



Asset Liability Management 101 - Part Three of Three:

How Good Governance Strengthens Your Model Framework and Mitigates Risk

Wednesday, November 17th, 2021

**MountainView Risk & Analytics,
a SitusAMC Company, provides model
risk management services and loan
and deposit behavior analytics that
enable financial institutions to
identify and manage risk.**

Formerly McGuire Performance Solutions, MountainView's team of experts empowers our partners to make informed and confident decisions leveraging our unrivaled depth of expertise, dedication, and market knowledge.



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ALM / IRR Webinar Series 2021

3 - TODAY

How Good Governance Strengthens Your Model Framework & Mitigates Risk

Webinar #1

**Laying The Foundation
For Interest Rate Risk Management**

Webinar #2

**Building a Sound IRR Model &
Testing Assumptions**



Goals of the Session

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Framework for a Solid Governance Solution



Supervisory Guidance on Model Risk Management

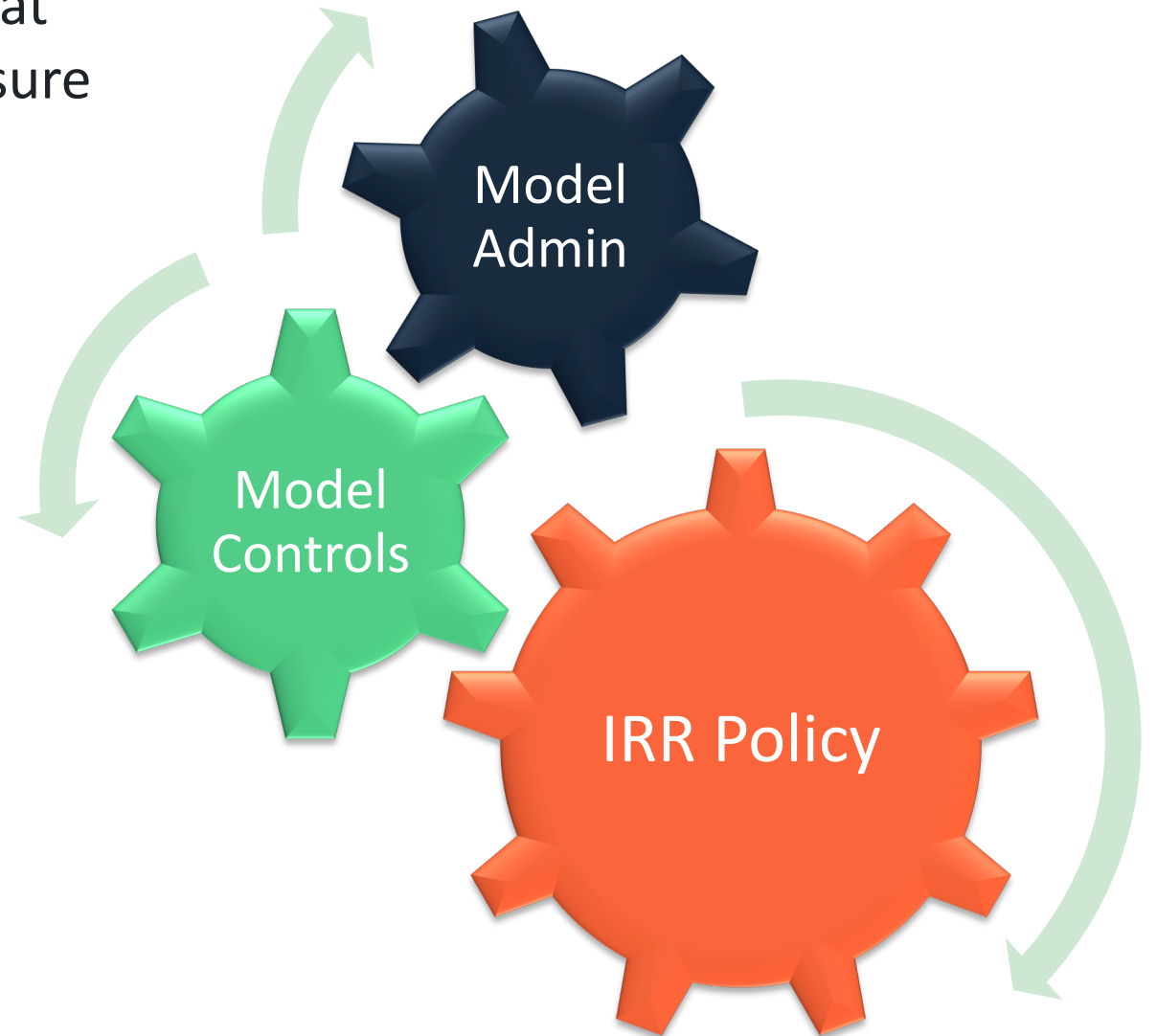
“Developing and maintaining strong governance, policies, and controls over the model risk management framework is fundamentally important to its effectiveness. Even if model development, implementation, use, and validation are satisfactory, a weak governance function will reduce the effectiveness of overall model risk management.”

- April 4, 2011



Effective Governance Solution

Regulatory guidance is clear in asserting that strong model governance is required to assure that ongoing model risk is minimized.



Components of a Solid IRR Policy



Interest Rate Risk Policy

Establishes the full disclosure of the entire “Implicit Contract” between all stakeholders for interest rate risk management

- Establishes accountability and responsibilities
- Formal policy addresses all facets of ALM modeling including systems, measurement methodologies, and risk analysis
- Policy limits and expectations
- Risk mitigating strategies
- Model monitoring activities
- Approvals, validation and policy interrelations

Stakeholders

- *Board of Directors*
- *ALCO*
- *Sr. Management*
- *Regulators*

Governance

Statement affirming the Board's acceptance of **full** responsibility for risk and **delegates** day-to-day management to ALCO

Comprehensive list of responsibilities and duties for clear lines of authority



IRR Measurement Methodologies

1 IRR Measurement

System used to measure IRR

IRR monitoring methods (NII and EVE/NEV)

Frequency of required assessment

2 Rate Scenarios

Source and type of Base Case rate projection

Defined Shock Scenarios

NII IRR time horizons (12 and 24 months)

3 Balance Sheet

Type of balance sheet used (static vs. dynamic)

Forecast source for dynamic.

