs – Exposure

2.7.1 Introduction

This section describes the approach employed by the Firm to ensure that the models developed internally to calculate counterparty credit risk exposure are correctly specified, implemented and used. This model validation is a collaborative effort occurring at different stages in the life of the model and involves several distinct groups across Global Risk Management, Technology and Corporate Audit as described in the remainder of this document. This section covers:

- scope of model validation;
- accountability;
- developmental model testing;
- independent review and validation;
- documents standards;
- model approval and release process;
- ongoing monitoring of model effectiveness;
- data standards;
- stress testing and back testing; and
- role of Corporate Audit.

2.7.2 Scope of Model Validation

The Firm employs several risk metrics (called “Maximum Potential Exposure” or “MPE” measures in the remainder of this document) to assess in whole or in part its counterparty credit exposure to a specific counterparty (or in aggregate with regards to a set of counterparties) and to assign regulatory capital in respect of such credit exposure. These measures are outputs from the different parts of the credit risk management systems (called the “MPE system” hereafter) and can be generically decomposed into three main components - inputs, processing components (Algorithms) and outputs. The processing components will depend not only upon the chosen model assumptions but also upon the practical implementation of such assumptions. Since both the inputs and processing components may affect the outputs of the MPE system, the Firm’s model validation effort covers both aspects of the MPE system.

The models which comprise the processing components are termed “MPE models” and will typically include (but not be restricted to) the following:

- models for producing distributions of market risk factors at future points in time;
- models for the full re-pricing of trades at future points in time under specified scenarios;
- models for the valuation of trades using risk sensitivities;
- models for the netting of trades;
- models for the provisioning of collateral and margining;

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- models for producing the exposure to a single trade without the use of scenario generation;
 - models for the aggregation of exposures across trades and time; and
 - methodologies for calculating the specified MPE measures.

2.7.3 Accountability

Different groups across Global Risk Management, Technology and Corporate Audit have specific responsibilities in the development, maintenance and validation of the MPE system:

- MPE models which are not used for the Firm's Securities Financing business are owned by Credit Risk Management (CRM) and are developed by Credit Risk Analytics (CRA) and implemented by Credit Risk Technology (CRT);
- MPE models which are used for the Securities Financing business are owned by Market Risk Management (MRM) and are developed by Market Risk Analytics (MRA) and implemented by Market Risk Technology (MRT); however, Credit Risk Management and Credit Risk Analytics are jointly responsible for ensuring that such risk- sensitivity models are correctly used within the context of calculating counterparty credit risk exposures;
- the responsibility of the Model Validation Group includes the independent review and validation of all risk models;
- Corporate Audit performs reviews of the MPE system, processes and controls; and
- the Credit Risk Management Committee is responsible for the overall governance of the Firm's internal credit risk models.

The "MPE Model Control and Validation Guidelines" describe in detail the control and validation guidelines documented by the Model Validation Group and which will apply to the Firm's MPE system, together with the responsibilities of the various groups involved in the development, validation, control and use of the models within the MPE system. These Guidelines are owned and maintained by the Model Validation Group ("MVG") and formally approved by the Model Validation Group and the Credit Risk Management Committee ("CRMC"). Any changes to these Guidelines must be approved jointly by the Model Validation Group and the Credit Risk Management Committee.

2.7.4 Developmental Model Testing

Credit Risk Analytics carries out extensive testing of the MPE models during the initial development phase of each model. This testing includes an examination of the applicability of the model for its intended usage, verification of standard relationships between the underlying variables (such as no - arbitrage conditions, put - call parity for vanilla and barrier options), and verification that boundary conditions are satisfied (for example, a call option with an infinite strike will have zero price). Furthermore, Credit Risk Analytics benchmarks the models against simpler models where possible by considering appropriate subsets of the model parameter space and benchmarks the pricing models against the front office pricing models. Other tests carried out by Credit Risk Analytics include assessments of the robustness of calibration procedures and stress testing the models to identify the situations in which the models are not applicable.

The MPE models used to estimate the counterparty credit risk in the Firm's Securities Financing business derive the potential exposures based on: (1) current exposure; and (2) the potential mark-to-market loss of the collateral over a 5-day close out period.

The current exposure and sensitivities of the portfolio to all the major market moves are generated by the Firm's front office systems with pricing models developed by Quantitative Research and independently validated by the Model Validation Group. These models are used as part of the Firm's books and records. Extensive testing and validation of these front office pricing models are performed at their development by Quantitative Research, Technology, Model Validation, and Product Control.

The potential mark-to-market changes of the collateral over the close out period are estimated using a historical simulation approach, applying the current sensitivities of the portfolio to the historical moves of the market risk factors, taking into account linear, nonlinear, and specific risks.

The development and testing of the models used in the Securities Financing business is a multi-step and iterative process:

1. Market Risk Analytics, working with CRM, determines the major risk factors that drive the valuation of the collateral, and determines the potential exposures to changes of these risk factors;
2. at the same time, Market Risk Analytics researches and determines the appropriate historical market data (or time series) to be used for scenario generation;
3. Market Risk Analytics then tests the methods and provides prototypes to Technology for implementation into production; these prototypes are often developed in Excel, and are also used later to test the production implementation of critical components of the models; and
4. in testing critical components, such as specific risk modelling, Market Risk Analytics uses back testing on various hypothetical portfolios to effectively validate the adequacy of the models or identify issues and remediation.

To the extent that the Firm's capital markets business trades the same type of products as the collateral, Market Risk Analytics, Credit Risk Management, and Market Risk Management work together in developing and testing the models.

2.7.5 Independent Review and Validation

The mandate of the Model Validation Group incorporates the independent review and validation of risk models and pricing models used in front office valuation systems. The review and validation carried out by Model Validation Group encompasses all MPE models and covers (amongst other aspects) the theoretical framework, numerical algorithms, calibration, model stability and applicability of the models for their intended use. The standards and validation guidelines supporting the Model Validation Group's independent reviews are detailed in the Guidelines.

The independent review and validation of MPE models is embedded within the model approval and release process.

2.7.6 Documents Standards

As part of the model approval process, Credit Risk Analytics must provide model documentation using the template specified in the Guidelines describing, amongst other things, the model scope and intended usage, calibration procedures, numerical algorithms, tests and results, and model limitations. The documentation must be substantially complete and standalone to allow for an independent review of the model. As part of its independent review, the Model Validation Group may ask for additional documentation and/or may modify this documentation to reflect the findings of its independent validation. The Model Validation Group additionally produces its own report detailing its due diligence with regards to the models reviewed.

2.7.7 Model Approval and Release Process

The Guidelines detail the steps which will be taken for the approval and release into production of new and/or materially changed MPE models. The approval process has been formulated not only to ensure that the MPE models are adequately challenged prior to entering into production, but also to ensure that this process is consistent with the guidelines and procedures instituted by Credit Risk Management to govern the technology applications used by CRM. The governance of IT applications used by CRM require that Credit Risk Analytics in conjunction with Credit Risk Technology (“CRT”) produce a Business Requirements Document (“BRD”) for the planned model implementation if this implementation requires significant allocation of resources by CRT and that the Credit Risk Management Committee (“CRMC”) explicitly approves this allocation of resources. Integrating this procedure into the model approval and release process in the Guidelines also allows for the detailed model documentation produced by Credit Risk Analytics to be attached to the BRD submitted to CRMC.

The actual steps involved in the approval process for an MPE model are as follows:

1. Credit Risk Analytics uploads and submits the documentation for the model on the website;
2. Model Validation Group then carries out an initial review of the theoretical soundness of the model;
3. the next step is the technology pre-implementation approval stage which is either automatic by CRT if the implementation is only minor or else requires approval from CRMC to carry out the implementation;
4. Credit Risk Technology then signs off with regards to the correctness of the implementation in the MPE system as compared with the description of the model in the documentation;
5. Model Validation Group provides a second approval which is linked to a more detailed review and validation of the model and its implementation;
6. the penultimate approval is from Credit Risk Reporting (“CRR”) to confirm that CRR is aware of the new or changed MPE model and of the impact that such a change may have on the counterparty credit risk exposure profile of the Firm through its UAT testing; and
7. the Credit Risk Management Committee provide the final approval to confirm that it is aware of the proposed changes to the MPE system and that it has discussed, if necessary, the potential impact on the credit risk profile of the Firm and/or regulatory capital with the Chief Risk Officer and senior management.

All approvals should be made on the “MPE Model Approval” intranet page which retains a locked down copy of the model documentation and a full audit trail of all approvals and comments. The intranet page is

securely permissioned to allow strict control of the viewer rights to the intranet page and of the setting of the approval rights. Requests for access to the intranet page can only be made through the Lehman Total Access Control (TAC) account management process.

2.7.8 Ongoing Monitoring of Model Effectiveness

Credit Risk Analytics has implemented procedures in order to be able to monitor the effectiveness of the MPE system on an ongoing basis. The daily exposure changes for all counterparties are also monitored and alerts sent to Credit Risk Management when these exceed pre- specified thresholds. Such changes are recorded in control reports. A large set of generic control trades has also been set up and is monitored on a daily basis. An alert process is in operation around these control trades if the changes in exposures on this control set breach specified limits. Extensive analysis on the set of generic control trades is also carried out as part of the developmental validation phase. A set of generic control portfolios is being created and will be monitored on a similar basis to capture additionally the impact of netting and collateral.

Credit Risk Analytics has also developed the “MPE Analyzer”, a comprehensive set of analysis and diagnostic tools allowing the detailed examination of the nature and drivers of the exposures generated by MPE models.

Finally, an information pack detailing the model effectiveness is sent by Credit Risk Analytics to the Securities and Exchange Commission on a quarterly basis.

Market Risk Analytics periodically analyses the MPE models used for the Firm’s Securities Financing business on a set of hypothetical portfolios for critical components of these models such as the specific risk modelling of corporate credit products. Portfolios are specifically selected to cover a wide variety of concentrations by issuer, rating, industry sector or sub-sector, to cover different economic environments and various P&L volatility regimes. These tests are designed to uncover the boundaries of applicability of these models and their behaviour under challenging economic and/or market conditions. All cases are carefully analysed and reported. If needed, model parameters and/or underlying assumptions are evaluated and adjusted to keep the models robust and accurate.

To the extent that the Firm’s capital markets business trades the same type of products as the collateral, Market Risk Analytics uses the same methodologies to those used in estimating the market risk of the Firm’s trading portfolios. Daily back testing of the historical simulation model outputs is performed at Firm aggregate as well as at various business levels and reported to the Securities and Exchange Commission on a monthly basis. Results are scrutinized for model adequacy on an ongoing basis.

2.7.9 Data Standards

The model approval process together with the developmental model testing, the Independent Review and the ongoing monitoring of the models ensures that the MPE models used in production are well - specified, and correctly implemented and used. However, errors in the estimation of counterparty credit risk exposures may still occur as a result of errors in the input data to the various MPE models used to obtain those exposures. The controls implemented by the Firm to ensure the integrity of the data feeding into the models are detailed in Section 2.9.

2.7.10 Stress Testing and Back Testing

Stress Testing is a key control to understand and explore the limitations of risk models and to illustrate the potential impact of risk drivers on the counterparty credit exposure of the firm. This is discussed in detail in Section 4.

Back Testing is also an important component in the verification of the adequacy of risk models. The firm undertakes a rigorous and continuous programme of backtesting all its exposure models.

2.7.11 Role of Corporate Audit

Corporate Audit performs reviews of the MPE systems, processes and controls, covering:

- 1) the methodology and implementation of the MPE simulation and pricing models, including the process to independently validate the models;
- 2) the completeness and accuracy of data feeds, calibration processes, aggregation and netting algorithms and exposure monitoring; and
- 3) the general technology controls over access to source code and data, application change management and disaster recovery.

Audit coverage is based on a global rolling three year program during which all major businesses, processes and models are reviewed.

2.7.12 Role of senior management

Senior management plays a pivotal role in the Firm's model and credit risk governance processes and, although they place some reliance upon the skilled individuals in the many divisions and departments that contribute the measurement, monitoring and reporting of counterparty credit risk, they are also sufficiently engaged in the day-to-day aspects of the Firm's counterparty credit risk management to be able to make an assessment of the robustness of the models' output. Senior management's comfort with the model output is based on the cumulative impact of the many controls in place to ensure the integrity of the internal models. Key aspects providing them comfort include, but are not limited to:

- Strong Risk Culture;
- New Product Approval Process;
- Integrity of Model Inputs;
- Model Design & Validation;
- Internal Use of Model Output;
- Senior Management Reporting; and
- Model Governance.

2.7.13 Strong Risk Culture

Lehman Brothers devotes significant resources (including investments in employees and technology) to the measurement, analysis and management of risk. Essential to the Firm's approach to risk management is a strong internal control environment with multiple overlapping and reinforcing elements. Risk management personnel have daily interactions with salespersons, traders and business managers at all levels of the organization. This close alignment with the business helps ensure that the Risk function is fully aware of the risk positions and ever-changing market dynamics.

2.7.14 New Product Approval Process

The Firm has a robust new product approval process built around a network of New Products and Transaction Approval Committees. The New Products Committee (Europe) ("NPCE") includes representation from all Corporate divisions, including Risk under the chairmanship of a senior member of the Legal, Compliance and Audit Division. The NPCE's scope covers:

- products or businesses that have not been offered or conducted by the Firm previously (or for a period of at least two years) that have a significant and materially different risk profile from that of existing products or businesses;
- offering products in a substantially different manner, which results in a significant and materially different risk profile; and
- marketing an existing product into a new country/region which presents significant jurisdictional issues.

The NPCE and its regional equivalents serve as the forum for business units to present new products or businesses to relevant areas of the Firm in order to:

- assess the potential risks of the new products or businesses to the Firm (including market, credit, operational, technology, legal, regulatory, documentation, tax, financial, capital and reputational risks);
- ensure that appropriate infrastructure and controls, including risk capture and exposure modelling, are in place for the new products or businesses; and
- approve/disapprove and/or recommend enhancements related to managing the risks of such new products or businesses.

Overall, the existence and operation of the New Products Committee process provides significant comfort to senior management that new products are reviewed and all risks assessed to ensure that they can be adequately managed by the Firm's risk infrastructure in advance of being booked. This gives us the ability to review and affirm that the Firm's internal models are appropriately suited and robust enough for the continually evolving business.

2.7.15 Integrity of Model Inputs

The quality of any model's output is dependent on the quality of its inputs. In the case of the Firm's exposure measurement models, the accuracy and completeness of trade details, counterparty information and market data are critical. The Firm has a comprehensive series of controls to ensure the integrity of data feeding into the Firm's models. Prior to the release of any exposure model into production, data feeds are subject to rigorous testing by each of Risk Technology, Quantitative Risk Management, Risk Control and Analysis and

Credit Risk Management (“CRM”). On a daily basis, the Risk Technology group analyzes incoming data feeds and resolves issues prior to releasing the data into the exposure models. Trade data are also reconciled with Finance to further ensure completeness and accuracy, and Credit Reporting investigates and resolves reconciliation breaks as necessary. Together, these controls provide significant comfort with respect to the model inputs.

2.7.16 Model Design & Validation

All exposure models are subject to a rigorous development cycle that combines knowledge of sophisticated quantitative methodologies with sound practical judgement and a deep practical understanding of the capital markets. The Firm’s model policy sets out risk assessment, documentation and validation requirements for all of the Firm’s credit risk measurement models. The model development process has recently been enhanced to include an independent review and validation by the Model Validation group on a going-forward basis. Corporate Audit also conducts regular reviews of the exposure models and tests whether documented policies and procedures are being followed in practice.

2.7.17 Internal Use of Model Output

The risk measures produced by the Firm’s IMM models are fully integrated with the Firm’s day-to-day credit risk management process. CRM approves trades and sets limits based on the same model output that drives the regulatory capital calculations under the IMM approach. As part of the daily exposure monitoring and reporting process, unusual moves and credit limit breaches are investigated, challenged and, if proven to be inaccurate, followed-up and resolved. As described above, many potential data issues are averted in the first instance by the systematic controls around the design, testing and reconciliation of data feeds into the model. This review of model output by credit analysts, who have a strong familiarity with the activity in their assigned portfolios, provides an additional layer of oversight and feedback.

2.7.18 Senior Management Reporting

Detailed credit exposure data is communicated to senior management through a collection of MIS reports and regular risk meetings. Credit reports showing overall portfolio metrics and large exposures are published daily and are formally reviewed by the Credit Risk Management Committee monthly. In addition, the largest exposures across the Firm are presented to the Firm’s global Risk Committee for discussion on a weekly basis. Similarly, the largest exposures within LBIE are reviewed and presented to the European Risk Committee at its regular weekly meetings. This constant cycle of reporting and management review provides important feedback and helps ensure that a high level of scrutiny is applied to model output.

