Model Governance

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FMS EAST COAST REGIONAL CONFERENCE

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Agenda

Importance of Model Risk

Challenges to the Validation

Ongoing Performance Monitoring

Definition of a Model

OCC 2011-12 / SR 11-7

Part 1:

- *"[T]he term model refers to a quantitative* ***method, system, or approach*** *that applies* ***statistical, economic, financial, or mathematical theories, techniques, and assumptions*** *to process input data into* ***quantitative estimates****."*

Good, but fails to mention the key discriminant of model vs. non-model tool: **uncertainty of the outputs.**

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Definition of a Model (cont.)

OCC 2011-12 / SR 11-7

Part 2:

- *"A model consists of **three components**:*
  - *an information input component, which delivers assumptions and data to the model;*
  - *a processing component, which transforms inputs into estimates; and*
  - *a reporting component, which translates the estimates into useful business information…"*

Accurate, but **not** useful in differentiating models vs. non-model tools (it applies equally to both).

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Regulatory Guidance

Office of the Comptroller of the Currency (OCC) & the Federal Reserve published Supervisory Guidance on Model Risk Management in April 2011 (OCC 2011-12, SR 11-7).

- Articulates elements of a sound program for effective management of risks that arise when using quantitative models in bank decision making.
- Models can improve business decisions, but they also impose costs, including potential for adverse consequences from decisions based on models that are either incorrect or misused.
- Potential for poor business & strategic decisions, financial losses, or damage to a bank's reputation when models play a material role is the essence of "model risk."

Risks of an Un-Validated Model

- Incomplete/inaccurate customer or transactional data
- Data mapping errors/irregularities
- Design of rules and/or configurations inconsistent with regulatory expectations & bank's exposure to related risks
- Lack of change management and/or adaptation to changes in products/services
- Underutilization of feature functionality
- False positive are costly
- Sustainability
- LOOK BACK!

Basic Principles of Model Risk Management

Governance, Policy & Controls	Development, Implementation & Use	Model Validation & Process
• Model Risk Management Policy • Defining a Model vs. a Tool • Risk Rating the Model • Using Vendor Models • Change Control Process • Interpretation of Regulation	• Process for Design • Model Limitations • Model Testing • Documentation • Model Error Remediation	• Model Validation Procedures • Nature of Monitoring • Frequency of Validation • Conceptual Soundness • Data Input Validation • Model Outcomes Analysis

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Institutional Decision Making

CECL (Current Expected Credit Loss) model validations to take effect in 2020/2021.

Customer Engagement /Marketing Models help broaden institution's outreach & identify effective marketing channels.

Transaction Monitoring for BSA/AML & Fraud

Reliance moves from experience and instinct to analytic models for financial decision making

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More Models Under Regulatory Definition

- Value at Risk (VaR)
- Asset-Liability Management & Liquidity
- Expected Shortfall
- Capital Forecasting
- Econometric
- Marketing Models
- Client Targeting Models
- Loss Given Default (LGD)
- Credit Valuation Adjustment (CVA)
- Actuarial
- Derivatives
- Risk Based Pricing
- Trading
- Security/Asset Pricing
- Portfolio Allocation
- Anti-Money Laundering (AML)
- Fraud Surveillance
- Profits & Loss Attribution
- Cash Flow Forecast
- Mergers & Acquisitions

Models exist in all business lines & reliance is increasing!