Scenario Stress Testing

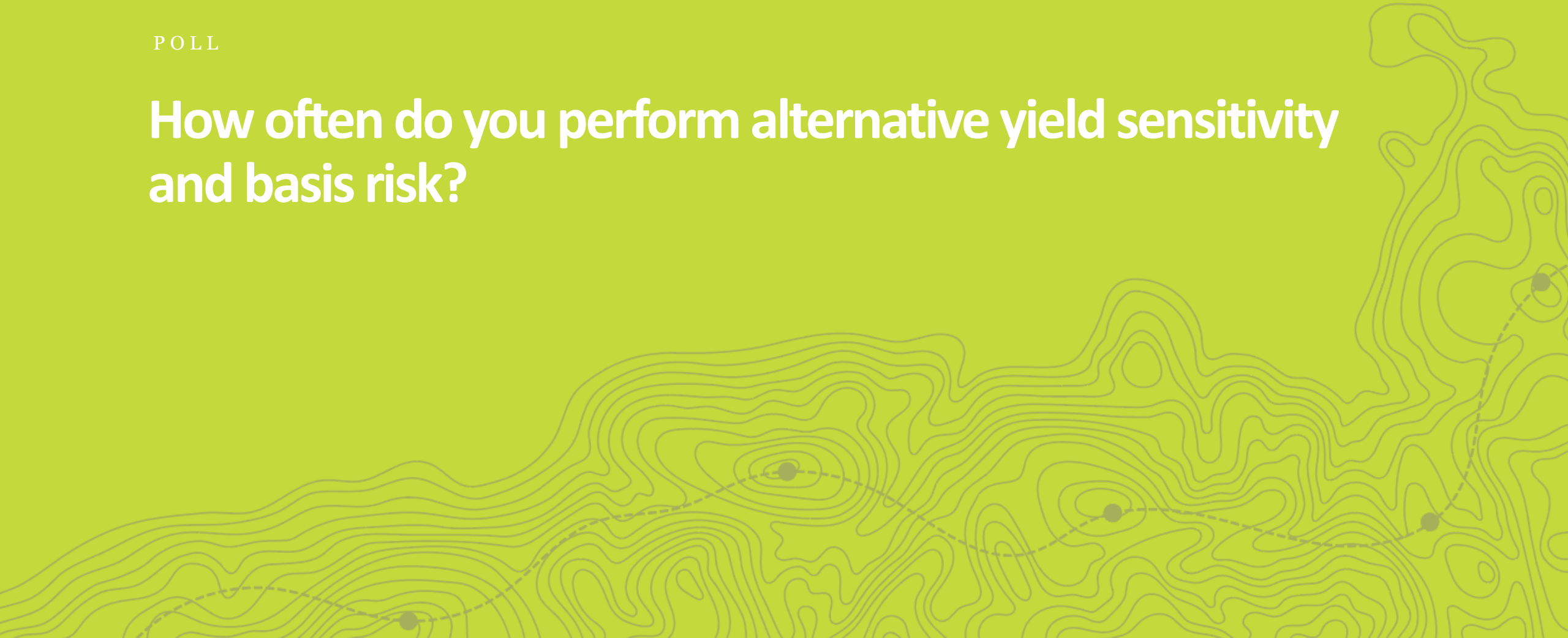
Regulatory guidance¹ mandates the rate of interest rate scenarios be sufficient to identify basis risk, yield curve risk and risks of embedded options.

- Scenarios to be tested
- Basis risk testing
- Yield curve risk
- Stressing of embedded options
- Suspension of scenarios in extreme rate environments

¹Advisory on Interest Rate Risk Management, January 6, 2010

POLL

How often do you perform alternative yield sensitivity and basis risk?



Defining Exposure Limits



Exposure Limits

What is the Board's "Appetite for Risk"?

Policy Limits for IRR should align with the Board's risk tolerance

- Must align with current structure of the balance sheet and current product offerings
- Define limits by rate scenarios for earnings and equity at risk (NII and EVE/NEV)
- Institutions should define limits across a range of scenarios to assess embedded optionality.
- Standard practice is to define for Rate Shock (instantaneous and parallel)
- Allow rate scenarios to be suspended because of market rate environment.

NII IRR Exposure Limits

Focus for NII measurement is to capture the short-term impact of interest rates changes on balance sheet performance.

- Limits should expand linearly at a minimum
- Limits for 24 months typically expand beyond the 12-month limits because more optionality can be triggered

NII Risk Limits (% Change from Base Case)		
Rate Shocks	NII Year 1	NII Year 2
+/- 100	-3%	-5%
+/- 200	-6%	-10%
+/- 300	-9%	-15%
+/- 400	-12%	-20%

EVE / NEV IRR Exposure Limits

Focus for EVE/NEV measurement is to capture the long-term impact of interest rate changes on the market value of the balance sheet

- Limits should expand linearly at a minimum
- Limits for EVE / NEV are typically larger than NII (long-term vs. short-term)

EVE / NEV Risk Limits (% Change from Base Case)	
Rate Shocks	EVE / NEV
+/- 100	-8%
+/- 200	-16%
+/- 300	-24%
+/- 400	-32%

Options and Limits

The amount of optionality held in the balance sheet will factor into the limits for IRR.

