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*Transition to IMA: How to
ensure a smooth ride?*

21th July 2010

Aptivaa

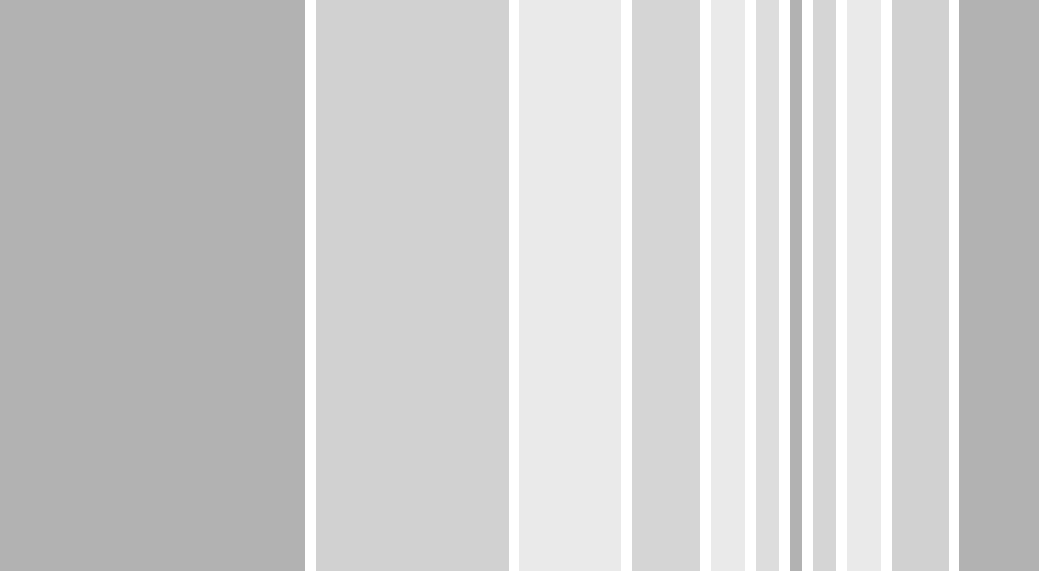
Business Case –For Adopting IMA

Strategic Opportunities

- A. Enhanced Reputation**
- B. Better Risk Management:** Driven by a more precise risk weighting
- C. Better Capital Management:** Internal efficiencies and disciplines in Risk reporting would lead to changes in product mix/pricing.
- D. Rating:** Banks may decide to grow via acquisitions or divest a portion of their assets, in order to maximize the benefits of a more efficient capital management model
- E. Competition:** Driven by Peer group

Potential Threats

- A. Capital Increase**
- B. Huge Initial Investment:** IMA implementation would entail huge investments in Staff training/hiring, systems development



IMA Framework

Qualitative Requirements for IMA approval

Independent Risk Control Unit

- The bank must have a Risk Control Unit that is fully independent of business units that generate market risk exposures.

Documentation

- The bank must have well documented policies for Trading Book, Market Risk, ALM Procedures
- Also, the bank must maintain an MRM Dossier to record model specification, changes and updates.

Integrity & Accuracy

- The bank must be able to demonstrate that it has a conceptually sound risk management system that is implemented with integrity
- The bank must have a proven track record of measuring risks with reasonable accuracy.

Skilled-Staff

- The bank must have a sufficient number of skilled staff using sophisticated methods in trading area, market risk control, validation and internal audit.

Use-Test

- The risk estimates produced must be closely integrated with the risk management process.
- The risk measurement system should be used in conjunction with internal trading and exposure limits.

Quantitative Requirements for IMA approval

VaR parameters

- VaR must be computed on a daily basis using a 10-day holding period and confidence level of 99%.
- No particular model prescribed, but the model in use should be able to capture all the material risks

Data

- Historical Time horizon for calculating VaR will be constrained to a minimum length of one year.
- Banks must update their data sets no less frequently than once every three months

Stress and Back Testing

- A rigorous Stress Testing exercise should be in place to supplement the risk analysis.
- The bank must conduct a rigorous Back Testing to carry out an ex-post comparison of the risk measure generated by the model against actual daily changes in the P/L as well hypothetical changes.

