

## EDUCATION

Massachusetts Institute of Technology, ASP Fellow, Math/Statistics, 1999

Harvard University, Master in Public Policy, concentration: empirical methods (statistics/econometrics), 1992

• Kennedy Fellowship (3 of 170 students) • Social Policy Research Fellowship (3 of 170 students)

Yale University, Bachelor of Arts, Sociology and Psychology (with honors), 1987

## SKILLS / EXPERIENCE SUMMARY

- **Building/Managing Masters/PhD-level Quant Teams:** For over 25 years, both in-house and at top consulting firms
- **Risk Analytics:** Operational Risk 13 capital estimation statistical modeling projects for multiple Global/Fortune 50's, multiple *Journal of Operational Risk* papers Voted **WINNER** of ORR Innovation Awards' "Paper of the Year," 2012 & 2015; Credit Risk (PD, LGD, EAD) for multiple Fortune 50 banks; Market Risk (published risk-adjusted performance metrics); and Model Risk.
- **14 Peer Reviewed Publications** spanning VaR-based capital estimation, number theory/combinatorics, computational and robust statistics, statistical finance / risk-adjusted market performance, statistical quality control, and applied econometrics
- **Industries:** Corporate Banking/OpRisk, Mortgage Banking/Credit Risk, Venture Capital, Credit Card, Telecom, Retail Pricing
- **SAS:** Over 25 years near daily experience – Base SAS, SAS/STAT, SAS/ETS, and Advanced SAS Macro
  - Unrivaled expertise, multiple peer reviewed publications of big data algos *orders of magnitude faster than SAS Procs*
  - National SAS conference paper Voted **WINNER – Best Paper for Statistics/Pharma** (later peer reviewed & published)

## PROFESSIONAL EXPERIENCE

### GE Capital

**Managing Director, Head of Operational Risk Modeling**

**2013 – present**

Built and lead the team responsible for all operational risk modeling and quantification for GEC, including AMA-consistent capital estimation (RCap and ECap), CCAR (stress testing), and all related analytics and reporting. Also lead enterprise-level model development for Economic Capital estimation, aggregation, and allocation across all business lines/risk types (operational, credit, market, industrial, & insurance); joint team received Dushman Award for "technical achievement with significant business impact."

### DataMineit, LLC

**www.DataMineit.com**

**Managing Director, Risk Analytics & Quantitative Strategies**

**2002 – 2013**

Provide profitable statistical/econometric modeling, risk analytics, and algorithm development to the industry & consulting sectors.

- **GE Capital:** Designed and implemented a comprehensive operational risk capital estimation framework. Based on statistically rigorous methods designed to withstand regulatory review, the framework allows for i) the proper statistical treatment of truncated severity distributions; ii) capturing diversification benefits by modeling dependence across UoMs; iii) statistically benchmarking scenario analysis data with base-model confidence intervals; iv) robustly combining internal and external loss data; and v) utilizing multivariate KRI-to-capital regression models fully compliant Basel II/III-AMA-LDA approaches.
- **Barclays Capital:** For the Group Operational Risk Team, researched, tested, and implemented robust statistical alternatives for more stable and reliable (heavy-tailed) severity distribution parameter estimation. Designed and implemented homogeneity analyses across all units of measure; designed and implemented a comprehensive operational risk capital estimation framework for nearly 100 UoMs that robustly combined internal and external loss data and statistically benchmarked scenario analysis data.
- **Northern Trust:** For the Corporate Operational Risk Group, per Basel II guidelines, researched, tested, and developed robust statistical alternatives to MLE for more stable and reliable capital estimation and severity distribution parameter estimation (heavy-tailed & truncated). Gave statistical modeling presentations to inform and develop regulatory strategy; incorporated multivariate regression approaches to mitigate heterogeneity within units of measure and account for time-varying real truncation thresholds. Also developed fully data-driven agglomeration algorithms to provide guidance on unit-of-measure definition.
- **Correlation Ventures:** As the Director of Quantitative Strategies (6/7-4/10), developed from scratch and implemented the firm's portfolio selection investment algorithms using a proprietary dataset containing tens of thousands of exit-related financing rounds spanning 20 years. As the sole model developer, wrote over 400K lines of SAS code. Made detailed presentations of model performance to all sizeable potential investors (including 3 largest institutions (as of 4/10) prior to their commitments to invest).
- **Numerous Big 4 and Economic Consulting Firms:** On large litigations, developed econometric models (TSCS, ARMA, non-proportional hazards, nonlinear price elasticity of demand); presented expert testimony in federal court arbitration (\$0.4b damages).
- **American Express:** For \$1B+ liability in rewards points, a) ensured robust estimation of complex statistical measures by deriving and implementing an original, mathematically optimal algorithm for automating the re-aggregation of "thin data" segments in large-data production runs (method later published); b) recurrent events econometric modeling of points redemptions; c) efficiently automated model selection in logistic regressions d) designed formal presentations of new methodologies for firm's CFO.
- **Wells Fargo:** For portfolios of 8 million mortgages and over half trillion USD, improved the estimation of creditworthiness by a) performing original econometric modeling of credit risk and delinquency behavior using proportional and non-proportional hazards, time series, count data and logistic regression models; b) increased the speed of established company SAS macros (from over a week to minutes) and created original statistical SAS Macros faster than SAS Procs, thus allowing the implementation of previously runtime-prohibitive analyses; c) analyzed complex credit class rules and quantified the impacts of proposed improvements; d) single-handedly designed technical presentations and presented across groups of senior management.