2.7.19 Model Governance

Ongoing assessments of the Firm’s models are built into the remit of a number of senior management committees. Of particular relevance is the reporting to these committees about various elements of the internal models and the forums where senior management discuss the workings of the internal models and debate the validity of the model’s assumptions.

Additional comfort is derived from the role that Corporate Audit plays in assessing whether the internal controls are well documented and functioning properly. Corporate Audit conducts regular reviews of our risk

management controls and internal models. Senior management are informed of the results of these audits and resolution of previous audit issues is a key performance indicator for all business unit and corporate department managers.

2.8 Model Validation and Robustness of Outputs – PD

2.8.1 Accountability for Model Validations

The following committees and functional units have the model validation accountabilities outlined below.

European Risk Committee

The European Risk Committee (“ERC”) has a “general understanding” of these models, including:

- knowledge of the materiality, nature, strengths and weaknesses of the rating and modelling systems;
- an appreciation of the roles and responsibilities of the different functions in the counterparty credit risk management processes; and
- an understanding of the review and validation processes of the counterparty credit risk management systems.

Credit Risk Management Committee

The Credit Risk Management Committee (“CRMC”) has a “good understanding” of the design, implementation, performance and results of counterparty credit risk governance, measurement and reporting tools used by the Firm. The Firm defines this as:

- knowledge of the materiality, nature, strengths and weaknesses of the rating and modelling systems;
- an appreciation of the roles and responsibilities of the different functions in the counterparty credit risk management process;
- an understanding of the review and validation processes of the counterparty credit risk management systems;
- an understanding of the design and operation of the credit process;
- an understanding of the process and metrics through which the rating and modelling systems are monitored to ensure that they are operating properly on an ongoing basis; and
- an understanding of the key drivers of risk affecting PD, LGD and EAD.

Credit Risk Control

Credit Risk Control (“CRC”) has particular responsibility for managing the internal ratings system including the design and implementation of the system components – policy, procedures, rating models, risk parameters, and reporting and analytical functionality. CRC is responsible for ensuring that the system is fully documented, being used appropriately, performing satisfactorily, and for communicating its findings to the CRMC. CRC works with Credit Risk Analytics (part of Quantitative Risk Management) when reviewing the risk parameter analytics, and will work with the Model Validation Group during the initial design and ongoing validation of rating models.

For the purposes of the IRB approach, CRC fills the role defined in BIPRU 4.3.15. and perform the tasks outlined in BIPRU 4.3.16, namely:

- testing and monitoring grades;
- production and analysis of summary reports from the Firm’s rating systems;

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- implementing procedures to verify that grade definitions are consistently applied across departments and geographic areas;
 - reviewing and documenting any changes to the rating process, including the reasons for the changes;
 - reviewing the rating criteria to evaluate if they remain predictive of risk (and changes to the rating process, criteria or individual rating parameters must be documented and retained);
 - active participation in the design or selection, implementation and validation of models used in the rating process;
 - oversight and supervision of models used in the rating process; and
 - ongoing review and alterations to models used in the rating process.

Corporate Audit

Corporate Audit will perform reviews of the Internal Credit Rating (“ICR”) model development and maintenance controls, including adherence to the internal guidelines and procedures supporting the development and validation of ICR models. Included in the scope of Corporate Audit reviews will be the governance roles of the Credit Risk Management Committee, the Model Validation Group and the Credit Risk Control group. Corporate Audit’s scope will also focus on model methodology documentation and design including default risk assessments, ratings drivers and bands, analyst overrides, risk ranking and benchmarking, use testing and probability of default validation. Finally, Corporate Audit will also review the controls implemented over access to source code and data, application change management and disaster recovery.

Model Validation Group

In addition, the CRMC has requested the Model Validation Group provide independent input and review of model validation carried out by CRC. In particular, the CRMC anticipates that the Model Validation Group will participate in the testing phase of future model development, and will review the statistical techniques applied, and the conclusions reached thereon, by CRC during comprehensive validation of in-place models. Together with the role played by Corporate Audit, the CRMC believes that this combined additional oversight provides sufficient comfort that the validation process is being conducted adequately and consistently.

Credit Risk Management

CRM works closely with CRC to provide qualitative input on the models performance throughout the validation process. CRC present the analytical findings of the model validation work undertaken to Credit Managers (i.e. team leaders) identifying any issues identified in relation to model performance or operational procedures, and if necessary allocating actions to CRM for resolution e.g. inaccurate use of override functionality for connected counterparties or government implied support. CRM provide CRC with model user feedback ensuring that redundant factors in the model are considered for refinement, additional factors considered by analysts due to new developments in the market are considered for potential inclusion in the model and any areas of ambiguity in model user guidance notes are rectified.

2.8.2 Independence of Model Validations

CRC reports directly to the Global Head of Risk Control & Analysis. CRC is independent of the users of the internal ratings system and other prudential controls and is therefore free from undue influence, specifically meeting the BIPRU 4.2.2 requirement.

2.8.3 Scope of ICR Model Validations

Internal credit rating models are designed to predict credit ratings reflecting relative default likelihood ranking rather than actual probabilities of default. ICR Models are validated at three points:

- design stage;
- periodic, comprehensive model specific validation; and
- as part of more frequent system wide high level (summary) validation.

ICR Model Design

Formal standards are in place for the implementation of new, or refinement of existing models, under the **Guidelines & Procedures for Implementing or Revising an Internal Credit Rating Model**. Criteria are clearly outlined for applying sampling techniques during model development to ensure that the development sample is representative of the portfolio examining concentrations within rating classes, regions, and obligors. For the defined development sample, a validation and impact analysis shall be undertaken prior to implementation that:

- incorporates feedback on the model from front-line users via the expert panel model development process;
- examines credit grade migrations as a result of the implementation of the model, i.e. comparing the Proposed Model ICR with the current ICR; and
- examines the alignment of the new Proposed Model ICRs against external benchmarks (where external benchmarks are available).

In addition where a significant sample has been selected CRC may select and apply additional validation techniques as noted in the guidelines & procedures document.

Comprehensive ICR Model Validations

Formal standards are in place for the validation of existing models as documented in the Guidelines & Procedures for Validating an Internal Credit Rating Model. A comprehensive ICR Model Validation Review is intended to assess whether the ICR model is (i) adequately discriminating default risk over time and (ii) being used as intended i.e. identify and minimize/eliminate any operational and user errors.

Discriminating Default Risk

Discrimination refers to the ability of the ratings system to successfully differentiate, ex-ante, between Counterparties that subsequently defaulted and those which did not. That is, determining if the model is correctly and consistently risk-ranking counterparties according to relative default probabilities. Various statistical techniques exist, but partly due to a lack of default data both across the industry and at individual institutions, industry research indicates there is no single validation tool that stands out as the preferred method for assessing default discrimination; best practice is therefore to use several tools and include both quantitative and qualitative elements. CRC has chosen to break this task into two main components

1. An evaluation of model design, including
 - a review of changes in default risk assessment methodologies used, proposed or tested by third parties since the prior review date or model implementation; this ensures that the intellectual basis of the model remains current e.g. the basis for the Ratings Drivers selection remains appropriate; due to its potentially

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- open ended nature, this review focuses on major sources only such as the main External Credit Assessment Institutions (“ECAI”) and Lehman’s primary regulators;
 - a review of whether the Ratings Drivers are economically meaningful; frequency analysis is used to ensure the individual risk drivers continue to discriminate risk across the rated population, regression analysis is performed to ensure that individual risk drivers are weighted appropriately in the Model and able to contribute to the overall Counterparty default assessment, and correlation analysis is performed for all pair-wise combinations of characteristics to ensure that they are measuring unique aspects of risk and not duplicative;
 - an assessment of whether the existing method of grouping Counterparties into ratings bands (the model’s ICR Conversion Table) is reasonable; spectrum analysis is undertaken to statistically quantify the ability of the model to produce the appropriate final credit rating; and
 - an investigation into whether analyst entered overrides indicate deficiencies in the model design, detailed override analysis examines the extent to which the model is overridden, the magnitude of model overrides, and the inherent level of conservatism in the model (i.e. are model overrides predominantly upgrades or downgrades); in addition, analysis of all override commentary provides insight into factors which should be considered for potential inclusion in the model, and those that may potentially be excluded.

2. An evaluation of risk-ranking, including:

- using statistical tools to assess internal risk-ranking based on experienced defaults, where possible Mann Whitney U, Cumulative Accuracy Profile and Receiver Operating Characteristic analysis is conducted to validate the ability of the model to identify default events;
- Benchmarking to compare the risk-ranking of the internal ratings versus the risk-ranking of ECAI for co-rated entities, where possible detailed analysis of ECAI benchmarks examines the alignment to ECAI ratings, the magnitude of any misalignment and also the inherent level of conservatism in the model; and
- using statistical tools to compare the ratings stability of the internal ratings versus ECAI ratings for co-rated entities and validate the internal rating philosophy of through-the-cycle ratings.

Thresholds are in place for each of the above mentioned statistical measures; model overrides are expected to be less than 15%, alignment with ECAIs is expected to be 75%, risk drivers are expected to pass the goodness-of-fit test for predicting the final rating, and risk driver pair-wise correlations are expected to be less than 80%. Breaches of thresholds are escalated to CRMC and where required mitigating actions undertaken.

Model Use

In order to produce adequate discrimination over time it is important that the model is and continues to be used as intended. CRC will consider three main elements:

- Model Implementation – this seeks to address if the model has been implemented according to the Model Design document; this is tested using a detailed walkthrough/data assessment for the population covered by the model that ensures: the mapping of counterparties to specific model (based on CWS industry codes), the model scoring algorithms, and the application of Sovereign Caps within the model are all working appropriately;
- Operational Issues – in particular, identifying cases where users have not used the model as intended; an examination of all overrides on a case-by-case basis ensures that the override functionality in the model is

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- used appropriately; trend analysis by counterparty ensures there is no unexpected ratings volatility and that the chosen model per counterparty remains consistent; finally analysis of ratings refreshes ensure that counterparties are evaluated on an annual basis as required; and
- Counterparty Peer Group reviews – to assess whether users are rating similar types of entities in a similar way i.e. checking for consistency in the assignment process.

Summary Internal Ratings System Performance

The purpose of the ongoing performance review is to help the CRMC form and maintain a good understanding of the performance of the internal ratings system, and to identify and address any weaknesses or deficiencies. The review is high level and covers the entire rating system, both current status and changes (rating events) since the previous review. The review includes the following items:

- exposure and counterparty count distributions across ratings, scorecards, and rating methods to evaluate whether there are any significant portfolio changes;
- analysis of activity under the Agent & Principal Policy (“APP”) and Connected Counterparty Policy (“CCP”) policies to ensure the rating methods are being applied as intended;
- assessment of the materiality of the unrated population to ensure that it remains immaterial;
- breakdown of the Past Dues status for identifying issues and trends;
- analysis of overrides – nature (rating v default scorecard), incidence, distribution, impact and reasons – to identify (i) situations where the internal ratings system may be experiencing deficiencies and (ii) to ensure that Credit Analysts are continuing to use the system as intended i.e. to identify and deal with any user errors or misuse;
- ICR v ECAI – to ensure that the internal ratings system continues to produce conservative ratings for co-rated entities; and
- Ratings Migrations – to ensure that the system displays stability and consistency with the through-the-cycle ratings philosophy

2.8.4 Scope of Probability of Default Validation

Internal credit rating models are designed to predict credit ratings reflecting relative default likelihood ranking rather than actual probabilities of default. The ICRs produced by each ICR model are mapped to a single rating scale, the “master scale” and for several years it has been based on the 1-year issuer-weighted global default rates published by Moody’s. PDs are validated at two levels:

- the master scale is reviewed annually as a standalone exercise; this exercise will also consider whether the information in the most recent Moody’s report should be incorporated, and if so then what if any adjustments are necessary; and
- the individual ICR models are reviewed against the master scale; this is carried out at the time of the model’s ICR validation so that any required recalibration can be considered as part of that model review and, if necessary, integrated and tested in the model validation.

In both cases the procedures followed are the same.

Default Data

Internal default data is collected in the defaulted counterparty database, collating performance data from historic CWS data tapes. Internal obligor default data dates back as far as 1994. Internal obligor data

providing information on total portfolio size and risk grade concentrations can be obtained from CWS back to the beginning of 2002 using consistent data formatting and extraction rules. Obligor data prior to 2002 can be obtained but this data does not contain the same levels of data integrity. The Firm therefore meets the requirement of BIPRU 4.4.31 where the underlying historical observation period of data used for PD estimation is at least five years from one single source.

External benchmark data is also considered for inclusion in the underlying dataset for the validation of PD rates. Consideration is given to the relevance of the ECAI data to the internal portfolio, including appropriateness of definitions of default industry concentrations, risk profile, and geographic concentrations. Where appropriate, ECAI data will be included in the underlying data set.

Validation Technique

Given the high credit quality of counterparties and the industry sectors in which the Firm operates, the volume of defaults in the portfolio is sufficiently small that each model has fewer than 20 defaults and hence the requirements of BIPRU 4.3.95 are triggered and that the Firm must use a statistical technique to derive the distribution of defaults implied by the Firm's experience, estimating PDs (the "Statistical PD") from the upper bound of a confidence interval set by the Firm in order to produce conservative estimates of PDs in accordance with BIPRU 4.3.88.

The Firm employs a low default portfolio technique that models:

- the number of defaults and number of obligor years in the sample;
- the number of years from which the sample was drawn;
- the interdependence between default events for individual obligors;
- the interdependence between default rates for different years; and
- the choice of the statistical estimators and the associated distributions and confidence intervals.

CRC, working closely with QRM, uses a simulation model to derive a PD using a simple Vasicek structural model, empirically observed internal volume of defaults and obligor years, 5 years of history, estimates of correlation between defaulting obligors and default rates in subsequent years, and an upper confidence bound of 75%. This is then compared to the internal average weighted PD for both the global internal rating scale and a given model to examine the degree of conservatism in the current model. If in the event that either the rating scale or a given model is deemed to be not conservative, the scale/model will be re-calibrated.

2.8.5 Documentation

ICR Model design and ICR and PD validations are comprehensively documented according to the relevant guidelines document and submitted to CRMC for approval. All documentation submitted to CRMC is stored in the CRMC website on LehmanLive. Minutes are recorded for each CRMC session and any actions arising are recorded, monitored, and followed-up. CRC will inform the CRMC periodically about the status of these follow up items.

2.8.6 Continuing Validation

As described above, CRC is responsible for performing summary and comprehensive validation exercises and for reporting to the CRMC. The high level system-wide summary validations are anticipated to be

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completed quarterly and the comprehensive model specific validations and the overall master scale validation are anticipated to be completed annually. ICR models covering immaterial populations and which have already been assessed as satisfactory via at least one comprehensive validation may be moved to a biennial basis and remain on that basis provided that summary validation and biennial comprehensive validation continue to indicate the model is performing satisfactorily.

2.8.7 Senior Management Involvement

Senior management play a pivotal role in model and credit risk governance processes and although they place some reliance upon the skilled individuals in the Global Risk Management Division who contribute to the measurement, rating, monitoring and reporting of counterparty credit risk, they are also sufficiently engaged in the day-to-day aspects of the Firm's counterparty credit risk management to be able to make an assessment of the robustness of the models' output. Senior management's comfort with the output of the rating systems and models is based on the cumulative impact of the many controls in place to ensure the integrity of the overall rating framework.

The internal ratings system has been designed and developed in-house specifically in order to meet the Firm's needs. The internal ratings system has been defined and implemented through the policy document, the associated procedures document, and the Ratings Maintenance application. Over recent years CRM has evolved the system from pure expert judgment to constrained expert judgment using scorecards and has built out a robust infrastructure to support additional ratings analysis and reporting. The fact that results of the internal ratings system have been used internally to manage the Firm's counterparty credit risk exposures for several years demonstrates that management are both familiar with the ratings process and confident in the quality of the outputs. At a more granular level, senior management is comfortable with the outputs of the system for a number of reasons which can be summarized into four areas:

- the Firm is satisfied with the governance and integrity of the overall internal ratings system;
- the CRMC is satisfied with the models contained within the system;
- the quality of the inputs to the models is assured through the use of highly skilled credit practitioners and appropriate checks and balances; and
- senior management have confidence in the outputs through a lengthy period of internal use and a program of user reviews, formal validations and other feedback/early warning processes.

