Track 2: Strategic Risk Management

Challenges for Practical Market Risk Management

4:30pm – 5:20pm

Presenter:

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Challenges in Practical Market Risk Management

GARP 15th Annual Risk Management Convention, New York

Presenter: Anshuman Prasad, Director, Risk and Analytics

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Executive Summary

- Shift underway from VaR to newer measures such as Expected Shortfall or Stressed VaR in order to better assess tail risk
- Newer regulations are making the boundaries between trading and banking books impermeable
- Strong focus on minimizing model risks through greater emphasis on model testing, back-testing and validation
- Market risk systems are being upgraded to ensure real-time measurements and greater data availability
- Market risk measurement is becoming more central to trading decisions as banks revisit trading costs by incorporating cost of risk

These large-scale changes are being driven by increased regulatory scrutiny and enhanced senior management focus
Agenda

- Market Risk Management: Outstanding Issues
- Impact of Regulations
- Measures of Market Risk
- Modeling Challenges
  - Valuation of Illiquid Instruments
  - Measurement: Illiquidity Discount
  - Computational Trade-offs
- Data Management Issues
- Trends in Market Risk Systems
- Organizational Culture
# Market Risk Management: Outstanding Issues

## Modeling Challenges
- Valuation of illiquid products
- Correlation under stressed environment
- Model calibration
- Tradeoffs: speed vs. accuracy

## Regulatory Issues
- Reliability of various measures of risk such as VaR, Expected Shortfall
- Validation and back-testing of models to reduce model risk
- Trading vs. banking book boundaries

## System and Data Issues
- Incomplete and/or inaccurate data
- Lack of unified data processing model
- Limited involvement of business
- Real-time computation, lack of integrated systems

## Organizational Culture
- Silo approach to risk management
- Limited role of risk managers in decision making
- Narrow, compliance-focused approach
**Impact of Regulations (1/2)**

Basel III regulations on “Fundamental review of the Trading Book” will have a significant impact on banks’ market risk management.

<table>
<thead>
<tr>
<th>Change to Market Risk Framework</th>
<th>Impact</th>
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<tbody>
<tr>
<td>▪ Redefinition of Trading and Banking book boundaries</td>
<td>▪ Difficult to move assets between the trading and banking books</td>
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<td>▪ Increased scrutiny of models</td>
<td>▪ Ensuring validation and periodic revalidation</td>
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<tr>
<td>▪ Emphasis on expected shortfall (ES)</td>
<td>▪ New models to be created</td>
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<td></td>
<td>▪ Capturing extreme scenarios tail risk</td>
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Impact of Regulations (2/2)

Basel III regulations on “Fundamental review of the Trading Book” will have a significant impact on banks’ market risk management

<table>
<thead>
<tr>
<th>Change to Market Risk Framework</th>
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<tbody>
<tr>
<td>Increased regulatory reporting requirements</td>
<td>- Trading-desk level reporting of risk measures</td>
</tr>
<tr>
<td>Modeling of stress period capital requirement</td>
<td>- Daily back-testing and P&amp;L attribution of all the trading books to test model performance</td>
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<td></td>
<td>- Increase in number of risk factors to be captured for capital calculations</td>
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<td>- Calibration of capital with stress periods is made mandatory to reduce cyclicalirty</td>
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<td>- Incorporating liquidity horizons</td>
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Measures of Market Risk

There is no single measure of risk that can provide a consistent view of risk across market participants and regulators.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pros</th>
<th>Cons</th>
<th>Key Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value at Risk (VaR)</td>
<td>- Simple, established&lt;br&gt;- Single view of risk</td>
<td>- Lacks coherence&lt;br&gt;- Extreme tails&lt;br&gt;- Inconsistencies</td>
<td>- Regulatory reporting&lt;br&gt;- Setting risk limits</td>
</tr>
<tr>
<td>Expected Shortfall (ES)</td>
<td>- Conservative&lt;br&gt;- Size and likelihood of losses&lt;br&gt;- Reduces cyclicality</td>
<td>- Difficult to back-test&lt;br&gt;- Prone to optimization errors</td>
<td>- Regulatory reporting&lt;br&gt;- Economic risk capital</td>
</tr>
<tr>
<td>Sensitivities</td>
<td>- Easy to interpret&lt;br&gt;- Simple modeling procedure</td>
<td>- Can be misleading&lt;br&gt;- Cannot be aggregated</td>
<td>- Key measure used for hedging risk&lt;br&gt;- Setting risk limits</td>
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### Modeling Challenges: Valuation of Illiquid Instruments

- FASB valuation categories are based on complexity – Level 1/2/3
- Level 3 assets are priced using in-house valuation models
- Models built can only be as good as the underlying data!