- Where there is a material amount of optionality the limits should expand more (non-linearly) due to the potential of triggered options (i.e., calls or puts).
- Options change maturity and repricing cashflows as rates rise or fall.
- The impact can be even larger when looking beyond the 12-month time horizon.

NII Risk Limits (% Change from Base Case)	
Rate Shocks	NII Year 1
+/- 100	-3%
+/- 200	-6%
+/- 300	-9%
+/- 400	-12%

NII Risk Limits (% Change from Base Case)	
Rate Shocks	NII Year 1
+/- 100	-3%
+/- 200	-7%
+/- 300	-12%
+/- 400	-18%



Exposure Zones for Reporting

Improve communication with the ALCO and Board



Increasing Levels of IRR Exposure

NII Risk Limits (% Change from Base Case)			
	NII Yr. 1	NII Yr. 1	NII Yr. 1
Rate Shocks	Green Zone	Yellow Zone	Red Zone
+/- 100	<-2%	-2.99 to -2.00%	-3% or >
+/- 200	<-4%	-5.99 to 4.00%	-6% or >
+/- 300	<-6%	-8.99 to 6.00%	-9% or >
+/- 400	<-8%	-11.99 to 8.00%	-12% or >

Risk Mitigating Strategies

Regulatory guidance² mandates a list of potential actions to bring limits back within acceptable levels

Include Policy discussion around strategies for managing IRR such as:

- Selling longer term loans and investments
- Additional longer-term funding
- Adjusting balance sheet mix
- Adjusting pricing
- Use of derivatives

Include a statement noting actions are not limited to those listed.

²Advisory on Interest Rate Risk Management, January 6, 2010

Policy Exception Actions

- Policy exception strategies help to mitigate IRR
- Identify steps to take when results are outside of tolerance limits
 - ✓ Inform ALCO/Board
 - ✓ Additional what-if scenarios may be required
 - ✓ More frequent monitoring or testing required
 - ✓ Present strategies and plans for correction and timing

POLL

Where do your policy limits fall?



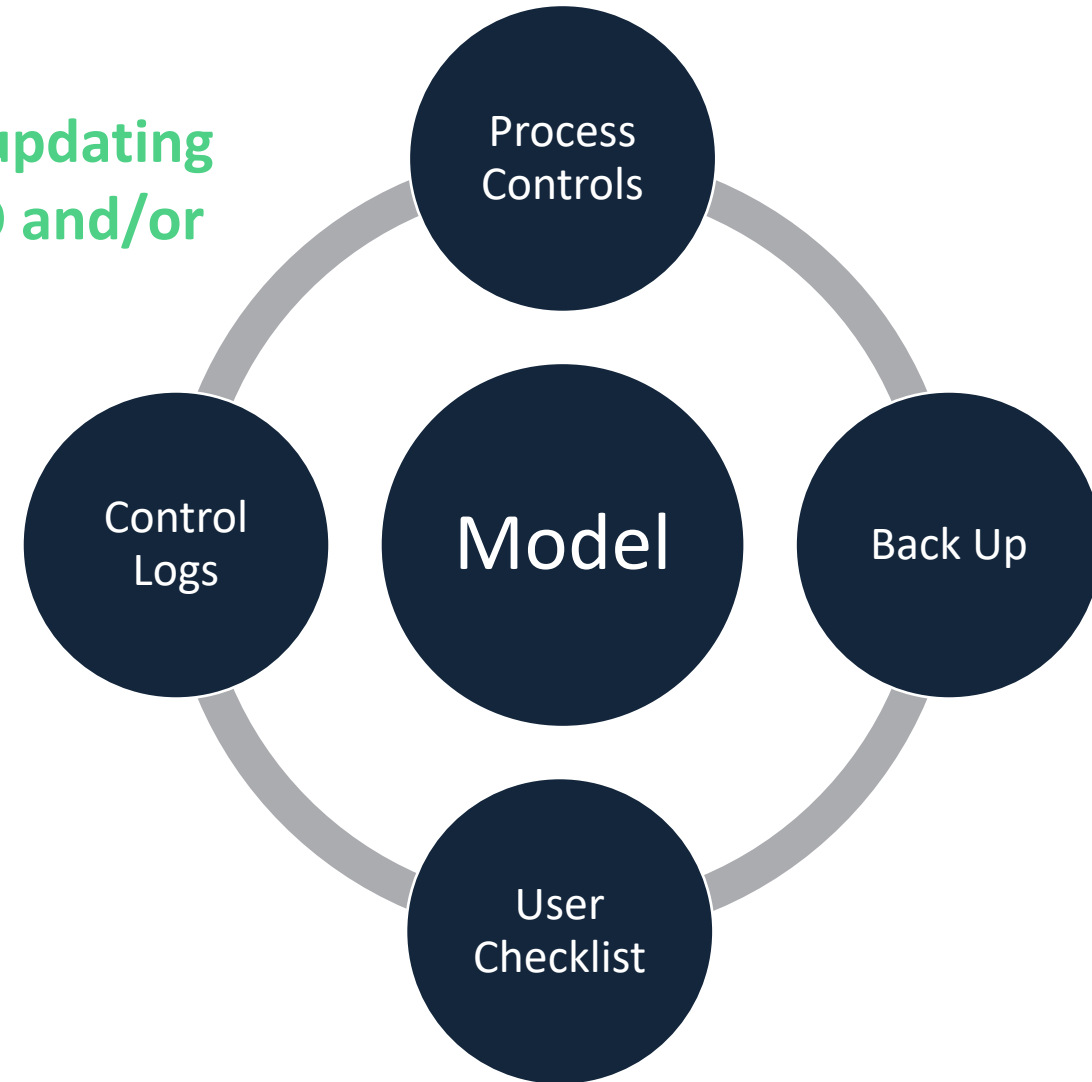
Model User Controls & Documentation



Model Control Documents

User's list of procedures documents each step to updating the IRR model and producing reports for the ALCO and/or Board package.

