WOLF
& COMPANY, P.C.

FMS New York/ New Jersey Chapter Meeting

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The Impact of Models

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About Wolf & Company, P.C.

- Established in 1911
- Offer Audit, Tax, and Risk Management services
- Offices located in:
  - Boston, Massachusetts
  - Springfield, Massachusetts
  - Albany, New York
  - Livingston, New Jersey
- Nearly 200 professionals

As a leading regional firm founded in 1911, we provide our clients with specialized industry expertise and responsive service.

Financial Institution Expertise

- Provide services to over 260 financial institutions:
  - Approximately 50 FIs with assets > $1B
  - Approximately 30 publicly traded FIs
  - Constant regulatory review of our deliverables

- Over 50 Risk Management Professionals:
  - IT Assurance Services Group
  - Internal Audit Services Group
  - Regulatory Compliance Services Group
  - WolfPAC® Solutions Group

- Provide Risk Management Services in 27 states and 2 U.S. territories

Agenda

- What is a model?
- Developing Models
- In-house vs. Outsourced Models
- Model Validation
- Highlighted Models:
  - Asset Liability Management
  - Anti-Money Laundering
  - Allowance for Loan and Lease Loss

Risk Management

As learned by Seinfeld's George Costanza:

http://www.youtube.com/watch?v=laKprX-HP94&sns=em

What is a model?

An objective method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques and assumptions.

Used to process data into quantitative estimates.

Model Components

Models consist of three components:

- Information input
- Processing
- Reporting

How are Models Used?

- Banks routinely use models for a broad range of activities
- In recent years, banks have applied models to more complex products and with more ambitious scopes, such as enterprise-wide risk measurement.
- Changes in regulation have spurred some of the recent developments.

Developing a Model – Points to Consider

- Clear statement of purpose
- Identify limitations
- Ensure components:
  - Work as intended
  - Are appropriate for business purpose
  - Are conceptually sound and mathematically correct.

Developing a Model – Points to Consider

- Assessment of data quality and relevance
  - Appropriate documentation
- Testing
  - Accuracy
  - Model is robust and stable
  - Assessing limitations
  - Behavior over a range of inputs
- Document and summarize the results

Models should not look like this:

Types of Models

- Financial instrument valuation and risk profiling
- Sensitivity analysis
- Credit risk evaluation
- Fraud detection
- Loan loss forecasting and reserving
- Borrower collections management
- Financial planning and forecasting

Model Risk

The potential for adverse consequences from decisions based on incorrect or misused model outputs and reports.

- Can lead to:
  - Financial Loss
  - Poor business and strategic decision making
  - Damage to a bank's reputation

Model Risk

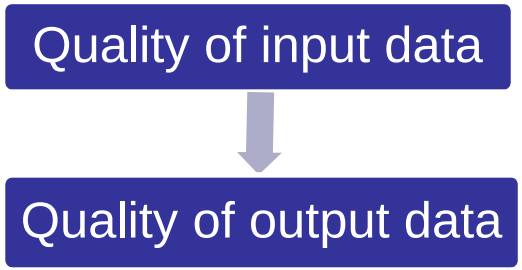
Models are never perfect. These factors must be managed to eliminate a model's limitations:

- Development
- Implementation and control
- Establish limits on model use
- Monitor performance
- Adjust or revise parameters over time
- Supplement model results with other analysis or information

Model Risk

Occurs primarily for two reasons:

1. Fundamental errors in the model

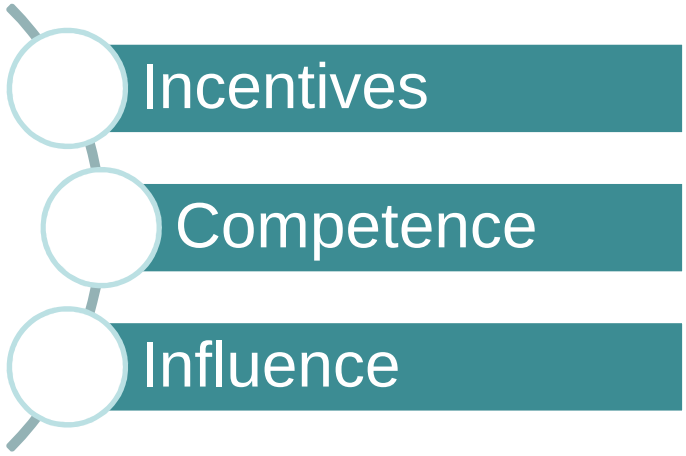


2. Model used incorrectly or inappropriately

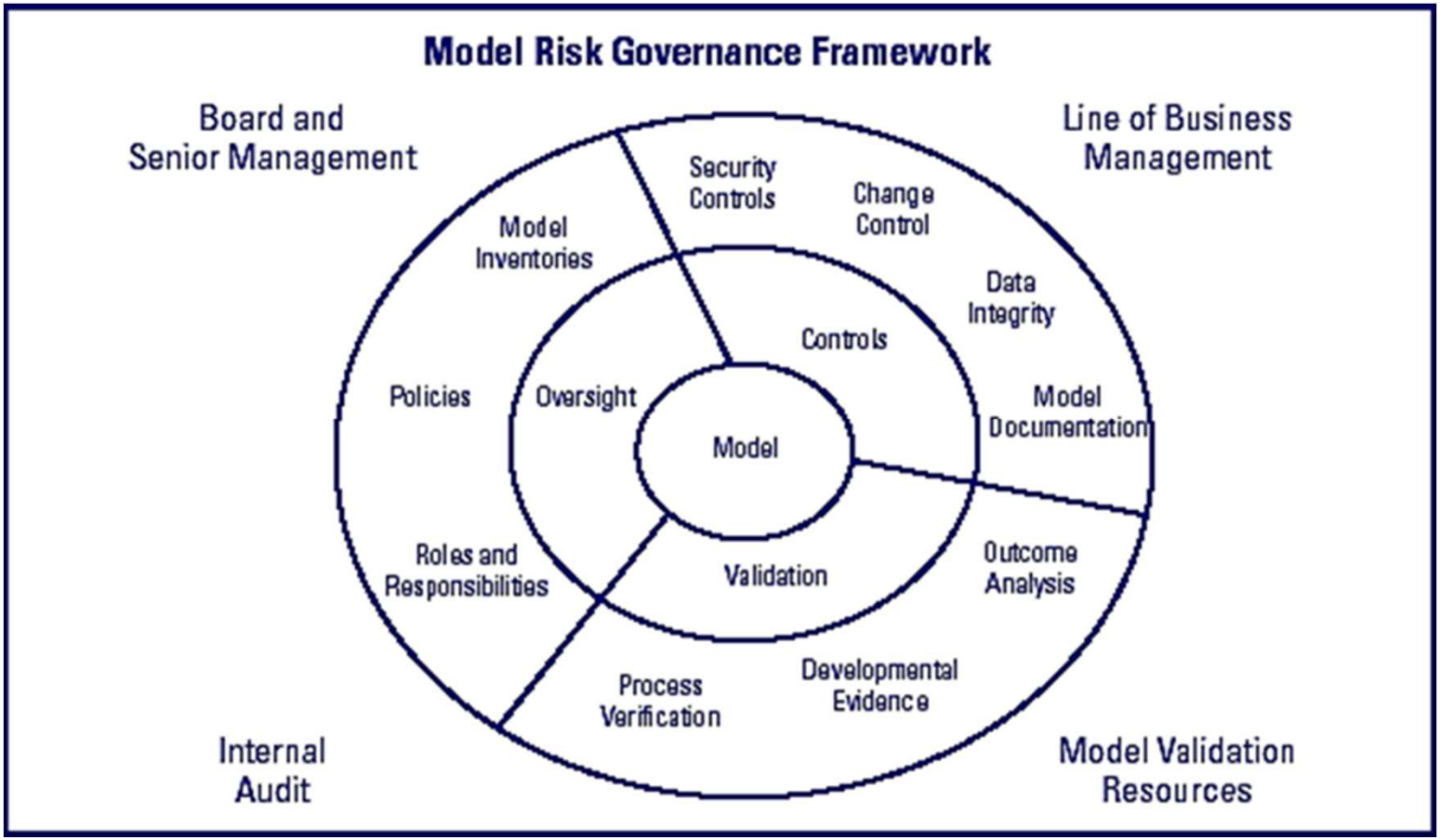
“Effective Challenge”

Critical analysis by objective, informed parties who can identify model limitations and assumptions and produce appropriate changes.