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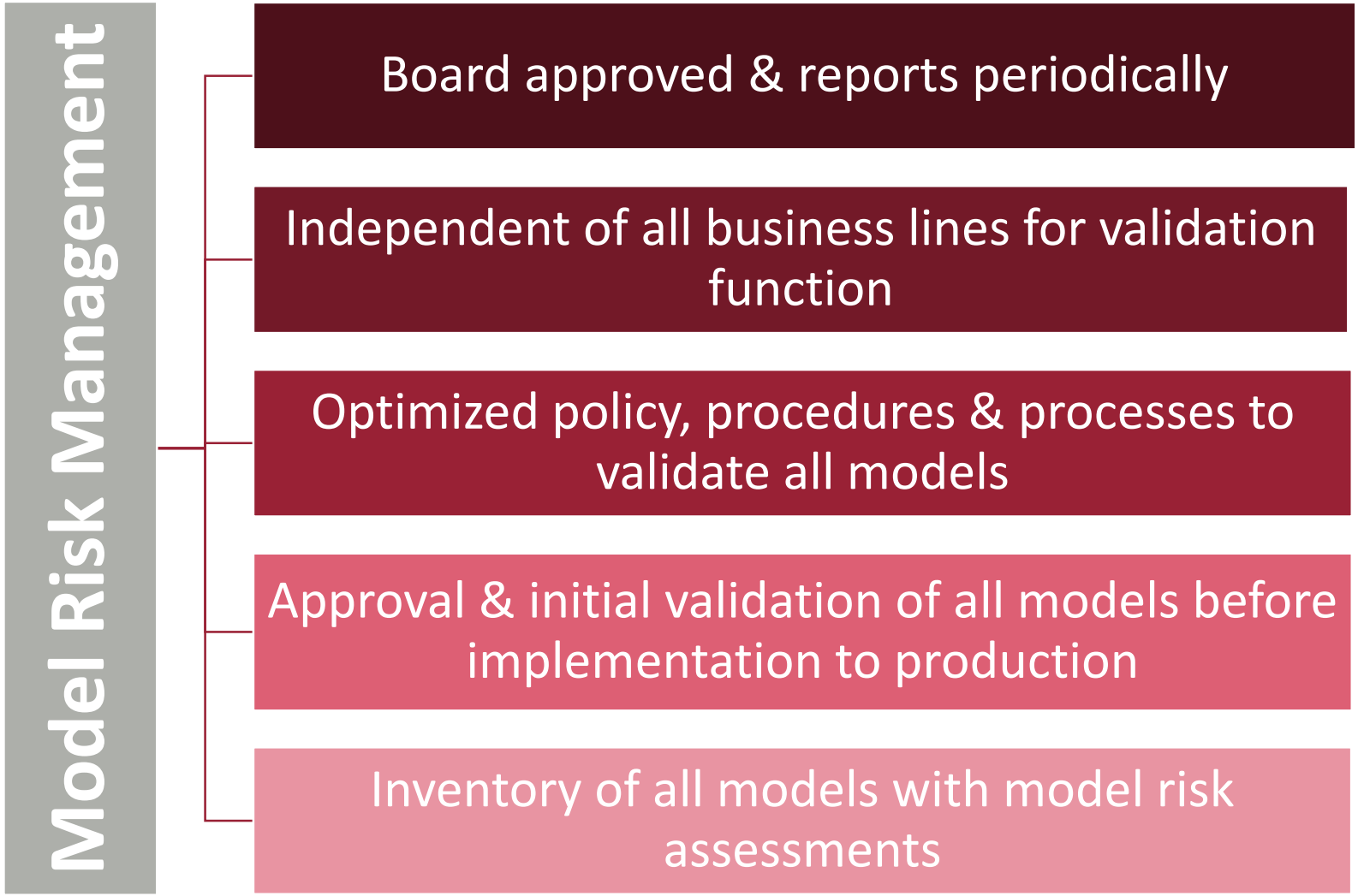
Model Control Framework



Model Control Framework

Model Development/Implementation

This includes much testing including back-testing, stress tests, stability tests, source code and data feed testing & sensitivity testing.

Model Review Approval

The Model is approved after the testing & implementation is complete, the model is validated & senior management/board committee approval.

Performance Monitoring & Ongoing Validation

Model review & revalidation should be driven by: Material model changes, significant risk appetite or market changes, model performance deterioration identified by users & regulatory guidance.

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Model Validation Steps

Conceptual Design

Evaluating conceptual design & capabilities to include business & regulatory alignment & developmental evidence

System Validation

Validating that systems are properly designed to execute on the model with specific focus on system functionality, limitations, & data integration

Data Validation

Validating that accurate & complete information is captured by a system to execute the models

Process Validation

Ensure adequate design & ongoing sustainability surrounding processes & administration of system & model

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After the Validation

Validation is like a snapshot

- How is the model evolving?

