Stanford

Kay Giesecke

Professor of Management Science and Engineering

CONTACT INFORMATION

- **Administrator**

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Bio

BIO

Kay Giesecke is Professor of Management Science & Engineering at Stanford University.

He is the Founder and Director of Stanford's Advanced Financial Technologies Laboratory, the Director of the Mathematical and Computational Finance Program and a member of the Institute for Computational and Mathematical Engineering. He has been on the Stanford faculty since 2005, and has held visiting positions at Cornell, UCLA, and the International Monetary Fund. He serves on the Governing Board and Scientific Advisory Board of the Consortium for Data Analytics in Risk and the Council of the Bachelier Finance Society. He is the founder and organizer of Stanford’s annual AI in Fintech Forum, which regularly draws over 300 delegates. Kay is Editor of Management Science (Finance Area) and Associate Editor for Operations Research, Mathematical Finance, Journal of Financial Econometrics, SIAM Journal on Financial Mathematics and several other leading journals.

Kay is a financial technologist whose research agenda is driven by significant applied problems in areas such as investment management, risk analytics, lending, and regulation, where data streams are increasingly large-scale and dynamical, and where computational demands are critical. He develops and analyzes statistical machine learning methods to make explainable data-driven decisions in these and other areas as well as efficient numerical algorithms to address the computational issues arising in this context. The methods and tools support, for example, sound and transparent investment, trading, lending and servicing decisions, measuring and controlling risk, surveilling financial markets, and assessing the impact of climate change on markets and institutions.

Kay is Founder, Chairman and Chief Scientist of Infima Technologies, a venture-backed capital markets SaaS company that provides transformative AI solutions to fixed-income market participants, helping them uncover attractive opportunities and avoid risks. Infima’s technologies are based on Kay’s pioneering academic work on large-scale deep learning for borrower behavior.

Kay has published more than 50 research articles in leading academic journals. He has co-authored several US patents, some of which underpin commercial investment analytics systems widely used in the financial industry. Kay’s research has won several prizes including the JP Morgan AI Faculty Research Award (2019), the SIAM Financial Mathematics and Engineering Conference Paper Prize (2014), the Fama/DFA Prize for the Best Asset Pricing Paper in the Journal of Financial Economics,

and the Gauss Prize of the Society for Actuarial and Financial Mathematics of Germany (2003). His research is supported by the National Science Foundation and several leading financial institutions.

Kay has supervised 24 doctoral dissertations, with graduates accepting faculty positions at Wharton, UC Berkeley, Oxford, NYU and other leading research universities or taking leadership positions at firms such as Goldman Sachs, JP Morgan, Google, and Morgan Stanley.

Kay is an award-winner teacher who has developed innovative new courses at the intersection of finance and technology. He is the Faculty Lead for Financial Analytics MS track. He has created and led several successful executive education programs that have attracted industry leaders from across the world.

Kay advises several venture-backed financial technology startup companies and has been a consultant or advisor to banks, investment managers, software companies, governmental agencies, and supranational organizations.

Kay received his doctorate in 2001 from Humboldt Universität zu Berlin where he was a fellow of the Deutsche Forschungsgemeinschaft.

ACADEMIC APPOINTMENTS

- Professor, Management Science and Engineering
- Member, Institute for Computational and Mathematical Engineering (ICME)

ADMINISTRATIVE APPOINTMENTS

- Member, Council of the Bachelier Finance Society, (2020- present)
- Director, Stanford Advanced Financial Technologies Laboratory (AFTLab), (2017- present)
- Director, Stanford Mathematical and Computational Finance Program, (2015- present)
- Scientific Advisory Board and Governing Board, Consortium for Data Analytics in Risk, (2014- present)