- Guiding principle for managing model risk.
- Depends on a combination of:



FDIC Viewpoint



In-house vs. Outsourced Models

In-house Models:

Benefits

- Control
- Understanding
- Customizable

Constraints

- Capacity to perform
- Expertise
- Complexity

In-house vs. Outsourced Models

Outsourced Models:

Benefits	Constraints
• Best practice knowledge • Task allocation	• Limited Control • Inner workings

In-house vs. Outsourced Models

Managing Outsourced Models Results

- Understand underlying analytics
- Assumptions
- Methodologies
- Incorporation in strategic and tactical decisions

Model Functionality

Is model working efficiently?

User feedback and insight

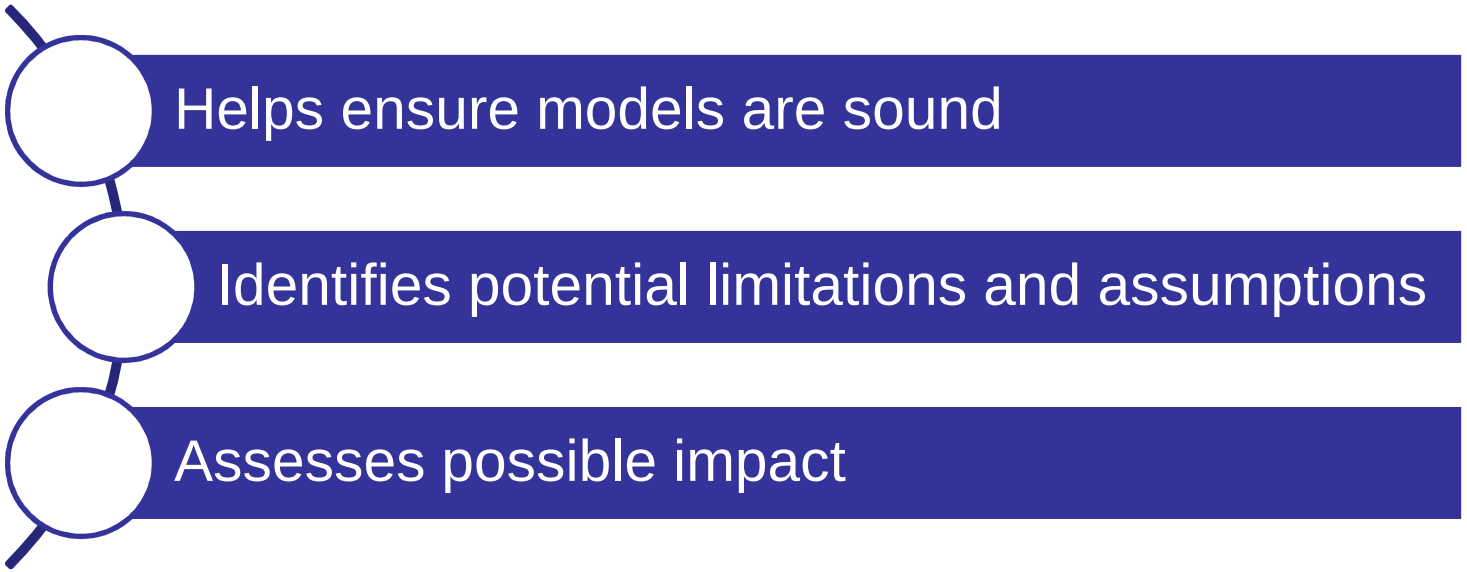
Managers question methods and assumptions

Model functions well and reflects reality

Justifies assumptions and design

Model Validation

Set of processes and activities intended to verify that models are performing as expected, in line with their design objectives and business uses.



Model Validation – What's Included?

- All components subject to validation.
- Rigor of validation equal to:
  - Banks overall use of models
  - Complexity and materiality of models
  - Size and complexity of bank's operations
- Range and rigor in line with potential risk
- Periodic review of each model
- Material changes subject to validation

Validation – Getting Started

What is the model doing in regards to your data?

