

Lehman Brothers
Detailed Findings and Management Action Plans

Value at Risk (VaR)

DRAFT - Report Under Review

Significance: Control Concerns

Data Quality and Completeness

1. Implement controls to validate data accuracy and completeness.

The feeds into LehmanRisk have not been validated to ensure that appropriate data elements are captured to calculate VaR. Based on the sample of feeds reviewed, we identified one instance where the maturity date for listed options was not properly reflected in the feed, leading to an incorrect VaR calculation.

In addition, although controls exist within the feeds to identify when the complete population of trades has not been received, we noted that the break reports are inaccurate and there is no follow up performed on the breaks identified.

Management Action Plan	Plan Owner	Plan Date
The issue with AMM has been resolved. We will design a validation for all data feed in Lehman Risk to detect similar issues in the future.	Garg, Sandeep Sabbineni, Prasad	11/30/2007
Control headers are only required for non client position feeds. Majority of the identified feeds don't fall into this category. We will start the process of negotiating simple control headers with the feeding system teams. There is currently a new reconciliation process that is being implemented between Lehman Risk and PALS and Quest which will reconciled the data between Lehman Risk and the source systems. --need to discuss with IT management	Sabbineni, Prasad	6/30/2007
The Laura and RAT IR Stress file feed will be migrated to the ICE feed. Feed controls will be implemented for HJM Summary Options Exposures Data file.	Maxwell, Stephen	4/30/2007
The FI Risk control and data files where several breaks are occurring will be fixed. FI Risk will reject all feeds where the control headers do not match the feed. Rejected feeds will be sent to Risk Technology to investigate breaks, make adjustments as necessary and resend.	Maxwell, Stephen	5/31/2007
The feed validation report page will be revamped to only capture feed transfer errors. The data validation has been moved to the recon process.	Sabbineni, Prasad	3/31/2007
Stress Matrices are unavailable as the business systems are not able to produce them.	Sabbineni, Prasad	4/16/2007
This will be addressed by the new ICE feed which will replace the current Miles feed.	Sabbineni, Prasad	6/30/2007

Significance: Control Concerns

Methodology**1. Enhance VaR methodology and model parameters.**

Our review highlighted inconsistencies and enhancements to the current methodology. Additionally, rationale and assumptions are not always documented.

- For Interest Rate Products in Europe, FX risk and credit delta risk are not included in VaR.
- Basis risk is not properly captured. For high yield CDS, a bond excess return series is used as a proxy for CDS which implicitly assumes that excess yield change in bonds is the same as the spread change in CDS. This approach fails to capture basis risk between CDS and bond spread, which is particularly important for high yield products.
- VaR models are not always consistently applied across businesses and regions. For example, a high grade position held by the high yield desk uses price return series whereas in high grade, the desk uses a spread return series.
- Issuer specific risk for HY is the same for all the issuers in a rating bucket; therefore it lacks the specificity of each issuer, e.g., not capturing sector and maturity.

Management Action Plan	Plan Owner	Plan Date
	Leng, Manhua	3/8/2007

2. Enhance process for updating VaR model documentation.

Our review of the VaR model documentation identified instances where the written documentation did not agree with the model in production. In addition, the rationale and assumptions used in the models were not always clearly documented.

Management Action Plan	Plan Owner	Plan Date
	Shotton, Paul Leng, Manhua	3/8/2007

Significance: Control Concerns

3. Periodically verify that stress testing scenarios are coherent, comprehensive and provide coverage of the firm risk profile

Although, the stress testing policy places a strong emphasis on the coherency of scenarios across different risk factors and businesses, there is no formal process to evidence that stress scenarios and assumptions are reviewed periodically. In particular, there is no evidence that the stress scenarios address the main risks in the Firm's portfolio and address each of the following factors:

- (a) concentration risk;
- (b) illiquidity of markets in stressed market condition;
- (c) one way markets;
- (d) event and jump to default risks;
- (e) non linearity of products;
- (f) deep out of the money positions;
- (g) positions subject to the gapping of prices; and
- (h) other risks that may not be captured appropriately in the VaR model.

