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Stressed Value-at-Risk

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Basel has introduced a Stressed Value-at-Risk' measure

- (i) This measure is intended to replicate a value-at-risk calculation in stressed markets that would be generated on the bank's current portfolio
- (ii) The relevant market factors should be based on experiencing a period of stress; and should therefore be based on the 10-day,99th percentile, one-tailed confidence interval value-at-risk measure of the current portfolio
- (iii) Model inputs calibrated to historical data from a continuous 12-month period of significant financial stress relevant to the bank's portfolio.
- (iv) The period used must be approved by the supervisor and regularly reviewed. As an example, for many portfolios, a 12-month period relating to significant losses in 2007/2008 would adequately reflect a period of such stress; although other periods relevant to the current portfolio must be considered by the bank.

Banks are allowed to build their own stress VaR model

Different techniques might need to be used to translate the model used for value-at-risk into one that delivers a stressed value-at-risk.

For example, banks should consider applying anti-thetic data, or applying absolute rather than relative volatilities to deliver an appropriate stressed value-at-risk.

The stressed value at-risk should be calculated **at least weekly.**

The Capital Requirement is a function of the Stress VaR calculation

Each bank must meet, on a **daily basis**, a capital requirement expressed as the sum of:

- The higher of (1) its previous day's value-at-risk number and (2) an average of the daily value-at-risk measures on each of the preceding sixty business days multiplied by a multiplication factor (m_c);

plus.

- The higher of (1) its latest available stressed-value-at-risk number calculated according to sVaR at t-1 and (2) an average of the stressed value-at-risk numbers calculated over the preceding sixty business days (sVaRavg), multiplied by a multiplication factor (m_s).

Therefore, the capital requirement (c) is calculated according to the following formula:

$$c = \max \{ VaR_{t-1}; m_c \cdot VaR_{avg} \} + \max \{ sVaR_{t-1}; m_s \cdot sVaR_{avg} \}$$

The mc and ms factors need to be approved by regulators

The multiplication factors mc and ms will be set by individual supervisory authorities on the basis of their assessment of the quality of the bank's risk management system, subject to an absolute minimum of 3 for mc and an absolute minimum of 3 for ms.

Banks will be required to add to these factors a “plus” directly related to the ex-post performance of the model, thereby introducing a built-in positive incentive to maintain the predictive quality of the model.

The plus will range from 0 to 1 based on the outcome of so-called “backtesting.”

The backtesting results applicable for calculating the plus are based on value-at-risk only and not stressed value-at-risk.

If the backtesting results are satisfactory and the bank meets all of the qualitative standards then the plus factor could be zero.

Supervisors will have national discretion to require banks to perform backtesting on either hypothetical (i.e. using changes in portfolio value that would occur were end-of-day positions to remain unchanged), or actual trading (i.e. excluding fees, commissions, and net interest income) outcomes, or both.

Banks' stress scenarios need to cover a range of factors

These factors can create extraordinary losses or gains in trading portfolios, or make the control of risk in those portfolios very difficult.

These factors include low-probability events in all major types of risks, including the various components of market, credit, and operational risks.

Stress scenarios need to shed light on the impact of such events on positions that display both linear and nonlinear price characteristics (i.e. options and instruments that have options-like characteristics).

Banks' stress tests should be both quantitative and qualitative nature

The stress tests should incorporate both market risk and liquidity aspects of market disturbances.

Quantitative criteria should identify plausible stress scenarios to which banks could be exposed.

Qualitative criteria should emphasize that the two major goals of stress testing are to evaluate the capacity of the bank's capital to absorb potential large losses and to identify steps the bank can take to reduce its risk and conserve capital.

This assessment is integral to setting and evaluating the bank's management strategy and the results of stress testing should be routinely communicated to senior management and, periodically, to the bank's board of directors.

Stress testing should include Supervisory Scenarios

Banks should combine the use of supervisory stress scenarios with stress tests developed by banks themselves to reflect their specific risk characteristics.

Specifically, supervisory authorities may ask banks to provide information on stress testing in three broad areas, which are discussed in turn in subsequent slides

Stress testing:

(i) Supervisory scenarios requiring no simulations by the bank

Banks should have information on the largest losses experienced during the reporting period available for supervisory review.

This loss information could be compared to the level of capital that results from a bank's internal measurement system.

For example, it could provide supervisory authorities with a picture of how many days of peak day losses would have been covered by a given value-at-risk estimate.

Stress testing:

(ii) Scenarios requiring a simulation by the bank

Banks should subject their portfolios to a series of simulated stress scenarios and provide supervisory authorities with the results.

These scenarios could include testing the current portfolio against past periods of significant disturbance, for example, the 1987 equity crash, the Exchange Rate Mechanism (ERM) crises of 1992 and 1993 or, the fall in bond markets in the first quarter of 1994, the 1998 Russian financial crisis, the 2000 bursting of the technology stock bubble or the 2007/2008 sub-prime crisis, incorporating both the large price movements and the sharp reduction in liquidity associated with these events.

A second type of scenario would evaluate the sensitivity of the bank's market risk exposure to changes in the assumptions about volatilities and correlations.

Applying this test would require an evaluation of the historical range of variation for volatilities and correlations and evaluation of the bank's current positions against the extreme values of the historical range.

Due consideration should be given to the sharp variation that at times has occurred in a matter of days in periods of significant market disturbance.

Stress testing:

- (iii) Scenarios developed by the bank itself to capture the specific characteristics of its portfolio.
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In addition to the scenarios prescribed by supervisory authorities, a bank should also develop its own stress tests which it identifies as most adverse based on the characteristics of its portfolio (e.g. problems in a key region of the world combined with a sharp move in oil prices).

Banks should provide supervisory authorities with a description of the methodology used to identify and carry out the scenarios as well as with a description of the results derived from these scenarios.

Stress testing:

- (iii) Scenarios developed by the bank itself to capture the specific characteristics of its portfolio.
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The results should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors.

Moreover, if the testing reveals particular vulnerability to a given set of circumstances, the national authorities would expect the bank to take prompt steps to manage those risks appropriately (e.g. by hedging against that outcome or reducing the size of its exposures).

External model validation is an important component of obtaining regulatory approval

The validation of models' accuracy by external auditors and/or supervisory authorities should at a minimum include the following steps:

- (a) Verifying that the *internal validation processes* are operating in a satisfactory manner;
 - (b) Ensuring that the *formulae* used in the calculation process as well as for the pricing of options and other complex instruments are validated by a qualified unit, which in all cases should be independent from the trading area;
 - (c) Checking that the *structure* of internal models is adequate with respect to the bank's activities and geographical coverage;
 - (d) Checking the results of the banks' *back-testing* of its internal measurement system (i.e. comparing value-at-risk estimates with actual profits and losses) to ensure that the model provides a reliable measure of potential losses over time. This means that banks should make the results as well as the underlying inputs to their value-at-risk calculations available to their supervisory authorities and/or external auditors on request;
 - (e) Making sure that data flows and processes associated with the risk measurement system are *transparent and accessible*. In particular, it is necessary that auditors or supervisory authorities are in a position to have easy access, whenever they judge it necessary and under appropriate procedures, to the models' specifications and parameters.
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