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### **Bates White LLC**

**2012 – 2013**

**Principal:** Served as the sole, designated Operational Risk Modeling Expert for the firm. Brought in multiple Global 50 and Fortune 500 financial clients. Designed unbiased VaR estimators for operational risk capital estimation and, consistent with Basel II's AMA, designed and implemented an entire OpRisk capital estimation framework – from loss data to capital – incorporating almost 100 units-of-measure. Also, developed cumulative incidence function competing risk models for estimating credit defaults and proportional hazard PD models for large securities litigations.

### **Bank of America, Corporate Investments Group**

**2010**

**SVP – Sr. Quantitative Finance Manager:** Responsible for credit portfolio management vis-à-vis model development and application, overall project management of Credit project (PD, LGD, EAD model review), and econometric research; coded computationally intensive statistical procedures nearly an order of magnitude faster than the relevant SAS Procs.

### **Andersen LLP, Economic Consulting Group**

#### **Senior Manager**

**1998 – 2002**

Conducted and supervised applied microeconomic, statistical, and econometric analyses in economic litigation consulting and the implementation of statistical data mining for diverse business consulting services. Provided key business development as one of the original senior managers building a new firm practice (1<sup>st</sup> hire into Boston office, 3<sup>rd</sup> team member nationally, fastest promotion to Sr. Mgr. directly under national partner). Growth to 30 team members upon departure 4 years later to start own firm. Individually responsible for hiring, training, and evaluating over half a dozen consultants; developed and led statistics/econometrics trainings.

#### **ANDERSEN, LLP: TELECOMMUNICATIONS:**

- Wrote and implemented permutation test statistical software for a Regional Bell Operating Company (RBOC) to satisfy the Operations Support Services (OSS) performance measurement regulatory requirements of multiple states and §271 of the Telecommunications Act of 1996. Code is 5x faster than pre-compiled code from a top statistical software firm consulted on the project, and 80x faster than the implementation of a competing consulting firm (**SAS, PROC StatXact**)
- Conducted a comprehensive statistical analysis and data audit of the retail and resale markets of an RBOC to satisfy state and federal (§271 of the Telecommunications Act of 1996) regulatory requirements (**SAS**)
  - selected and implemented rigorous parametric and nonparametric statistical methods for parity testing on the full range of §271-related OSS performance measure data (hundreds of performance measures)
  - hired and managed a team of consultants during initial phase of data/statistical parity analysis
  - developed a statistical algorithm for a mandated, computationally intensive statistical test (permutation test) which cut computer runtime from well over a week into hours
  - wrote a statistical affidavit detailing the appropriate implementation of permutation tests for OSS parity testing
  - performed root cause statistical analyses to determine causes of disparate service provision to CLECs
  - wrote technical appendix of a statistical affidavit filed with multiple state public service commissions
  - managed the implementation of strict quality control guidelines verifying data integrity
- For the audit of a large Bell Company, estimated cost of ISP traffic relative to CLEC local exchange revenue
- Determined and implemented a range of statistical sampling methods for an RBOC potentially facing large fines regarding its call-monitoring practices (**SAS**)
- Employed many parametric and nonparametric statistical sampling and testing methods for two RBOCs requiring, under regulatory mandate, a performance measure sampling methodology (**SAS**)