Additionally, our review of the current stress testing methodology identified:

For the equity derivatives business, stress scenarios do not include shock to correlation parameters for basket options (rainbow).

If there is no stress matrix available, Taylor expansion is used to calculate the P&L, but the shocks in risk factors are scaled down (the actual size of scale down is not clear).

Finally, only a high level summary of the stress scenarios are documented on the LehmanRisk website, there is no methodology document that provides all the necessary details of risk factors and scenarios.

Management Action Plan	Plan Owner	Plan Date
Stress scenarios and assumptions will be reviewed and signed-off whereby necessary but at least annually by MRM senior management. The review will include a comparison with the main risks in the Firm's portfolio.	Shotton, Paul	4/22/2007
As a one off exercise for the existing scenarios and each time a new scenario is set-up, MRM will verify that all the following factors are addressed or their materiality assessed if they are not: (a) concentration risk; (b) illiquidity of markets in stressed market condition; (c) one way markets; (d) event and jump to default risks; (e) non linearity of products; (f) deep out of the money positions; (g) positions subject to the gapping of prices; and (h) other risks that may not be captured appropriately in the VaR model (for	Shotton, Paul	4/30/2007
NY to include MAP on Stress testing methodology	Shotton, Paul	4/22/2007
The stress testing procedure document will be enhanced to include the periodic review and sign-off of all existing scenarios as well as to describe all the necessary details of shock factors.	Shotton, Paul	4/22/2007

Significance: Control Concerns

Aggregation**1. Automate the VaR aggregation process.**

At the time of our review, the VaR aggregation process was manually intensive, and as such, did not provide assurance over completeness and accuracy.

Additionally, the VaR aggregation methodology for all products is not formally documented.

Management Action Plan	Plan Owner	Plan Date
The spreadsheet error related to the Energy business was resolved in early October. In addition, the aggregation has since been automated in January 2007. [any completeness and accuracy check in the automation?]	Leng, Manhua	4/14/2007
The error in the aggregation database for the Equity division has been resolved. The impact of the error was immaterial. [Is there a new control in place to prevent such error happen in the future?]	Garg, Sandeep	4/14/2007
The aggregate spreadsheets used 1044 days while individual VaR engines used 1049 days (slightly longer than 4 years). The truncation of 5 days were the earliest historical dates in the time series and the impact was immaterial.	Leng, Manhua	4/14/2007

2. Utilize a consistent hierarchy for the aggregated risk and P&L data.

The VaR aggregation process does not utilize the Pathfinder BPM hierarchy which is used for the Firm's books and records and P&L aggregation. In addition, the hierarchy used by LehmanRisk is not synchronized with Pathfinder in an automated manner which may lead to new businesses / accounts not being included in the VaR estimate.

Management Action Plan	Plan Owner	Plan Date
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Significance: Control Concerns

Governance**1. Clarify process for independent validation of the VaR model**

There is not a clear segregation between the VaR model development and validation functions. In addition, there is no evidence that all the model and methodology limitations have been identified and their materiality assessed.

As a result, there is a risk that model changes are made without appropriate independent scrutiny and also that any existing material model limitations are not identified and escalated in a timely manner.

Management Action Plan	Plan Owner	Plan Date
An independent structure with no responsibility in the VaR model development process will be set-up to review and approve the VaR model and all its subsequent enhancements. This structure will also be responsible in identifying, documenting, and assessing the materiality of all model and methodological limitations, and in timely escalating to Senior Management all	Rathgeber, Lisa	4/30/2007

2. Formalise the delegation of authority from the LBIE Board to the European Risk Committee (ERC) and document procedures for the Committee

The European Risk Committee provides oversight of all aspects of risk management in the region. We noted that the delegation of authority from the LBIE Board to the ERC requires reviewing and updating to reflect this oversight role, as the existing delegation relates only to risk limit approval and the exceptions to those risk limits.

Also the procedures governing the operation of the ERC are not sufficiently documented and do not include a comprehensive charter, maintenance of minutes and follow-up of actions decided. There is not an audit trail to verify that actions decided at the meeting are implemented in practice.