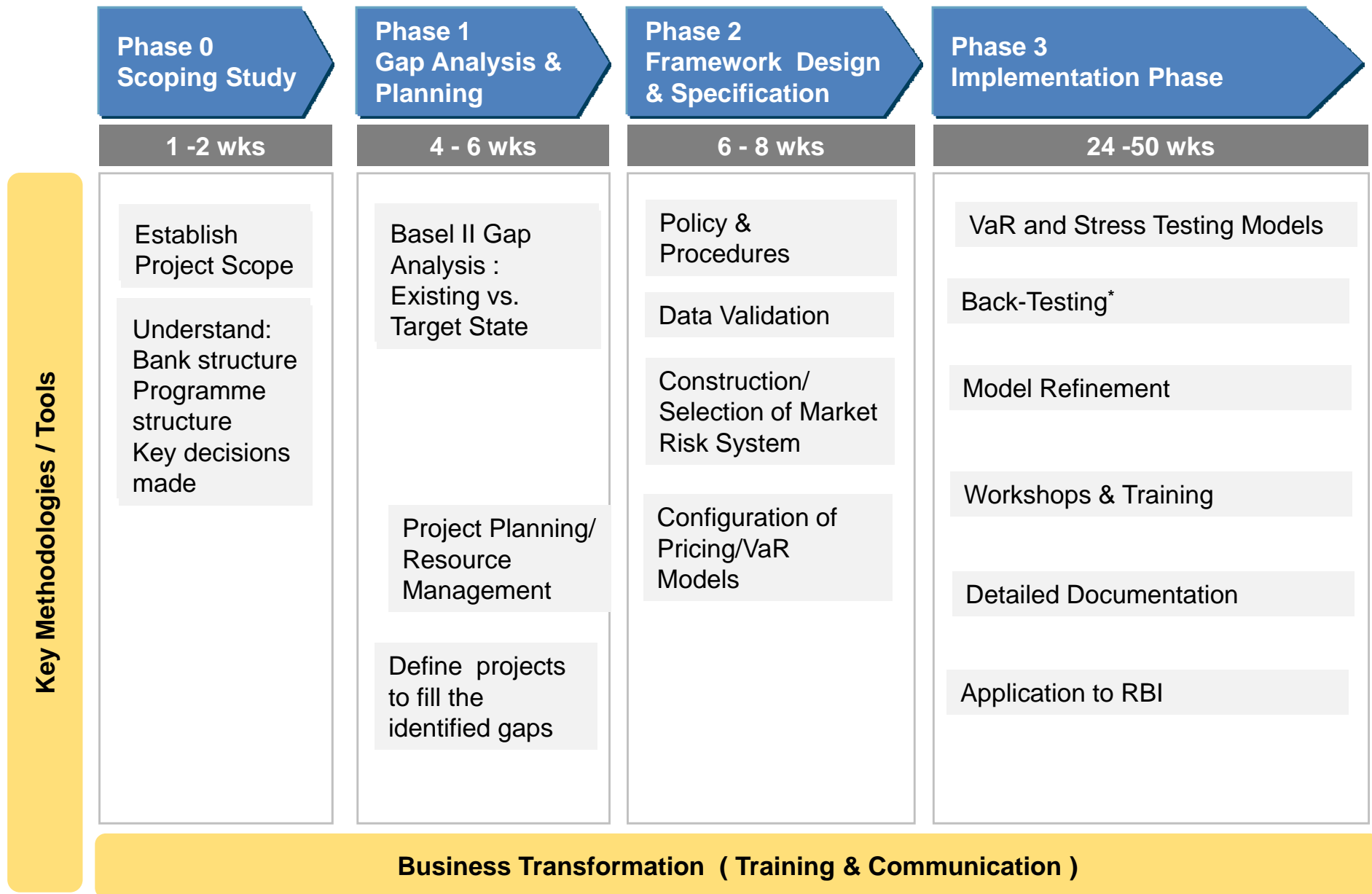
Empirical Correlations

- VaR models should ideally capture correlations across broad risk categories spanning Market Risk (Interest Rate, FX, equity Price, Commodity)

Non-Linear Risks

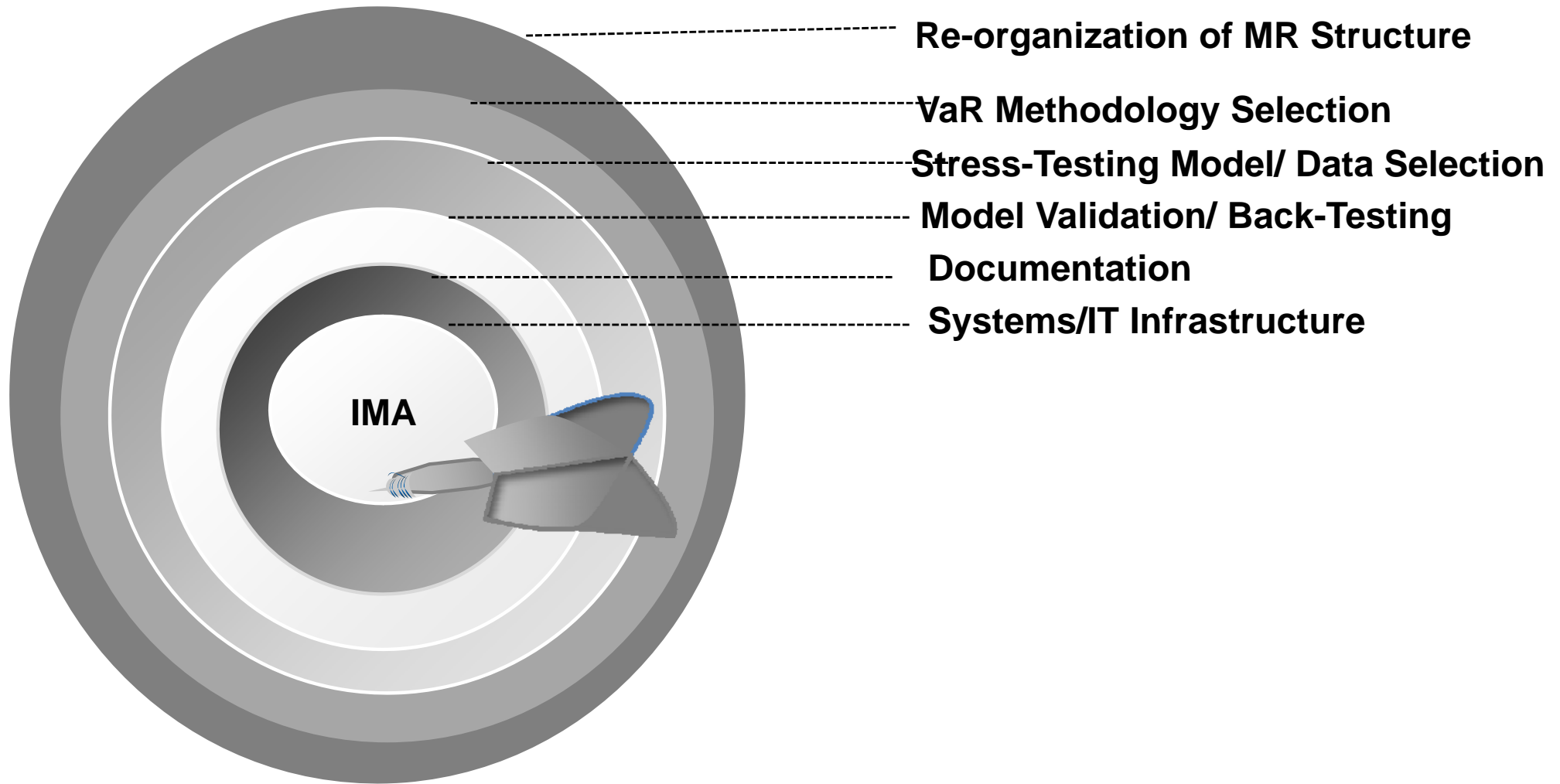
- Models must accurately capture the unique risks associated with options with suitable models
- For banks using advanced derivative products, the models must capture the non-linear risks like gamma, vega.