- Provides transparency of the process
- Provides a “corporate memory” of the model changes and processes
- Increases confidence of the user and Board\ALCO in the model results
- Emergency coverage and update of the model



User Checklist

The User's checklist formally documents all the key modeling steps.

IN-HOUSE MODELS

- ✓ Each step is “checked-off” by initialing
- ✓ Secondary review (i.e., by manager)
- ✓ Include steps to gather data for model (source data and files)
- ✓ Include when items need review (i.e., prepayments)
- ✓ Special reporting or processes (i.e., monthly/quarterly/annually)
- ✓ Review of results for reasonableness

OUTSOURCED MODELS

- ✓ Include steps to gather data for model (source data and files)
- ✓ Include when items need review (i.e., prepayments)
- ✓ Special reporting or processes (i.e., monthly/quarterly/annually)
- ✓ Review of results for reasonableness when receiving the IRR results back from the vendor

Institution
is still
responsible

Change Control Log

The corporate memory of all changes (significant) to model:

- Model set up
- Data (i.e., additions to file import layouts)
- Contractual inputs
- Behavior Assumptions
 - Decay rates or average lives
 - Prepayment rates
 - Offering rate formulas or ties

Ideally, include results before and after changes in order to quantify impact of the changes.

User Controls, Back Ups, and Model Admin

- Model User Access
- Defined model contingency plan:
 - ✓ Model back up, storage, and restore process
 - ✓ Contingency plan if the model is not available for a long time
- User cross-training procedures
- An independent validation of the model and assumptions periodically

Model Documentation

Comprehensive documentation is critical

- Documents model's intended use and design and limitations
- Organized with how to operate the model and producing reports/results
- Inclusion of screen shots of model steps is beneficial
- Process Flow Charts
- Model maintenance notes
- File inventory of all files used to update the model
- Ideally, one single guide (document)

“Without adequate documentation, model risk assessment and management will be ineffective.

Documentation should be sufficiently detailed so that parties unfamiliar with a model can understand how the model operates, its limitations, and its key assumptions.”

Supervisory Guidance on Model Risk Management, April 4, 2011

Assumption Documentation

Create and maintain comprehensive assumption documentation as it relates to the IRR model.

- Detailed documentation of all IRR model assumptions
- What is the source of the model assumptions?
- How was the model methodology developed?
- How often are the assumptions reviewed and updated?

This assumption documentation is the “**how**” and “**why**” of key assumptions. It allows for full transparency to the stakeholders.

On-Going Model Monitoring Plan



On-Going Model Monitoring Plan

Model monitoring plan confirms that the IRR model is appropriately implemented and performs as intended.³

- Core element of the risk management process
- Assess model performance
- Check the model accuracy
- Provides confidence in model results for strategic decision making

³*Supervisory Guidance on Model Risk Management, April 4, 2011*

Components of an Effective OMM Plan

Component	Description / Examples
Outcomes Analysis / Back Testing	<ul style="list-style-type: none"> • Forecasted NII vs. Actual Results
Back Testing Assumptions	<ul style="list-style-type: none"> • Prepayments on investments/loans • Non-maturity deposit pricing (betas) • Non-maturity deposit decay rates or average lives
Sensitivity and Stress Testing of Key Assumptions	<ul style="list-style-type: none"> • Prepayments on investments/loans • Non-maturity deposit pricing (betas) / decay rates • New business pricing assumptions • CD early withdrawals
Benchmarking	<ul style="list-style-type: none"> • Comparing current yields/costs to results of the forecast • Comparing IRR results from last model to current model

Outcomes Analysis



Back Testing of Net Interest Income (NII)

A key element of establishing model performance is a comparison of model outputs to corresponding actual outcomes.

NII Back Test Example:

1. Complete the March 31, 2021, model as usual.
 2. Take forecast results from the model and save the balance sheet forecast, income statement and market rates.
 3. Once the 2nd quarter of 2021 is complete and closed compare the March 31st model **Projected** results of 2nd quarter to **Actual** results.
- Typically, quarterly back tests of NII are acceptable.