HONORS AND AWARDS

- JP Morgan AI Faculty Research Award, JP Morgan (2019)
- SIAM Financial Mathematics and Engineering Conference Paper Prize, Society for Industrial and Applied Mathematics (2014)
- Paul Pigott Faculty Scholar, Stanford School of Engineering (2013)
- Fama/DFA Prize for the Best Asset Pricing Paper, Journal of Financial Economics (2011)
- Meritorious Service Award, Operations Research, INFORMS - Institute for Operations Research and the Management Sciences (2009, 2010, 2012)
- Graduate Teaching Award, Stanford University (2007)
- David Morgenthaler II Faculty Scholar, Stanford School of Engineering (2005)
- Gauss Prize, Society for Actuarial and Financial Mathematics of Germany (2003)
- Post-Doctoral Research Fellow, National Science Foundation of Germany (2002-2003)
- Deutsche Bundesbank Fellow, Deutsche Bundesbank (2002)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Chairman, Infima Technologies, Inc. (2020 - present)
- Editor, Management Science (2018 - present)
- Associate Editor, Operations Research (2008 - present)
- Associate Editor, Journal of Financial Econometrics (2020 - present)
- Associate Editor, Mathematical Finance (2013 - present)

- Associate Editor, Journal of Financial Data Science (2023 - present)
- Associate Editor, Digital Finance (2021 - present)
- Associate Editor, SIAM Journal on Financial Mathematics (2013 - present)
- Associate Editor, Journal of Risk (2015 - present)
- Editorial Board, SIAM Book Series on Financial Mathematics (2013 - present)
- Associate Editor, Mathematics and Financial Economics (2017 - 2021)
- Associate Editor, Finance & Stochastics (2018 - 2021)
- Associate Editor, Journal of Credit Risk (2016 - 2021)
- Vice Chair, SIAM Activity Group on Financial Mathematics and Engineering (2013 - 2015)
- Associate Editor, IIE Transactions (2009 - 2015)
- Associate Editor, Journal of Banking and Finance (2011 - 2015)
- Associate Editor, Operations Research Letters (2009 - 2012)

PROFESSIONAL EDUCATION

- PhD, Humboldt University Berlin, Germany , Economics (2001)

PATENTS

- Kay Giesecke, Justin Sirignano. "United States Patent 15/331,825 Apparatus for Analyzing the Risk of a Large Loan Pool and Method of Using"
- Kay Giesecke, Justin Sirignano. "United States Patent 15/613,256 Apparatus for Optimizing a Loan Pool and Method of Using"
- Kay Giesecke, Randy Correll, Peter McMahon. "United States Patent 62/354,817 A quantum-annealing computer method for selecting the optimum bids in a combinatorial auction"
- Kay Giesecke, Randy Correll, Peter McMahon, Vincent Su. "United States Patent 62/354,818 A quantum-annealing computer method for financial portfolio optimization"
- Kay Giesecke. "United States Patent 7536329 Method and Apparatus for an Incomplete Information Model of Credit Risk", Nov 11, 2004

LINKS

- Kay's personal website: https://people.stanford.edu/giesecke/
- Advanced Financial Technologies Laboratory: https://fintech.stanford.edu/
- Mathematical and Computational Finance Program: https://mcf.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Kay is a financial technologist whose research agenda is driven by significant applied problems in areas such as investment management, risk analytics, lending, and regulation, where data streams are increasingly large-scale and dynamical, and where computational demands are critical. He develops and analyzes statistical machine learning methods to make explainable data-driven decisions in these and other areas as well as efficient numerical algorithms to address the computational issues arising in this context. The methods and tools support, for example, sound and transparent investment, trading, lending and servicing decisions, measuring and controlling risk, surveilling financial markets, and assessing the impact of climate change on markets and institutions.

Teaching

COURSES

2023-24

- Financial Risk Analytics: MS&E 246 (Win)

- Introduction to Finance and Investment: MS&E 145 (Win)

2022-23

- Financial Risk Analytics: MS&E 246 (Win)
- Introduction to Finance and Investment: MS&E 145 (Win)

2021-22

- Advanced Investment Science: MS&E 245B (Spr)
- Financial Risk Analytics: MS&E 246 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Junting Duan, Greg Zanotti, Jiacheng Zou

Doctoral Dissertation Advisor (AC)

