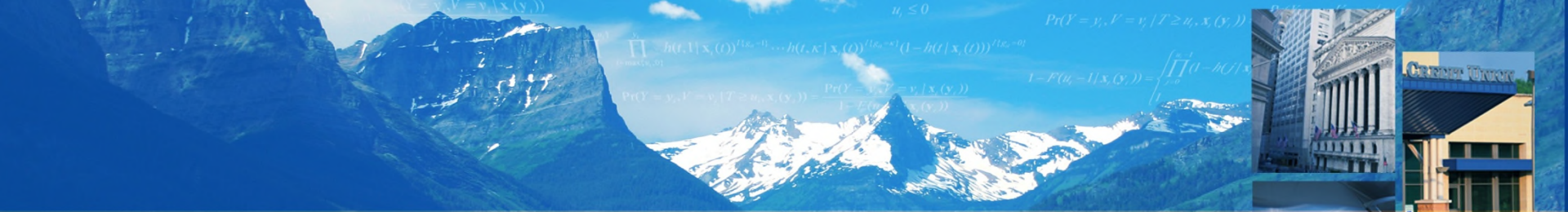# Montana Analytics Overview

Our Team Origins

- Started working in the financial industry in the early 1990's

- Trained and developed leading quantitative methods at Freddie Mac, Fannie Mae, Wells Fargo, Countrywide, Deloitte

- Grew within a dynamic quantitative finance industry including advanced modeling and challenges

- Maintained and enhanced a drive towards accuracy, testing and improving risk measurement methods

- Seasoned quants supporting ERM initiatives and SVP/EVP-level leaders focused on delivering high-quality analysis

Montana Analytics Overview

Our Focus

- Quantitatively-focused risk management consulting firm delivering innovative solutions in enterprise risk management, analytical development, model validation, asset valuation and risk analytics for all types of fixed-income instruments

- We focus on solutions for CECL/ALLL, ALM, MSR, market risk, credit risk, consumer scorecards, Basel models, economic capital and Stress Testing

- Comprised primarily of highly-seasoned professionals with diverse and deep experience

- Speakers at conferences on various topics in Enterprise Risk management

Service Offerings

Enterprise Risk Management	Analytical Model Development	Predictive Solutions

Model Risk Management Program
• ERM Model Governance Policy development
• Model Inventory and Risk Rating method
• Model Development Standards
• Model Documentation framework
• Model Validation
• Custom Designed Analytics
• Stress Testing analysis
• Gap Analysis to best practices
 	
Independent Model Validation
• Independent Examination
• Fully regulatory compliant with FDIC/OCC/Fed/FHFA guidance
• Rigorous test-case design and execution
• Seven (7) sections cover key regulatory focus
• Fifty (50+) test-cases covering all details
• Comprehensive report and recommendations
	Analytical Model Development
	• CECL Life of Loan Expected Loss Analysis
	• Loan performance risk analysis with advanced statistical modeling techniques for interest rates, prepayment, and credit risk.
	• Scorecards for loan underwriting
	• Stress Testing
	• BASEL loss modeling
	• Economic Capital simulation modeling
	
	Benchmarking
	Independent proprietary model comparisons
	
	MBS/ABS Data Warehouse
	• Tracking 2,500 MBS/ABS deals and 12.7 million of loans spanning 15 years.
	• Vast data warehouse enables development of loan performance and behavioral models.
		Quantitative Modeling
		• Origination Decision Models
		• Credit Scorecards
		  • Consumer credit, Auto, Mortgage, Line, Loan, Heloc
		• Loan performance behavior models
		  • Prime, Subprime, Alt-A, 1st/2nd Lien,
		• Cash Flow, prepayment and valuation
		• CECL and ALLL Modeling
		• Loss Exposure Analysis
		• Point in Time and Life of Loan Analysis
		• Economic Capital modeling
		• Repurchase Exposure Analysis
		• Loss Mitigation Analysis
		• Security Performance Review
		• Security Predictive Forecast
		• Residential Housing Analytics
		• Statistical risk ranking