Continuous Monitoring of the Model

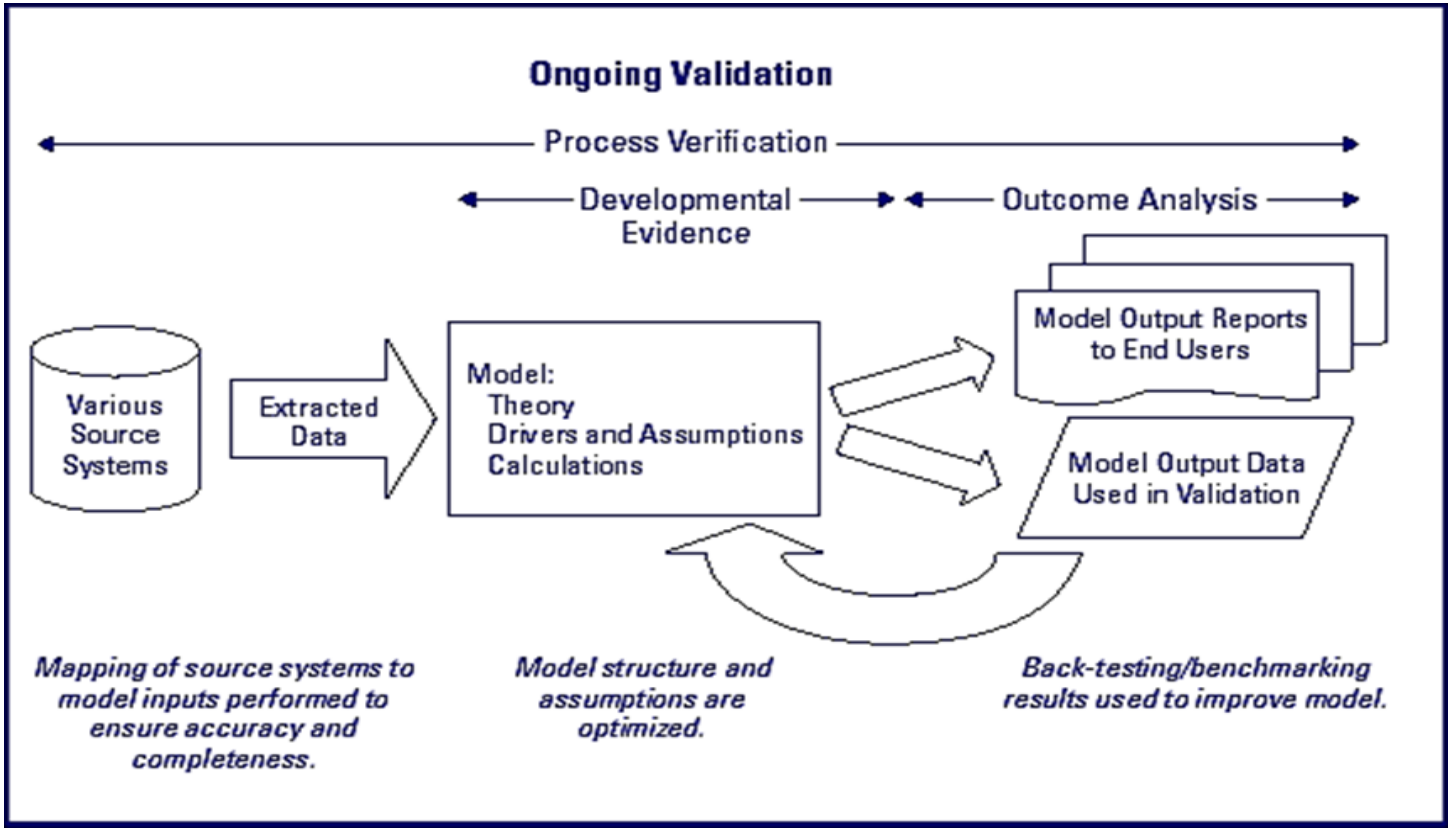
- Ongoing monitoring of stress test models may place less emphasis on performance testing and more emphasis on risk identification

Governance & Owner responsibilities

- Is there a model management group?
- Have any conditions changed impacting inputs?
- How has the business or product offerings evolved
- Are market conditions still supporting assumptions?

After the Validation - Ongoing

- Source: www.Model Validation\FDIC Supervisory Insights - Compliance Examinations.htm