<table>
<thead>
<tr>
<th>Technique</th>
<th>Description</th>
<th>Type of Products</th>
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<tbody>
<tr>
<td>Discounting</td>
<td>By discounting cashflows at future dates</td>
<td>IRS, Bonds, Floaters</td>
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<tr>
<td>PDE-based</td>
<td>Closed-form pricing for low factor/low dimension models; path independent</td>
<td>First generation structures</td>
</tr>
<tr>
<td>Lattice-based</td>
<td>Closed-form pricing for low factor/low dimension models; path dependent</td>
<td>Caps/Floors, CBs, TS models</td>
</tr>
<tr>
<td>MC Simulation</td>
<td>Simulation pricing for high factor/high dimension models; path dependent</td>
<td>Highly complex structures</td>
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Measurement: Illiquidity Discount

- Initial steps being taken towards better management of the market impact of illiquidity; measures include
  - Checking for variability in liquidation times for illiquid positions
  - Setting up processes for measuring impact of trade volumes on market prices
  - Monitoring widening bid-ask spreads, specially in times of adverse market conditions

- CCPs started for most liquid OTC derivatives; liquidity adjustment challenges seen in more exotic products

- Methods for incorporating the illiquidity discounts in OTC valuation models

**Bid-ask Spread Adjustment**

- Adjustment of bid-ask spread for specific market risk parameters

**Bounding Approach**

- Determine lower and upper limit price by relying on reasonable limits to trade performance
Computational Trade-offs

- Choice between delta-based methods and the full revaluation method
- Control and agility often contradictory and difficult to implement simultaneously
- An optimum balance needs to be maintained for both these trade-offs

Decreasing cost of computation is helping reduce the impact of tradeoffs
Data Management Issues

Increased regulatory focus on providing granular and frequent analysis of real time data

Data Management Process

Data Acquisition
- Trade Data
- Market Data

Data Management
- Validate
- Enrich

Data Distribution
- Reports
- Ad hoc Queries

- ETL model is inappropriate to provide real time view of risk. Viable alternatives to ETL are:
  - **ELT**: Data transformation after the data load
  - **Data Federation**: Single virtual view without actually moving the data
  - **Real Time Data Integration**: Integration of data using message-based technologies
Trends in Market Risk Systems

Increase ‘risk velocity’ and ‘risk management’ clock-speed

<table>
<thead>
<tr>
<th>Data/Reporting Attribute</th>
<th>Measure</th>
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<tbody>
<tr>
<td>Timeliness and Accuracy</td>
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<tr>
<td></td>
<td>‧ Automation of stress testing and reporting framework</td>
</tr>
<tr>
<td></td>
<td>‧ GPU based farms enabling move to full revaluation approach</td>
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<tr>
<td>Comprehensiveness</td>
<td></td>
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<td></td>
<td>‧ Cloud Computing, a natural solution for higher data capacity needed for granular regulatory reporting</td>
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<tr>
<td>Adaptability</td>
<td></td>
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<tr>
<td></td>
<td>‧ Service-based architecture with detailed data captured at trade level</td>
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<tr>
<td></td>
<td>‧ Flexible data capture and storage solutions</td>
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- Risk measurement and analysis methods need to be based on strategic objectives, diversity of business and level of complexity
- Banks are aligning financial incentives with risk-based performance indicators

**Organizational Culture**

- **Implement** Risk Informed Strategy
- **Align** Resources as per Risk Tolerance
- **Monitor** Performance Indicators
- **Identify** Key Risk Categories
- **Assess** Potential Impact