Asset Classes

Consumer - Retail
• Consumer credit, loans, Auto, credit cards, student loans, installment loans, Lines, HELOC
Commercial - Wholesale
• Commercial Real Estate (CRE), Commercial and Industrial (C&I), Construction and Development, Auto, Lease Finance
Mortgage
• Single family residential (fixed, ARM, prime, subprime, Alt-A), pay-option ARM, multi-family, reverse mortgages, HELOC, CRE
Mortgage Backed Securities (MBS)
• Single class MBS, multi-class MBS (strips, CMOs, CDOs, CMBS), servicing rights
Asset Backed Securities (ABS)
• Auto, credit cards, student loans, installment loans, HELOC, CLO, CDO
Miscellaneous Assets
• Deposits, Derivatives, Corporate and Muni Bonds, Treasuries, FHLB Advances, leases, personal loans, installment loans, Lines

Industry Expertise

	Mortgage and Fixed Income	Capital Markets	Modeling Focus
Risk Experience	**Loan Origination** • Application, credit decision and scorecards • Analytical solutions for risk assessment **Secondary Marketing** • Pipeline management • Best Execution analysis **Loan Servicing** • Master servicing and default asset management • MSR valuation analytics **Securitization and re-securitization** • Collateral valuation and exposure analysis • Ex post and ex ante loan-level risk analysis • Buy/Sell analytical due diligence **Portfolio Risk Retention** • All facets of analytical risk measurement • Advanced econometric tools for accurate risk decisions	**Risk Management** • Asset Liability Management • Liquidity management • Capital management • Hedging strategies **Portfolio Management** • Investment analysis • Performance attribution • Pricing and valuation **Fixed Income Investment** • Pre and post-trade analytics • Settlement and servicing **Financial Modeling** • Cash flow and prepayment • Credit risk • Prepayment risk	**Credit and Prepayment Risk** • Retail and Commercial loans • Structured Finance bonds MBS **ALLL Financial Modeling** • CECL Life of Loan modeling • ASC 450, 310-10-35 • Loss exposure modeling **Stress Testing** • Quantitative modeling • Macroeconomic variables • Scenario sensitivity **PPNR Modeling** • Non-interest income/expense • Time series statistical methods **BASEL and Economic Capital** • Modeling PD, EAD, LGD • Basel rules and requirements
In-House Models	**Mortgages, Loans, Assets, Pools, Portfolios** • Interest rates, prepayment, delinquency, default, loss, severity, PD, EAD, LGD, cash flow, valuation, price, stress testing **Scorecards** • Consumer credit, loan origination, performance, workout, risk mitigation **Methods** • Point-in-Time (PIT), Through-The-Cycle (TTC), OLS, logistic regression, discrete-time hazards, multivariate layered risks		
Vendor Models	**Mortgage** • AdCo Prepayment, AdCo LoanDynamics, Black Knight (AFT, LPS), CoreLogic LP Risk Model, Moody's RiskCalc, CMM and MPA, S&P Levels **Portfolio – Hedging – Trading** • QRM, Polypaths, INTEX, Blackrock Aladdin, Principia, Yieldbook, ZMdesk **Asset Valuation** • DebtX, MIAC Valuation, Trepp		

Sample Client Listing

We have provided services over the past decade for financial institutions of various sizes and leading Vendors:

PNC	Signature Bank
Trepp	DebtX
BancorpSouth	Associated Bank
Wells Fargo	State Street Bank
TIAA (fka EverBank)	Numerous FHL Banks
Freddie Mac	Hedge Funds
Washington Mutual	GMAC-RFC
ResCap	Countrywide

Projects

- Active with Mid-Size and smaller institutions focused on model development and validation solutions

- Maintain strong relationships with leading vendors such as DebtX, Trepp, MIAC, ZMFS, CoreLogic

  - Validator for various Trepp and DebtX Credit Risk Models
  - Validated many solutions from these and other leading vendors

- Active in ERM and quantitative development across large institutions with 200+ models including Stress Testing models

Vendor Software Experience

We have examined and validated numerous vendor software applications over the past decade:

- ALM Software: QRM, Polypaths, ZMFS, Yieldbook, Principia

- Vendor Credit Risk Models: Moody's RiskCalc, CMM, and MPA Trepp-DM and DXCDA, DebtX models for CRE and residential loans and CoreLogic residential behavioral models

- Mortgage Prepayment & Loss: ADCo, Black Knight (f.k.a. LPS), Moody's MPA, CoreLogic (Loan Performance Risk Model)

- CRE and Resi Mortgage Loan Valuation: MIAC, DebtX, Primatics

- INTEX, S & P Levels

- Funding Optimization: Premium Solver and ZMFS

Model Development

- Design/build and implement proprietary predictive cash flow models for credit and market risk and interest rates for all types of financial instruments