Governance and Integrity of the Internal Ratings System

The Firm continues to invest significant resources to develop, review and refine the relevant policies and associated procedures that underpin the overall credit risk control framework. Changes to these documents must be reviewed and approved by both the CRMC and the CRO. System performance, the results of model validations, new ratings models and changes to existing models are reviewed by the CRMC and the CRMC escalates issues to the CRO as appropriate. In addition, the Regional Head of Credit for Europe communicates material issues with, and any material changes to the internal ratings system to the European Risk Committee, thus ensuring that senior management in the Firm and the Lehman Brothers UK consolidated group possess a general understanding of the Firm's rating system.

The ratings maintenance application has been designed and implemented in-house in order to ensure that it caters to the Firm's business model and counterparty base, to ensure that it wholly reflects policy and procedural requirements, and to ensure that any enhancements or deficiencies can be addressed quickly. The internal ratings system policy, procedures and IT specifications are designed and integrated with the other

control structures for internal consistency and cohesion, and Credit Risk Control is specifically responsible for maintaining the prudential control environment. Policy and procedure documents are published to authorized users. System-wide data accuracy and completeness is maximized through a series of defined steps and clear responsibilities to ensure that all counterparties requiring ratings are rated:

- CRM replicates account and client information from the Firm's central repository GARM/EAM;
- Credit Risk Reporting ("CRR") and Finance are jointly responsible for ensuring that all trading activity is correctly captured by CWS and the Firm's general ledger;
- CRR is responsible for ensuring that all accounts with trading activity are associated with a client record and that new client records are set up accurately;
- CRR is responsible for mapping all active clients to Credit Analysts; the definition of an active client is contained within the credit policy and permeates CWS; one of the reasons is trading activity;
- Credit Analysts and CRR are jointly responsible for verifying static system data and for taking any necessary action to correct data issues;
- Credit Analysts are responsible for rating counterparties in their portfolios and past due functionality tracks ratings refreshes; credit managers are responsible for managing their credit analysts and monitoring past due refreshes in the portfolio; and
- CRR are responsible for following up on missing ratings on a monthly basis.

Senior management takes additional comfort from the validation procedures that CRC has recently implemented and CRMC will allocate a significant portion of the committee's time to reviewing both summary and comprehensive validation results and other ratings MIS prepared by CRC. The CRMC has also defined Industry Reviews as an opportunity for users to address ratings issues (and other prudential controls) at the same time as reviewing industry dynamics and counterparty issues. Corporate Audit have an important role to play in assuring the system-wide quality. Deficiencies and weaknesses that require remedial action are the responsibility of CRC and progress in closing such issues is assessed at CRMC.

Quality of Model Inputs

CRM employs skilled credit practitioners and provides appropriate training as and when required, including general credit analysis skills and specific training around Lehman processes and systems. CRM uses both in-house and external training providers. The internal ratings system is constrained expert judgment and therefore, whilst wholly transparent to non-CRM users, it does require extensive credit experience to operate. CRM employs approximately 70 credit analysts globally. Among these analysts, 31% have both Bachelors and Masters degrees (or CFA or equivalent), and a further 67% have Bachelors degrees or equivalent. Credit Managers have on average 17 years experience in the industry.

Senior management is comfortable with the inputs made to the models through the use of appropriate checks and balances during the ratings event and through the validation exercises conducted post ratings event. The Ratings Maintenance Application must be used to insert ratings into CWS: there is no capacity for permanent ratings to be entered without using Ratings Maintenance. If CWS detects that there is insufficient static data to complete the scorecard, or the scorecard has not been fully completed, then CWS will prevent the user from completing the ratings event and provide an accompanying message. For example, if the physical residence of the counterparty is not rated then no Sovereign Cap can be applied, and when the Refresh button is selected Ratings Maintenance will ask the user to insert a rating for the Sovereign before the counterparty can be rated. Similarly, if a scorecard has already been initiated for a particular counterparty then Ratings Maintenance will not allow another scorecard to be initiated for the same counterparty. When the user does

complete the scorecard a series of logic checks makes sure that incomplete scorecards cannot be submitted and any numeric values entered by the user must be within certain pre-defined parameters. Where overrides are detected, Ratings Maintenance solicits mandatory comments from the user to enable CRC to conduct detailed override analysis when validating the system.

CRM's workflow process requires all rating events to be reviewed by a second pair of eyes to challenge and review the basis of the ratings assignment, which includes the choice of rating method, choice of scorecard, selection of driver scores and use of any ratings override. The approval workflow is based around approval authorities: at least one of the Analysts – either the Analyst completing the Scorecard or the Analyst reviewing the Scorecard – must be Level 5 or higher. Level 7 Analysts are authorized to propose internal ratings but cannot act as the second pair of eyes. An RCM must act as the “second pair of eyes” for Counterparties being assigned ICR iD, and for Counterparties moving from ICR iD to an ICR in the range iAAA – iCCC.

Comprehensive model validation exercises include a review of the operation of the ratings system to make sure that it is working as intended. The ICR model validation standards document specifically requires CRC to review model usage to check that Credit Analysts are using the scorecards in the way they are intended to be used. For example validation testing includes, inter alia:

- default scorecard overrides and use of the miscellaneous rating method;
- ratings overrides;
- ratings refreshes; and
- ratings volatility.

Analyst use is tested during both ongoing quarterly system wide validation and the more comprehensive annual model specific validations.

Quality of the Models

The rationale for the design of the ICR models was discussed and debated extensively within CRM during each model's design phase, and all models were formally approved by the Global Credit Committee (GCC; predecessor of the CRMC) ahead of original implementation. CRC is currently putting together formal design documents explaining model scope and rationale and these documents are reviewed at CRMC. Part of CRC's remit is to remain abreast of model methodology changes in the industry and academic circles, and during each annual model validation CRC will formally review the model's rating rationale against significant papers that have been published since the current model version launch date (or latest validation if earlier) to determine if changes to the rationale and methodology may be necessary.

The Model Validation Group will have an increasingly important role to play in reviewing the design of new or revised models.

During the annual model validation exercises CRC will ensure that the system is working as intended, including:

- mapping of clients to models;
- mapping of scores to ICR conversion tables;
- correct application of the Sovereign Cap;

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- investigation of overrides to determine if users are experiencing deficiencies in the rating modelling process; and
 - user review of the overall model process.

Quality of Model Outputs

CRM has been assigning ratings to counterparties and assigning probabilities of default based on Moody's default data to internal credit ratings for a number of years. Ratings are a well established and integral part of the Firm's credit risk management framework and are used by CRM to establish limits and approve transactions, and are also used for risk reporting purposes. Senior management have received and acted on internal ratings based counterparty credit risk exposure reporting since the ratings framework was established in the mid 1990s. The Firm also makes use of internal ratings for external reporting to regulators and other external users including the Firm's annual audited financial report.

Internal ratings are a key input to the decision to implement a credit limit for a counterparty. Credit limits are proposed via the credit review process and the credit review document template includes a section for credit assessment i.e. the basis for the ratings assignment. This means that additional controls exist for reviewing ratings assignments during the credit review process. Credit Analysts are individually assigned to credit authority levels – L1 (highest authority) through L7 (nil authority) – which is used for assigning ratings, approving trades, sanctioning limits, and escalating documentation and margin issues. Within each authority level, approval authorities vary according to the internal credit rating of the counterparty and the tenor of the exposure. This process means that credit reviews and the associated ratings assignments are escalated to layers of management based on limit size, thus ensuring that the final ratings assignment has been verified and approved at a level commensurate with the materiality of the potential exposures that may be engaged with the client. Successively senior eyes on ratings assignments based on materiality allows the Firm's senior management to take additional comfort around the outputs from the system.

Converting the ratings process to constrained expert judgment and the introduction of scorecards, and the implementation of a formal validation program provides senior management additional comfort around the ratings. In particular, the comprehensive validation exercises demonstrate that the outputs of the rating system are robust:

- the ICR validations include an assessment of the model's ability to discriminate and rank counterparties according to default risk; and
- the PD validations are designed to assess whether the Firm's master scale is suitably conservative, and whether the individual scorecards are correctly calibrated to the master scale with appropriate conservatism.

To date, CRC has completed the ICR Model validation for the Bank Scorecard, which set a strong precedent and indicated that the model is highly conservative in assigning internal credit ratings and performing well. CRC will proceed to validate all ICR Models based on materiality and maintain an ongoing program of validations. CRC has also produced PD Validation standards and conducted an initial comprehensive PD Validation, including applying LDP techniques, which has indicated that the overall master scale used by CRM is highly conservative. The Bank ICR validation and all future ICR and PD validations will be reviewed by the CRMC with escalation to CRO and ERC as necessary.

The Model Validation Group will have an increasingly important role to play in reviewing the validation undertaken by CRC.

CRC conducts ongoing reviews of the internal ratings system generating summary management information. These reviews employ a sub-set of the analytical tools used in the comprehensive validation exercises and are intended to help the CRMC form and maintain a good understanding of the performance of the overall system and to identify and address any weaknesses or deficiencies before they become material. The summary review is high level and covers current status and activity since the previous review was conducted.

2.9 Data Standards

2.9.1 Introduction

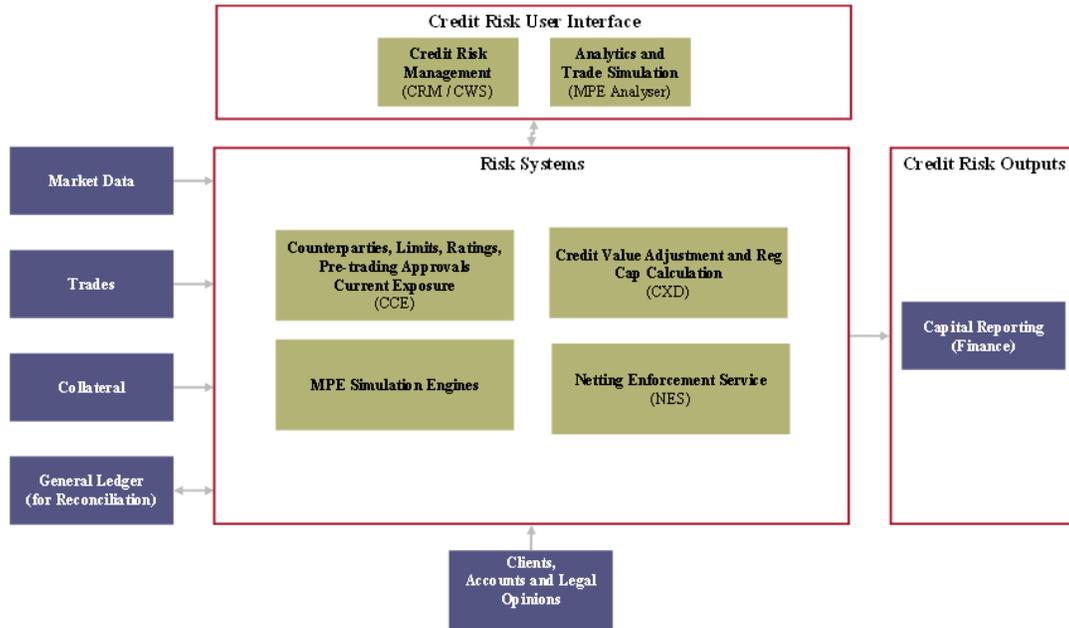
Lehman Brothers data standards incorporate policies and procedures, work flow processes and technology solutions to ensure information appropriateness, reliability and integrity. In combination, these standards represent the commitment for collecting, generating and sharing quality information / data within the Firm. The technology infrastructure focus is to provide best practice methods for application change management, performance management, application packaging, and incident management and provide a secure distributed environment to support our data standards.

2.9.2 Data Model

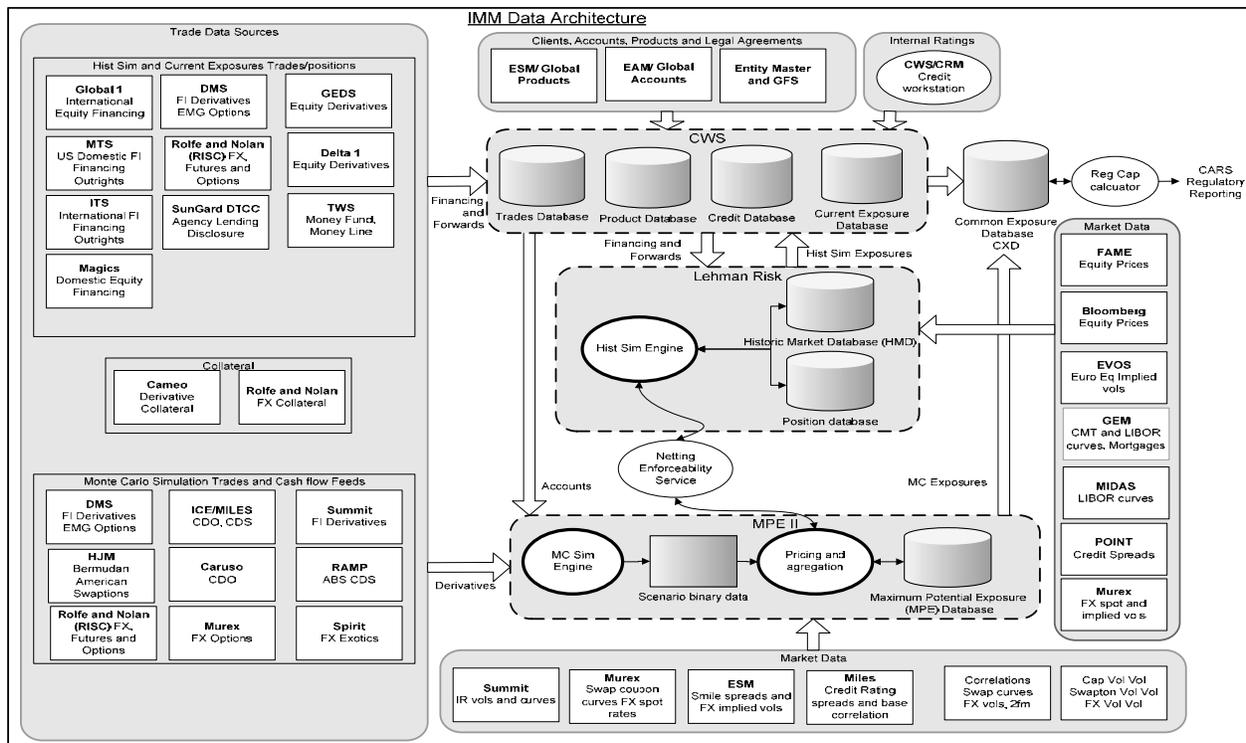
Lehman Brothers data model consists of the Firm's policies, controls and system architecture for ensuring the data integrity, completeness and appropriateness of the information that is necessary to complete the regulatory capital computations. The components of the data model that provide information to the Potential Exposure engines and regulatory capital computation process are:

- ◆ Market data – current and historic market information, including but not limited to interest rates, foreign exchange rates, stock prices, volatilities, correlations, etc.;
- ◆ Position / Trade data – transaction terms of outstanding trades, including but not limited to: legal entity, account, client identifier, notional / quantity, trade date, maturity date, etc.;
- ◆ Client / Account information – client creation and account association;
- ◆ Legal Agreement information – legal terms and conditions of our trading relationships;
- ◆ Collateral data – margin and security information of our trading relationships; and
- ◆ Counterparty Ratings – internal and facility counterparty ratings.

A high level diagram of the data model interaction that leads up to the regulatory capital computation is set out below:



A more granular view of the data flows is shown with the following diagram:



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Each data model or information system has process controls that promote data accuracy and completeness of the underlying data. Groups responsible for the integrity of their respective data model will determine the appropriateness of the underlying data in accordance with their informational requirements and those of the Firm, as discussed in the following sections.

2.9.3 Market Data

Lehman Brothers has vast data requirements for pricing and valuing portfolios of transactions for internal and external purposes. This market information is critical to Firm's operations, thus the data standards for market data requires that all information be:

- ◆ Accurate - all internal and external data providers / vendors are reliable, reputable and responsive to their clients; data is of the highest quality, while each provider / vendor has sufficient support staff to resolve data issues;
- ◆ Complete - has sufficient history (i.e. 4 years), breadth (i.e. full curve or currency pairs) and be global in coverage; and
- ◆ Appropriate - has the proper attributes for use in exposure or pricing models.