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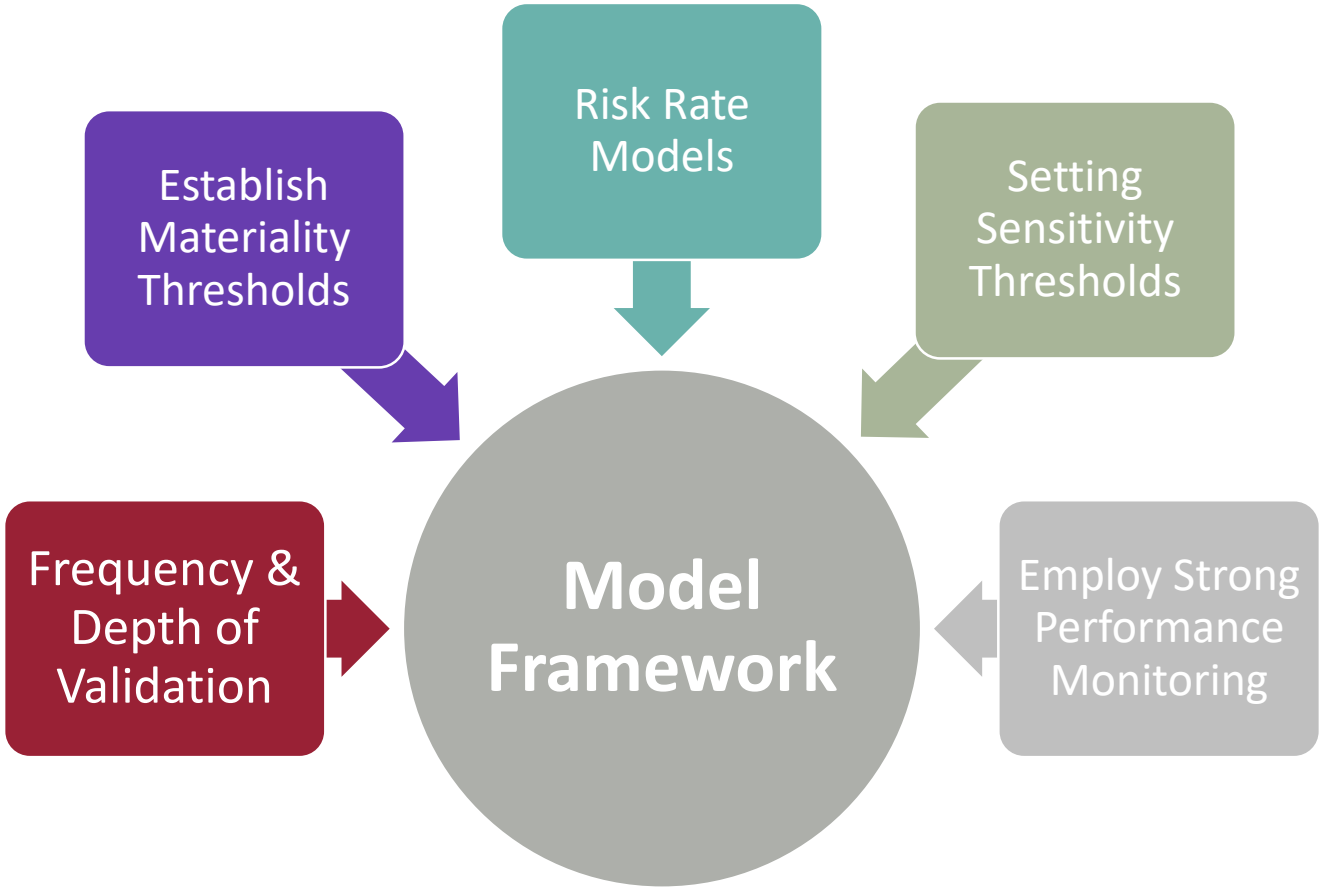
After the Validation – Model Use & Purpose

After validation, Model Risk should ***continue*** to review the current usage of the model to ensure that it is consistent with the limitations & conditions identified during development & validation.

Model Risk should also be ***ensuring*** it remains relevant & appropriate for use.

Model Risk should also be ***ensuring*** the model is only being used for what it was designed to do & under conditions in which it is expected to perform well.