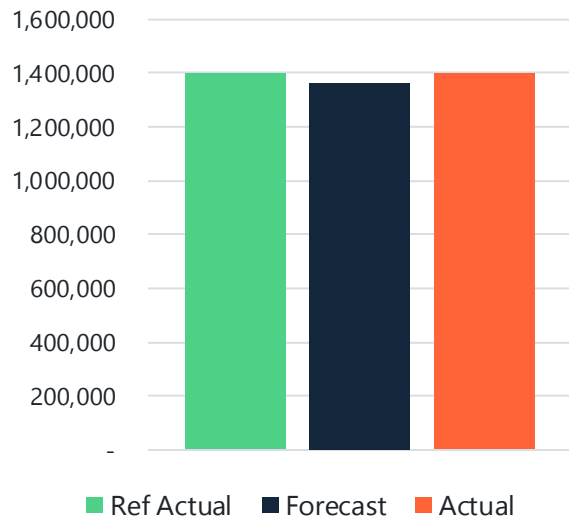
Back Testing of Net Interest Income

Forecast Versus Actual Income and Expense Performance

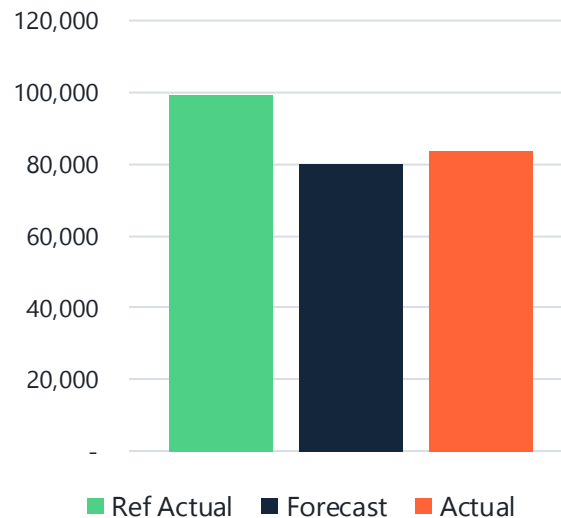
	Qtr 1 2021	Qtr 2 2021		Variance	Variance
	Ref Actual	Forecast	Actual	(dollars)	(percent)
Total Interest Income	1,400,300	1,364,000	1,400,350	(36,350)	-2.60%
Total Interest Expense	99,450	80,000	83,500	(3,500)	-4.19%
Net Interest Income	1,300,850	1,284,000	1,316,850	(32,850)	-2.49%

Within defined variance threshold

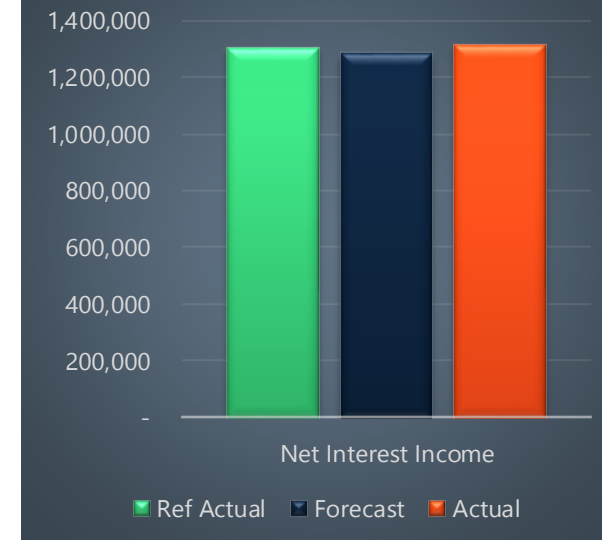
Total Interest Income



Total Interest Expense



Net Interest Income



Back Testing of NII – Rate / Volume Variance Reports

Variance report identifies key contributors to variances between volume, rate and mix.