#### **ANDERSEN, LLP: PRICING / RETAIL:**

- Created a comprehensive firm-wide pricing tool for a multibillion dollar global professional services firm. Project manager for the data analysis component requiring identification, cleaning, and merging of disparate internal financial and client data to perform modeling for price prediction and strategy. Methods used included hedonic regression, neural nets, and the application of resampling methods to tobit models. For each model, constructed GUI interfaces that accepted project and client characteristics as input, and as output, predicted prices with user-specified confidence intervals. (**SAS, Statistica, Excel**)
- Increased profit margins for the largest privately owned retail organization in the country as project manager of the data mining component of a comprehensive product, customer, and pricing and profitability analysis. Developed and implemented a data warehouse system linking point-of-sale data (half a billion records annually) with databases across multiple systems (store, merchandise, store account, and department) to perform: a) multivariate customer segmentation utilizing various classification algorithms; b) econometric modeling of purchasing behavior; and c) sales margin, price point, geographic, competitor, departmental, and product class analyses. (**SAS, Angoss (KnowledgeSEEKER), SPSS (AnswerTree)**)
- For an audit of a retail manufacturer, estimated total dollars correctly invoiced by designing and implementing nonparametric stratified bootstrap algorithms applied to ratio estimators. (**SAS, S-Plus**)
- Increased profit margins for a national retail department store as the project manager for the data mining component of a comprehensive product, customer, and pricing analysis. Performed multivariate customer segmentation utilizing various classification algorithms, as well as competitor, price point, profit margin, geographic, departmental and product class analyses.

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### ANDERSEN, LLP: LITIGATION / REGULATION:

- Project manager of an evaluation of statistical sampling techniques of a Department of Justice audit of a city's administration of federally funded programs; case settled favorably based mainly on analysis (SAS)
- Project manager of a \$0.5 billion litigation for a Fortune 50 global retailer. Critiqued opposing expert's time-series – cross-section econometric event study and assisted counsel in numerous depositions (SAS).
- Project manager of a 65,000 individual class action lawsuit requiring extensive database construction, statistical and data analysis, and damages scenario analyses (SAS)
- Project manager of an IRS binding arbitration case. Conducted all analysis for Expert Report and Decision
- Project manager of a personal injury litigation. Critiqued opposing expert's analyses, assisted counsel in depositions.
- Performed demographic analyses in support of smoking-related tobacco class action litigation (SAS)
- Performed statistical analyses for an electric utility estimating incremental benefits of improved metering accuracy from generation to transmission, and transmission to distribution (SAS, Mathematica)

### Charles River Associates, Inc.

#### Senior Associate

1993 - 1998

As an associate and later as a project manager, performed advanced statistical and econometric analyses for large antitrust litigation and merger cases requiring predatory pricing and price elasticity studies (SAS).