There is a risk that the ERC cannot demonstrate that there is an appropriate delegation in place and that the taking and follow-up of decisions occurs in a sufficiently structured way.

Management Action Plan	Plan Owner	Plan Date
[Audit proposed action] New resolution to be passed by the LBIE board to clarify the delegation of authority to the ERC.	Hutcherson, Sophie	4/23/2007
[Audit proposed action] Formalisation of procedures will incorporate drafting of charter, a process for taking minutes and process to maintain centrally documentation presented to the Committee.	Turner, Maria	4/23/2007

Significance: Control Concerns

Back Testing**1. Review accumulated backtesting results and enhance exceptions commentary.**

A periodic review of accumulated backtesting results is not performed and documented. According to the backtesting policy, if the accumulated exceptions indicate that the VaR calculation is deficient (i.e. more than 13 exceptions in any 12 month period at any level of corporate hierarchy for the 95% confident level), the VaR calculation process will be examined by MRM and QRM to ensure that material positions are not being omitted, and to ensure that the calculation methodology is embellished sufficiently to address any shortcomings which may have allowed VaR to be understated.

Backtesting exceptions were not always commented upon. For example, Equities Global and for regions - Americas and Europe, there are no exceptions comments despite a high frequency of exceptions in backtesting reports. Additionally, where commentary for the exceptions was available, the commentary was not sufficient to fully explain the exception.

Management Action Plan	Plan Owner	Plan Date
	Shotton, Paul	3/8/2007

2. Streamline clean P&L process

Our review of the clean P&L process identified:

- Clean P&L methodologies implemented are inconsistent or inadequate.
- Submission and approval of clean P&L to LehmanRisk was significantly delayed.
- Commentary for the adjustments made to clean P&L on LehmanRisk are not always sufficient to fully explain the nature of the adjustments.
- Approval process of clean P&L methodology is not centralized and documented.
- User acceptance test process performed is not documented.
- There is no formal policy for clean P&L process, including approval process, timing and commentary guidance.

Management Action Plan	Plan Owner	Plan Date
	Bishop, Michael	3/8/2007

Significance: Control Concerns

Limit Monitoring

1. Enhance documentation on limit excess, approval and resolution.

According to the Limit Policy, Risk Management is responsible for maintaining documentation for all current limits, limit changes, limit breaches and the course of action taken in respect of all breaches. However, we noted several exceptions to the policy. Specifically:

- The course of action taken for limit breaches is not always documented.
- There is no commentary on the aggregated Firm-wide limit breach.

Management Action Plan	Plan Owner	Plan Date
	Shotton, Paul	3/8/2007

Significance: Control Concerns

Technology**1. Streamline Lehman Risk mapping and reporting methodology**

Some businesses use inconsistent reporting and mapping methodology across regions, such as Credit Products, Interest Rate Products, Liquid Markets Prop and FX. Additionally, the VaR calculation for certain businesses, i.e. Energy, IMD, Munis and Real Estate, are performed on manual spreadsheets outside of the Lehman Risk engine.

Inconsistent mapping methodology may result in inconsistent calculation of VaR across regions.

Management Action Plan	Plan Owner	Plan Date
This will be addressed by migration of the regional systems to Lehman Risk. ETA will be based on the resource approval for 2007.	Sabbineni, Prasad	3/31/2007

2. Establish and test disaster recovery practices

Risk Technology does not have a documented Disaster Recovery plan and does not regularly perform Disaster Recovery tests.

Management Action Plan	Plan Owner	Plan Date
Disaster Recovery plan will be documented for Lehman Risk.	Sabbineni, Prasad	6/30/2007
An annual failover test will be performed for Lehman Risk and FI Risk.	Sabbineni, Prasad Maxwell, Stephen	5/31/2007
Hardware has been budgeted and will be installed.	Sabbineni, Prasad	6/30/2007

Significance: Control Concerns

3. Strengthen the Application Change Management process.

The Firms Change Management process in respect of Risk Management systems need strengthening in the following areas:

- Unauthorized and inappropriate users have access to the production, staging, development environments and source code.
- No monitoring of changes made to the FI Risk production servers.
- Technology management does not sign off on all LehmanRisk Remedy release tickets.
- Release version is not documented on all of the Lehman Risk Remedy tickets.
- Test plans and results are not properly documented and retained.