- Identifying

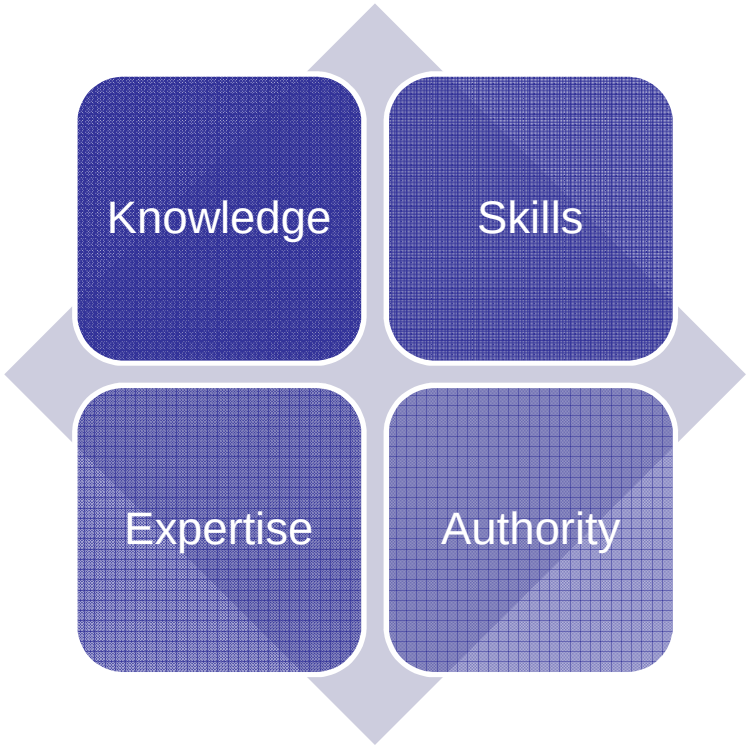
- Evaluating

- Reporting

Model Validation – Who Should Perform it?

- Degree of independence:
  - Incentives aligned with goals of validation

- Staff or consultants must have:



Model Validation & Independence

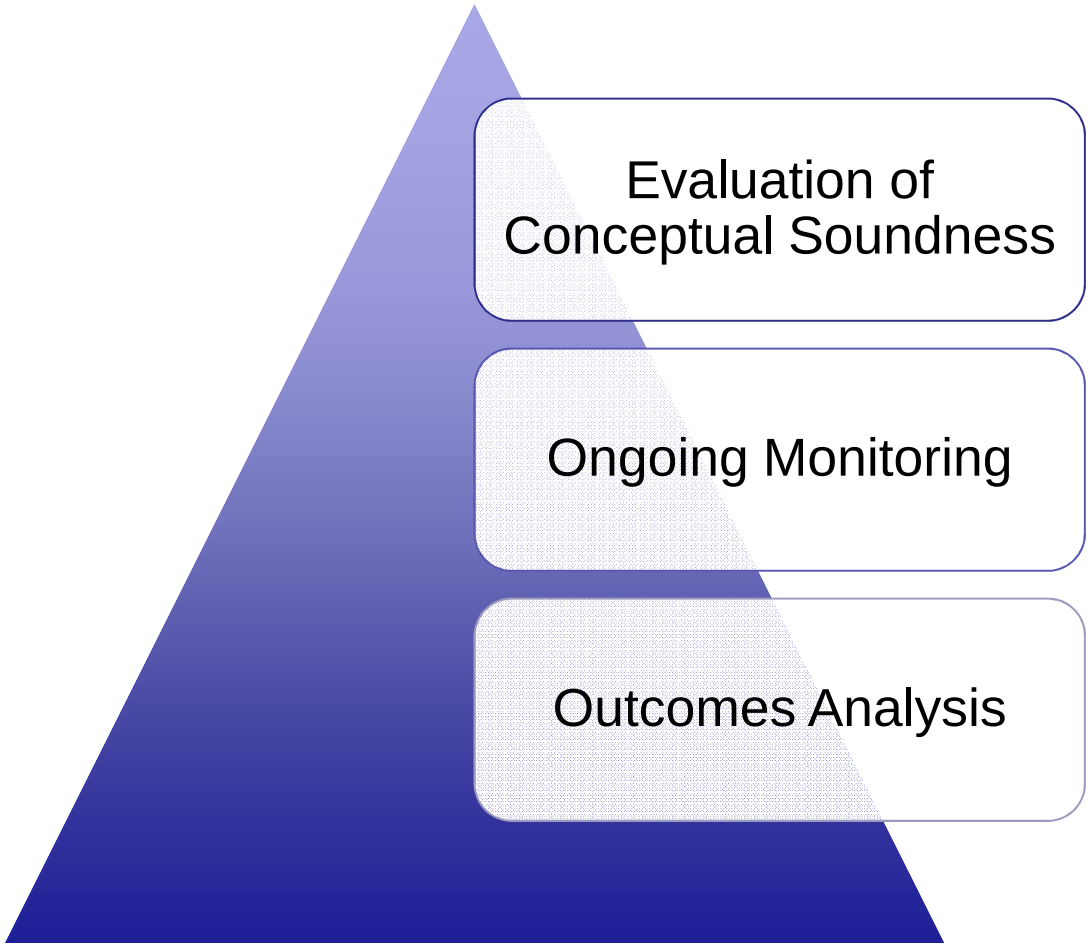
Set of processes and activities intended to verify that models are:

- Performing as expected
- Identify limitations and potential impacts
- Model aligns with objectives and business use

Model data input, processing, and reporting should be subject to validation.

Actual validation must be performed by an independent party.

In-house Model Validation



Model Validation - Evaluate Conceptual Soundness

- Documentation and testing
  - Convey understanding of limitations and assumptions
- Validations ensure qualitative and judgmental assessments
  - Well supported and documented
- Documented evidence in support of all model choices
- Sensitivity analysis (where appropriate)
- Plan for using results of quantitative testing

Model Validation - Ongoing Monitoring

- Evaluate changes and make adjustments
- Extension beyond original scope is valid
- Should continue periodically
- Program for ongoing testing
  - Include process verification and benchmarking.
- Process verification:
  - All model components functioning as designed.
- New empirical evidence or theoretical research

Model Validation – Ongoing Monitoring

- Analysis of integrity and applicability of information sources
  - Performed regularly
- Analysis of overrides w/ documentation
- Benchmarking
  - Discrepancies trigger investigation

Model Validation – Outcomes Analysis

- Comparison of model outputs to actual outputs
- Evaluate model performance
- Conducted on an ongoing basis
- Use variety of quantitative and qualitative testing
- Parallel outcomes analysis
- “Early warning” metrics

Highlighted Models

1. Asset Liability Management (ALM)
2. Anti-Money Laundering (AML)
3. Allowance for Loan and Lease Loss (ALLL)

ALM Model Validation

Area of Validation	In-house ALM Model	Outsourced ALM Model
Model Documentation	• User Manual • Procedures over data input	• Procedures over data input and assumption development
Sensitivity Analysis	• Performed during development over model calculations • Assumption analysis	• Assumption analysis
Changes to Model	• Document all improvements	• Improvements should be communicated by vendor
Detail Testing	• Performed periodically over all areas	• Validation Report • Supplemented by ALM audit • Detail testing for any customization