Lehman Brothers Potential Exposure ("PE") system has extensive market data requirements for processing transactions through the exposure engines. Market data requirements are for current and historical market data covering a broad range of products and markets. The key categories of market data types are:

- ◆ Fixed Income Derivatives
 - Interest rate curves (i.e. Government, LIBOR, Indices, Par, Zero, etc.)
 - Spread curves (i.e. Basis, High Grade/High Yield, Off-the-run, etc.)
 - Swaption volatilities
 - Cap/Floor volatilities
 - Volatility of implied swaption/cap/floor vols.
- ◆ Credit Derivatives
 - Credit rating spreads
 - Base correlations
- ◆ Foreign Exchange
 - Spot and interest rates
 - Implied Volatilities
 - Smile spreads
 - Volatility of implied foreign exchange vols.
- ◆ Equity Derivatives
 - Equity and Index prices
 - Implied volatilities
- ◆ Financing
 - Equity and fixed income bond prices
 - Financing rates
- ◆ Other
 - Foreign exchange and interest swap rates for computing correlations

Each provider / vendor of market data is required to provide accurate and timely information. Each feed then undergoes a process of feed monitoring, cleaning and validation to ensure the integrity of this incoming market data.

There are four data integrity processes within the Firm:

1. Data Quality Control Group (“DQCG”) is responsible for the data quality of market data stored within the Historical Market Database (“HMD”). All HMD market data has a sponsor or owner, which is the Risk Manager or Designated Risk Manager (“DRM”) responsible for the specific time series. Data collection begins with:
 - DQCG confirms interface and loads respective market data or time series;
 - DQCG reviews market data or time series via a graphical representation;
 - Data anomalies are reviewed with DRM and validated against other reliable data sources or highly correlated markets for reasonableness; and
 - DQCG and DRM sign-off on cleansed data and release market data into production.

DQCG has created tools for market data monitoring and correction. Existing tools include:

- missing data report: a daily report that monitors the number of data points that are missing from a time series relative to the “as of date”; DQCG contacts the source provider to resolve the missing data problem; this report is one of the main tools used currently to control the status of market data;
 - FX spot rate automated data correction: duplicate data sources, Murex (internal) and Bloomberg (external), allow for cross-checking of market data; when a currency pair exhibits a 5% or greater daily change, then a cross-check with the alternate source (Bloomberg) occurs and priority is given to the data point that has changed the least;
 - visual graph inspection: Expo software allows for the charting of up to 99 individual time series; this software enables the user to resize, manipulate and examine sections of a time series in graphical or digital (tabular) form;
 - preference algorithm: prevents manual data changes from being over-ridden by an automated validation process or source system; and
 - audit trail: HMD stores information on data adjustments: who made the changes (user or source system), time of change, previous and new data point values; a report showing data changes over the last 10 days is available on the LehmanRisk intranet site.
2. Product Control Price Testing: Inventory positions are accounted for on a market or fair value basis. These marks are then subject to price testing on a monthly basis. Product Control verifies market or fair value for cash instruments and listed derivatives by utilizing vendor prices, broker quotes, exchange prices or similar instruments, as appropriate. Market or fair value of OTC derivative positions is calculated through the use of models. The market parameters that drive the model valuation are independently validated by utilizing broker quotes, market data providers and industry consensus surveys, primarily market valuations.

In situations where a direct price quote is not available, Product Control looks to similar instruments being traded or benchmark levels of similar securities, e.g. if a corporate bond had no direct price quote they might look to benchmark this against another bond of similar credit quality and

characteristics. Additional analysis may also be performed based on appraised asset values and company valuations.

3. Technology and Quantitative Risk: operate a process to monitor, clean and validate the market data that goes into the PE batch. Presently, the following monitoring activities occur during the batch process:
 - confirm the arrival of all necessary market data feeds prior to batch initiation (~03:30pm GMT); If a data feed is incomplete or fails, batch operators are notified with an error message that requires immediate investigation and resolution;
 - an automated validation of the interest rate swap zero curves occurs prior to each production batch; the validation confirms: (i) there is a benchmark curve for each currency; (ii) the currency of each curve is recognized as valid; (iii) interest-rate curve points fall on monotonically increasing dates; (iv) curves have a least 20 points of raw data; (v) there are no duplicate data points in the curve; and (vi) there are no negative forward rates between adjacent future months of the curve; if one or more of these conditions exist, then an automatic email alerts the technology support group, along with the status of the automatic repair process, for further investigation; and
 - after the collection of weekly market data and the generation of market scenarios are complete, a “mini-batch” consisting of several thousand carefully chosen generic control trades are processed and validated; the validation process compares batch over batch results to tenor based thresholds; trades exceeding the threshold are reported to the group for further investigation; once all trades have been validated, then the full batch process proceeds onto the next production step.

Once a data issue has been isolated, Technology and/or Quantitative Risk personnel cleanse the market data. The cleaning activities are market data specific:

- Interest Rate Zero curves: these are automatically scanned for internal consistency; if negative forward rates are detected, curves are repaired through an algorithm developed within the group; the repair process iteratively and gradually attempts to “fill-in” steep pockets in the curve until negative forward rates no longer exist; when this event occurs, the Technology group receives automatic notification of the repair details; Latvia, China, Thailand and Gold are the curves that periodically exhibit negative forward interest rates; and
 - FX spot rates, implied volatilities and credit curves: a manual process that involves visual inspection of the offending data, comparison against previous historical data, and possibly comparison against alternative sources of market data; often the suspicious data segment can be easily identified and back-filled with corresponding data from the previous day’s feed; Technology will repair, report and escalate the incident to our data feed provider for follow-up action.
4. Manual Process: a monthly process that sources four years and one month of foreign exchange and interest rate swap zero rates from Bloomberg for computing a correlation matrix. On or around the eighth of each month, the following data validation steps are taken on the time series beginning as of the previous month end:
 - visual inspection of each foreign exchange and interest rate tenor time series;

-
- questionable data points (i.e. large spikes or drops inconsistent with surrounding observations) will be brought to the attention of Bloomberg's data representatives for investigation and resolution;
 - if the data issue hasn't been resolved in time, Quantitative Risk will clean the data by comparing against: surrounding data of the same tenor for similar behaviour, similar tenors for the surrounding dates, related currencies for surrounding dates and against alternative sources of market data;
 - normally, there are no data problems with foreign exchange rates and only one or two data issues per month for interest rate swap data.

2.9.4 Position / Trade Data

Data integrity of the position / trade data is fundamental to the risk management of the Firm; there are three key processes that exist to ensure data accuracy and completeness.

- ◆ Trade Confirmations: Lehman Brothers standards of operation are that all trades are properly documented and confirmed with the client, all trades are booked in an appropriate source system, all terms and conditions entered into the source system are validated against the confirmation and intersystem trade reconciliations are completed.
 - Non-Derivative transactions: Confirmation of non-derivative transactions is the responsibility of Operations Control, where trade confirmations are automated via the product specific settlement system.
 - OTC Derivative transactions: Confirmation of OTC Derivative transactions is the responsibility of Operations Transaction Management and Corporate Advisory Transaction Management. OTC Derivative transactions booked through front office systems are processed via the Documentation Risk Effort Assessment Management ("DREAM") system.
 - If the counterparty and product are eligible for electronic processing, then executed transactions will be automatically sent to either DTCC or SwapsWire for confirmation of terms and conditions. An exception report for unconfirmed trades or terms is generated for timely resolution.
 - For non-electronic vanilla OTC Derivative transactions, the DREAM system uses SmartTicket data fields to generate a documentation requirement template. This semi-automated drafted document is then approved by a drafting team member and auto routed to the client via fax or other transmission mechanism.
 - For non-electronic structured OTC Derivatives transactions, the DREAM system uses SmartTicket to generate a template but the manual drafting intervention is much greater such that reliance is placed upon the drafting team in Corporate Advisory Transaction Management to draft the terms of the confirmation in accordance with the SmartTicket terms and a term sheet created for many of the traded OTC Derivative transactions. Upon creation of a first draft, the confirmation is verified by another drafter and by the front office trader or salesperson before being auto routed to the client via fax or other transmission mechanism.

Upon delivery of the confirmation to the client, a client relationship owner (chaser) is assigned and will work with the client to obtain the return of a signed confirmation. All client communications are recorded

within DREAM (i.e. owner, date and discussion details). All outstanding confirmations are chased, at a minimum, on a weekly basis with larger volume counterparties contacted two or three times per week. An audit trail is kept within DREAM to demonstrate status of confirmation

MIS is produced for distribution to senior management within the business and operations to demonstrate volumes of trades and outstanding confirmations by product and age.

- ◆ Price Testing: product controllers are responsible for the analysis and validation of the P&L. This responsibility requires the following steps to be completed in a new deal review for derivative or structured products:
 - ensure that all contractual terms (i.e. trade / settlement date, trade type, maturity date, reset / observation / payment dates, notional or quantity, currency, underlying reference instrument(s), buyer / seller or payer / receiver details, fees and other specific economic conditions) are captured accurately in the books and records against the confirmation; and
 - ensure initial valuation is correct and confirm model appropriateness and that the appropriate day 1 P&L is recorded in accordance with current accounting policy
- ◆ Trade Reconciliations: Intersystem trade reconciliations are produced, reviewed and reconciled on a daily basis. The specific systems reconciled are dependant upon the product. Reconciliations are produced post the overnight batch runs on a T+1 basis. Standards are to ensure any exceptions are investigated and resolved on T+1. MIS is produced and reported as this is a key control process.

The T+1 reconciliations are in place to ensure accuracy and completeness of data between systems to further ensure a consistent single representation of the trade.

2.9.5 Client / Account Information

Lehman Brothers has rigorous client / account data standards both to ensure that the client is correctly set up within the Firm's global systems architecture, but also to ensure full compliance with Anti-Money Laundering and Know Your Customer ("KYC") rules. These rules stipulate the following objectives:

- ◆ rigorous and robust process of investigation that seeks to verify, with reasonable assurance, a customer's identity;
- ◆ complete and accurate customer information (i.e. name, address, etc.);
- ◆ understand and reaffirm customer's profile, business and account activity;
- ◆ identify relevant adverse information about customer; and
- ◆ accurate account to client association.

Customer Accounts Services ("CAS") is responsible for enforcing these data standards for Lehman Brothers and its affiliated entities by ensuring that all accounts opened are in compliance with all government and Firm regulations.

Enterprise Account Management ("EAM") is the global system for Client, Master and Account creation and maintenance and acts as the foundation for the workflow process that ensures data integrity. EAM guides

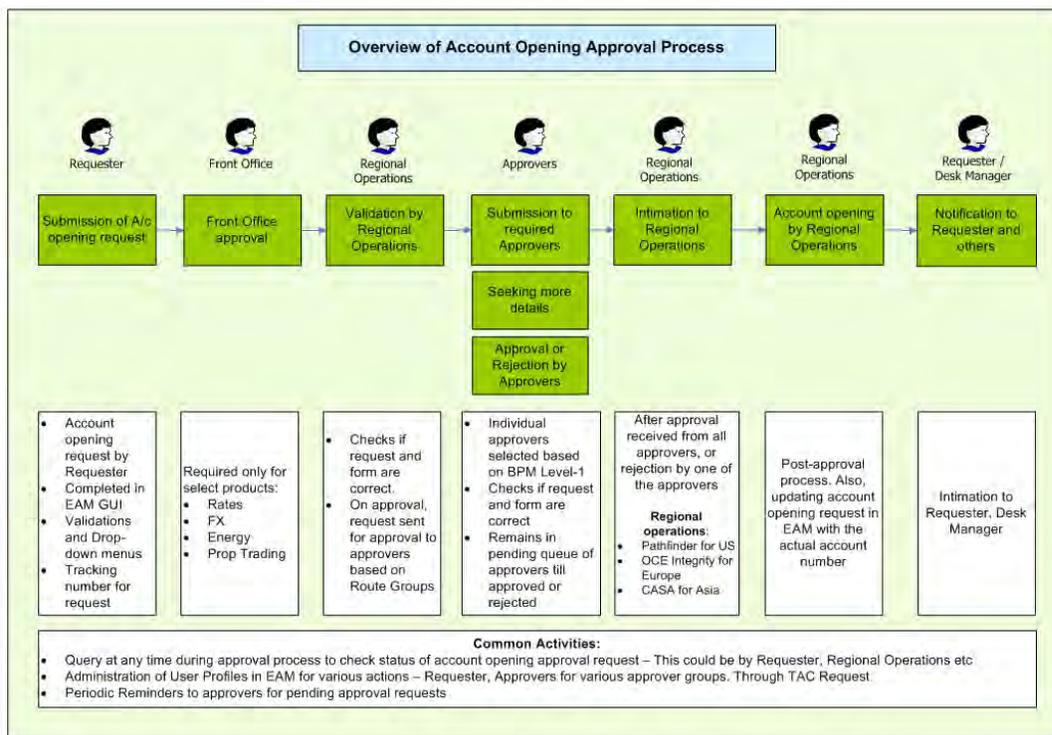
data to the appropriate department for specific action, which ranges from data entry to validation by Credit, Compliance, CAS, etc.

EAM's data model has three major components that relate to one another as follows:

- ◆ **Clients** are the core to which everything else in the model is related; clients can be related to one another in a variety of relationships and one or more clients can be related to one or more account profiles or system accounts;
- ◆ **Account Profiles** represent the client's view of their account relationships with Lehman Brothers; a client (or clients, as in the case of Agent and Principal Account relationships) may have one or more account profiles; and
- ◆ **System Accounts** represent the Lehman Brothers view of our relationship with a client; for a single account from the client's view (the account profile), we may require multiple system accounts based on Lehman Brothers legal entity or Lehman Brothers branch; an account profile can have as many system accounts associated with it as required to transact business but an account can only be associated with one account profile.

EAM's account opening process involves a workflow that touches multiple groups prior to final approval. These workflows tend to be regionally oriented for expediency, language and efficiency reasons, although other regional groups can and will provide assistance when necessary.

The firm account opening approval process can be shown with the following diagram (note: customer account opening is very similar):



In the Firm account opening process, the workflow process requires multiple ‘approvers’ (i.e. Product Control, Risk Management, Margin Group, Regulatory and Legal Entity Control) to review and sign off on a request prior to final approval.

In the customer account opening process, the workflow process requires multiple ‘approvers’ (i.e. Money Laundering Prevention Group, Client Identification Department, Due Diligence Reporting Group, Transaction Management Group, Credit Risk Management and, on occasion, Compliance). Each of these groups has a responsibility to research, validate or enhance customer information, such as client name and address. Upon validation, a client record is created in Global Accounts (“GAC”) and the name and address information is held on this record for future requests. The EAM request will then come through to CAS for final review and provided all of the details / approvals are obtained, the account will then be created.

Credit Risk Reporting’s Counterparty Maintenance Group is responsible for the review of new client/account openings that flow through EAM into CWS on a daily basis. The review process will validate the legal name of each new client via internal/external resources (i.e. legal agreements, regulatory websites, Dunn & Bradstreet, etc.) and ensures accounts are linked to the correct client for exposure purposes.

An account opening request can be rejected for a variety of reasons, some of which are:

- ◆ incomplete documentation;
- ◆ legal name or entity of counterpart not verifiable;
- ◆ inadequate description of account usage;
- ◆ inadequate reasons to open account; and
- ◆ missing data fields in account opening request.

CWS sources client and account hierarchy information from the EAM database tables on a real-time basis, thus ensuring timely and accurate data in a completely reliable process. This information (i.e. account/client links, legal names and the parent/child relationships) forms the basis for creating portfolio sets that flow into the MPE engines that generate the exposure profiles used for computation of regulatory capital.

2.9.6 Legal Agreement Information

The Transaction Management Group (“TMG”) is responsible for the negotiation and execution of Master Agreements on a global basis. Master Agreements are legal agreements which set forth terms that apply to all applicable over-the-counter transactions and Firm financing between a Lehman Brothers entity and each of its respective clients, both internal and external. The data standards for managing the legal agreement information are to:

- ◆ facilitate the drafting, negotiation and execution of derivatives documentation;
- ◆ record all legal agreement terms within Entity Master; and
- ◆ validate manual data entry with two independent sources.

A rigorous workflow process and system architecture ensures data integrity. TMG’s work flow process revolves around the Entity Master (“EM”) system, which is their tool for managing the negotiation and execution of Master Agreements on a global basis. Master Agreement coverage includes: ISDA and other

derivatives/foreign exchange agreements, CSA/collateral annexes to such derivative agreements, physical commodity trading agreements, cross margin netting agreements (“CMNA”) and funding documents. Presently, funding agreements are stored in GFS as a tactical repository. This information is to be entered into the respective EM data tables in 2007.

Drafting of a Master Agreement commences upon the initiation of a prospective trading relationship with a new or existing client and with credit term approval from Credit Risk Management. The respective TMG negotiator, or in some cases an attorney from the Legal Capital Markets department (in consultation with the credit analyst, sales and/or trading personnel as applicable), will work with the client to execute the Master Agreement.