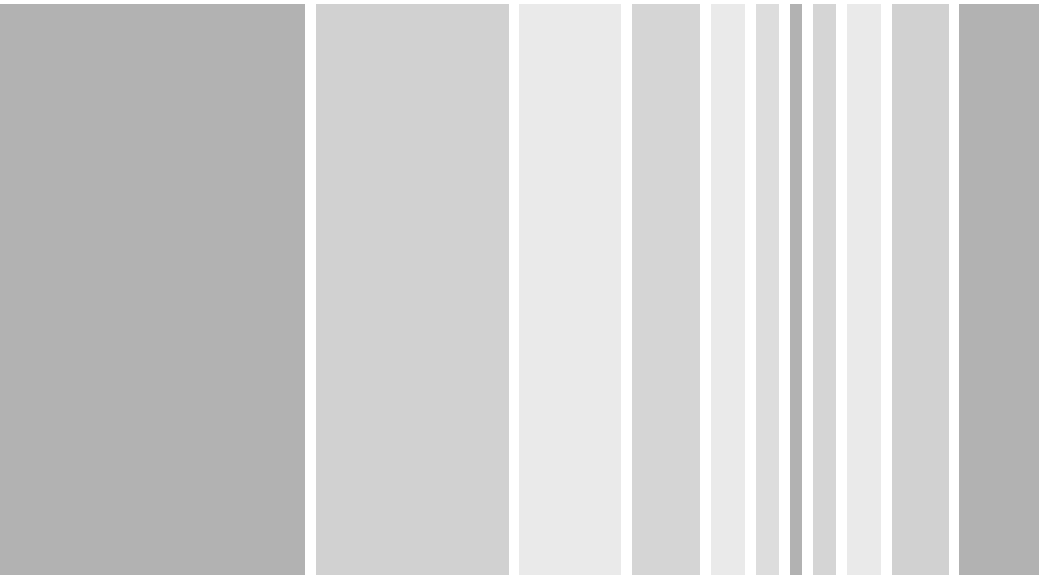
Typical Implementation Approach



* The implementation of the back testing program should begin at least six months before the bank decides to make an application to RBI for approval.

IMA Implementation in phases

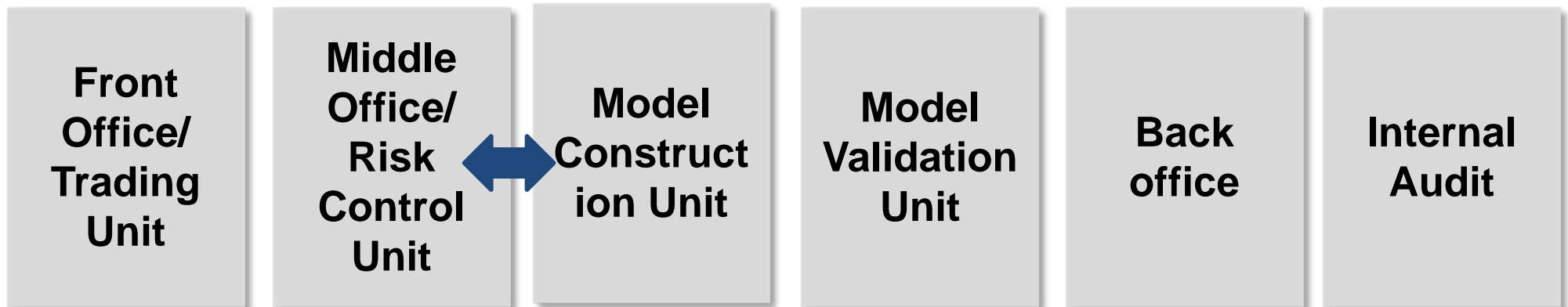




Step-by Step Implementation

Market Risk Governance Under IMA

A typical organizational design of the market risk function under IMA would have the following '**Independent**' entities.



While most banks have well defined Front/Middle/Back offices, Model Construction and Model Validation units are often integrated

Segregation of the two as well more active involvement of internal audit team mark the inception of 'IMA Implementation'



Design and Methodology

Choosing the VaR Method

Currently, Banks in India calculate capital for Market Risk using SMM and use different VaR models for calculating Market Risk for Internal Purposes.