As a result, unauthorized changes may impact the integrity of the VaR Reports.

Management Action Plan	Plan Owner	Plan Date
Will change group on production, staging and development environment to a new group and also change world permissions. Users and obsolete accounts that do not require access will also be removed.	Sabbineni, Prasad	3/31/2007
Etrust has a documented exception as it cannot lock down HugeMem servers (njbc11lxb14). The server will be lock down to the Risk Management group. --to be discussed	Sabbineni, Prasad Maxwell, Stephen	4/2/2007
Once FI Risk migrated to Lehman Risk, Etrust will be implemented on the production server. In the meantime, a weekly report will be run to show any code which has been checked into production without going through CVS. Any variances on the report will be investigated.	Maxwell, Stephen	6/30/2007
IT management will signoff on all remedy tickets. Changed IT release policy -- to be discussed.	Sabbineni, Prasad	4/2/2007
Release version will be documented on all the remedy tickets. Changed IT release policy. --to be discussed.	Sabbineni, Prasad	3/31/2007
UAT and test plans will be documented by the new QA resource for Lehman Risk changes.	Sabbineni, Prasad	3/31/2007
Test procedures and plans will be documented for all major release. Documentation will be retained and attached to the release ticket prior to approval for FI Risk system.	Maxwell, Stephen	4/30/2007

Significance: Control Concerns

4. Strengthen access control to Risk Management systems and system files.

Data in Lehman Risk and FI Risk is insufficiently protected from unauthorized changes due to:

- Risk Management staff make regular changes to Excel data files used in FI Risk without any validation or audit trail.
- A large number of users outside of the Risk Management group were found to have read, write and execute access to the directories where the system files are stored.
- Privileged ID and passwords were identified in the Lehman Risk production scripts.
- A large number of IT staff have access to modify data via Lehman Risk front end.
- Summary and dynamic entitlement review process and results are not documented.

As a result, errors may be entered into the data files or in Lehman Risk dynamic system which may cause inaccurate reporting of VaR.

Management Action Plan	Plan Owner	Plan Date
Access to the FI Risk Data files will be restricted to relevant users from Market and Risk Technology groups. An adjustment facility will be build where users can only make adjustments through a controlled front end system which interfaces with the database. Adjustment facility is to include an audit log of all changes made.	Maxwell, Stephen	4/30/2007
Will change group on production directories to a new group and also change world permissions.	Sabbineni, Prasad	2/28/2007
Hardcoded IDs and passwords will be removed	Sabbineni, Prasad	3/31/2007
IT access to the dynamic system will be limited to a few users who will require access for support.	Sabbineni, Prasad	4/30/2007
Risk Management will perform and document a quarterly user access	Rathgeber, Lisa	3/31/2007

5. Enhance access control in Risk Management database

Access to Lehman Risk and FI Risk databases is not adequately protected due to the following:

- Terminated users have access to the database.
- A large number of users have access to update the dynamic system database user access and audit trail tables.
- Privileged database account passwords that are not regularly changed as per firm's standard.
- Human accounts with database owner ('DBO') privileges and FI Risk developers use a generic DBO login to access the database.

As a result, unauthorized changes may be made directly in the database.

Management Action Plan	Plan Owner	Plan Date
1.A-Terminated accounts will be removed. 1.B-Passwords will be change regularly for priviledged accounts. 1.C-Human DBO accounts will be reviewed and be prefixed with z8 if DBO access is required. 1.D-Inappropriate users will be removed from the dynamic system database user access and audit trail table.	Sabbineni, Prasad	3/31/2007
2. Individual (non-DBO) accounts will be created for developers. DBO accounts will be prefixed with z8 which logs the account activities. A read-only account will be created for users to connect to the database.	Maxwell, Stephen	3/31/2007

Significance: Control Concerns

VaR Reconciliation**1. Improve the business coverage and frequency of the LehmanRisk to PALS/Quest reconciliation.**

The Firm continues to make progress in developing a daily reconciliation between VaR data and the Firm's books and records. However, at the time of our review, a number of businesses were not being reconciled including Captial Market Prime Services, Global Trading Strategies, Insurance Products Group and Commodities Trading.