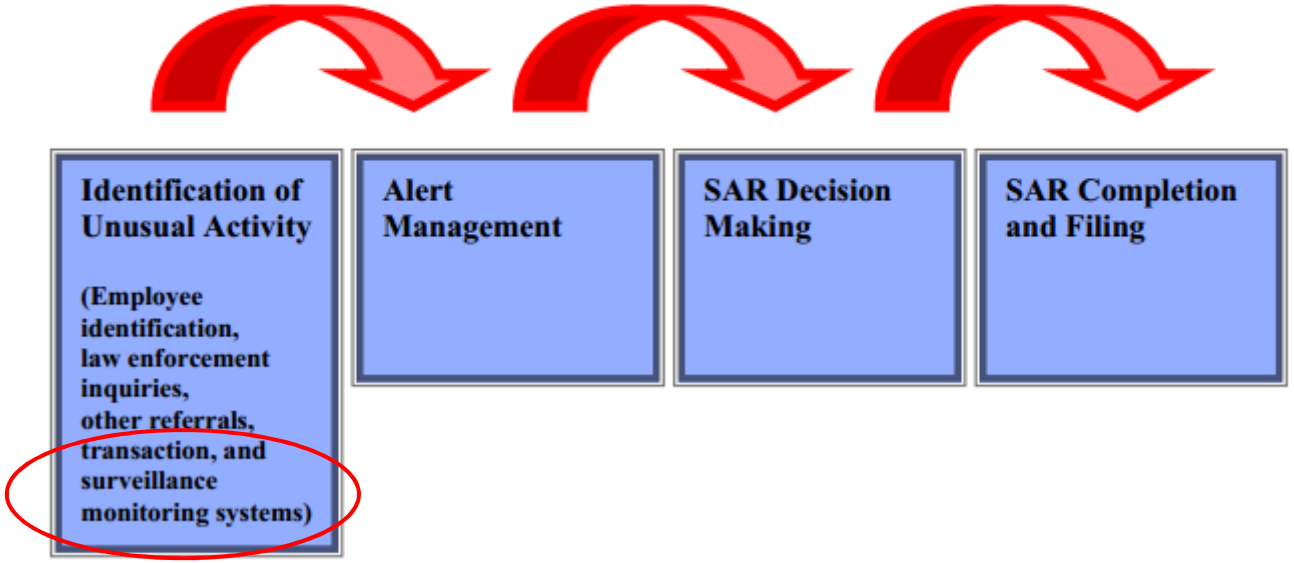
ALM Model Validation

Area of Validation	In-house ALM Model	Outsourced ALM Model
New Theory	• Model should be expanded to address	• Discuss with vendor
Comparison of Outputs	• Back-testing should be performed periodically	• Provided by vendor or performed internally
Evaluate Performance	• Discuss at ALCO	• Discuss at ALCO
Parallel Analysis	• Determine if needed	• Determine if needed
Contingency Plan	• Train employees	• Evaluate in-house option or other vendors

AML Model - Requirement

Where does the Validation piece come from?

Appendix S: Key Suspicious Activity Monitoring Components



AML Model - Introduction

Areas a model could impact include:

- Suspicious Activity Monitoring
- Suspicious Activity Reports (“SARs”)
- Enhanced Due Diligence
- Currency Transaction Reporting (“CTRs”)
- CTR Exemptions
- 314(a) Request Lists
- OFAC
- Wire Transfers

AML Model - Structure

Theses models often review customer activity by various means and identifies possible occurrences of suspicious activity, frequently referred to as “alerts”.

Similar to any suspicious activity that was manually identified, the institution has an obligation to review the activity to determine if a SAR filing is necessary.

How the Model identifies these “alerts” is a key part of the software structure which should be understood by the institution.

AML Model - Structure

Rules Based – Alerts are based on specific, often logic or activity based rules. When the criteria for that rule is met then an alert is generated.

Behavior Based – Alerts are based on specific customer behavior. Defined parameters exist for expected behavior (either overall or for specific customers) and alerts are generated when activity is outside such expected behavior.