Historical

Uses historical values to arrive at the VaR

Monte-Carlo
Simulation

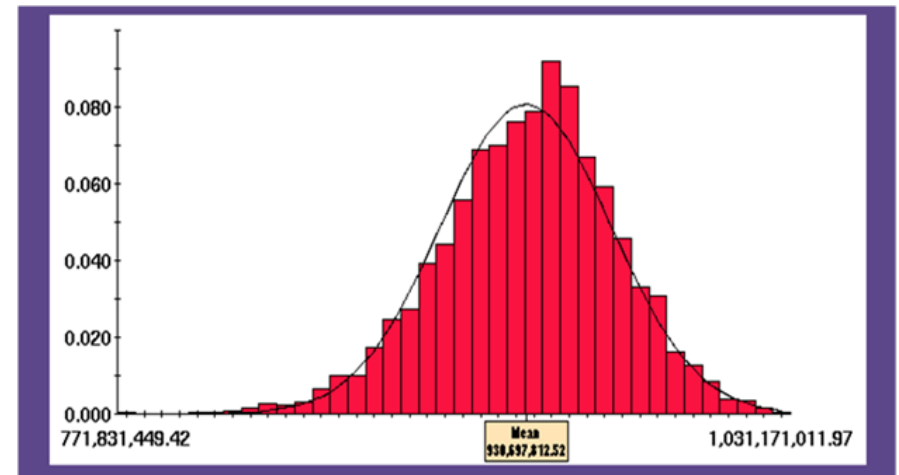
Generates random values assuming that portfolio returns follow a Normal Distribution

Variance-
Covariance

Uses historical values and incorporates correlations

Choosing the Methodology depends on

- ✓ Complexity of the portfolio,
- ✓ level of staff skills/system and,
- ✓ Bank's specific Requirements



A typical Market Risk Distribution for a Sample Portfolio



Select your Method

Historical Method

- Easy to understand & implement
- Captures Non-Linear Risks

- Historical Scenarios may be irrelevant in the present context

Var-Covar

- Incorporates correlations
- Easy to implement

- Doesn't capture non-linear risks
- Runs model risk
- Regular updation of correlations

Monte-Carlo

- Covers the gamut of risk factors
- Effective for treatment of complex and non-linear products

- Computationally intensive
- Runs model risk

Globally, despite its limitations, Historical Method has an element of mass appeal among Banks due its simplistic approach

Stress Testing Framework

Under Stress Tests, Banks could face two key challenges

- Choosing the right framework
- Choosing the most suitable 'Stress Period'

In order to cover the gamut of Risk Factors, Stress Tests would ideally entail:

Historical Analysis

- Includes scenarios from recent history, and simulate the effect on P/L of repeats of past historical events.

Sensitivity Analysis

- Includes pre-defined or regulator prescribed scenarios that have proven to be useful in practice. Example, change in equity price by x%, yield curve shift of y-basis points.

Mechanical-Search

- Includes automated routines to generate over prospective changes in risk factors, and report the worst effect on P/L.

'Reverse' Stress Testing

- Starts from an outcome of business failure and identifies circumstances where this might occur.

Stress Testing- Selecting the Data-period

Choosing the Right Data-Period

Data selection for Historical Analysis remains a key challenge. Data-period will depend on

- ✓ Historical Experience of the Bank
- ✓ Bank's integration with global markets
- ✓ Types of assets in the Trading Book

Depending upon the requirements, Banks could use a mix of following global and local scenarios for Historical Analysis