In addition, of the businesses currently being reconciled, the majority were reconciled weekly with a few areas performed on a monthly cycle.

Management Action Plan	Plan Owner	Plan Date
VaR calculation for neither Prime Services nor Insurance Product Group is being completed. LehmanRisk must be updated with the VaR exposure in order for VaR calculation to be performed.	Shotton, Paul Seminara, Gregory	8/31/2007
Prime Services utilize access database to generate and calculate P&L. TLM must be set up with feeds from LehmanRisk and the Access database. Prime Services does not source P&L from Quest therefore, the reconciliation needs to be done through TLM.		
Insurance Product Group is currently performing manual spreadsheet VaR calculation based on Quest data. Currently there is no planned completion date to bring the VaR data into LehmanRisk to perform VaR reconciliation.		
See below bullet points for various action plan timelines.	Bishop, Michael	10/31/2007

- For Prime Servies and Insurance Product Group, the VaR reconciliation is contingent upon completion of the LehmanRisk feed.

- Commodities Trading: VaR is currently being calculated in LehmanRisk. The reconciliation will be performed automatically with targeted completion date end of Q2.

- GTS: currently reconciliation is being performed automatically. However, due to resource issues in Risk Control, the reconciliation is currently not being reviewed. GTS reconciliation is to be reviewed by the end of the Q2.

2. Conduct periodic review of all positions in the excluded accounts to verify compliance with exclusion criteria

There is no evidence that a periodic review of all positions in the excluded accounts is performed to verify that these positions comply with the criteria for exclusion specified in the global policy. It must also be noted that this control is not described in the 'LehmanRisk Position Reconciliation Policy and Procedures' document.

As a result, there is a risk that positions get incorrectly excluded from the Lehmanrisk to G/L reconciliation without being identified.

Management Action Plan	Plan Owner	Plan Date
Risk Control will enhance its policy and procedure document to include a monthly review of all positions in the excluded accounts to verify compliance with the exclusion criteria. The responsibility of this review and its sign-off will be given to the same group having the responsibility of the LehmanRisk to	Bishop, Michael	4/30/2007

Significance: Control Enhancements

Governance**1. Develop a process to monitor the compliance with the model waiver permission and to address the Regulator's quarterly reporting requirement**

There is no evidence that a process has been set-up to verify that the Firm will remain in compliance with its model permission and to address its quarterly reporting requirement to the FSA.

As a result, there is a risk that one or more regulatory reporting requirements will not be addressed.

Management Action Plan	Plan Owner	Plan Date
MRM will develop and document a process to verify that the Firm will remain in compliance with its model permission and to address its quarterly reporting	Turner, Maria	4/30/2007

Technology

1. Ensure VaR is signed off by appropriate individuals.

The system access levels required for sign off in the LehmanRisk summary system do not segregate responsibilities by business. Any individual with access to the summary sign off link, including technology users, can sign off on the VaR for any business.

Management Action Plan	Plan Owner	Plan Date
	Shotton, Paul	3/8/2007

Significance: Control Enhancements

VaR Reconciliation**1. Enhance the reconciliation to provide aging of breaks and include the legal entity attribute in the logic of the reconciliation.**

The 'legal entity' attribute is not included in the logic of the LehmanRisk to Quest reconciliation.

In addition, the current LehmanRisk to PALS and Quest reconciliations do not provide any information on the aging of breaks.

As a result, all legal entity breaks may not always be identified and the break resolution process for items below the materiality threshold may not always be performed timely.