Upon execution of the applicable Master Agreement, the agreement terms and conditions are manually entered into the EM application, typically by TMG paralegals if the Agreement was negotiated within TMG. The TMG Negotiator working on the Agreement should then validate the entered information by comparing each data field against the corresponding agreement and upon completion check the “Verified” checkbox in Entity Master.

Entity Master transmits information to downstream “subscribers” via two methods: 1) a near real-time database replication (i.e. CAMEO & CWS) or 2) TIBCO broadcast. These technologies guarantee timely, accurate and complete delivery of the information to the downstream subscribers.

Corporate Audit reviews EM and all associated general application controls on a regular cycle as part of its ongoing program of information system audit coverage. Specific controls that are confirmed include: application access as controlled by the Firm’s Total Access Control system and process and managed by IT Security; database controls; application change management controls; interface controls including database replication, messaging services, and file transmission controls; and disaster recovery and business continuity planning.

2.9.7 Collateral Data

Collateral Management data standards are to:

- ◆ accurately compute client exposures on a daily basis using marks from close of business the day before;
- ◆ generate and track margin calls in a timely and accurate manner;
- ◆ confirm with client outstanding margin calls and resulting settlement instructions; and
- ◆ escalate delinquent calls to senior management when necessary.

For regulatory capital computations, a complete collateral perspective requires four sources of collateral information:

- ◆ CAMEO provides a majority of the collateral information;
- ◆ ARAP provides collateral for a subset of bond option positions;
- ◆ Rolfe and Nolan (RNN or “RISC”) provides collateral for a subset of foreign exchange transactions; and
- ◆ MTS provides collateral relating to a subset of MTS booked positions.

Collateral Management's Collateral & Margin Exposure Optimization System ("CAMEO") is the Firm's global exposure and margin management system. It provides the ability to manage client exposure, generate and track margin calls and contains consolidated operational reporting facilities to view exposure information in various levels of detail. The system provides margin management tools like margin rate maintenance and generation of MtM statements for our clients. Globally supported business areas currently include Prime Broker, Derivatives (i.e. Credit, Energy, Equity and Fixed Income), Fixed Income Financing, Futures, Retail and Institutional Private Client Services and Stock Borrow/Stock Loan.

The margin group is responsible for ensuring that margin collateral notices are generated and confirmed with the counterparty on a timely basis. If there are any disputes, the margin group will review them, discuss the appropriate actions needed with management and ensure they are cleared in a timely manner.

The daily margin call tracking report provides information for margin calls by region that require action. The report outlines four specific types of actions:

- ◆ Suggested Margin Calls – provides information on the collateral that Lehman is expecting to receive;
- ◆ Pending Margin Calls – where the margin analyst makes a call to the counterparty;
- ◆ Disputed Margin Calls – where a counterparty has a dispute with a margin call; and
- ◆ Unsettled collateral – collateral that will be sent the following day or future date for a specific account.

Utilizing the margin call tracking report, a margin supervisor divides the workload among the collateral management group by assigning one analyst to each margin call. At the end of the day, the supervisor reviews the queue to ensure that items are being resolved in a timely manner.

Once the margin call notice is sent to the counterparty, the margin analyst will confirm with the counterparty the margin to be received by a specific time and date (e.g. generally next business day). The margin analyst will record this information in CAMEO's Margin Call Event tool for tracking pledge/receive collateral.

- ◆ If the collateral is cash collateral, a notice and message is automatically sent to the settlement group and ASAP. ASAP (Automatic Settlement and Payment System) is the Firm's automatic settlement and payment system. ASAP generates a Swift message to the bank and creates an ITS journal. This is true for legal entities except for LBK, LBI and LBCC.
- ◆ If the collateral is a Fedwire deliverable security the notice and message is automatically sent to the cage and MTS. MTS then sends a message to the bank which returns a message to CAMEO with settlement information.
- ◆ If the collateral is a DTC delivery or physical delivery then a memo is generated and sent to the appropriate back office areas to settle the collateral. The mainframe systems are reconciled to CAMEO to ensure that all counterparty collateral pledged is received.

CAMEO reconciles daily to ITS, RISC, TMS, and MTS. These systems house all collateral that is pledged to the Firm in the form of US treasuries, mortgages in MTS, cash, foreign equities, some domestic equities in ITS and other domestic equities in TMS. The Collateral Reconciliation Report is run on a daily basis and compares the mainframe systems to CAMEO. It is broken out into three categories: 1) In Cameo-Not in MF, 2) In MF- Not in Cameo and 3) Quantity Mismatches. Differences may exist due to timing (i.e. collateral may be booked in CAMEO when it is expected and not into ITS/MTS until it is actually received). If breaks

are identified between the two systems, the collateral analyst responsible for the account affected will investigate and clear the breaks. The Settlement Group is responsible for reviewing GSSR reconciliations and making sure that collateral is ultimately collected. The Settlement Group will notify the Margin Group when a collateral movement fails.

CAMEO receives a pricing feed from Global Pricing (ESM), which prices all security derivative collateral held by the Firm. The pricing group advises on any securities that were not able to be priced by ESM daily.

The Orphan Collateral Report is run on an entity basis and shows collateral that has been booked to a risk management ID that is no longer in DMS and should be returned to the counterparty.

The Redemption Collateral report is run daily on an entity basis. It shows collateral that is going to be redeemed or will mature in the coming week. The analyst assigned to the specific counterparty requests a substitution of collateral to take place before the redemption date.

The Collateral Receive/Pledge Shredder (the Shredder is the report generation module of CAMEO) shows all the collateral that has been received or pledged for a given date. This report can be customized by entity, account name, specific currencies or specific security. There are various shredders/reports that report exposures in specific manners.

At the end of day the Margin Supervisors review the margin call tracking report to verify that all margin calls have been made for the day. The Margin Call Summary Shredder is run to verify that outstanding (pending, or disputed) margin calls have appropriate comments and are escalated if need be. Generally, the business and corporate credit will be advised. The Global MIS report is run after this verification is completed by using the Margin Call Summary.

Global MIS displays outstanding margin calls on a global basis for all business and margin centers. This is distributed to the business, corporate credit, finance, regulatory and operations.

2.9.8 Counterparty Ratings

Credit Analysts are responsible for developing and maintaining counterparty ratings. The data standards for counterparty ratings are to ensure:

- ◆ ratings driver information is complete, accurate and timely;
- ◆ credit ratings are approved by two credit analysts in accordance with Global Credit Policy;
- ◆ all analyst overrides have mandatory comments / explanations; and
- ◆ periodic model reviews and validations are completed.

The Rating Maintenance application provides a consistent and transparent approach for credit analysts to determine Internal Credit Ratings (“ICR”) and Internal Facilities Ratings (“IFR”) using internally developed scorecards. The application contains a set of industry sector templates. Each template will contain a specified set of pre-weighted key drivers. Credit analysts will then be given the opportunity to select values in the scoring framework. A calculated ICR value and IFR value(s) are determined by the cross product summation of the driver weights and credit analyst’s score assessments.

Rating drivers are provided by Credit Analysts manually; the application provides multiple levels of validations to enforce data integrity upon entry of scorecard attributes and submission of the final scorecard. Here are a few crucial system validation rules:

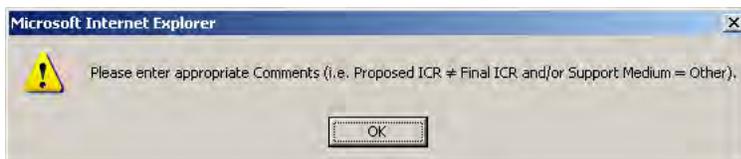
- ◆ all data fields have to be complete; the application will not generate or allow submission of a final ICR/IFR when there is missing data; a warning message will inform the user of missing information, as shown below;



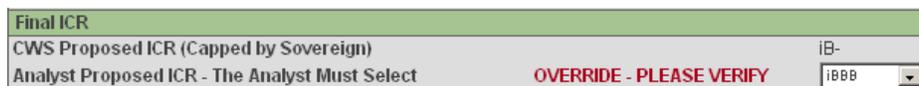
- ◆ if an Analyst selects a rating driver that is not pre-defined by the application, such as “Other” Support Medium for the CCP scorecard, they will be required to provide a justification for using the undefined driver; the rating application will reject the entry if the analyst fails to do so; and



- ◆ if an Analyst elects to submit their own ICR as oppose to using the proposed ICR, which is generated by the Rating Maintenance application based on pre-defined Global Credit Policy rules, they are required to provide supporting documentation for their proposal; the same requirement applies for an IFR.



Credit Rating submissions require approval from two analysts, referred to as a “second pair of eyes”, as outlined in the Global Credit Policy. The rating application institutes a workflow that routes a rating proposal to the alternate analyst/manager for approval after the first analyst submits the proposal. If an ICR/IFR is overridden by the alternative analyst/manager, the originating analyst is informed to verify the override action.



Rating scorecards receive a comprehensive review (annual) and a summary review (quarterly) to ensure that the system is (i) discriminating risk properly and (ii) being used properly.

3. Risk Exposure and Capital Calculation

3 Risk exposure and capital calculation methodologies

3.1 Summary of Risk Exposure

Set out below is a summary of LBIE's exposures at 28 February 2008.

Regional Mapping	CCE	% CCE	MPE	% MPE
Central & Eastern Europe Central Asia	102	0.7%	313	0.9%
Japan	39	0.3%	115	0.3%
Latin America Region	218	1.5%	1,053	2.9%
MidEast / Africa Region	189	1.3%	487	1.4%
NonJapan Asia Region	809	5.6%	1,968	5.5%
USA / Canada	2,103	14.6%	4,373	12.2%
Western Europe Region	10,987	76.1%	27,630	76.9%
Grand Total	14,448	100.0%	35,939	100.0%

Industry Counterparty Exposure

Product Counterparty Exposure

Product Family	CCE	% CCE	MPE	% MPE
Repo/RR	2,754	19%	4,722	13%
Stock Loan/Borrow	4,919	34%	7,689	0%
Derivatives	6,571	45%	23,297	65%
CASHf	204	1%	231	1%
Grand Total	14,448	100%	35,939	79%

Industry Group	CCE	% CCE	MPE	% MPE
BANKS	5,174	35.8%	12,277	34.2%
BROKER/DEALER	1,253	8.7%	2,272	6.3%
GOVT ENTITY	1,608	11.1%	2,768	7.7%
HEDGE FUND	130	0.9%	1,254	3.5%
HIGH NET WORTH INDIVIDUALS	3	0.0%	8	0.0%
INDUSTRIAL SERVICES	572	4.0%	1,924	5.4%
INSURANCE	544	3.8%	1,650	4.6%
MUNICIPAL ISSUER	872	6.0%	1,540	4.3%
OTHER FINANCIAL	4,054	28.1%	10,483	29.2%
PENSION/RETIREMENT FUND	238	1.7%	1,763	4.9%
Grand Total	14,448	100.0%	35,939	100.0%

Internal Credit Rating Counterparty Exposure

LEHMAN BROTHERS

Confidential Treatment Requested

ICR	CCE	% CCE	MPE	% MPE
iAAA	3,074	21.3%	6,913	19.2%
iAA	5,801	40.1%	14,101	39.2%
iA	4,087	28.3%	10,297	28.7%
iBBB	1,022	7.1%	2,970	8.3%
iBB	154	1.1%	898	2.5%
iB	278	1.9%	667	1.9%
<iB	6	0.0%	38	0.1%
Not Rated	27	0.2%	55	0.2%
Grand Total	14,448	100.0%	35,939	100.0%

3.2 Basel 1 Capital Calculation

The Firm calculates LBIE counterparty credit risk, non-trading book credit risk and concentration risk under IPRU (INV) rules on a T+1 basis as part of the Basel 1 Floor calculation from the Firms underlying front office, settlement and finance systems.

The Basel 1 floor calculation, together with the Basle 2 MPE results, forms the basis of the Daily LBIE Capital Adequacy Report (CAPAD) that is distributed to Senior Management on a T+2 basis.

Capital calculations are compared to the results from the MPE Model and where appropriate unexpected variances are followed up with Lehman Brothers Credit Risk.

On a monthly basis the Basel 1 Monthly Reporting Statement is completed and reviewed by Senior Management. Variances are reviewed and explanations provided for material movements. All balances are reconciled to the Firm's underlying accounting records for inclusion in the mandatory FSA submissions.

3.3 Basel 2 Capital Calculation

The Basel 2 Capital calculation is performed by the Firm through the Capital Adequacy Reporting System (CARS). The calculation is done on a daily T+2 basis based on BIPRU and GENPRU and it comprises two main sources of input:

1. Calculations per the Credit Model MPE (based on the IMM wavier)
2. Calculations of Finance Non-MPE products

Once the data has been loaded into CARS, calculations are run to produce the capital adequacy numbers (subject to Basel 1 floor). The calculations performed include:

1. Credit Risk
2. Counterparty Credit Risk
3. Concentration Risk

On a monthly basis a suite of FSA reports are required to be submitted based on the Integrated Regulatory Reporting (IRR) regime. The main reports include the P&L, balance sheet, capital adequacy, market risk and large exposures. These are produced through business objects which obtains the data from CARS.

Lehman Brothers internal exposure models are an integral part of the firm's limit management, internal capital allocation and regulatory capital computation processes. Internal models provide the necessary information to compute the Firm's regulatory capital requirements for OTC derivatives (with the exception of equity derivatives where an appropriate model is in development) and securities financing transactions.

The Firm's process for regulatory capital computations includes the following elements:

- ◆ A Foundation – Internal Ratings Based (FIRB) approach
- ◆ Incorporation of all BIPRU requirements
- ◆ Models which generate exposure on a legal agreement / legal entity basis
- ◆ Conservative exposure representation where internal models are not used to generate exposures.

This is an evolutionary process whereby the firm's risk management, internal models, workflow processes and technology architecture are continually improving in terms of accuracy, completeness, reliability, security and performance.

Lehman Brothers computes a bilateral counterparty valuation adjustment ('CVA') on a monthly basis at the holding company level to meet FASB 157 financial reporting obligations in the United States. The same set of internal exposure models are used for the CVA and LBIE regulatory capital computations.

Alpha, loss given default ('LGD'), maturity ('M'), probability of default ('PD') and exposure at default ('EAD') are the primary inputs into the regulatory capital computation.

- ◆ Alpha
 - Standard values of 1.4 for CCR internal model generated exposures and 1.0 for cash balances or receivables that are not internal model generated
- ◆ LGD
 - Senior unsecured facilities use a 45% value, senior subordinated facilities use a 75% value and non-performing facilities use a 100% value
- ◆ M
 - All netting sets use BIPRU 4.4.67R (5), where the original maturity is assumed to be equal to or greater than 1 year. Future enhancement will incorporate the 'M' formula clarifications of the 19 March 2007 communication and/or ISDA Counterparty Risk Work Group's consultations with the FSA.
- ◆ PD

- Internal credit ratings are mapped to a modified Moody's historical default probability matrix with a 3 basis point floor

◆ EAD

- Alpha times effective expected positive exposures (EPE) as calculated by internal model

Lehman Brothers regulatory capital computation follows the BIPRU handbook rules. The primary formulas for LBIE are:

$$\text{Credit Risk Charge} = \text{EAD} \times \text{RW} \times 8\%$$

Where

EAD = α x effective expected positive exposures (EPE) as calculated by internal models

RW = a function of PD, LGD and M

PD = ICRs are mapped to modified Moody's historical default probabilities with a 3 basis point floor

LGD = 45% for senior unsecured facilities, 75% for senior subordinated facilities and 100% for non-performing facilities

M = CCR internal model exposure value

Alpha (α): 1.4 for CCR internal model generated exposures
1.0 for cash balances or receivables that are not internally modelled

Effective EPE: average effective EE during the first year of future exposure

$$\left(\sum_{k=1}^{\min(1 \text{ year; maturity})} (\text{Effective EE}_{tk} * \Delta t_k) \right)$$

Where

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

$$\text{Risk Weight: } (\text{LGD} * N[1-R]^{-0.5} * G(\text{PD}) + (R/(1-R))^{0.5} * G(0.999)) - \text{PD} * \text{LGD} * (1-1.5*b)^{-1} * (1+(M-2.5)*b) * 12.5 * 1.06$$

$$\text{Correlation (R): } 0.12 \times (1 - \text{EXP}(-50*\text{PD})) / (1-\text{EXP}(-50)) + 0.24 * [1 - (1-\text{EXP}(-50*\text{PD})) / (1-\text{EXP}(-50))]$$

Maturity Factor (b) : $(0.11852-0.05478*\ln(PD))^2$

N(x): denotes the cumulative distribution function for a standard normal random variable (i.e. the probability that a normal random variable with a mean zero and variance of one is less than or equal to x). G(z) denotes the inverse cumulative distribution function for a standard normal random variable (i.e. the value x such that N(x) = z).