Elliot Epstein

Master's Program Advisor

Boris Beltinoff, Pedro Carvalho, Adam Chang, Carson Levit, Grace Li, Jueshen Li, Harsh Parikh, Jingruo Sun, Dominic Waltz, Amy Wang, Sara Wu, Yonglai Zhu

Doctoral (Program)

Alec Madayan, Xueye Ping

Publications

PUBLICATIONS

- **Advances in Blockchain and Crypto Economics** *MANAGEMENT SCIENCE*
  Biais, B., Capponi, A., Cong, L., Gaur, V., Giesecke, K.
  2023
- **Introduction to the Special Section on Data-Driven Prescriptive Analytics** *MANAGEMENT SCIENCE*
  Giesecke, K., Liberali, G., Nazerzadeh, H., Shanthikumar, J., Teo, C.
  2022; 68 (3): 1591-1594
- **Reducing Bias in Event Time Simulations via Measure Changes** *MATHEMATICS OF OPERATIONS RESEARCH*
  Giesecke, K., Shkolnik, A.
  2022
- **Computationally Efficient Feature Significance and Importance for Predictive Models**
  Horel, E., Giesecke, K., ACM
  ASSOC COMPUTING MACHINERY.2022: 300-307
- **Deep Learning for Mortgage Risk** *JOURNAL OF FINANCIAL ECONOMETRICS*
  Sadhwani, A., Giesecke, K., Sirignano, J.
  2021; 19 (2): 313-368
- **Call for Papers-Management Science Special Issue on Blockchains and Crypto Economics** *MANAGEMENT SCIENCE*
  Biais, B., Capponi, A., Cong, L., Gaur, V., Giesecke, K.
  2021; 67 (1): 6–7
- **Editorial Statement-Finance** *MANAGEMENT SCIENCE*
  Biais, B., Capponi, A., Giesecke, K., Ivashina, V., Manso, G., Piskorski, T., Zhu, H.
  2020; 66 (8): V
- **Significance Tests for Neural Networks** *JOURNAL OF MACHINE LEARNING RESEARCH*

Horel, E., Giesecke, K.
2020; 21

- **UNBIASED SIMULATION ESTIMATORS FOR PATH INTEGRALS OF DIFFUSIONS**
Chen, G., Shkolnik, A., Giesecke, K., IEEE
IEEE.2020: 277-288

- **Inference for large financial systems** *MATHEMATICAL FINANCE*
Giesecke, K., Schwenkler, G., Sirignano, J. A.
2019

- **Dynamic Portfolio Execution** *MANAGEMENT SCIENCE*
Tsoukalas, G., Wang, J., Giesecke, K.
2019; 65 (5): 2015–40

- **Risk Analysis for Large Pools of Loans** *MANAGEMENT SCIENCE*
Sirignano, J., Giesecke, K.
2019; 65 (1): 107–21

- **UNBIASED SIMULATION ESTIMATORS FOR JUMP-DIFFUSIONS**
Chen, G., Shkolnik, A., Giesecke, K., IEEE
IEEE.2019: 890–901

- **Filtered likelihood for point processes** *JOURNAL OF ECONOMETRICS*
Giesecke, K., Schwenkler, G.
2018; 204 (1): 33–53

- **Editorial Statement-Finance** *MANAGEMENT SCIENCE*
Adams, R., Diether, K., Giesecke, K., Manso, G., Piskorski, T., Shumway, T.
2018; 64 (3): V

- **Large-Scale Loan Portfolio Selection** *OPERATIONS RESEARCH*
Sirignano, J. A., Tsoukalas, G., Giesecke, K.
2016; 64 (6): 1239-1255

- **Variation-based tests for volatility misspecification** *JOURNAL OF ECONOMETRICS*
Papanicolaou, A., Giesecke, K.
2016; 191 (1): 217-230

- **Affine Point Processes: Approximation and Efficient Simulation** *MATHEMATICS OF OPERATIONS RESEARCH*
Zhang, X., Blanchet, J., Giesecke, K., Glynn, P. W.
2015; 40 (4): 797-819