Model Risk - Leveraging the Validation

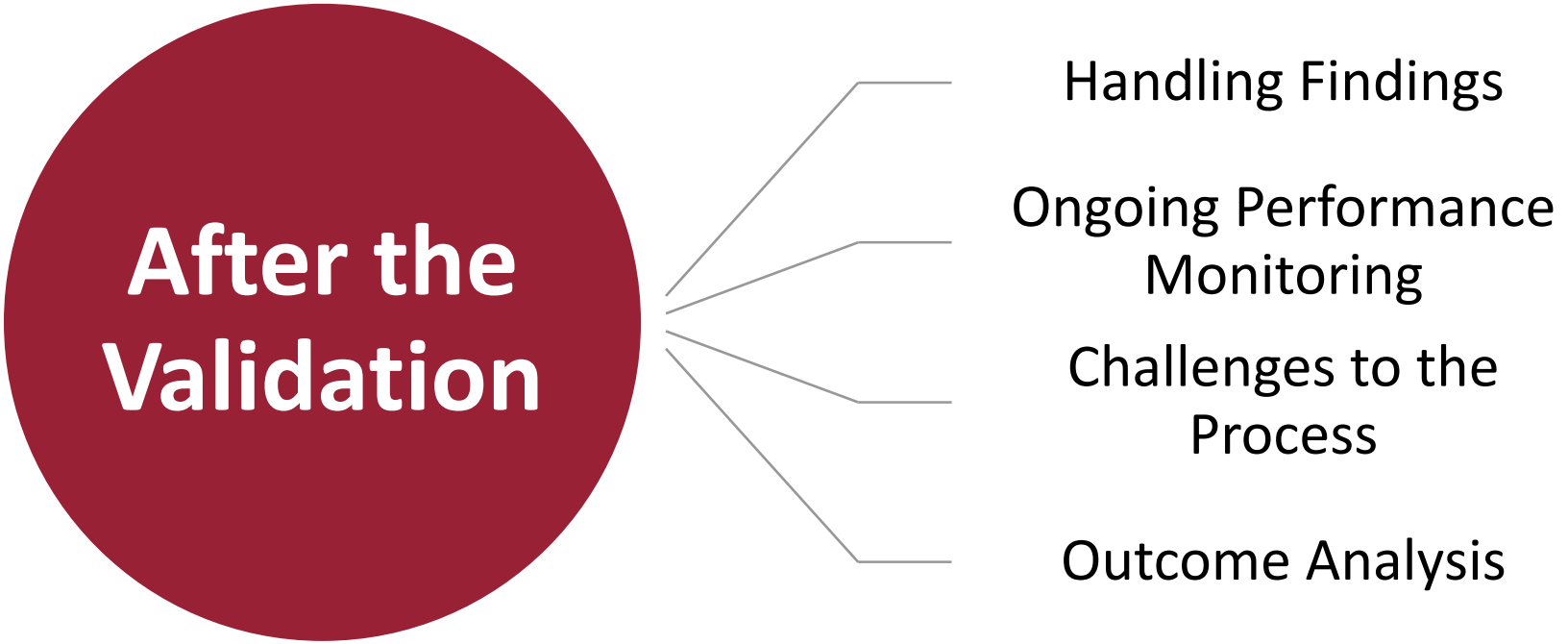


End Users - Effective Challenge

Follow-up to a validation

- Handling findings, ownership of change – what is the catalyst?
- Resolving differences of opinion
- Fixing identified problems
- Governance process – who owns the model?
- Resolving conflicts

Key Takeaways



Ongoing Performance Monitoring

Performance monitoring should be ongoing

Ongoing monitoring should address one or a combination of the following:

- Analysis of overrides with appropriate documentation
- Benchmarking
- Code Review
- Model Replication
- Data Reconciliation
- Assessing the control environment
- Review reporting to ensure accuracy

Ongoing Performance Monitoring

Determine Thresholds

- Measure Materiality
  - Earnings Risk
  - Compliance Risk
  - Default Risk
- Set Boundaries
  - Static Measurement
    - Plus or Minus x or y
  - Dynamic Measurement
    - One Standard Deviation

Determine Risks

- Impact
  - Earnings
  - Compliance
  - Default
- Likelihood
  - Model Use
    - Velocity

Determine who performs the monitoring – you or the vendor or both?

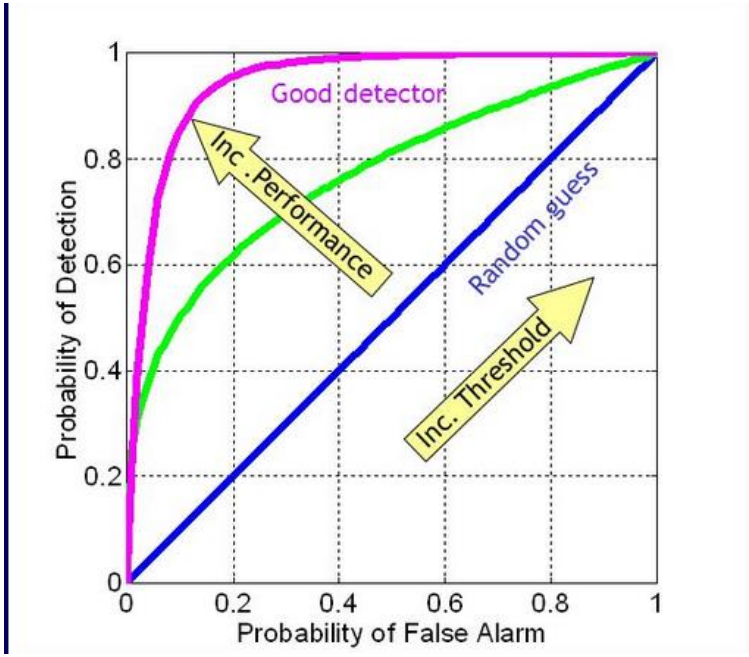
Performance Monitoring

Performance Monitoring Basic Touchpoints

- A review of model weaknesses & limitations
- Change in the model use
- Change in portfolio composition
- Change in the Bank's strategy
- Industry & economic environment changes
- Observed data errors or other operational failures