Maturity (M): For CCR internal model exposure values, the formula is:

$$M = \text{MIN} \left(\frac{\sum_{k=1}^{tk \leq 1 \text{ year}} \text{Effective} EE_k * \Delta t_k * df_k + \sum_{tk > 1 \text{ year}}^{maturity} EE_k * \Delta t_k * df_k}{\sum_{k=1}^{tk \leq 1 \text{ year}} \text{Effective} EE_k * \Delta t_k * df_k} ; 5 \right)$$

Lehman Brothers computes a capital add-on for known model deficiencies. These capital add-ons represent an additional measure of conservatism, are reviewed on a monthly basis and include inter alia trade and mark to market reconciliation breaks between Credit Risk Management and Finance systems, deficiencies in the calibration of CRD models, MPE independent model validation feedback yet to be incorporated into MPE methodologies, incomplete back testing, MPE proxies, missing product coverage for example prime brokerage, modelling of long settlement transactions, netting deficiencies, outstanding enhancements to incorporate wrong way risk, collateral eligibility, haircuts and balances into MPE methodologies and PD smoothing.

3.4 Risk Equity Capital Calculation

3.4.1 Introduction

The maintenance of the appropriate level of equity is central to the Firm's ability to raise capital and to transact with credit-worthy counterparties. The Firm's Risk Equity Model determines the amount of required equity at the Firm level and for each of the Firm's businesses, on both a global and a regional basis. It is measured at a 99.5% confidence level for a one year or longer holding period.

The amount of equity required by the Firm is the Firm's economic capital augmented by capital requirements due to external constraints. To the extent leverage or regulatory equity is an overriding constraint for the Firm, businesses are charged incremental equity on top of their economic (risk) equity.

Specifically, the total economic capital of the Firm and the risk-based equity usage by each business are calculated as the sum of:

1. equity required to protect the Firm and businesses against market, event and counterparty credit risk;
2. operational risk;
3. and equity required to support other corporate assets.

The total required equity is the greater of: a) the economic equity as described above; b) regulatory equity required by businesses in regulated entities; c) leverage equity required to maintain the Firm's target leverage ratio.

3.4.2 Risk Equity Measurement

Risk Equity usage is measured at a 99.5% level of confidence, combining market, event, counterparty credit, operational risks, and corporate assets allocation and augmented by leverage or regulatory equity.

Market risk measures the potential mark to market loss on positions from adverse moves in all market risk factors. It is computed by historical simulation (similarly to daily value-at-risk measure) but with a one-year holding period. Event risk measures the potential loss beyond those measured in market risk such as losses associated with a downgrade for high quality bonds, defaults of the high-yield bonds and loans and loss on real-estate-backed loans, etc. Counterparty credit risk measures the potential losses across all of the Firm's forward settlement, financing and derivative transactions. Operational risk measures the loss resulting from inadequate or failed internal processes, people and systems, or from external causes, whether deliberate, accidental or natural. Currently we use a modified CSE Basic Indicator Approach (BIA) to estimate operational risk.

3.4.3 Economic Capital

Market Risk

Market Risk measures the potential mark-to-market loss on all positions of a portfolio from adverse moves in market risk factors. The VaR methodology employed by Lehman Brothers is the historical simulation based on 4 years of historical market data. A distribution of simulated daily P&L of the trading portfolio is derived from the exposures of the portfolio to the relevant risk factors and the historical movements of these factors. The risk factors include the level, shape, and volatility of the yield curves in various currencies; basis spreads, on-the-run/off-the-run spreads, credit spreads by currency, rating, sector and maturity; high yield bond price indices; option adjusted spreads; foreign exchange rates and volatilities; equity prices and volatilities, etc. The exposures of the portfolio to the risk factors include both linear and non-linear components. The linear component is estimated based on the local sensitivities of the portfolio to these factors (e.g. deltas, gammas, vegas); the non-linear component is estimated using stress grids obtained through full re-pricing of positions. When the change in the mark-to-market of a position is mapped to movements of an index, our VaR methodology also estimates an issuer-specific risk. For fixed income securities, this type of risk arises in the cases of high grade bonds and high yield bonds where historical indices of credit spread and bond price are used. For equity securities, the issuer-specific risk arises when there is insufficient historical data for the stock price or the volatility.

Event Risk

Event risk measures the potential stress and "gap" risks beyond the mark-to-market P&L as measured by market risk, including:

- defaults for high yield debt and credit derivatives
- downgrades for high grade debt and credit derivatives

-
- property value losses on real estate
 - deal break risk for merger arbitrage strategies
 - defaults for sub-prime mortgage loans
 - unexpected dividend risk for equity derivatives
 - gap risk for fund derivatives and other principal protection trades

Each event has an associated loss and a probability of occurrence. Correlations between events affecting a portfolio are estimated and the portfolio loss distribution is calculated as such to give rise to the portfolio tail (99.5%) event risk measure.

Counterparty Credit Risk

Counterparty credit risk measures the potential loss due to the Firm's forward settlement, financing and derivative transactions with its customers. We calculate the EAD (exposure-at-default) to each counterparty as the 95% potential exposure (less recovery). Then, we simulate a default loss distribution based on the probability of default of each counterparty. The 99.5th percentile tail of this distribution is the measure of counterparty credit risk.

Operational Risk

Operational risk is the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external causes, whether deliberate, accidental or natural. Currently we use a CSE Basic Indicator Approach (BIA) to estimate the required capital, calculated as 15% of net revenue. The CSE BIA approach is modified to reflect the Firm's current business mix and financial targets by setting the net revenue as the greater of revenue in the trailing 4 quarters and the current year budget. A bottom-up approach is employed for the Firm and the division level operational risk calculation. The operational risk for each division is the sum of operational risks of all businesses within the division.

Corporate Asset Allocation

Certain assets are shared among businesses and held at the corporate level. These include buildings, receivables, and deferred taxes. The equity required to support these assets is estimated using the CSE capital charge on these assets and allocated to the various businesses according to their respective uses of the underlying assets. The main driver for allocation is headcount, which is used to allocate most corporate assets. One exception is deferred taxes, which is driven by compensation because deferred taxes are mainly from restricted stocks distributed to employees as bonuses.

3.4.4 Capital due to External Constraints

Leverage Equity

Leverage equity is the minimum amount of equity that the Firm is required to hold in order to maintain the Firm's target leverage ratio. The maximum financing leverage and net balance sheet leverage the Firm can have are currently set as 125 times and 14 times of the required equity, respectively. Total leverage equity is the sum of financing leverage equity and net leverage equity.

Regulatory Equity

Regulatory capital is the capital required against positions in our regulated entities, in the form of subordinated debt (55%) and equity (45%). It is computed according to regulatory requirements.

4. Stress and Scenario Testing

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4 Stress and scenario testing

4.1 Introduction

Stress testing and scenario analysis are key elements of a robust risk management practice. They provide complementary information to statistical measures of risk such as MPE and EE, allowing the assessment of specific scenarios and extreme events such as LTCM or 9/11 on the Firm's risk profile. By using an appropriate suite of stress events and scenarios, senior management and risk management personnel can better assess the risks facing a given business or sector, allowing them to identify risk concentrations and plan mitigating action. The Firm considers both the market and credit risks resulting from such events. A portfolio of Market Risk scenarios is used to evaluate the vulnerability of the firm to extreme market events. The Market Risk stress testing framework is described in a separate document; here we describe the Credit Risk element of the Firm's stress testing programme.

4.2 Credit Risk Stress Testing

The Firm has developed a Credit Risk stress testing framework to support the day to day management of credit risks, strategic planning and capital assessment. Stress testing of business lines and counterparty sectors allows the Firm to assess the sensitivity of its portfolios to risks falling outside of the standard MPE and EE measures. Stress testing of capital allows senior management to assess the impact on capital adequacy of a set of extreme, but plausible scenarios. This is a valuable input in assessing the Firm's risk appetite and is a powerful tool for understanding the key drivers of risk capital across the Firm. The capital stress test is also designed to meet the specific Pillar 1 economic cycle stress testing requirements under BIPRU. This requires an assessment of the impact on regulatory capital for the LBIE legal entity of a downturn scenario as might be experienced "one in 25 years"

4.3 The Stress Test Framework

4.3.1 Introduction

Lehman Brothers Credit Risk stress testing is a framework to identify, measure and report the impact of specific stress scenarios on the credit risk profile and capital of the Firm and its component legal entities. Specifically it has the capability to provide stressed exposure and credit rating analysis at a number of levels, for example:

- Regional level;
- Legal entity level: LBIE, etc.;
- Business unit level; and
- Counterparty level.

The exposure stress test is performed on the global counterparty and trade portfolios for the IMM derivatives (FID, FX, CDS) and securities financing businesses. The framework allows for common stress scenarios to be applied consistently across all businesses, regions and legal entities, facilitating concentration risk analysis. The exposure stress testing analytics and infrastructure have been built out and are in production.

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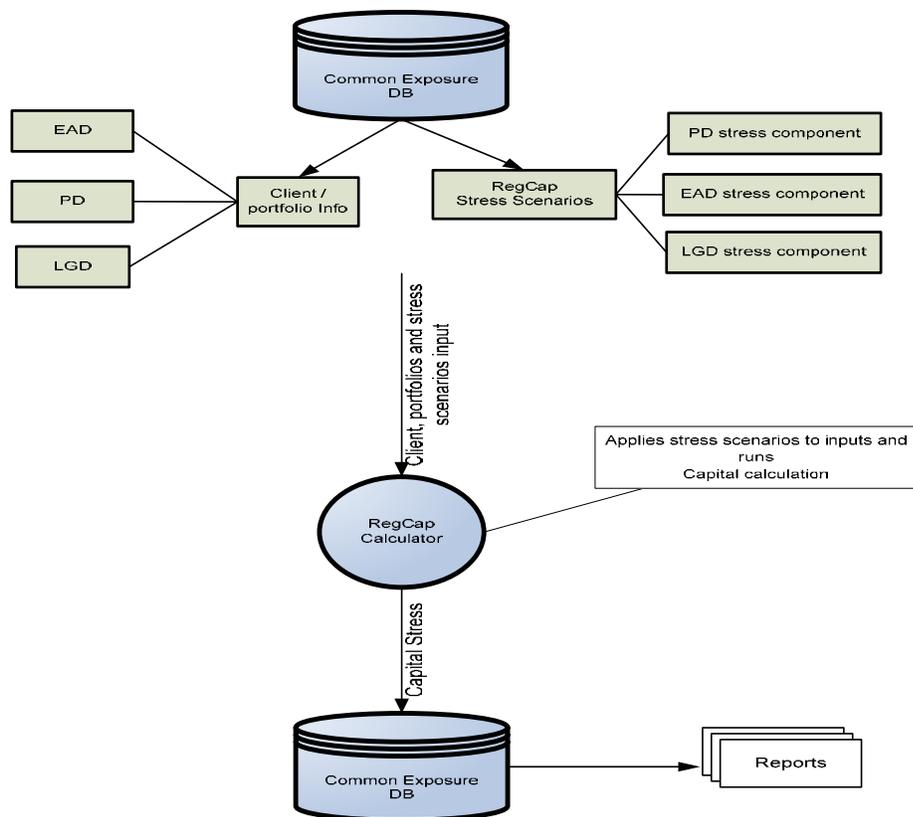
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The capital stress test applies the exposure and rating stresses to the primary inputs to the regulatory capital calculation:

- Exposure at Default (“EAD”)
- Probability of Default (“PD”)
- Loss-Given Default (“LGD”)

Each factor is stressed under scenarios defined with reference to a specific set of historical and potential events. The framework is flexible and allows new scenarios to be incorporated to reflect a changing economic climate. It also allows the capital impact to be assessed under many different combinations of EAD, PD and LGD. This “point of failure” analysis allows senior management and risk managers to identify those stress scenarios that would need to occur to incur loss levels outside the Firm’s risk appetite. The LBIE CCR capital charge is computed under each scenario using the same automated capital calculator used for the standard capital charge. The results of the stress process are collated and stored in a Common Exposure Database. The capital stress test reports are updated quarterly, and provide breakdowns by region, business line, rating and industry sector. The flow process is outlined in Figure 1.

Figure 1: Capital Stress Framework



4.3.2 Scenario Definition

The framework allows for both scenario analysis and stress testing of individual factors.

Scenario analysis considers the impact of simultaneous movements in the parameters affecting the credit risk profile of the Firm, for example the combined effects of strengthening major currencies, falling interest rates, depressed equity markets & widening credit spreads resulting from a flight to quality under an event similar to September 11, 2001.

Factor stresses provide sensitivity analysis of the Firm's portfolios to movements in key factors, for example a sudden depreciation of the US dollar. Factor stresses provide business managers, risk managers and senior management insights into the nature of the Firm's exposures and the key risk drivers.

The stress scenarios for each of the risk elements have been designed in consultation with senior management and business heads with reference to specific historical events and to possible future adverse events, to include:

- recessionary events;
- market dislocation;
- regional crises;
- catastrophes; and
- joint stressing of market and credit risk factors.

The scenarios are constructed to reflect extreme, but plausible events. Historical events are used as a means of judging the magnitudes of plausible shock factors. The scenario set is designed to incorporate events that are relevant to the nature of the Firm's exposures; the scenarios will be reviewed periodically in light of changes in the Firm's business activities or to reflect a changing economic climate.

4.4 Exposure Stress Test

4.4.1 Introduction

The exposure stress is conducted for a broad set of stress scenarios that are relevant to the Firm's businesses and risk profile:

- Scenario analysis for 13 composite scenarios eg:
 - Re-runs of historical episodes of extreme market moves, for example:
 - 9/11 terrorist attacks;
 - Russia default contagion and LTCM;
 - November 2001 volatile bond market; and
 - October 1987 stock market crash
 - Hypothetical scenarios due to shocks that have some probability of occurrence and are driven by macro fundamental shifts, for example:
 - Sovereign risk shock of exchange rates and interest rates; and
 - other ad-hoc scenarios and catastrophic events e.g. Avian Flu pandemic.
- 18 hypothetical single factor shocks e.g.
 - US dollar declines 10% due to the current account deficit; and

— ECB increases Euro interest rates 50bp.

Appendix A lists the full set of scenarios as at 1/6/08. The Bull Steepening Scenario, modelled after the events following September 11, 2001 is used to illustrate the level of detail in the construction of each scenario. The majority of the multi-factor scenario analyses are also utilized for the Market Risk stress, providing the capability for the Firm to assess the joint impacts of Credit and Market risks resulting from a given stress event.

4.4.2 Exposure Stress Platform Coverage:

The exposure stress platform covers the global business lines of:

- Fixed Income Derivatives
- Foreign Exchange
- Credit Derivatives
- Securities Financing

4.4.3 Exposure Stress Platform

The stress test engine is fully integrated with the platform used to generate the Firm's MPE and EE measures. The same data sourcing, infrastructure, hardware and aggregation/netting information is used, ensuring consistency between the stress, average and percentile measures of exposure. Each day (t+1) the portfolio of trades with each client is stressed under each scenario in Appendix A and the exposure re-evaluated taking into account the relevant netting and portfolio aggregation logic. The revaluations of each trade under each scenario are based on a combination of internal pricing models, front office sensitivities and front office stress grids:

- the Fixed Income Derivatives, FX and CDS exposure stresses use a combination of internal MPE pricing models and front office stress grids; and
- the securities financing exposure stresses are based upon sensitivities sourced from front office platforms.