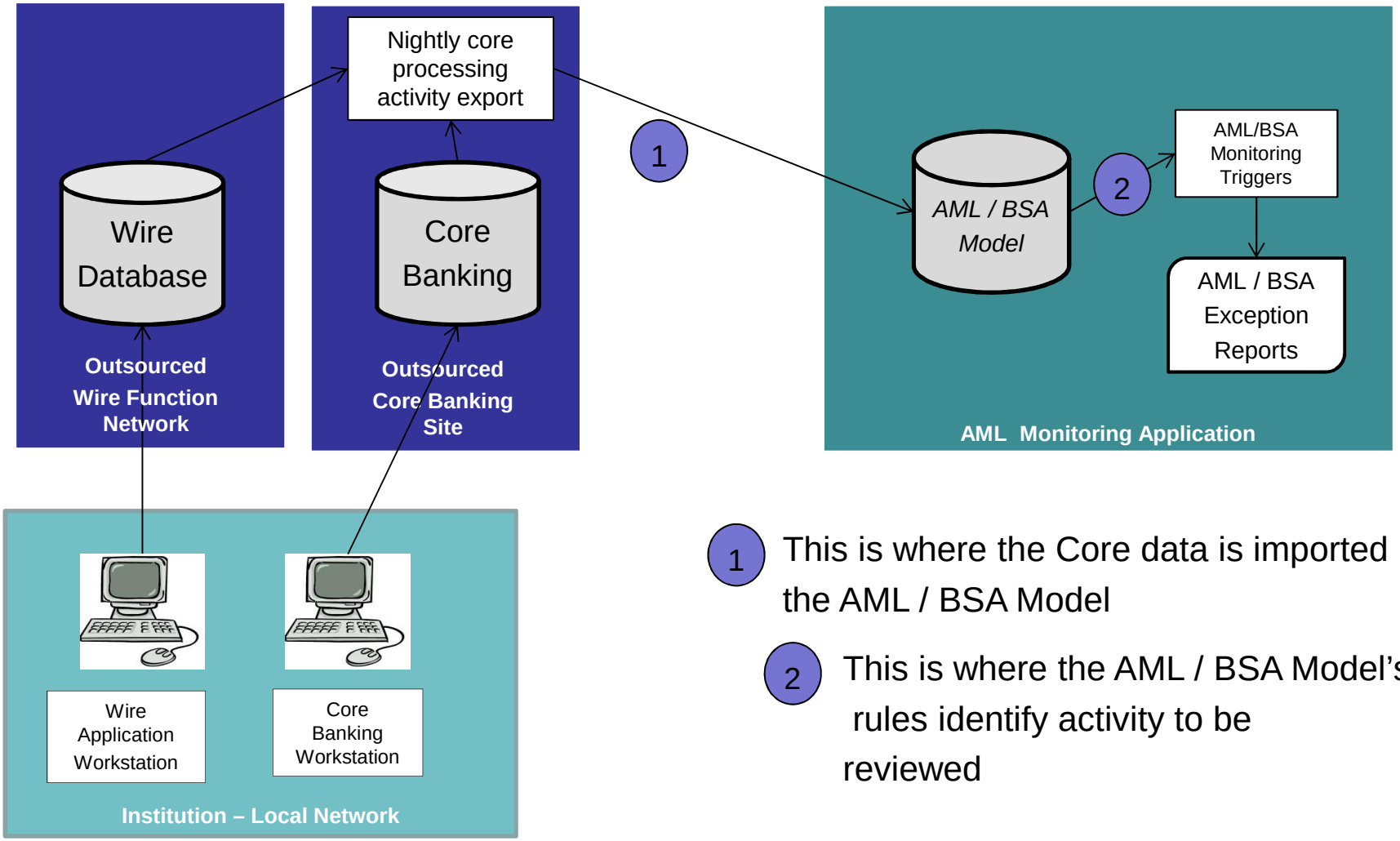
AML Model - Components

Items Required for Testing:

- Core Reports showing all transactional data for the time period
- Wire activity reports
- BSA/AML system reports for rules and/or configurations
- Exception lists
- User Access List
- Employee Roster
- Change Management Policies and Procedures surrounding your BSA/AML system

AML Model – Data Flow

Where do we start? Identify the Data flow:



1 This is where the Core data is imported into the AML / BSA Model

2 This is where the AML / BSA Model's rules identify activity to be reviewed

AML Model - Known Issues

- Bad data inappropriately mapped to the

- Entire modules not processing over
- Random transactions not processing over
- Transactions not being appropriately risk rated in the BSA/AML model

Lending Models

- How many banks have completely integrated the use of credit scoring models into their retail lending?

- How many banks have completely integrated the use of credit scoring models into their small business lending?

ALLL Models

- Documentation tends to vary, depending upon the level of sophistication in the bank's allowance evaluation process.

- In many banks, the documentation consists of a simple narrative.

- In banks with greater analytical capabilities, the adjustments to historical loss experience may be based upon the results of a regression analysis or other modeling technique.

ALLL Models

- According to a recently published survey, approximately 23% of banks smaller than $5 billion in assets have not performed a validation.

- ALLL back testing compares the allowance as of a point in time with the actual losses experienced over the loss emergence period.

- Conservative estimates often lead to over-estimation bias.

ALLL Back Testing

- ASC 310/FAS 114 “Accounting for Creditors for Impairment of a Loan”

- Determine if loan impairment analysis was an accurate predictor for the total loan loss associated with those loans.

Information Technology: System Validations

- Part of Model Risk Management is ensuring that your system is functioning correctly

- Testing includes validation of the following:
  - Completeness and Accuracy
  - Data Integrity
  - Data Security

- The institution needs to validate that system monitoring and interfaces are functioning appropriately as configured

Models - Your Role

- Management plays a key role in verifying that acceptable policies are in place and are followed.
- Documentation supporting model usage and an effective test program improves the effectiveness of each model your institution uses.
- Failure to effectively manage your model risk will prevent your institution from achieving your strategic objectives

Thank You

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