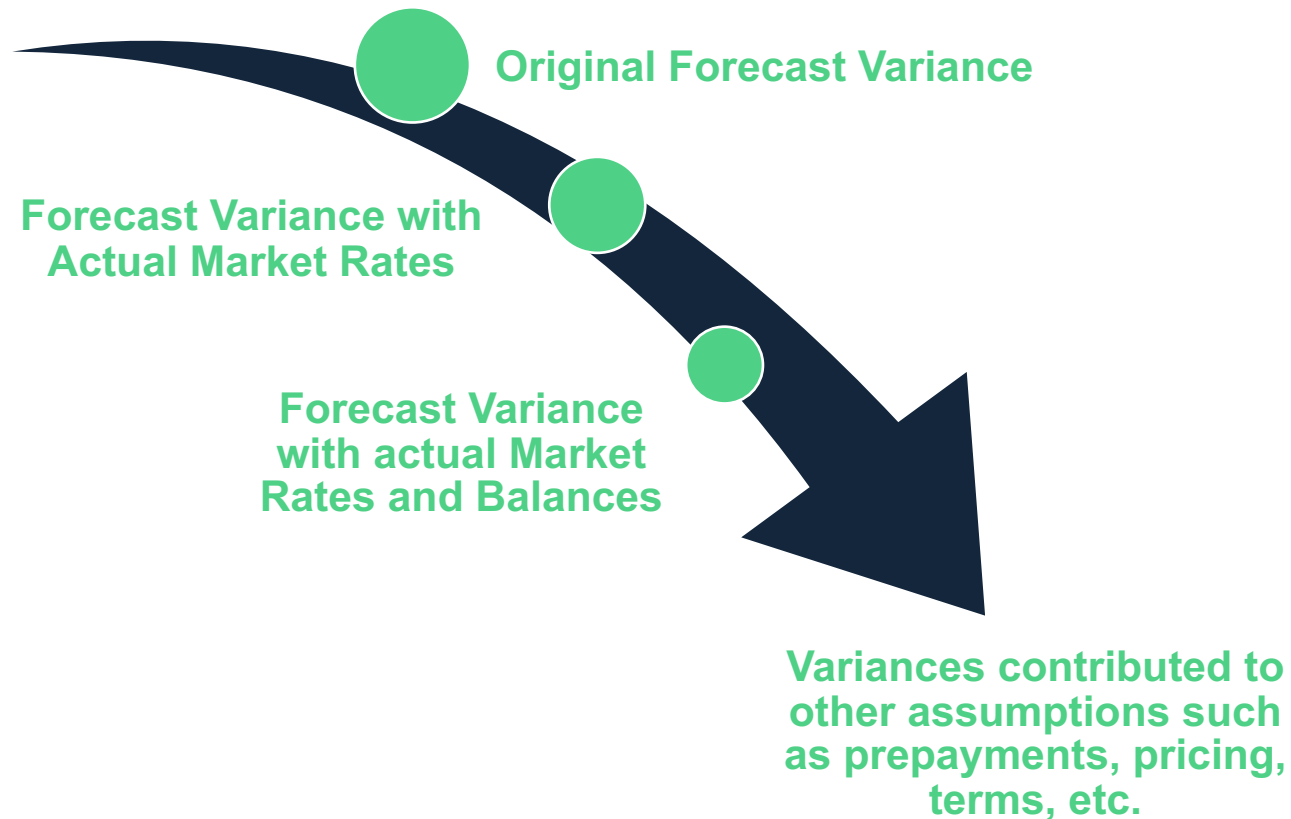
Rate-Volume Analysis

	Qtr 2 2021			Qtr 2 2021			Income / Expense		
	Volume: Balance			Rate: Yield / Cost			Increase / (Decrease) due to:		
	Forecast	Actual	Variance	Forecast	Actual	Variance	Volume	Rate	Mix
Interest Income									
Overnight Funds	2,400,000	850,000	1,550,000	0.17%	0.16%	0.00%	638	4	8
Total Investments	36,000,000	37,500,000	(1,500,000)	0.98%	1.07%	-0.09%	(4,000)	(8,333)	333
Total Loans	121,000,000	125,000,000	(4,000,000)	4.21%	4.16%	0.05%	(41,600)	17,149	(549)
Earning Assets	159,400,000	163,350,000	(3,950,000)	3.42%	3.43%	-0.01%	(44,962)	8,820	(208)
Interest Expense									
Int-Bearing NMD	60,200,000	65,500,000	(5,300,000)	0.17%	0.21%	-0.04%	(2,832)	(6,711)	543
Term Deposits	13,500,000	11,000,000	2,500,000	0.98%	1.00%	-0.02%	6,250	(611)	(139)
Borrowings	22,400,000	21,300,000	1,100,000	0.38%	0.39%	-0.02%	1,085	(1,031)	(53)
Int-Bear Liabilities	96,100,000	97,800,000	(1,700,000)	0.33%	0.34%	-0.01%	4,502	(8,353)	351
Net Interest Sprd	63,300,000	65,550,000	(2,250,000)	3.09%	3.09%	0.00%	(49,464)	17,173	(559)

Rate
Variances
muted at
total

Taking Back Testing One Step Further – Retrocasting

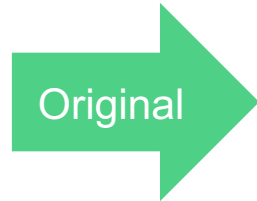
Retrocasting is an advanced modeling practice which helps specifically quantifies the individual drivers of variance.



Retrocasting Example

Forecast Versus Actual Income and Expense Performance

06/30/21



	Qtr 2 2021		Variance	Variance
	Forecast	Actual	(dollars)	(percent)
Total Interest Income	1,364,000	1,400,350	(36,350)	-2.60%
Total Interest Expense	80,000	83,500	(3,500)	-4.19%
Net Interest Income	1,284,000	1,316,850	(32,850)	-2.49%

Actual Market Rates

Total Interest Income	1,370,000	1,400,350	(30,350)	-2.17%
Total Interest Expense	81,200	83,500	(2,300)	-2.75%
Net Interest Income	1,288,800	1,316,850	(28,050)	-2.13%

Actual Market Rates & Balances

Total Interest Income	1,390,000	1,400,350	(10,350)	-0.74%
Total Interest Expense	82,500	83,500	(1,000)	-1.20%
Net Interest Income	1,307,500	1,316,850	(9,350)	-0.71%