The internal pricing models and front office sensitivities are those used in the MPE & EE calculations. The front office stress grids (Appendix A) provide full model revaluations of trades under a grid of pre-defined stress values; where available these are used to supplement the coverage of the stress population. The stress process is executed in several stages:

1. Price each counterparty portfolio using current market rates ("base scenario") and generate exposure profiles over the life of each portfolio:
 - calculate the current credit exposure (CCE) under the base scenario;
 - calculate effective expected positive exposure for each portfolio; and
 - calculate EAD using the effective expected positive exposures for each portfolio.
2. Re-price each counterparty portfolio under the relevant stress scenario:
 - calculate the portfolio mark-to-market for each netting set under the stress scenario; and
 - calculate the change in mark-to-market $\Delta MTM(scenario)$ between base and stress scenario.
3. calculate the stressed exposure and stressed EAD net of current collateral:

- stressed exposure $CCE_{Stress} = \text{Max}(0, CCE_{Base} + \Delta MTM(\text{scenario}))$
- stressed EAD is given by $EAD_{Stress} = \text{Max}(0, EAD_{Base} + \Delta MTM(\text{scenario}))$

Calculations are executed at the netting set level. Netting and collateral rules are respected in the above process. For counterparties with CSAs, two measures of EAD are available:

- stressed CCE & EAD assuming client fails at the next margin call (Step 3 above); and
- stressed CCE & EAD assuming client performs on the next margin call and the collateral is updated (UC):

— $CCE_{Stress}(UC) = \text{Max}(0, CCE_{Base} + \Delta MTM(\text{scenario}) - \Delta B)$

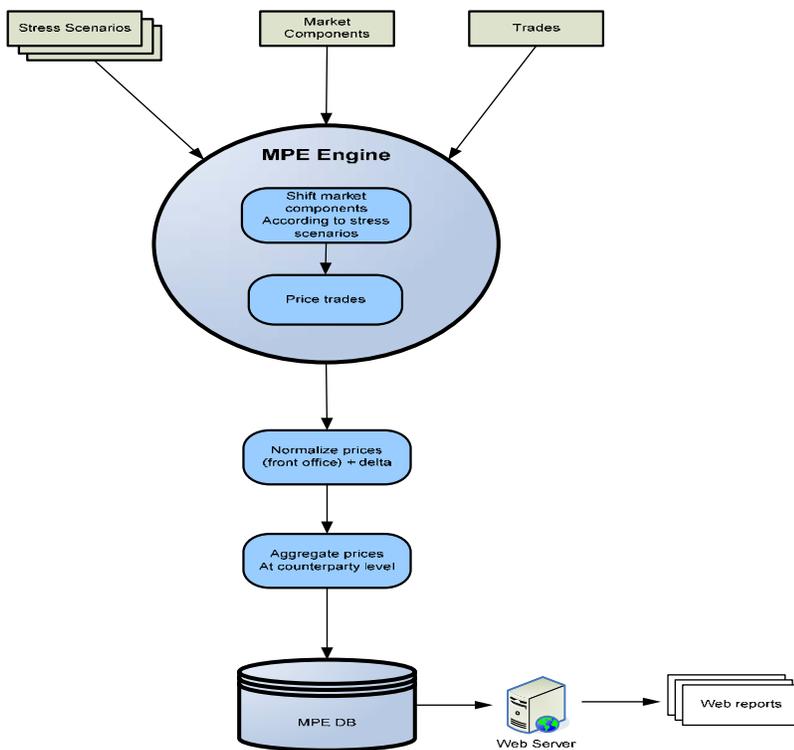
— $EAD_{Stress}(UC) = \text{Max}(0, EAD_{Base} + \Delta MTM(\text{scenario}) - \Delta B)$

— where the incremental collateral ΔB is calculated using the counterparty unsecured (threshold) and minimum transfer amount (MTA) levels:

$\Delta B = \text{Max}(0, MTM(\text{scenario}) - (CP_{THRESHOLD} + CP_{MTA}))$

The choice of EAD measure used depends upon the likelihood of the counterparty’s performance on the next margin call. The architecture underlying the EAD stress is outlined in Figure 2:

Figure 2: Exposure Stress Test Framework



4.4.4 Exposure Stress Reporting

The exposure stress analysis under each scenario in Appendix A is performed daily on all active counterparties globally and stored in the MPE Database (See Figure 2). The stressed EAD's are used as inputs to the stressed regulatory capital calculation. For each counterparty, stressed exposures are published to the Credit Risk Management web portal. These reports give detailed stress analysis of each credit officer's counterparties, showing the current exposure under the baseline scenario and the impact of each stress scenario assuming no further collateral is forthcoming, and where relevant assuming updating of collateral. The results for a single product line are displayed by master agreement, with counterparty level results also available. An example is attached in Figure 3 below. Credit officers can see clearly the scenarios of concern for their accounts and compare the stressed exposure levels to those reported in the 95% MPE results. For the example illustrated, the baseline unstressed CCE of \$2.75mm rises to \$3.38mm under a 50bp cut in interest rates, whereas rising rates would lead to a decline in the current credit exposure. From the scenario analysis results it is seen that the 1987 equity crash, bull steepening and parallel move down scenarios result in a rise in exposure to approximately \$3.1mm; a more extreme Avian Flu event would increase exposure to \$3.6mm.

Figure 3: Example Exposure Stress Results for United Overseas Bank Ltd

Drill down information is available for each client portfolio under each scenario. This enables credit officers to identify the contribution to the portfolio stressed exposure of each component trade in the portfolio.

Master Agreement Id	Counterparty Name	Lehman Entity	Risk Horizon	Rating	Industry	Country	Region														
1201990UHL	United Overseas Bank Limited	LBIE	Lifetime	IA+	BNKC	SG	ASIA														
								FX Rates USD-15% vs. Emerging-Ccy	FX Rates USD+15% vs. Emerging-Ccy	G10 FX Vol+30%	G10 FX Vol-30%	Emerging FX Vol+50%	Emerging FX Vol-50%	Credit Spread Curve Shift Up	Credit Spread Curve Shift Down	Credit Spread Curve Flattening	Credit Spread Curve Steepening	CDO correlation shift up	CDO correlation shift down	CDO spread/risk e volatility up	
No shock	Swap Rates +50bp	Swap Rates -50bp	Swap Implied Vol +10%	FX Rates USD-10% vs G10	FX Rates USD+10% vs G10			2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	
Parallel Move Up	Parallel Move Down	Bull Steepening	Bull Flattening	Bear Steepening	Bear Flattening	EMG Crisis	Rating/Default and Hedge Fund Risk	2.15	3.16	3.13	3.01	2.32	2.09	3.02	2.94	2.94	3.13	3.62	0.68	-0.28	1.33
% Stressed Legs	Total Legs	Stressed Legs	Hot Stressed Legs	Collateral	Pledge	Pledge Type	Mini Pledge	CCY for Pledge	CP Unsec Amt	Min Call Amt	Call Freq	Netting	Analyst	Client Code	Client Description						
100	32	32	0	0	N	N/A	N		0	0	N/A	Y	TEH	13791	UNITED OVERSEAS BANK LTD.						

The user can isolate single trades' contributions and also evaluate how much impact diversification has on the total stress figure.

Figure 4: Example Portfolio Drill Down for United Overseas Bank

System	MTM USD	No shock	Swap Rates +50bp	Swap Rates -50bp	Swap Implied Vol +10%	FX Rates USD-10% vs G10	FX Rates USD+10% vs G10	FX Rates USD-15% vs Emerging-Ccy	FX Rates USD+15% vs Emerging-Ccy	G10 FX Vol+30%	G10 FX Vol-30%	Emerging FX Vol+50%	Emerging FX Vol-50%	Credit Spread Curve Shift Up	Credit Spread Curve Shift Down	Credit Spread Curve Flattening	Credit Spread Curve Steepening	CDO correlation shift up	
SUMM	133,571	133,571	165,296	101,691	133,571	133,571	133,571	157,184	116,118	133,571	133,571	133,571	133,571	133,571	133,571	133,571	133,571	133,571	133,571

Leg Id	Focus Id	Book Id	System	Notional	Currency	Notional USD	MTM Currency	MTM USD	Status code	Product type
1034271E.763N4S	1034271E	90302	SUMM	SGD	-13,004,747	SGD	-316,274	SIM		SWAP
1034271E.763N4T	1034271E	90302	SUMM	SGD	13,004,747	SGD	449,845	SIM		SWAP

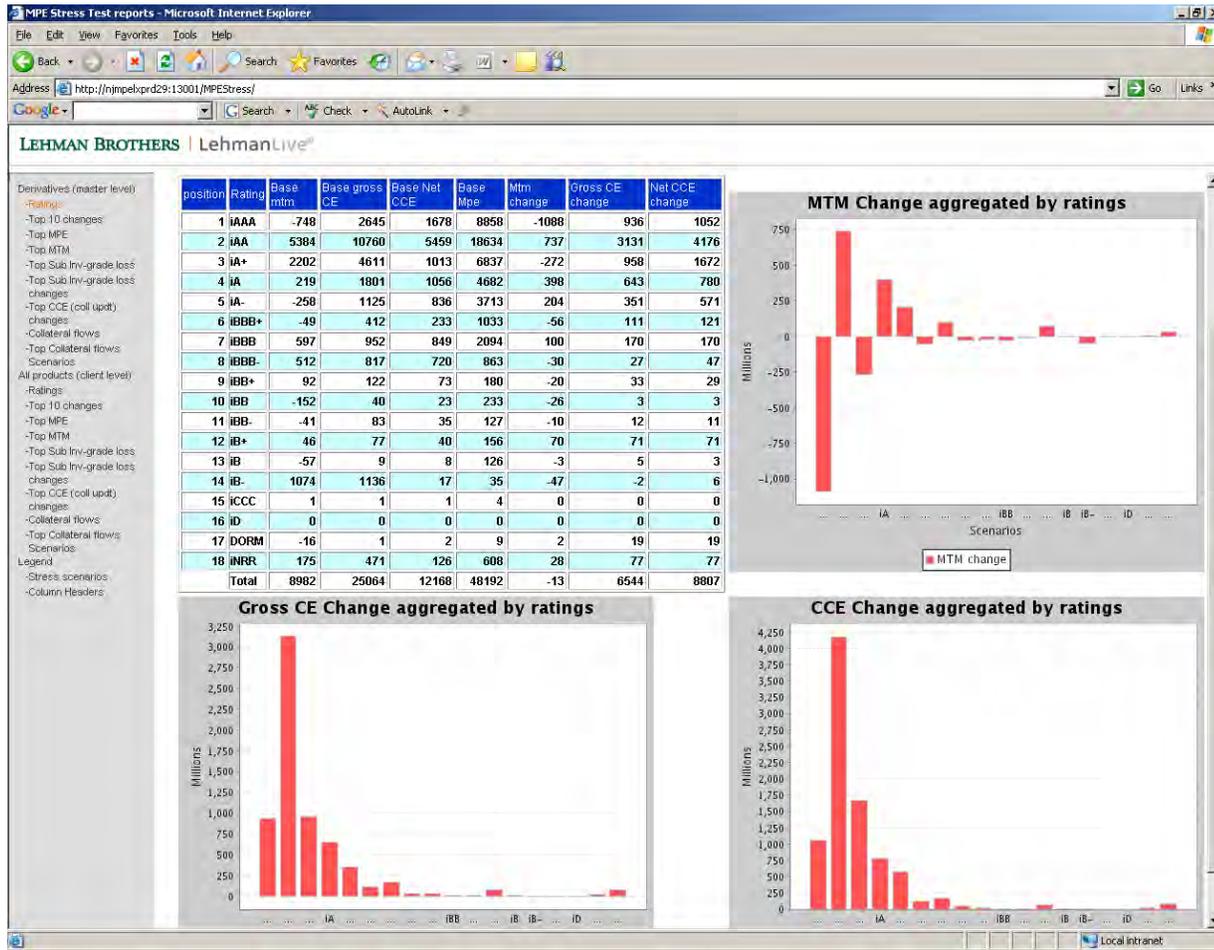
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4.4.5 Stress Exposure Summary Reports

Summary reports are published daily to the Credit Risk web portal showing exposure concentration risk under each scenario. Exposure impact is reported both net of current collateral and assuming further collateral calls under CSA provisions. Figure 5 illustrates an example report of ratings concentration risk reporting under the scenario where US dollar weakens by 10%. The aggregate Firm current exposure net of collateral rises from approximately \$12,168mm to \$20,975mm under this scenario. The primary impact is in the iAA ratings class, where the exposure net of collateral rises \$4,176mm.

Figure 5: Exposure Ratings Summary (Scenario: USD weakening 10%)



The exposure stress also facilitates a liquidity impact analysis. Under each scenario the collateral inflows and outflows to counterparties are calculated accounting for moves in the portfolio mark to market and levels of unsecured thresholds and MTAs under the relevant CSA documents. This allows an assessment of the potential collateral posting obligations of the Firm in order to ensure that these are within tolerances. An example of the liquidity analysis is shown in Figure 6.

Figure 6: Liquidity Impact Analysis

Scenario Name	In flow	Out flow	flow
No Shock	0	0	0
Swap Rates +50bp	4974	6173	-1199
Swap Rates -50bp	5844	5254	590
Swap Implied Vol +10%	1731	2618	-887
FX Rates USD-10% vs G10	7008	6445	563
FX Rates USD+10% vs G10	5488	5854	-366
FX Rates USD-15% vs Emerging-Ccy	2051	1649	402
FX Rates USD+15% vs Emerging-Ccy	1080	1335	-255
G10 FX Vol+30%	54	56	-2
G10 FX Vol-30%	54	56	-3
Emerging FX Vol+50%	24	9	15
Emerging FX Vol-50%	8	18	-11
Credit Spread Curve Shift Up	860	1606	-746
Credit Spread Curve Shift Down	745	508	237
Credit Spread Curve Flattening	400	757	-357
Credit Spread Curve Steepening	1422	2545	-1123
CDO correlation shift up	102	151	-49
CDO correlation shift down	174	109	66
CRD spread/price volatility up	33	0	33
Bull Steepening	6186	8485	-2299
Bull Flattening	7240	5585	1655
Bear Flattening	9793	10586	-793

4.4.6 Exposure Stress Management Reporting

Management reports are produced quarterly and provide summaries of the top stressed exposure concentrations by region, rating, industry sector and counterparty.

4.5 PD Stress Testing

The PDs used in the F-IRB capital calculation are based on Moody’s long run average one-year default rates measured over the period 1983-2005 (“Default & Recovery Rates of Corporate Bond issuers, 1920-2005”). Table 1 shows the PD rates assigned to each internal ratings band (ICR) based on the Moody’s default experience adjusted for the regulatory floor of 3 basis points (refer to F-IRB waiver application).

Table 1: PD – ICR assignment

ICR	PD
iAAA	0.03%
iAA	0.03%
iA+	0.03%
iA	0.03%
iA-	0.04%
iBBB+	0.17%
iBBB	0.24%
iBBB-	0.34%
iBB+	0.75%
iBB	1.25%
iBB-	2.07%
iB+	3.22%
iB	5.46%
iB-	10.46%
iCCC	20.98%
iD	100.00%

The PD stresses are specified as migrating up or down the internal credit rating (ICR) for the relevant counterparty set. For example, a two notch migration down for an iBB implies the one year PD changes from 1.25% to 3.22%, the rate for an iB+. Note iNRR ratings are mapped to iCCC for the purposes of the baseline capital calculation and receive stresses on this basis. PD stresses can be applied *en-mass* for all counterparties, or targeted to a given region, industry sector, or individual counterparty. Credit Risk Management has developed a set of PD stress scenarios that are relevant to its portfolio coverage:

- Differential ratings shocks to particular industry sectors eg. German banks, hedge funds and EMG counterparties;
- failure of a major counterparty – identify the top 5 counterparties across all scenarios resulting in the largest single loss in default, assuming no further collateral is forthcoming;
- the impact of a two-notch downgrade on regional and industry risk concentrations and wrong way risks.

Scenarios will be updated periodically in line with changes to the economic climate and portfolio composition.

4.6 LGD Stress Testing

LGD stresses can be specified as notching up or down the internal facility rating (IFR) for the relevant client set. The internal facility rating scale has ten bands:

IFR	Expected Recovery Rate %		Assigned LGD %
	>	<=	
i1	85	100	10
i2	75	85	20
i3	65	75	30
i4	55	65	40
i5	45	55	50
i6	35	45	60
i7	25	35	70
i8	15	25	80
i9	5	15	90
i10	0	5	100
iNRR	N/A	N/A	100

Table 2: Internal Facility Rating Scale

Notching down a counterparty by one IFR grade equates to a 10% upward stress in the associated LGD. LGD stresses can be applied *en-mass* for all counterparties, or targeted to a given region or industry sector. Currently the LGD stress is applied in conjunction with the 1 in 25 year IRB stress.

4.7 Stressed Capital

The capital stress test is based on the EAD outputs from the exposure stress level of the PD outputs from the credit ratings (ICR) stress, and where appropriate, the LGD outputs from the IFR stress. The PD and LGD shocks are applied to the full portfolio of exposures, inclusive of products outside the IMM model such as intercompany balances and equity derivatives. The capital stress engine is based around the same core analytics used to compute the unstressed CCR capital charge. The engine can calculate the CCR capital requirement based on any combination of EAD, PD and LGD inputs. The capital stress is performed based on the prescribed combinations of EAD, PD and LGD and the base capital requirement is compared to the stressed capital for each scenario. The Firm uses this capital stress engine to stress its portfolios on a quarterly cycle.