- **LARGE PORTFOLIO ASYMPTOTICS FOR LOSS FROM DEFAULT** *MATHEMATICAL FINANCE*
Giesecke, K., Spiliopoulos, K., Sowers, R. B., Sirignano, J. A.
2015; 25 (1): 77-114

- **Optimal Credit Swap Portfolios** *MANAGEMENT SCIENCE*
Giesecke, K., Kim, B., Kim, J., Tsoukalas, G.
2014; 60 (9): 2291-2307

- **Fluctuation analysis for the loss from default** *STOCHASTIC PROCESSES AND THEIR APPLICATIONS*
Spiliopoulos, K., Sirignano, J. A., Giesecke, K.
2014; 124 (7): 2322-2362

- **Macroeconomic effects of corporate default crisis: A long-term perspective** *JOURNAL OF FINANCIAL ECONOMICS*
Giesecke, K., Longstaff, F. A., Schaefer, S., Strebulaev, I. A.
2014; 111 (2): 297-310

- **TRANSFORM ANALYSIS FOR POINT PROCESSES AND APPLICATIONS IN CREDIT RISK** *MATHEMATICAL FINANCE*
Giesecke, K., Zhu, S.

2013; 23 (4): 742-762

- **Exact Sampling of Jump Diffusions** *OPERATIONS RESEARCH*
  Giesecke, K., Smelov, D.
  2013; 61 (4): 894-907
- **DEFAULT CLUSTERING IN LARGE PORTFOLIOS: TYPICAL EVENTS** *ANNALS OF APPLIED PROBABILITY*
  Giesecke, K., Spiliopoulos, K., Sowers, R. B.
  2013; 23 (1): 348-385
- **Exact Sampling of Jump-Diffusions , e-companion** *Operations Research*
  Giesecke, K., Smelov, D.
  2013; 4 (61): 894-907
- **Sequential Importance Sampling and Resampling for Dynamic Portfolio Credit Risk** *OPERATIONS RESEARCH*
  Deng, S., Giesecke, K., Lai, T. L.
  2012; 60 (1): 78-91
- **Monte Carlo Algorithms for Default Timing Problems** *MANAGEMENT SCIENCE*
  Giesecke, K., Kim, B., Zhu, S.
  2011; 57 (12): 2115-2129
- **Corporate bond default risk: A 150-year perspective** *JOURNAL OF FINANCIAL ECONOMICS*
  Giesecke, K., Longstaff, F. A., Schaefer, S., Strebulaev, I.
  2011; 102 (2): 233-250
- **Exact Simulation of Point Processes with Stochastic Intensities** *OPERATIONS RESEARCH*
  Giesecke, K., Kakavand, H., Mousavi, M.
  2011; 59 (5): 1233-1245
- **Premia for correlated default risk** *JOURNAL OF ECONOMIC DYNAMICS & CONTROL*
  Azizpour, S., Giesecke, K., Kim, B.
  2011; 35 (8): 1340-1357
- **Systemic Risk: What Defaults Are Telling Us** *MANAGEMENT SCIENCE*
  Giesecke, K., Kim, B.
  2011; 57 (8): 1387-1405
- **A Top-Down Approach to Multiname Credit** *OPERATIONS RESEARCH*
  Giesecke, K., Goldberg, L. R., Ding, X.
  2011; 59 (2): 283-300
- **Risk Analysis of Collateralized Debt Obligations** *OPERATIONS RESEARCH*
  Giesecke, K., Kim, B.
  2011; 59 (1): 32-49
- **Affine Point Processes and Portfolio Credit Risk** *SIAM JOURNAL ON FINANCIAL MATHEMATICS*
  Errais, E., Giesecke, K., Goldberg, L. R.
  2010; 1 (1): 642-665
- **IMPORTANCE SAMPLING FOR INDICATOR MARKOV CHAINS** *2010 Winter Simulation Conference*
  Giesecke, K., Shkolnik, A. D.
  IEEE.2010: 2742–2750
- **Exact and Efficient Simulation of Correlated Defaults** *SIAM JOURNAL ON FINANCIAL MATHEMATICS*
  Giesecke, K., Kakavand, H., Mousavi, M., Takada, H.
  2010; 1 (1): 868-896
- **Time-Changed Birth Processes and Multiname Credit Derivatives** *OPERATIONS RESEARCH*
  Ding, X., Giesecke, K., Tomecek, P. I.

