LEHMAN BROTHERS

Market Risk Management

VaR Back-Testing Procedures

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CONFIDENTIAL

VaR Back-testing Procedures

Overview:
This document explains the procedures we follow in order to test the robustness of our internal Value at Risk (VaR) model. Ensuring robustness of the model encapsulates two distinct requirements; first, to ensure that all material trading book exposures are being captured by the risk engine used to calculate VaR, and second, that the methodologies implemented for the subsequent VaR calculation are apposite and do, indeed, represent the likely maximum loss at a given confidence level.

Positions which are held in the Firm's Trading Books & Records, and which are therefore feeding the P&L account, must also all be captured by risk management and capital calculation systems. Were there to be positions which were not being captured by risk systems, over time we would expect to observe P&L events in excess of the forecast VaR, to an extent greater than that which would be expected statistically, given the model parameters.

Given our internal VaR methodology, which calculates VaR at a 95% confidence level over a 1-day holding horizon using historical simulation and data-histories over a 4-year look-back period, exponentially weighted with a time decay factor of approximately 0.5% per day to give greater emphasis to more recent market volatilities, we would expect to see extreme losses in excess of our VaR forecast (termed "back-testing exceptions") about 13 times per year. Likewise, for VaR at a 99% confidence level, which is used for regulatory capital calculations, we would expect to see extreme losses in excess of the VaR amount two or three times in any twelve-month period. Greater incidences of back-testing exceptions than th~~ei~~se could indicate that the VaR calculation was not fully capturing risk, either through missing positions, or else through not fully incorporating all risk-factors. Regardless of the cause, a surfeit of exceptions would indicate a potentially deficient VaR process and would trigger immediate action to further investigate the issues and correct any discovered deficiencies.

Back-testing Process:
We~~ plan to~~ back-test our internal VaR model against the subsequent clean~~actual~~ P&L systematically on a daily basis using both 95% C.L. and 99% C.L. VaR forecasts. We ~~will~~ take time-series for the daily VaR forecasts and the corresponding clean~~actual~~ P&L for units at the same level of the corporate hierarchy in order to carry out back-testing. Finance is~~will be~~ responsible for supplying time-series of daily clean~~actual~~ P&L at the following levels of the corporate hierarchy:-

- Firm-wide
- Division
- Line of Business (i.e. BPM1) – globally and by region
- Legal Entity – where required

Risk Management is~~will be~~ responsible for back-testing VaR on a daily basis for the same nodes in the hierarchy.

At each level, VaR calculated for positions as of the close of business on day T is~~will be~~ compared with the subsequent clean P&L outcome for day T+1 on a daily basis. At this point, all losses which exceeded the VaR forecast are~~will be~~ termed "potential back-testing exceptions" and are~~will be~~ individually investigated as to the cause by both Product Controllers and Risk Managers.

In cases where it is determined that the VaR engine was fed with incorrect positions, or that the data-histories used to calculate the VaR were incomplete, leading to a material understatement of the true VaR, the VaR calculation is~~will be~~ re-performed. If such re-calculation using correct data results in the VaR now being in excess of the loss, the potential back-testing exception is~~shall be~~ regarded as false and recorded as such, together with the explanation. False exceptions do~~shall~~ not contribute towards the aggregate of genuine back-testing exceptions.

Likewise, if it is determined that the clean P&L was materially mis-stated, resulting in a false potential back-testing exception, then the P&L will be corrected, and the exception not counted as genuine.

If investigation determines that both the P&L calculation and the VaR calculation are materially correct then the potential back-testing exception is~~will be~~ recorded as genuine, documented as such, and~~ shall~~ contributes to the aggregate of back-testing exceptions. Back-testing exceptions are reviewed by the Market Risk Control Committee (MRCC). If, over time, the accumulated exceptions indicate that the VaR calculation is deficient (i.e. if we experience more than 13 genuine exceptions in any twelve-month period at any level of the corporate hierarchy for the 95% C.L. VaR forecast, or more than 3 genuine exceptions for the 99% C.L. VaR forecast) then the VaR calculation process will be examined by the MRCC~~arket Risk~~ which determines and documents the course of action to be taken (see below: Reporting of Back-testing Analysis).~~Management and Quantitative Risk Management to ensure that material positions are not being omitted, and to ensure that the calculation methodology is embellished sufficiently to address any short-comings which may have allowed VaR to be understated.~~

~~Back-testing results and such actions as are deemed necessary for modification of the VaR model shall be documented by the Risk-Reporting Group, within Risk Management.~~

Treatment of Joint Ventures:

For all risk measurement purposes, regardless of the prescription for the P&L split, 100% of the risk in a JV is apportioned to the JV-partner which, in practice, is managing the risk. For the purposes of back-testing, therefore, 100% of the JV P&L is also~~also needs to be~~ apportioned to that same JV-partner. Finance is responsible for providing P&L series to Risk Management according to this prescription.