Management Action Plan	Plan Owner	Plan Date
The LehmanRisk to QUEST and PALS reconciliation will be enhanced to include the "legal entity" field as part of the LR to QUEST reconciliation's logic.	Bishop, Michael	4/21/2007
As of end of Jan 07, the position level aging is in place. The aging by legal entity will be implemented in Q2.	Bishop, Michael	5/31/2007

2. Enhance the break resolution process.

The current break explanations for both automated and manual LehmanRisk to the Firm's P&L systems are not sufficient and consistent. There are no formal guidelines established globally for Product Control and Risk Management on the level of details required for resolution commentary and timeliness of the reason code submission.

Management Action Plan	Plan Owner	Plan Date
Starting March 1 2007, the Risk Control will take the role of assigning reason tags for the products that are going on daily reconciliation process. Respective Product Control and/or Risk Managers are to review and sign off on the reconciliations and the breaks on a monthly basis.	Bishop, Michael	8/31/2007
For the products reconciliations that are not daily as of 3/1/07, respective Product Controllers and/or Risk managers will continue to hold the responsibility of the research and resolution of the breaks in timely manner		

3. Implement VaR reconciliation for the Global Foreign Exchange business.

Currently, the VaR reconciliation for the global FX business consists only of matching currency pairs by accounts between GQuest/PALS and LehmanRisk. The mark to mark or notional values are not matched.

Management Action Plan	Plan Owner	Plan Date
IT is implementing position level feed into LehmanRisk from Maria and Murex. GQuest and PALS also needs to be getting position level data from the upstream systems.		5/31/2007
Upon completion of the system feed, Risk Control will implement VaR reconciliation.		
Upon completion of the position level system feed into LehmanRisk, Risk Control group will implement VaR reconciliation.	Bishop, Michael	8/31/2007

Significance: Control Enhancements

4. Ensure timely sign off the LehmanRisk to Quest/PALS reconciliation and remove all false breaks

Our review of the Lehman Risk ('LR') to PALS and QUEST reconciliations for HG CTE identified that:

- The reconciliation report is not always signed timely. In January 2007 about 38% of the reconciliation sign-offs were performed in average 1 day after the escalation date (set at 5 days after the report production date); and
- The feed issue generating false breaks related to the 'Emerging Markets' business line has not yet been fixed.

As a result, there is a risk that the reconciliation report is not produced timely or that human mistakes are not timely identified.

Management Action Plan	Plan Owner	Plan Date
On the day of the HG CTE reconciliation report, Product Control will evidence its review and sign-off of the reconciliation by emailing the same distribution list.	McPherson, Grant Ellis, Tony	3/15/2007
Need proper wording to address the false break issue	[TBD]	4/23/2007

5. Ensure unique identifier in LehmanRisk is stable.

The reconciliation tool uses a pre-determined unique identifier for account mapping logic. This unique identifier must remain constant in order to perform the LehmanRisk to GQuest/PALS reconciliation. Currently this unique identifier in the LehmanRisk file is unstable for certain businesses (Equities and Munis) which creates the mapping entered in the reconciliation tool being dropped and required manual remapping.

Management Action Plan	Plan Owner	Plan Date
LehmanRisk IT is currently addressing this issue. More detailed action plan and target date will be provided by the end of Q1. Potential target date is currently set at the end of Q2.	[TBD]	5/31/2007

6. Increase the reconciliation population by lowering the exclusion threshold.

At the time of our review, the LehmanRisk reconciliation to the Firm's books and records only excluded breaks that were under USD\$10mm but did not factor in the percentage of the total market value of the account.

Management Action Plan	Plan Owner	Plan Date
As of Feb 07, Risk Control has implemented the 3% market value position level variance threshold consistent throughout all regions and products.	Bishop, Michael	Complete

7. Ensure data source between LehmanRisk and the Firm's books and record is consistent.

Our review of the LehmanRisk to Quest/PALS reconciliation identified that LehmanRisk does not use the same product data source as the Firm's books and record. The Firm's books and record uses the Global Product system as the source data while LehmanRisk uses Bloomberg. Due to the inconsistency of the source data, it creates numerous false breaks in the reconciliation process such as incorrect FX rates and inconsistent multiplier for Future positions.

Management Action Plan	Plan Owner	Plan Date
		4/30/2007