2009; 57 (4): 990-1005

- **RARE EVENT SIMULATION FOR A GENERALIZED HAWKES PROCESS** *Winter Simulation Conference 2009*
  Zhang, X., Glynn, P. W., Giesecke, K., Blanchet, J.
  IEEE.2009: 1271–1278
- **Assessing the Systemic Implications of Financial Linkages** *Global Financial Stability Report, International Monetary Fund*
  Giesecke, K., Chan-Lau, J., Chan-Lau, J., Espinosa-Vega, M., Sole, J.
  2009
- **An Overview of Credit Derivatives, Presentation Slides** *Jahresbericht der Deutschen Mathematiker-Vereinigung*
  Giesecke, K.
  2009; 111
- **SIMULATING POINT PROCESSES BY INTENSITY PROJECTION** *2008 Winter Simulation Conference*
  Giesecke, K., Kakavand, H., Mousavi, M.
  IEEE.2008: 560–568
- **Measuring the Risk of Large Losses** *Journal of Investment Management*
  Giesecke, K., Schmidt, T., Weber, S.
  2008; 4 (6): 1-15
- **Portfolio Credit Risk: Top-Down vs. Bottom-Up Approaches** *Frontiers in Quantitative Finance: Credit Risk and Volatility Modeling*
  Giesecke, K.
  edited by Cont, R.
  Wiley.2008: 1
- **Estimating tranche spreads by loss process simulation** *2007 Winter Simulation Conference*
  Giesecke, K., Kim, B.
  IEEE.2007: 946–954
- **Default and information** *JOURNAL OF ECONOMIC DYNAMICS & CONTROL*
  Giesecke, K.
  2006; 30 (11): 2281-2303
- **Credit contagion and aggregate losses** *JOURNAL OF ECONOMIC DYNAMICS & CONTROL*
  Giesecke, K., Weber, S.
  2006; 30 (5): 741-767
- **Cyclical correlations, credit contagion, and portfolio losses** *JOURNAL OF BANKING & FINANCE*
  Giesecke, K., Weber, S.
  2004; 28 (12): 3009-3036
- **Correlated default with incomplete information** *JOURNAL OF BANKING & FINANCE*
  Giesecke, K.
  2004; 28 (7): 1521-1545
- **A Simple Exponential Model for Dependent Defaults** *Journal of Fixed Income*
  Giesecke, K.
  2003; 3 (13): 74-83
- **Credit Risk Modeling and Valuation: An Introduction** *Credit Risk: Models and Management*
  Giesecke, K.
  edited by Shimko, D.
  Risk Books.2004 : 1
- **Estimating Tranche Spreads by Loss Process Simulation**
  Giesecke, K., Kim, B.
  2007

- **Rare-Event Simulation For a Generalized Hawkes Process**
  Giesecke, K., Blanchet, J., Glynn, P., Zhang, X.
  2009
- **In Search of a Modigliani-Miller Economy** *Journal of Investment Management*
  Giesecke, K., Goldberg, L.
  2004 ; 3 (2): 1-6
- **Credit Risk Modeling** *Handbook of Fixed Income Securities*
  Giesecke, K.
  edited by Fabozzi, F.
  Wiley.2004 : 1
- **Forecasting Default in the Face of Uncertainty** *Journal of Derivatives*
  Giesecke, K., Goldberg, L., Goldberg, L.
  2004 ; 1 (12): 14-25
- **Sequential Defaults and Incomplete Information** *Journal of Risk*
  Giesecke, K., Goldberg, L., Goldberg, L.
  2004 ; 1 (7): 1-26
- **Forecasting Extreme Financial Risk** *Risk Management: A Modern Perspective*
  Giesecke, K., Goldberg, L.
  edited by Ong, M.
  Wiley.2004 : 1