These scenarios could also be used for calculating 'Stressed' VaR

2007-08
Sub-Prime
Crisis

2000
Bursting of
Technology
Bubble

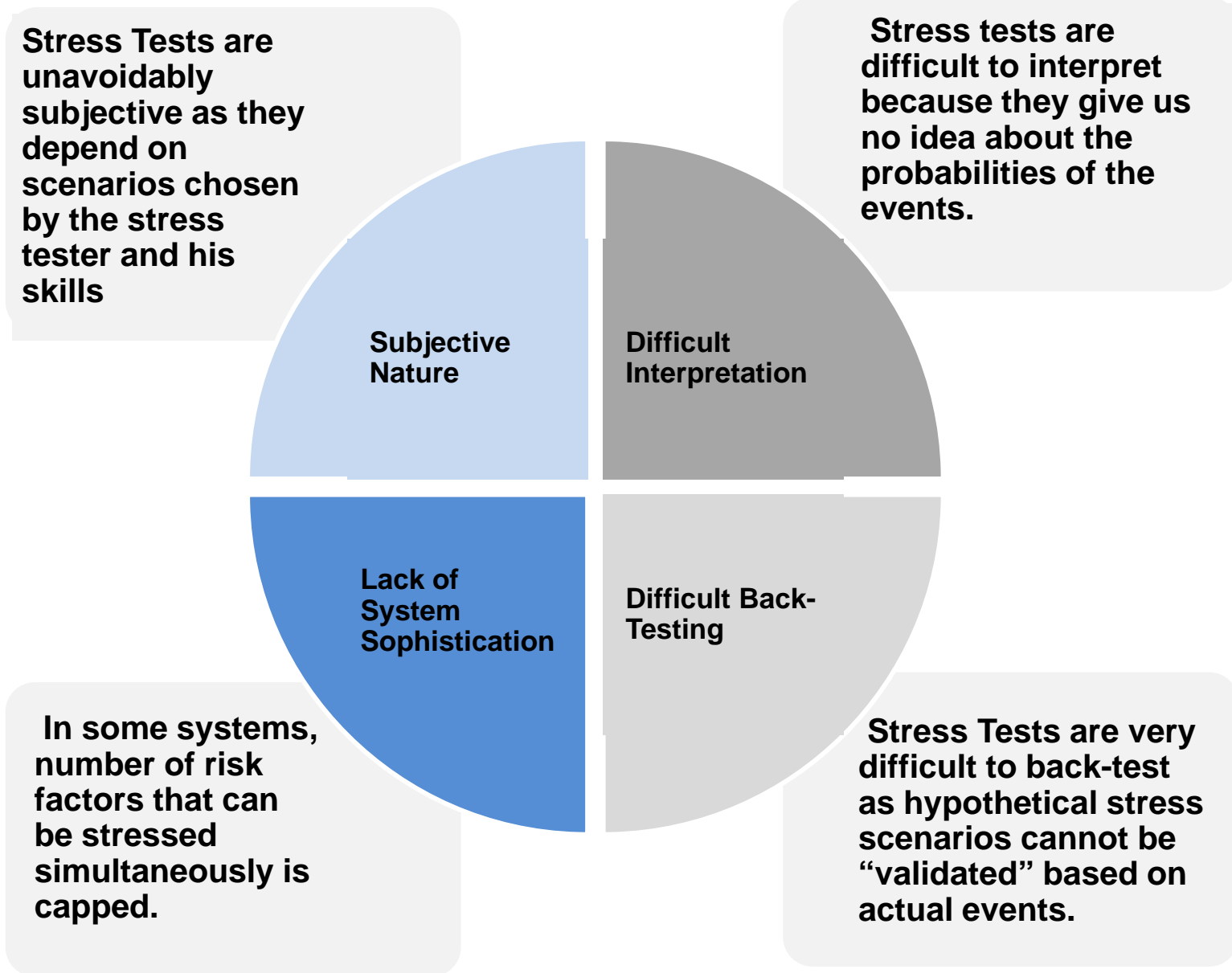
1998
Russian
Financial
Crisis

1994 fall
of Bond
Markets

1992-93
exchange
rate crisis

1987
Equity
Crisis

Potential Challenges in Stress-Testing



Independent Internal and External Validation must be carried out before RBI Accreditation

Model validation consists of assessing five major components:

- **Governance & Oversight**
- **Data integrity**
- **Underlying Assumptions**
- **Analytics/Methodology**
- **Output/Back testing**



Dirty Back-Testing

Compares the VaR estimates with the actual P/L .

Actual P/L includes fees and commissions, intraday trading, cash flows, contract expiration

Clean Back-Testing

Back-Testing will be done at portfolio as well desk-level and will include

Dirty Back-Testing

Clean Back-Testing

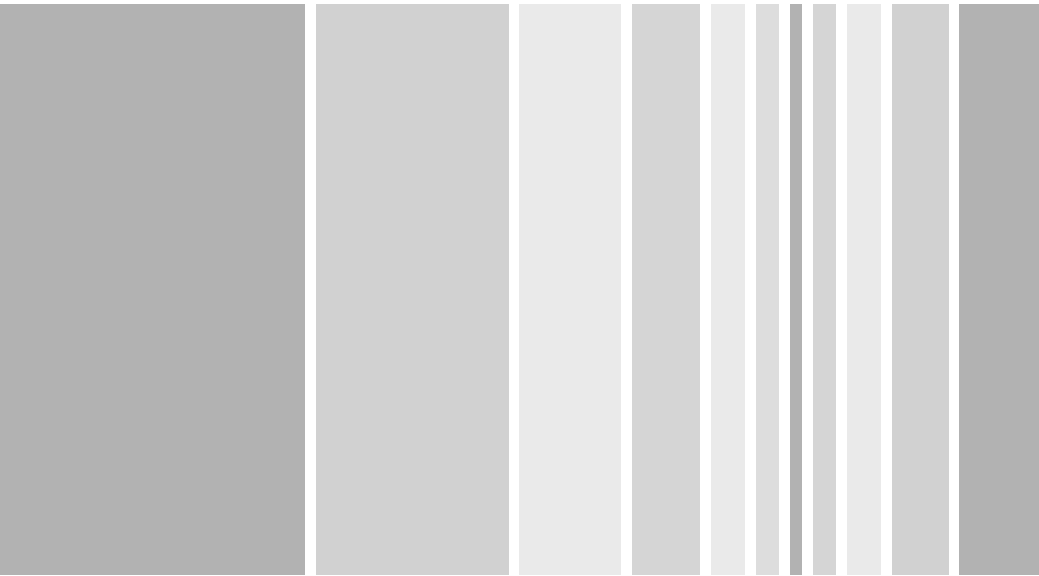
Compares VaR estimates with some hypothetical P/L having kept the portfolio intact.

Hypothetical P&L assumes a static portfolio from time t to $t+1$.

Exceptions up to 4 are allowed under IMA guidelines, above which capital charge increases by a suitable scaling factor. There are many ways to fail the Back Testing :

- Incorrect valuation models (e.g. incorrect risk info)
- Production issues (e.g. missing information)
- Unexpected extreme market moves
- Breakdown in market correlation
- Lack of reliable liquid prices
- Convexity in derivative contracts

..... even if everything is perfect, statistical noise can generate more than 4 exceptions



Documentation

For obtaining RBI approval, the following documents are to be submitted:

- Request for RBI approval of the IMA model
- Internal audit report of the model
- A Market Risk (MR) file
- MR Model Dossier

MR file describes the internal model, the risk management control system and substantiates the compliance with the quantitative and qualitative requirements of these guidelines.

MR File Content

- Scope of Application of the Model
- Description of Exposures
- Estimation of Regulatory Capital
- Policies and Organization
- Market Risk Measurement System
- Stress Testing Programme
- Back Testing Programme
- Technological Environment and Information Integrity Controls
- Limits Structure/Information Systems/ Databases Employed
- Operational Manual and Input Tables of the Market Risk Calculation
- Internal Audit Report
- Other Independent Assessments
- Future Developments

The content of this document is similar to the content of the MR file. MR file is submitted at the time of application to the RBI, whereas the MRM Dossier is maintained and updated on a regular basis.