4.7.1 Stress Test Management Reporting

The management reporting process is designed to focus on plausible and meaningful risk scenarios for the regulated entity and for the Firm. The management reporting includes clear definitions of the scenario assumptions and their impact on the capital charge. Management reports are produced on a quarterly basis and distributed to the CRMC, ERC and relevant risk managers. Management reporting has been designed to:

- Summarise key exposure and capital stress results for the LBIE entity;

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- Identify counterparty risk concentrations by country, ratings, industry sector and counterparty;
- Identify cases of general wrong way risk;
- Provide drill down to individual counterparties/trades driving exposure & regulatory capital; and
- Provide consolidated stress test reporting across counterparty risks and market risks.

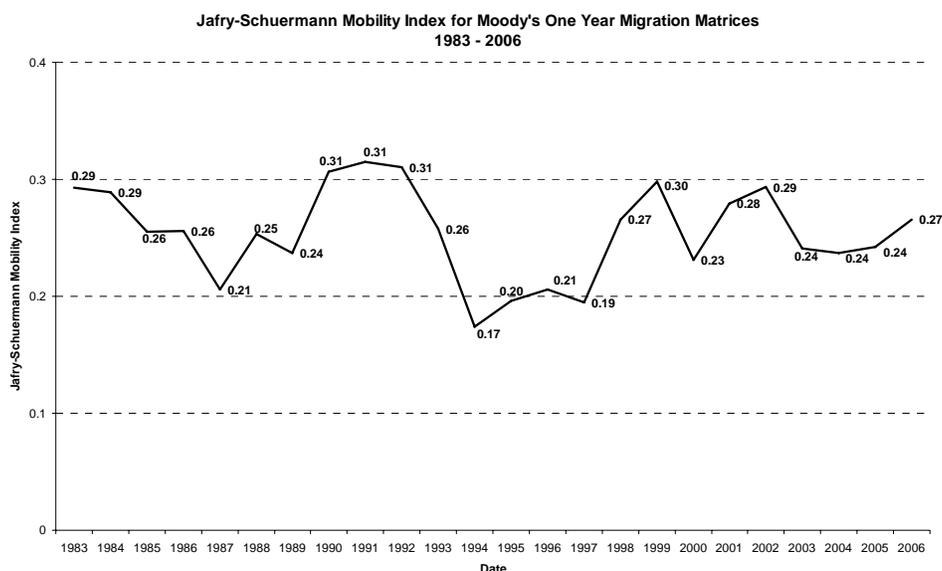
4.8 Meeting the 1 in 25 Year stress requirement

BIPRU (4.3.40) specifically requires the Firm to consider the impact of a downturn stress “such as might be experienced once in 25 years”. Whilst CRM has been assigning internal ratings since the mid 1990s, the Ratings Maintenance application and the Scorecard Framework have only been in place since April 2005 and therefore the Firm believes that internal rating migrations experienced to date have not been recorded over a period that includes sufficient ratings strain to observe a 1-in-25 year ratings impact.

Therefore, the Firm has designed its downturn stress scenario with reference to available external data from Moody’s. Moody’s has credit grade migration and default experience from 1983-2007. This is the same set of data used to derive the long run average one year PD for the baseline capital calculation. In addition Moody’s has recovery rate experience over the same period.

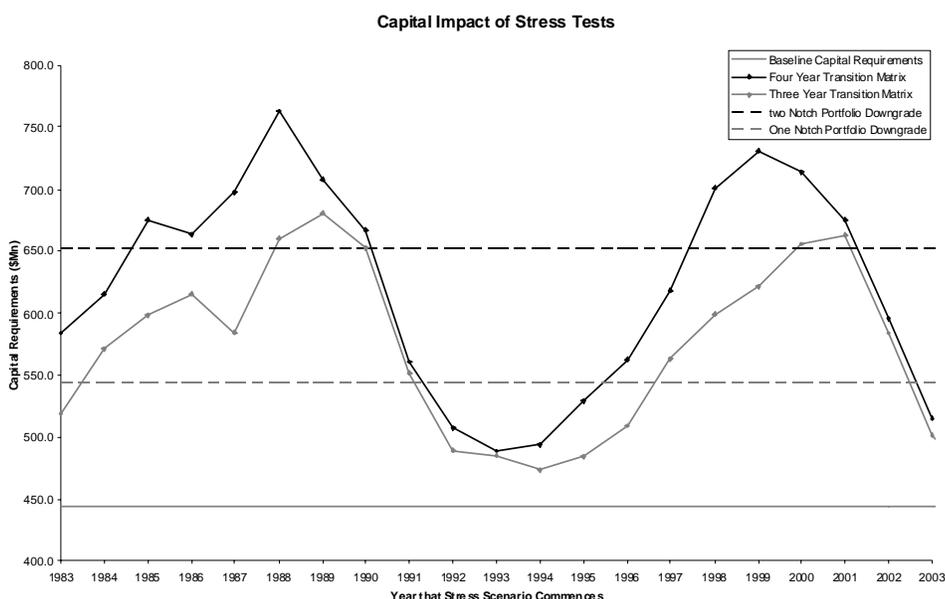
4.8.1 PD Stress: Meeting the 1 in 25 Year Stress Requirement

Examining Moody’s historic rating migrations over the last 25 years it can be seen that whilst Moody’s rating philosophy is “through-the-cycle” we do observe that ratings migrations tend to increase around recessionary periods. This may be due to an increase in fundamental changes being revealed due to external stresses in the business/economic cycle. The “worst” period for ratings migrations is observed to occur in 1990 – 1991 as shown below where the Jafry-Schuermann Mobility Index has been calculated for Moody’s one year migration periods:



Analysis of macro-economic trends by the Firm's Global Economics department suggests that the 1988-91 recessionary epoch is a proxy for a 1 in 25 year economic downturn. Therefore the Firm assumes a four year migratory epoch for the 1 in 25 year recessionary scenario.

Calculating the capital impact of instantaneously applying the Moody's observed four year cumulative migration matrix to the portfolio, the period 1988 – 1991 results in the largest capital increase¹, providing further justification for the selection of the 1988 – 1991 period for the 1-in-25 year downturn scenario. The four year recessionary scenario results in capital increases that are comparable to, yet more conservative than, an instantaneous two notch downgrade across the board.



The Firm has constructed a hypothetical scenario which is pertinent to its portfolio of exposures and for which the assumed stresses to credit ratings, default probabilities and recovery rates are commensurate with those the Firm might expect to experience during an event of a severity which might occur once every 25 years. Quantitatively, the Firm has assumed:

- 60% rise in oil price.
- 30% increase in non-oil commodity prices.
- 30% drop in stock market wealth in the US and Euro area; for Japan, a 10% fall in urban land prices.
- 5% drop in European government spending.
- 10% weakening of US\$ against the Euro.
- Inversion of US yield curve, with short rates rising by 50bp and long-term interest rates declining by 40bp, and commensurate moves in other major markets.

¹ This represents LBIE capital

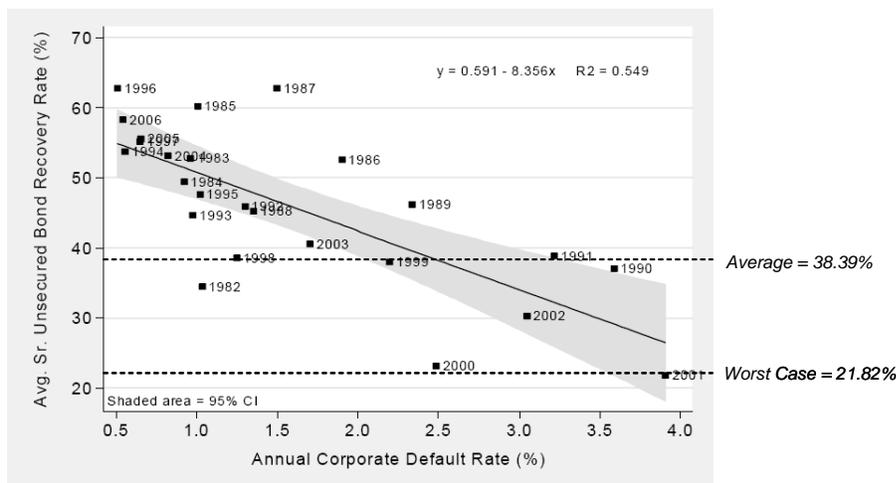
- Doubling of credit spreads.

Given the structure of the Firm’s models and the rating philosophy employed, it is not possible to directly assess the impact of the 1-in-25 year scenario on rating driver responses. The Firm’s analysts rate counterparties through-the-cycle and not in relation to specific macro economic scenarios. As a result the historic changes in rating driver responses have been analyzed to establish what level of increase in rating driver volatility would be required to result in a two notch down-grade across the whole portfolio, given that a two-notch downgrade is representative of, but not as conservative as, the 1-in-25 year scenario. Rating driver volatility would have to increase beyond levels deemed plausible (greater than 4.5 times for all models excluding Special Purpose Vehicle), especially given the degree of rating volatility experienced over the past 6 months during which time a number of the 1-in-25 macro economic scenario changes have actually occurred. The Firm concludes that rating driver volatility on internal rating models as a result of a 1 in 25 year scenario would not produce ratings migrations that would be in excess of those observed during the Moody’s 1988 – 1991 epoch. Therefore the Moody’s 1988 – 1991 epoch forms the basis of the Firms 1 in 25 Year PD Stress Requirement.

4.8.2 LGD Stress: Meeting the 1 in 25 Year Stress Requirement

Examining Moody’s historic recovery rates over the period 1982 – 2006, the average senior unsecured recovery rate was 38.39%, with the worst recovery rate of 21.82% being observed in 2001. Based on these results the Firm chose to implement an 80% LGD parameter for senior unsecured exposures in a 1 in 25 year stress scenario. Given that the LGD for subordinated unsecured exposures under F-IRB is 30% higher than that of senior unsecured exposures, to ensure consistency the LGD of 100% was assumed for subordinated unsecured exposures.

Exhibit 7 - Correlation between Default and Recovery Rates*, 1982-2006



5. Appendices

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5 Appendices

5.1 Appendix A — Stress and Scenario Tests

Appendix A-1: Bull Steepening Scenario

Bull Steepening Scenario Modelled after post 9/11, Flight to Quality (Sep 11, 2001 - Sep 25, 2001)	
Interest Rate	<ul style="list-style-type: none">◆ USD: Treasury rates: 2Y -90bps, 10Y -30bps (60bps steepening),<ul style="list-style-type: none">– Swap Spr: 2Y +20bps, 10Y +5bps– Cap vol +5%, Swaption vol +3%◆ EUR: Govt rates: 2Y -57bps, 10Y -17bps (40bps steepening),<ul style="list-style-type: none">– Swap Spr: 10Y +11 bp– Cap vol +5%, Swaption vol +3%◆ GBP: Govt rates: 2Y -72bp, 10y rates -32bp (40bps steepening) ,<ul style="list-style-type: none">– Swap Sprd :+20 bps,– Cap vol +7%, Swaption vol +3.5%,◆ JPY: 10Y rate unchanged, sprd +10 bps,◆ Inflation: +35 bps <i>(vol shocks are absolute)</i>
Currency	<ul style="list-style-type: none">◆ Major ccys up 4%, except CHF up 7% and GBP up 1%, EM ccys down 5%◆ Vols: Latam 20%, TRY and Eastern Europe 15%, RUR 45%,◆ Major ccys 30%, Minor Asia 35% <i>(vol shocks are relative)</i>
Mortgage	<ul style="list-style-type: none">◆ FNCL (Fannie Mae 30yr) LOAS tightens by 5 bps, HEL AAA tightens by 2 bp and BBB tightens by 10 bp. OAS Drop (i.e. spread between non-agency and agency mortgage securities) decreased by 3bp, CMBS AAA -2bp, BBB -5bp
Credit	<ul style="list-style-type: none">◆ HG spreads out 25%◆ HY market down 4.3% (Ba), 5.7% (B), 8.5% (Caa and below), HY Loans down 1.0% (Ba), 2.4% (B), 4.8% (Caa and below). CDS down 5.7% (Ba), 6.3% (B), 8.5% (Caa and below) Latin/East Europe EMG spreads widen 30%, Asia credit spreads widen 25%◆ Correlation skew increases by 15pts
Equity	<ul style="list-style-type: none">◆ North America -11.5%, UK -12%, Germany -19%, France -16.5%, Remaining Euro -14% Japan -6%, Hong Kong -14%, Korea -14%, Mexico -13%, Brazil -12.5%, India -14.4%, Turkey -23%◆ 1M Vol +69.3%, 3M Vol +40%, 6M Vol +28.3%, 9M Vol +23.1%, 1Y Vol +20%, 2Y Vol +14.1%, 3Y Vol +11.5%, 5Y Vol +8.9% <i>(vol shocks are relative)</i>

Appendix A-2: Exposure Stress Scenarios

Below is the current list of stress scenarios.

Hypothetical factor stresses

1. No stress scenario
2. Interest Rates Up [Swap rates rise 50bp absolute parallel shift]
3. Interest Rates Down [Swap rates fall 50bp absolute parallel shift]
4. Volatilities up [Swap implied vols up 10% absolute]
5. Major FX rates up [USD weakens 10% relative to G10 currencies]
6. Major FX rates down [USD strengthens 10% relative to G10 currencies]
7. Emerging market FX rates up [USD weakens 15% relative to EMG currencies]
8. Emerging market FX rates down [USD strengthens 15% relative to EMG currencies]
9. Major FX volatilities up [G10 FX implied vol up 30% relative]
10. Major FX volatilities down [G10 FX implied vol down 30% relative]
11. Emerging market FX volatilities up [EMG FX implied vol up 50% relative]
12. Emerging market FX volatilities down [EMG FX implied vol down 50% relative]
13. Credit Spread Up [Credit spreads scaled up 1 std dev percentage spread volatility by ratings]
14. Credit Spread Down [Credit spreads scaled down 1 std dev percentage spread volatility by ratings]
15. Credit Spread Flattening [Credit spread curve flattening --- up by 1 std dev for 0-2y, & 0.25 std dev beyond 2y]
16. Credit Spread Steepening [Credit spread curve steepening --- up by 0.25 std dev for 0-2y, & 1 std dev beyond 2y]
17. Credit Correlation Up [CDO correlation skew up --- equity tranche scaled up 50%, other tranches down 25%]
18. Credit Correlation Down [CDO correlation skew down --- equity tranche scaled down 50%, others up 25%]
19. CrdVolUp [Credit spread/price volatility shift up --- scaled up by 25%]

Hypothetical and historical based scenarios

1. **Parallel Shift Up** [Parallel move up in the swap rates to model a scenario similar to 30 Oct 01-14 Nov 01 period]
2. **Parallel Shift Down** [Parallel move down in the swap rates to model a scenario similar to post 9/11 period (11 Sep01-25Sep01)]
3. **Bull Market Steepening** [Bull steepening move in the swap rates to model a scenario similar to the post 9/11 period]
4. **Bull Market Flattening** [Bull flattening move in the swap rates to model a scenario similar to the period before major rates backup in Summer 03; low inflation, reduced energy demand]
5. **Bear Market Steepening** [Bear steepening move in the swap rates to model a scenario similar to post LTCM 28Sep98-13Oct98]
6. **Bear Market Flattening** [Bear flattening move in the swap rates to model a scenario similar to the period 30Oct01-14Nov01 : Treasury down trade due asset reallocation, yield searching, HG tightening]
7. **Emerging Market Crisis '98** [Market meltdown due EMG Russia default. High PD, correlations, falling energy modelled after 17Aug98-30Aug98 period]
8. **Rating Default & Hedge Fund Risk '02** [Significant rating risk (GM), hedge funds blow out on CDS, panic selling, market widening modelled after 18Jul02-2Aug02 period]
9. **High Yield / LBO / Default Risk** [Global PD increase, lower recovery, investor demand dries up modelled after 16Sep02-17Oct02 period]
10. **Equity Crash '87** [Weakening USD, deteriorating current a/c deficit, similar to 5Oct87-19Oct87 period]
11. **Avian Flu** [Simulation of an avian flu pandemic]
12. **Country Risk Stress** [Sovereign risk shock of exchange rate and interest rate based on country currency tier]
13. **Global Recession** [1 in 25 year recession modelled on US experience of July 1990 - March 1991 & March 2001 to Nov 2001]
14. **Credit Crunch** [Widening of credit spreads similar to Jul-Aug07; significant mortgage declines; general flight to quality]

Appendix A-3: Stress Grid

Specification of Stress Grid Provided by Front Office Systems

Stress Grid		
Scenarios	Variables	
	Yield curve stress	Volatility stress
Grid Scenario 1	-50 bps	0
Grid Scenario 2	0	0
Grid Scenario 3	+50 bps	0
Grid Scenario 4	0	4%

This table shows the unitary stresses that the system receives in form of a grid from the front office systems. For each of the macro scenarios these results are then used, at trade level, to extrapolate the correct changes according to the scenario's stress parameters.