### National Bureau of Economic Research

Research Analyst – Performed statistical & econometric modeling as an applied empirical researcher (Gauss, SAS) 1991-1992

### Harvard University, John F. Kennedy School of Government

Teaching Assistant, Econometrics, Advanced Section (TSP)

Spring, 1992

Research Assistant, Wiener Center for Social Policy (SAS)

Winter, 1991

### PEER REVIEWED PUBLICATIONS

- “Fast, Accurate, Straightforward Extreme Quantiles of Compound Loss Distributions,” *Journal of Operational Risk*, forthcoming 2017.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, and Robustness” *Journal of Operational Risk*, pp.3-78, 9(4), December, 2014. ORR Innovation Awards **WINNER – VOTED “PAPER OF THE YEAR”** by Operational Risk & Regulation staff in consultation with industry experts.
- “Bootstraps, Permutation Tests, and Sampling Orders of Magnitude Faster Using SAS®,” *Computational Statistics: WIREs Interdisciplinary Reviews*, Vol. 5, Issue 5, 391-405, 2013.
- “OpRisk Capital Estimation and Planning: Exact Sensitivity Analysis and Business Decision Making Using the Influence Function,” with Alex Cavallo, in *Operational Risk: New Frontiers Explored*, Davis. E., ed., Risk Books, London, 2012.
- “Estimating Operational Risk Capital: the Challenges of Truncation, the Hazards of MLE, and the Promise of Robust Statistics,” with Alex Cavallo, *Journal of Operational Risk*, pp.3-90, 7(3), 2012. ORR Innovation Awards **WINNER – VOTED “PAPER OF THE YEAR”** by Operational Risk & Regulation staff in consultation with industry experts.
- “Permutation Tests (and Sampling Without Replacement) Orders of Magnitude Faster Using SAS®,” *InterStat*, January, 2011.
- “Much Faster Bootstraps Using SAS®,” *InterStat*, October, 2010.
- “A Unified Approach to Algorithms Generating Unrestricted and Restricted Integer Compositions and Integer Partitions,” *Journal of Mathematical Modelling and Algorithms*, Vol. 9, No. 1, 53-97, March, 2010.
- “A Powerful and Robust Nonparametric Statistic for Joint Mean-Variance Quality Control,” *InterStat*, September, 2009.
- “Comparing Sharpe Ratios: So where are the  $p$ -values?,” *Journal of Asset Management*, Vol. 8, No. 5, Dec., 2007.
- “A Single, Powerful, Nonparametric Statistic for Continuous-data Telecommunications ‘Parity Testing’,” *Journal of Modern Applied Statistical Methods*, Vol. 4, No. 2, November, 2005.
- “Misuse of the ‘modified’  $t$  Statistic in Regulatory Telecommunications,” *Telecom.Policy*, Vol. 28, No. 11, 821-866, 2004.
- “Fast Permutation Tests That Maximize Power Under Conventional Monte Carlo Sampling for Pairwise and Multiple Comparisons,” *Journal of Modern Applied Statistical Methods*, Vol. 2, No. 1, May, 2003. Earlier draft presented at National Conference (PharmaSUG 2002), **WINNER–VOTED BEST PAPER**, Statistics and Pharmacokinetics Section.
- “The Use of Regression Techniques in Transfer Price Analysis,” with R. Hartman and D. Wright, *European Taxation*, International Bureau of Fiscal Documentation, TP, Suppl. No. 18, July, 1996.

### JOURNAL REFEREE

*Quantitative Finance; The American Statistician; Journal of Operational Risk; J of Applied Statistics; Communications in Statistics – Simulation & Computation; Telecommunications Policy; Behavior Research Methods; A. Matematika*

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## PRESENTATIONS / CONFERENCE CHAIRS