  - Applicable to CECL ALLL Analysis

- Experience with complex methods and statistics

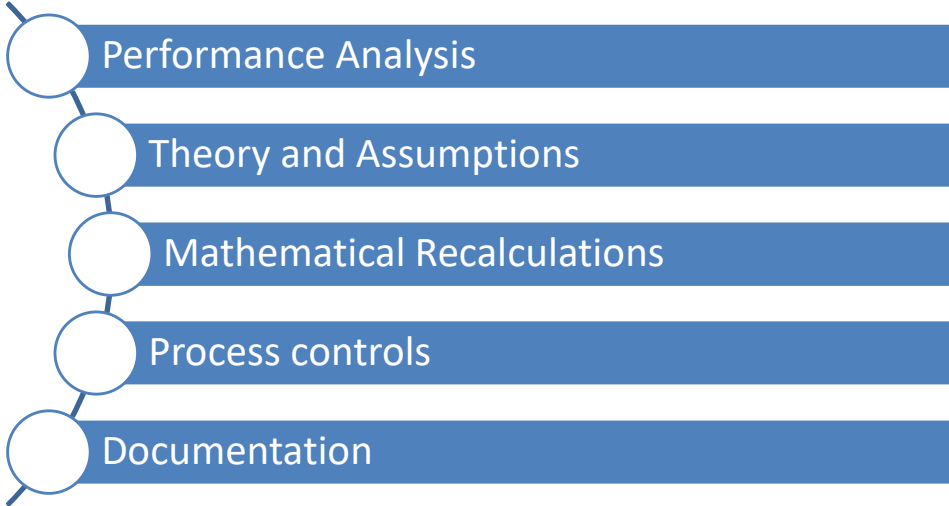- We manage a large PL MBS/ABS database that can supplement internal data for model development or reporting

Benchmarking

- Independent benchmarking of credit loss results across a variety of asset classes

Independent Model Validation

- Proven proprietary *Model Validation Program*

- Comprehensive Validation of all model components satisfying key regulatory guidance (OCC, Fed, FDIC bulletins)

- Performance Analysis

- Theory and Assumptions

- Mathematical Recalculations
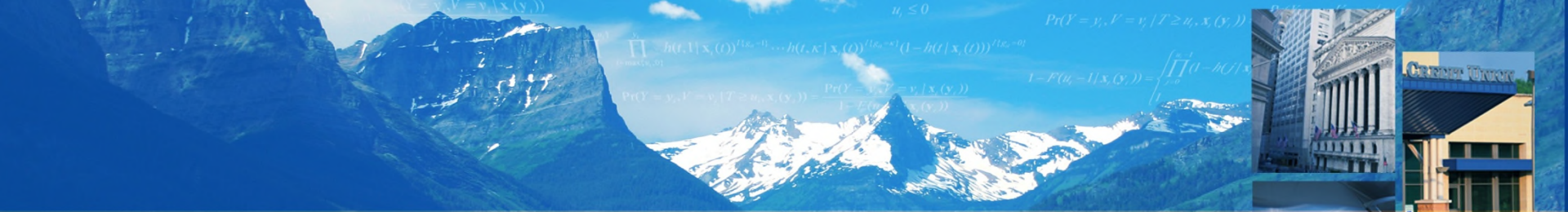
- Process controls

- Documentation

- Rigorous technical results – Transparent tests with clear conclusions
- Final Report is typically 100+ pages including test details
- Recommendations to improve identified deficiencies and model based on best practices

ERM Advisory Services

Our Enterprise Risk Management Advisory service assists in the development and implementation of a comprehensive internal Risk Management program centered on our main principles of Governance Leadership, Risk Assessment, Measurement and Monitoring and Performance Improvement.