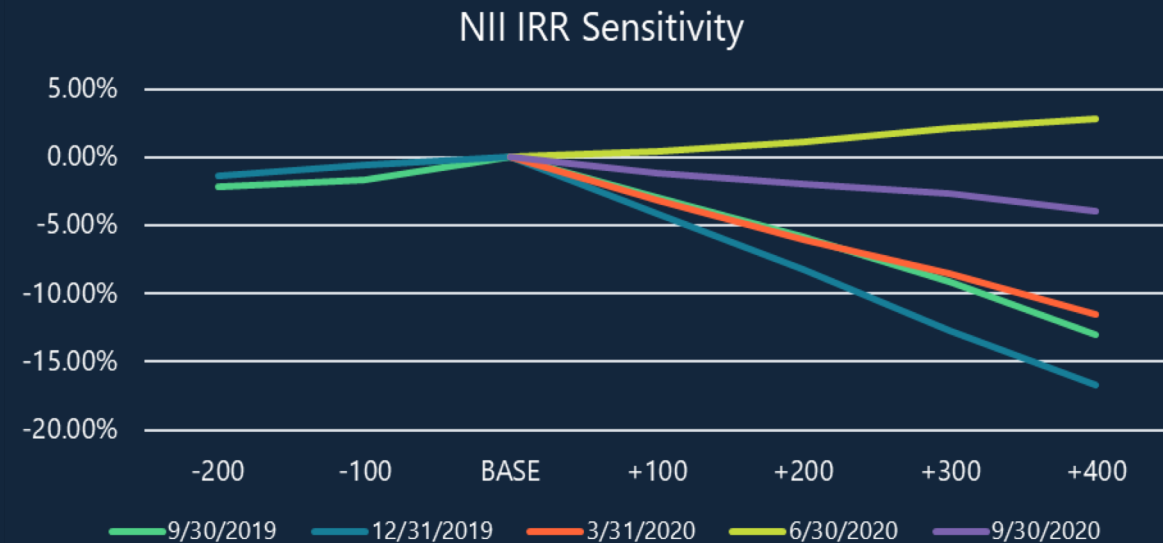
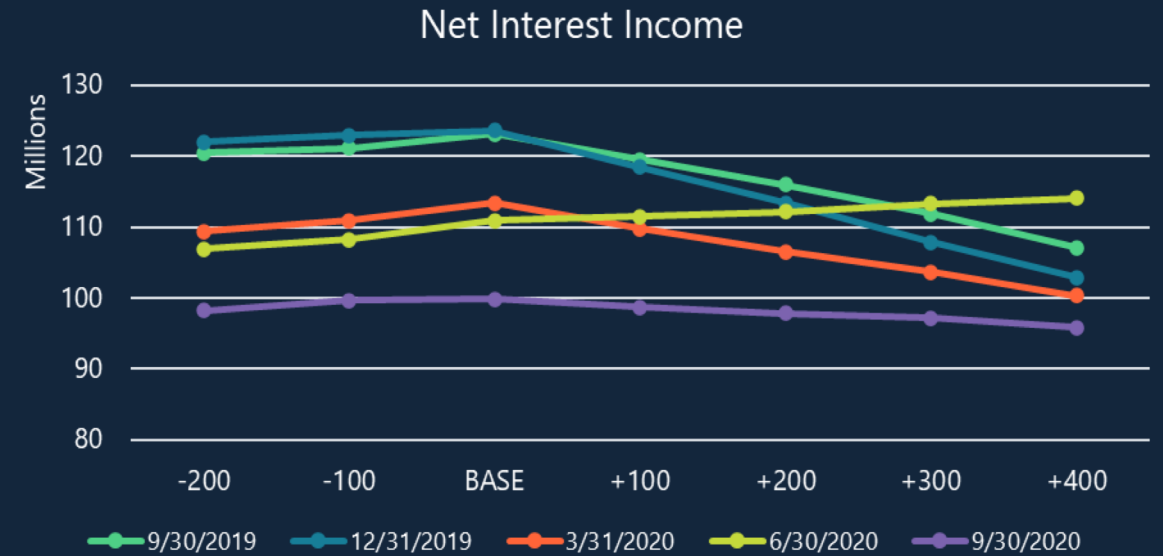
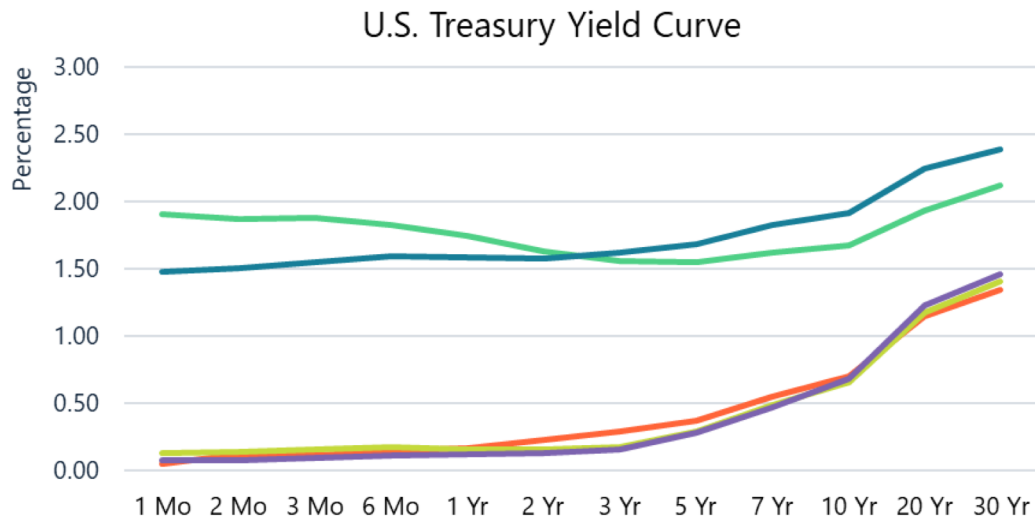
Variations attributable to assumptions



Outcomes Benchmarking

Compare current IRR Profile to historical or last model run

- Confirm changes are reasonable, if not, investigate
- Review of profile results over time can indicate trends.



Outcomes Benchmarking – Short term view

Benchmark actual yields/costs to forecasted yields/costs (month 1)

- Review the yields/costs to ensure the rates are logical.
- Variance between the current vs. forecasted should be easily explained (i.e., variable rate index increases).

Account Category	6/30/21 Current Position Rate	Model Produced Month 1 Rate	Yield or Cost Variance	Comments
Bus Ln Fixed Rate Term	4.38	4.35	(0.04)	
Bus Ln 5 Yr FHLB	4.82	4.80	(0.02)	
Bus Ln Prime I/O	5.96	6.23	0.27	Review suggested
Bus Ln Prime	4.58	4.58	(0.00)	
Tot Comm Loans	3.39	3.37	(0.02)	
R/E 5+ Family Mtg	5.68	5.68	0.00	
R/E 5+ Fam. 5 Yr FHLB	5.26	5.25	(0.01)	
R/E Comm Mtgs	4.53	4.53	(0.00)	
R/E Var 5 Yr FHLB	5.14	5.13	(0.01)	
R/E Var Prime	4.51	4.71	0.20	
R/E Var Prime I/O	4.41	4.39	(0.02)	
Part Bought Mtgs - Var	3.82	0.08	(3.74)	Significant variance
Part Bought Mtgs - Fixed	5.50	4.34	(1.16)	Significant variance
Tot Mortgage Loans	4.85	4.93	0.08	

Can identify
bad data or
assumptions

Time Optimization for Effective Model Monitoring



Time Optimized Production

- Time optimized production must be an efficiency enhancement – not a reduction in risk monitoring
- Model monitoring is just as important as IRR profile updates
- If each quarter is the same without testing for accuracy, errors can go unnoticed
- Optimize production time by spreading tasks throughout the year
- Working smart with limited resources

Production Calendar

Time Period	IRR Analysis/Report	Trigger Checks	Special Production Activities
Quarter End /Month 1	NII and EVE/NEV IRR		
Month 2		✓	Alternate IRR Rate Tests 3 Month NII Back Test
Month 3		✓	IRR Position Sensitivity and Stress Testing
Quarter End /Month 4	NII and EVE/NEV IRR		
Month 5		✓	Alternate IRR Rate Tests 3 Month NII Back Test
Month 6		✓	Model Behavior Assumption Back Testing
Quarter End /Month 7	NII and EVE/NEV IRR		
Month 8		✓	Alternate IRR Rate Tests 3 Month NII Back Test
Month 9		✓	Model Validation Review
Quarter End /Month 10	NII and EVE/NEV IRR		
Month 11		✓	Alternate IRR Rate Tests 3 Month NII Back Test
Month 12		✓	Model Policies and Board Approval