- “If not AMA, or SMA, then What? MIAMA” **RiskMinds Americas 2016**, Invited Speaker, Chicago, September 20-23, 2016.
- “The Challenges of, and Practical Solutions to, Capital Aggregation and Allocation under Heavy-Tailed, Empirical Loss Distributions,” **Quant Summit USA 2016**, Invited Speaker, NYC, July 12-13, 2016.
- “Operational Risk Modeling,” **OpRisk North America-2016**, Invited Speaker-Chairman, Quant Studies in OpRisk Stream, NYC, March 15-16, 2016.
- “Operational Risk Modeling,” **Global Association of Risk Professionals (GARP)-17th Annual Risk Management Convention**, Invited Speaker, NYC, NY, March 1-2, 2016.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, and Robustness,” **Marcus Evans Operational Risk Management Series**, Conference Chairman and Invited Presenter, NYC, NY, September 16-17, 2015.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, and Robustness,” **Operational Risk eXchange (ORX) Analytics Forum**, Invited Presenter, Milan, Italy, May 21-22, 2015.
- “Extreme Losses & Operational Risk Capital: Myths & Realities,” **OpRisk NA**, Invited Presenter & Moderator, NYC, 3/24/15.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, and Robustness,” **Risk Week – Yale**, Invited Presenter, Yale University, New Haven, CT, December 9-12, 2014.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, & Robustness,” **JSM 2014**, Boston, MA, 8/5/14.
- “From Loss Data to Capital: Implementing a Comprehensive Operational Risk Capital Estimation Framework Under the AMA-LDA,” **OpRisk North America-2014**, Invited Workshop Leader, 4-session, 6 hour Workshop, NYC, March, 2014.
- “Estimating Operational Risk Capital with Greater Accuracy, Precision, and Robustness – OR – How to Prevent Jensen’s Inequality from Inflating your OpRisk Capital Estimates,” **Globally Attended Webinar**, Boston, MA, February 11, 2013.
- “Better Capital Planning via Exact Sensitivity Analysis Using the Influence Function,” **American Bankers Association: ABA Operational Risk Modeling Meeting**, Invited Presenter, Washington, DC, July 18-20, 2012.
- “Robust Statistics vs. MLE for OpRisk Severity Distribution Parameter Estimation (with and without truncation)” **Operational Risk eXchange (ORX) Analytics Modeling Forum**, Invited Presenter, San Francisco, California, September 27-29, 2011.
- “Robust Statistics vs. MLE for OpRisk Severity Distribution Parameter Estimation,” **American Bankers Association: ABA Operational Risk Modeling Meeting**, Invited Presenter, Charlotte, North Carolina, August 10-12, 2011. Discussant: Bakhodir A. Ergashev, Ph.D., Lead Financial Economist, Federal Reserve Bank of Richmond.
- “Bootstraps, Permutation Tests, and Sampling With and Without Replacement Orders of Magnitude Faster Using SAS®,” **JSM 2011 – Joint Statistical Meetings**, Miami, Florida, July 30-August 4, 2011.
- “Easily Implemented Confidence Intervals and Hypothesis Tests for Sharpe Ratios Under General Conditions,” **JSM 2006 – Joint Statistical Meetings**, Seattle, Washington, August 6-10, 2006.
- “A Nonparametric Statistic for Joint Mean-Variance Quality Control,” **Joint Statistical Meetings**, Minneapolis, 8/8/2005.
- “Misuse of the ‘modified’  $t$  statistic in Regulatory Telecommunications,” **Joint Statistical Meetings**, San Francisco, 8/3/03.
- “Fast Two-Sample Permutation Tests, Especially for Multiple Comparisons and Even When One Sample is Large, That Efficiently Maximize Power Under Conventional Monte Carlo Sampling and Allow for Simultaneous Permutation-Style P-value Adjustments,” **MCP 2002 – The 3<sup>rd</sup> International Conference on Multiple Comparisons**, Bethesda, MD, 8/5-7, 2002.
- “Fast Two-Sample Permutation Tests, Even When One Sample is Large, That Efficiently Maximize Power Under Crude Monte Carlo Sampling,” **PharmaSUG 2002** (National Pharmaceutical SAS Users Group), Statistics and Pharmacokinetics – Reporting and Analysis Section, May 5-8, 2002. **WINNER–VOTED BEST PAPER**, Statistics and Pharmacokinetics Section.

## PATENTS

- **Fast Two-Sample Permutation Tests**, Patent pending-US2003/0065477 A1, Filing Date: Aug. 30, 2001  
A statistical program for performing fast, multiple two-sample permutation tests, even when one of the samples is large.

## PROFESSIONAL ASSOCIATIONS

- Amer. Statistical Assoc. • The Econometric Society • Amer. Finance Assoc. • Nat. Assoc. of Business Economics

## OTHER AWARDS / SCORES

- GRE Quantitative: 800 • LSAT: 99<sup>th</sup> Percentile • Harvard Book Award • National Merit Finalist