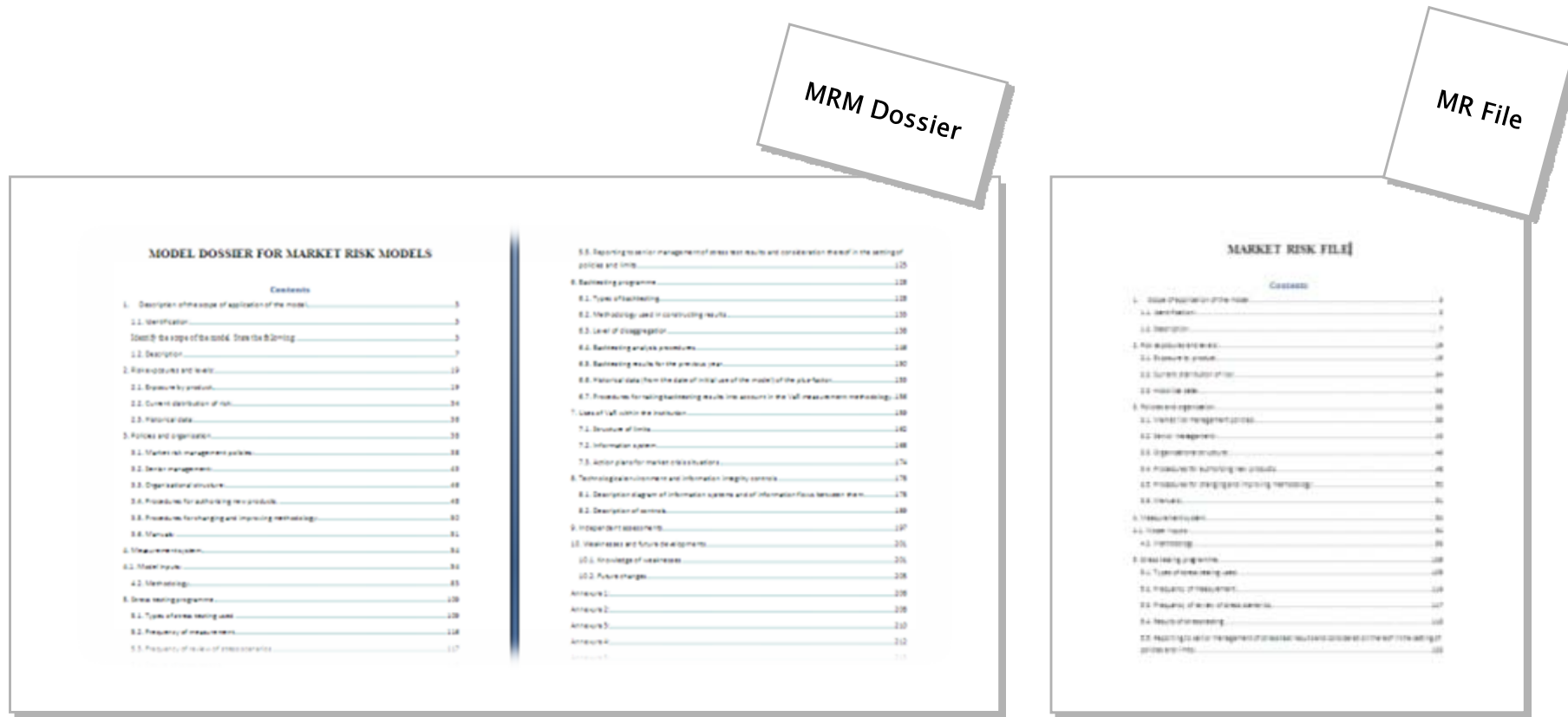
Apart from the various components of the MR file, the following information must also be contained in the MRM Dossier:

The purpose of the MRM Dossier is to keep a record of the details of the model and the changes/refinements, if any, made from time to time.

MRM Dossier

- Full technical specifications of the model
- RBI approval for the model and subsequent changes, if any, made to the model along with the conditions subject to which the approval has been granted.
- Complete details and record of subsequent changes, if any (such as new products covered, modifications to the score of the model, revision of sources of external data, modifications in the applications, organizational changes etc.) in the operation of the approved model.
- Authors responsible for the contents, date updated
- Detailed Stress Testing and Back Testing Results
- Uses to which the VaR is put within the bank
- Weaknesses identified in the model