Monthly IRR Modeling

Define what results demand a return to monthly IRR analysis

Potential Criteria for Special Monthly Update to NII IRR Analysis

Change in interest rates	Any notable (e.g., > 50 bp) change in the month
Prior forecast accuracy	Poor back test to most recent NII IRR analysis
Balance sheet size or structure	Any material structure changes
Liquidity or credit risk profile position	Any notable adverse change
Economic or financial sector conditions	Any notable situational or interest rate change
Request from ALCO or Board	At any time, a request is made

Conclusions

Regulatory guidance is clear in asserting that a strong model governance is required to assure that on-going model risk is minimized

We do this by:

- Establishing a solid IRR Policy – sound framework
- Confirming comprehensive model documentation and user controls
- Effective on-going model monitoring plan that takes a front seat is the IRR process



Thank You

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Our Offering

MountainView Risk & Analytics, a SitusAMC Company, is the leading provider of model risk management solutions and loan and deposit behavior analytics to financial institutions.

Formerly McGuire Performance Solutions, MountainView's team of experts leverage our Patented Advanced Assessment Methodologies and licenses to most major ALM models to empower our partners to make informed and confident decisions leveraging our unrivaled depth of expertise, dedication, and market knowledge.

OUR SERVICES

Model Validation

- Asset Liability Management "ALM" / IRR / FTP Models
- Liquidity Stress Testing Models
- CECL / ALLL Models
- Credit Models
- BSA / AML / Fraud Models
- MSR / Mortgage Pipeline Models
- Capital Stress Testing Models
- Pricing Models

Model Risk Management

- Model Risk Management Program Development
- Model Risk Management Gap Analysis
- Model Risk Management Program Review
- Model Documentation Development or Completion
- Liquidity Risk Management Function Review
- Policy Enhancements or Reviews
- ALCO or Board Training

Deposit Analysis

- Comprehensive Deposit Analysis
- Repricing/Runoff Analysis
- Summary Data Analysis
- Core Deposit Index
- Segmentation Analysis
- Structured Vintage Analysis

Loan Prepayment

- ALM Model Inputs Analysis
- CECL Model Inputs Analysis
- Loan Prepayment Index

CDI & Other Valuations

- Core Deposit Intangible Valuation Analysis
- CD Valuation Analysis
- Entity Valuation



By The Numbers

180+

Yearly Average of
180+ Model Validations

170+

Yearly Average of
170+ Deposit Studies

25+ Years


Robust Database & Experience
With Over 25 Years of
Data Collection and Delivery

Our Journey To Date

'95 **McGuire is Formed**
Dr. Bill McGuire and Dr. Richard Sheehan form McGuire Performance Solutions, an analytics firm providing loan and deposit behavior analysis and financial model validations

 **18+ Colleagues**


'14 **MountainView Acquires McGuire**
MountainView Financial Solutions, a leader in the valuation and brokerage of MSRs, Whole Loan and other financial instruments, acquires McGuire Performance Solutions.

 **80+ Colleagues**


'18 **Situs Acquisition**
MountainView Financial Solutions is acquired by Situs.

 **800+ Colleagues**

'14 **Further Investment in Analytics Services**
Company expands solutions and team to capture stress testing risk analytics including econometric credit models for DFAST/CCAR.

 **95+ Colleagues**

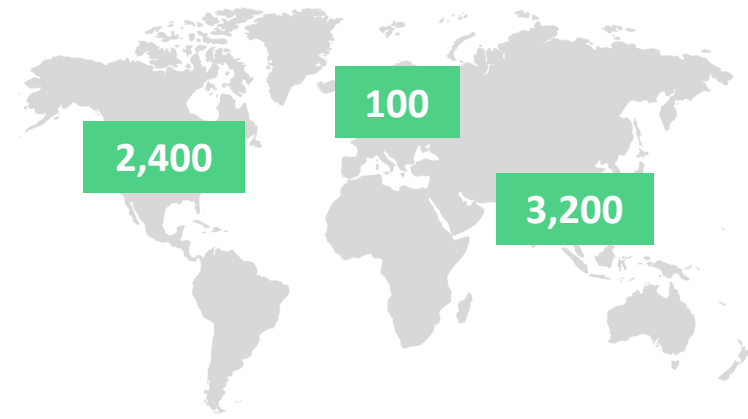
'19 **SitusAMC is Formed & MVRA Rebrands**
Situs merges with American Mortgage Consultants, Inc. to form SitusAMC, the leading technology and services provider to the real estate and corporate finance industry. MountainView's model risk management and loan and deposit offering is rebranded as MountainView Risk & Analytics, a SitusAMC Company.

 **5,700+ Colleagues**

SitusAMC is the leading independent provider of technology, data & analytics, strategic outsourcing, advisory, & talent solutions to the real estate & corporate finance industries



SitusAMC is a global firm that was formed in June 2019 by the merger of Situs Group Holdings Corp., American Mortgage Consultants, Inc., & associated firms



Situs

AMC

TECH ESSENTIAL

RERC

String

mbms
Not Just Software. Solutions.

MOUNTAINVIEW FINANCIAL SOLUTIONS
A Situs Company

MERIDIAN
Asset Services

SBO
Alan King and Co., Inc.

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CJC Technologies

ComplianceEase

Cohen Financial
A Division of SunTrust Bank

CrSquared
Shaping CRE Technology

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