Governance Leadership	Risk Assessment
ERM	
Measurement and Monitoring	Performance Improvement
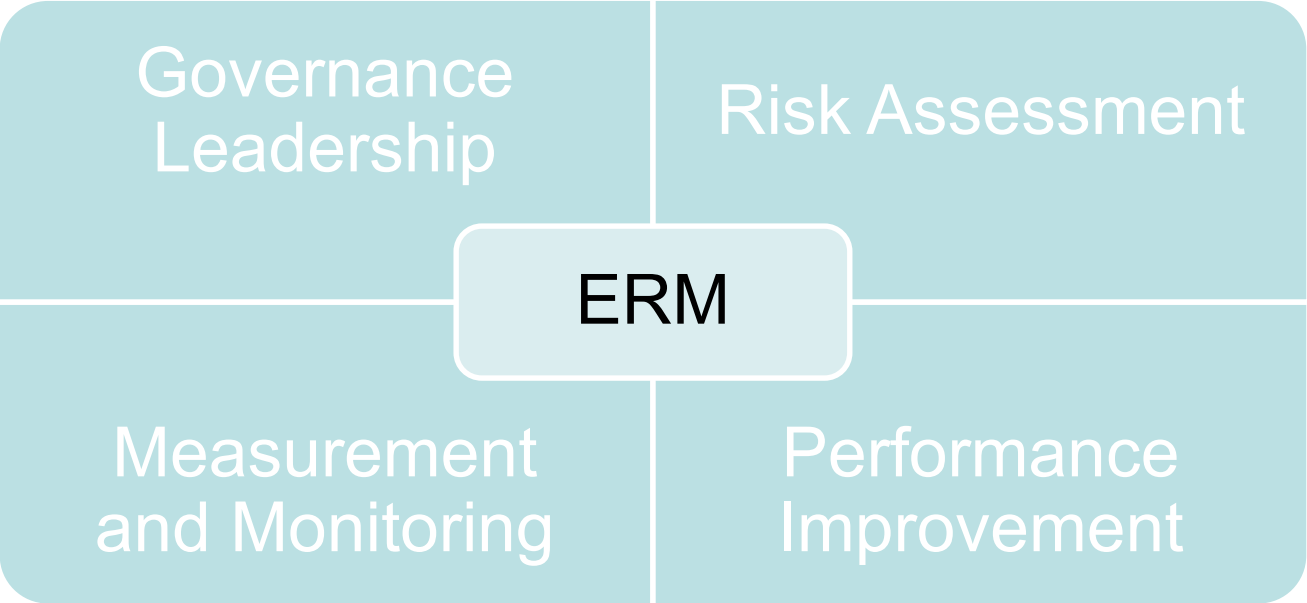
ERM Principles

- *Governance Leadership:* Board and Management Oversight Policies, Procedures, and risk limits. Establish an approach for developing, supporting, and embedding the risk strategy and accountabilities.

- *Risk Assessment:* Identifying, assessing, and categorizing risks and controls to mitigate risks.

- *Measurement and Monitoring:* Measurement, analysis, Reporting, monitoring, and assurance activities to provide insights into risk management strengths and weaknesses

- *Performance Improvement:* A strong ERM function will not only identify and measure risks, it can employ risk-based prioritization to reduce costs and add value to the business.

Key Team Members

Clayton Botkin – Managing Principal

    Experience: 29 years Enterprise Risk management, quantitative finance and model validation

    Developed and implemented statistical tools for quantifying risk and valuing all mortgage assets

    Established a comprehensive Model Validation program for ERM in a large corporation

    Developed mortgage behavior models, scorecards, predictive analytics and model risk management solutions

    at: Freddie Mac, GE Capital, Wells Fargo, GMAC-RFC, ResCap, Countrywide, WaMu and PNC

James Van Osten – Managing Director

    Experience: 16 years analytical risk management, model development and validation

    Developed and validated analytical tools to value financial assets including: Non-Agency and Agency MBS

    loans/securities, CRE loans/bonds, deposits, derivatives, student loans, ABS. Passed Level II CFA exam

Lyoubomir Mirtchev, CFA – Senior Financial Engineer

    Experience: 12 years analytical Structuring/Analysis for various consumer asset types including:

        Loans, bulk, pool and MBS assets with Intex

    Analysis and valuation of interest rate derivatives, FHLB Advances, CRE, deposits.

    Analytical risk management and model validation

Value Proposition

- Excellent Customer Service based on commitment to developing client and partner relationships for long lasting success

- Decades of Industry Experience and Knowledge, specializing in Enterprise Risk Management

- Experts in Quantitative Methods

    - Proven experience developing models and analytics, including internally developed suite of Credit loss and prepayment models

    - Industry-leading *Model Validation Program*

Questions?

Our many years of combined experience with credit and market risk management, coupled with rigorous econometric analytics provide a formidable competitive advantage for our company …

— and for yours.   Thank you for your time.

Clayton Botkin

Managing Principal

Montana Analytics

Office   800-920-3967, ext. 700

www.MontanaAnalytics.com

Jim Van Osten

Managing Director

Montana Analytics

800-920-3967, ext. 701