Benchmarking & Parallel Testing

- Benchmark the appropriate metric
- Measure against development data
- Run last version against current version
- Consider KS (Kolmogorov-Smirnov) test
- ROC (Receiver operating characteristic) Test



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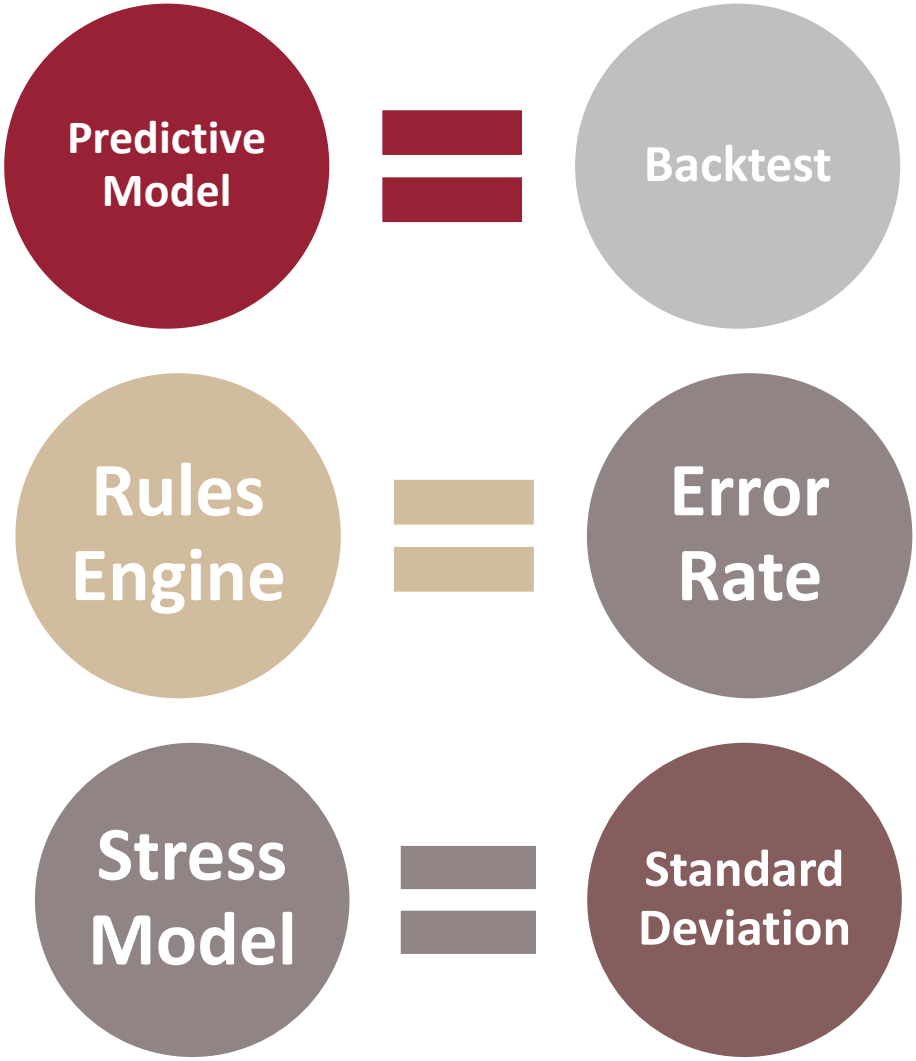
Different Models, Different Approaches



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Session Takeaways

- ✓ Model Risk has three lines of defense:
  1. Model Development/User
  2. Model Validation/On-going Validation
  3. Internal Audit
- ✓ Model Risk Management should centralize all models & be able to validate & assess the risk of all models at the institution
- ✓ Initial validation & re-validation periodically, based on centralized risk assessment
- ✓ Subject Matter Experts may be needed to provide efficient & sustainable performance monitoring enhancements

Questions?

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