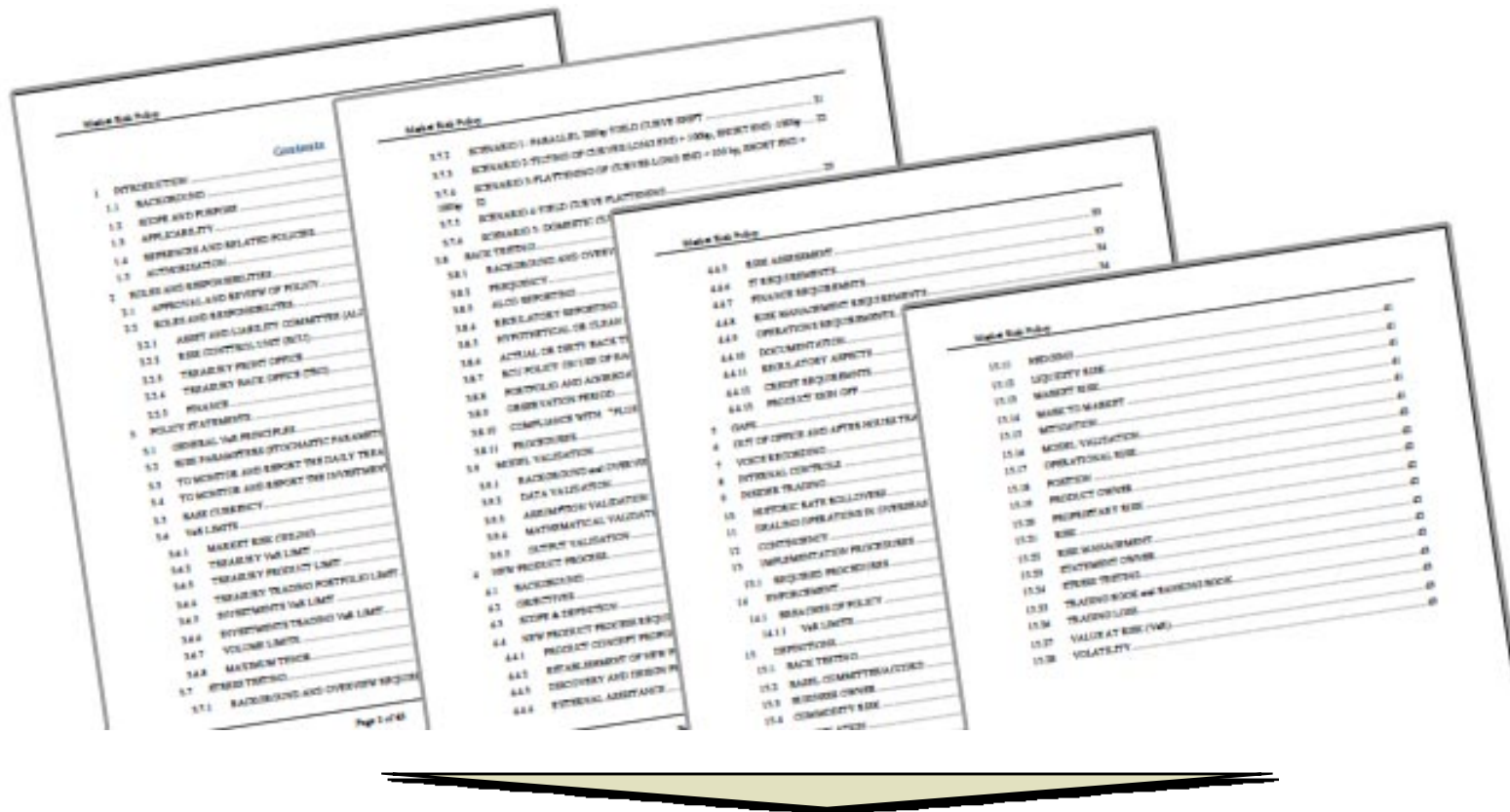
Snapshot of MR Documentation



➔ MR File Volume: typically 200-300pages (A4 Word)

➔ MRM Dossier Volume: typically 150-200 pages (A4 Word)

Documentation for Market Risk policy



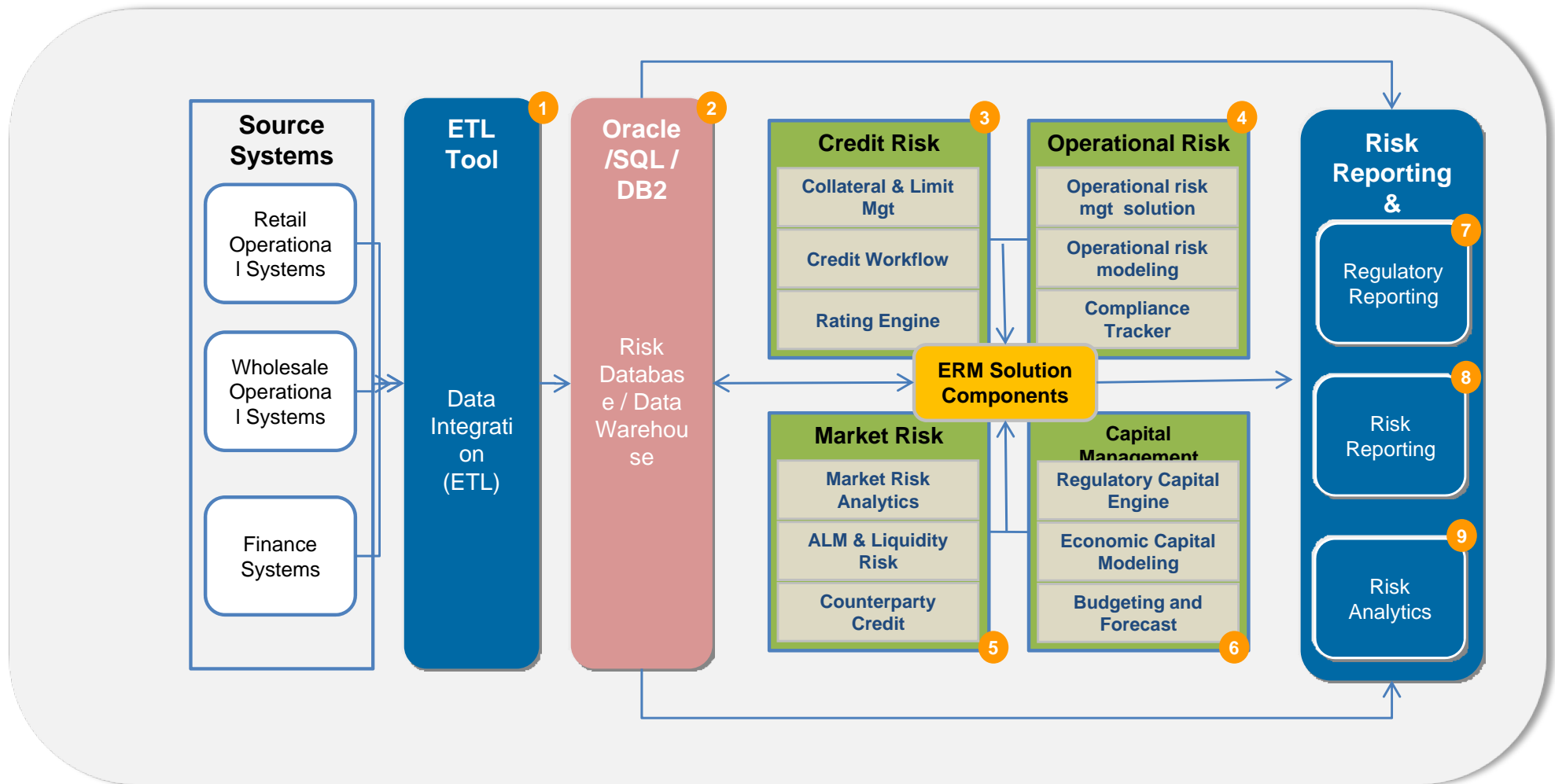
Market Risk Policy: typically 50-100 pages (A4 Word)