Reporting of Back-testing Analysis:
The Market Risk Control Committee~~Management will~~ reviews the back-testing results on a monthly basis. Results are~~will be~~ reviewed at the Firm-wide, Divisional, global and regional Line of Business levels, as appropriate, and for specific legal entities, as required by regulatory supervisors. Reports showing the number of exceptions, explanations of their causes, and their categorization as genuine, or otherwise, are~~will be~~ made by the secretary to the MRCC. Clusters of exceptions, and numbers of exceptions which, in aggregate, are large relative to the numbers expected statistically, are~~will be~~ investigated by the MRCC~~arket and Quantitative Risk Management departments~~, which is responsible to~~o will~~ identify possible deficiencies of the VaR model which such exceptions would indicate. The MRCC is then responsible for determining the appropriate course of action.~~A plan to rectify the model deficiencies will then be drawn up, together with a timetable for implementation.~~

~~Summary results of the back-testing analyses will be presented to the Senior Management on a quarterly basis on the same schedule as we present them to the SEC. At a minimum, the analysis will consist of summary statistics and explanation of exceptions at the Firm-wide, Divisional and global Line of Business level, and for specific legal entities, as required. Details of any methodological shortcomings highlighted by the exceptions analysis, and the plans for any changes in methodology or other actions to be taken by Risk Management as a result of the analysis will also be presented.~~

Regulatory Requirements

Results of back-testing analyses are~~The SEC requires us to~~ formally communicated to the SEC~~the results of our back-testing analysis~~ at a Firm-wide level on a quarterly basis, and are informally shared with the SEC at a Firm, division and line of business basis at monthly meetings with the SEC Market Regulation team.~~.~~

Addendum

In addition to the above global policy, there are additional procedures the firm will implement to comply with the requirements of the FSA's BIPRU Rules Book section 7.10 regarding back-testing, and are described here. Currently, these apply to the products in the trading books for which a CAD II waiver application has been submitted to the FSA, which is limited to the CTE business in the LBIE legal entity in Europe. This addendum will be updated in time as submissions are made for additional business lines and products for the CAD II waiver.

Hypothetical P&L

The firm will carry out back-testing VaR against hypothetical P&L, that is, clean P&L excluding:

- Any new trading activity to ensure that the trade population used for generating VaR and for which P&L is compared are the same, and
- Any P&L generated that would not be factored into a VaR model.

Risk Management will perform back-testing of the daily VaR against the daily hypothetical P&L as required, and at least quarterly.

Exceptions in the hypothetical back-testing will be investigated by Market Risk Management and appropriate corrective action will be taken. If significant back-testing exceptions occur, then a comprehensive review of the VaR model will be undertaken by Market Risk Management and Quantitative Risk Management.

A summary of the hypothetical P&L back-testing results will be included as part of the quarterly report sent to the FSA.

Specific risk back-testing against hypothetical P&L

Our policy with regards to back-testing specific risk is to test VaR due to specific risk for a relevant set of portfolios chosen consistently. We do this by generating a series of appropriate hypothetical portfolios that represent the range of possible scenarios for the specific risk, and compare the 1 day VaR (at 99% significance level) for each of the hypothetical portfolios with the hypothetical P&L for that portfolio.

The frequency with which specific risk back-testing is carried out will be appropriate to the type of specific risk to be tested.

Exceptions will be investigated by Market Risk Management. If the exception is due to missing data or incorrect P&L, then these will be corrected and the tests re-run. If the aggregate of the exceptions over a period of time is above the expected statistically significant level, then a review of the VaR methodology will be undertaken by Market Risk Management and Quantitative Risk Management.

Additional regulatory requirements

The FSA requires us to report a back-testing exception against clean P&L orally within two business days after the business day for which the back-testing exception has occurred, and within five business days following the end of each month a written account of the previous month's back-testing exceptions.

The FSA also require us to report a summary of the results of back-testing against hypothetical P&L in the quarterly report.

Where the VaR model covers specific risk, the results of specific risk back-testing will be reported in the quarterly report as per the requirements of the VaR model permission.