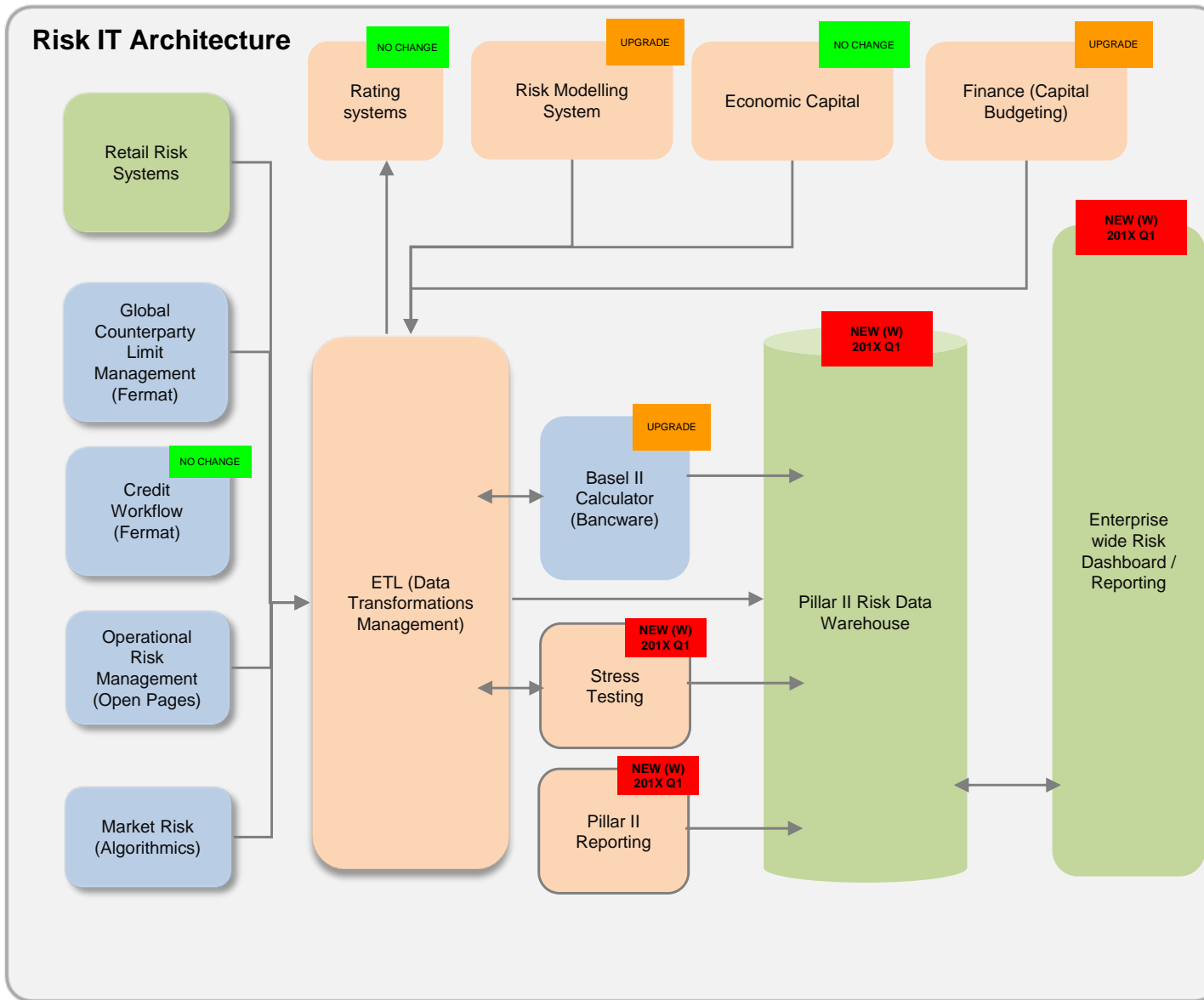
System/IT

Risk Technology Architecture

Risk Technology architecture would be driven by the functional Risk architecture design and implementation at Group and Entity level. A generic risk technology architecture (illustrative) highlighting the key technology and systems components is presented below.



Timing of System Initiatives



- Multiple systems are used to source the risk data and then run through series of data transformations and integration layers for Pillar I /ECAP calculations.
- Additionally, the Risk Technology Architecture must be interfaced with Finance Systems and the impending risk management components* to provide for an enterprise wide risk dashboard / reporting mechanism
- With some systems already bought/built/implemented and or under implementation (either bought or being built), some interim adjustments / upgrades may be made in the architecture to ensure a practical transition to the target risk architecture.

* The diagram outlined is indicative based on our understanding and may/may not reflect the current or proposed architecture at the Bank.

Build Buy N/A

Other Key Points to Consider

- Pricing/Valuation models and Market data should be independent of Front office
- Inclusion of India Specific Scenarios India-specific scenarios under Stress-Tests
- Maintenance of Audit Trails and access controls in System
- Integration with existing multiple systems
- Enhancement of Staff Skills/Training

Thank You

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