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Department of Electrical & Systems Engineering
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PROFESSIONAL EXPERIENCE

Washington University in St. Louis — August 2014 – Present
Department of Electrical & Systems Engineering — Assistant Professor
Department of Mathematics — Assistant Professor (Courtesy)
Institute for Public Health — Faculty Scholar

INFORMS Finance Section — January 2019 – Present
Secretary and Treasurer

Prattle Analytics, LLC — August 2014 – January 2016
Board of Advisors

EDUCATION

Doctor of Philosophy – Princeton University, Princeton, NJ — June 2014
School of Engineering and Applied Science
Department of Operations Research and Financial Engineering
Thesis: Set-Valued Risk Measures (*Advisor*: Prof. Birgit Rudloff)

Master of Arts – Princeton University, Princeton, NJ — September 2011
School of Engineering and Applied Science
Department of Operations Research and Financial Engineering

Bachelor of Science – Washington University in St. Louis, St. Louis, MO — May 2009
School of Engineering and Applied Science
Major: Systems Science and Engineering
Second Major: Applied Mathematics
Summa Cum Laude, *Valedictorian*

RESEARCH GRANTS AND CONTRACTS

Current Grants and Contracts

- External Collaborator. "Dynamic measures of systemic risk." *The Oesterreichische Nationalbank (OeNB) Anniversary Fund*, 03/01/2019–02/28/2023, €170,000.
- Principal Investigator. "Assessing the impact of costs of HIV chemoprophylaxis use among young Black men." *Washington University Center for Health Economics and Policy Pilot Grant*, 07/01/2018–06/30/2019, $30,000 (Credit 50%).
- Principal Investigator. "Modeling the cost per HIV infection averted with pre-exposure prophylaxis (PrEP) using an innovative simulation approach." *Washington University Institute of Public Heath PH3*, 12/01/2017–12/31/2018, $15,000 (Credit 50%).

Completed Grants and Contracts

- Principal Investigator. "REU: Undergraduate research on financial engineering." *Prattle Analytics*, 01/01/2015–12/31/2015, $2,000 (Credit 100%).

PUBLICATIONS

Journal Papers

- M. Bichuch, Z. Feinstein. "Optimization of fire sales and borrowing in systemic risk." *SIAM Journal on Financial Mathematics*, 2018. Accepted for publication.
- Z. Feinstein, W. Pang, B. Rudloff, E. Schaanning, S. Sturm, M. Wildman. "Sensitivity of the Eisenberg–Noe clearing vector to individual interbank liabilities." *SIAM Journal on Financial Mathematics*, 2018. Accepted for publication.
- Z. Feinstein, B. Rudloff. "A supermartingale relation for multivariate risk measures." *Quantitative Finance*, 18(12):1971-1990, 2018.
- Z. Feinstein, B. Rudloff, S. Weber. "Measures of systemic risk." *SIAM Journal on Financial Mathematics*, 8(1):672-708, 2017.
- Z. Feinstein, F. El-Masri. "The effects of leverage requirements and fire sales on financial contagion via asset liquidation strategies in financial networks." *Statistics & Risk Modeling*, 34(3-4):113-139, 2017.
- Z. Feinstein. "Financial contagion and asset liquidation strategies." *Operations Research Letters*, 45(2):109-114, 2017.
- Z. Feinstein, B. Rudloff. "A recursive algorithm for multivariate risk measures and a set-valued Bellman's principle." *Journal of Global Optimization*, 68(1):47-69, 2017.
- A. Cassidy, Z. Feinstein, A. Nehorai. "Risk measures for power failures in transmission systems." *Chaos*, 26(11):113110, 2016.
- Z. Feinstein, B. Rudloff. "Multi-portfolio time consistency for set-valued convex and coherent risk measures." *Finance and Stochastics*, 19(1):67-107, 2015.
- Z. Feinstein, B. Rudloff. "Time consistency of dynamic risk measures in markets with transaction costs." *Quantitative Finance*, 13(9):1473-1489, 2013.
- S. J. Dyke, R. Christenson, Z. Jiang, X. Gao, Z. Feinstein. "Tele-operation tools for bench-scale shake tables for instruction in earthquake engineering." *Seismological Research Letters*, 78(4):460-463, 2007.

Chapter in Edited Book

- Z. Feinstein, B. Rudloff. "A comparison of techniques for dynamic multivariate risk measures." *Set Optimization and Applications in Finance – The State of the Art*. Springer Berlin Heidelberg, pp. 3-41. 2015.

Conference Papers

- N. Hoang, A. Friedman, W. Song, J. Char, Z. Feinstein, S. J. Dyke. "System equivalent reduction expansion process: An experimental validation," 11th East Asia-Pacific Conference on Structural Engineering & Construction, Taipei, Taiwan, November 19-21, 2008.
- Z. Huang, B. Xu, Z. Feinstein, S. J. Dyke. "Nonparametric modeling of magnetorheological damper," 10th International Symposium on Structural Engineering for Young Experts, Changsha, China, October 19-21, 2008.

Submitted Journal Papers

- T. Banerjee, Z. Feinstein. "Impact of contingent payments on systemic risk in financial networks." 2018. Minor revisions at *Mathematics and Financial Economics*.
- Z. Feinstein, B. Rudloff. "Time consistency for scalar multivariate risk measures." 2018. Submitted for publication.

- T. Banerjee, Z. Feinstein. "Pricing of debt and equity in a financial network with comonotonic endowments." 2018. Submitted for publication.
- Z. Feinstein, B. Rudloff. "Scalar multivariate risk measures with a single eligible asset." 2018. Submitted for publication.
- Z. Feinstein. "Capital regulation under price impacts and dynamic financial contagion." 2018. Submitted for publication.
- T. Banerjee, A. Bernstein, Z. Feinstein. "Dynamic clearing and contagion in financial networks." 2018. Submitted for publication.
- Z. Feinstein. "Obligations with physical delivery in a multi-layered financial network." 2018. Submitted for publication.
- Z. Feinstein. "Continuity properties and sensitivity analysis of parameterized fixed points and approximate fixed points." 2016. Submitted for publication.

Public Outreach Papers and Works

- Z. Feinstein. "Harry Potter and the Goblin Bank of Gringotts." 2016.
- Z. Feinstein. "In 'Star Wars,' Was the Death Star Too Big to Fail?" *New York Times*, pp. SR10. January 3, 2016.
- Z. Feinstein. "I have discovered the reason that 'Star Wars' exists in the first place." *Wonkblog*. Washington Post. December 19, 2015.
- Z. Feinstein. "It's a trap: Emperor Palpatine's poison pill." 2015.
- Z. Feinstein. "Fictionomics." `http://sites.wustl.edu/fictionomics`

PRESENTATIONS

Conference Presentations

- "Systemic risk in a multilayered network." *INFORMS Annual Meeting*, Phoenix, AZ, November 4-7, 2018.
- "Dynamic clearing and contagion in financial networks." *10th World Congress: Bachelier Finance Society*, Dublin, Ireland, July 16-20, 2018.
- "Dynamic contagion in an Eisenberg-Noe clearing network." *SIAM Annual Meeting*, Portland, OR, July 9-13, 2018.
- **General Prize** "Systemic risk in a multi-layered financial network." *Third Bar-Ilan Conference on Financial Mathematics*, Ramat Gan, Israel, May 30-31, 2018.
- "Dynamic modeling of systemic risk." *Meeting on Dynamic Multivariate Programming*, Vienna, Austria, March 12-16, 2018.
- "Time consistency for scalarizations of set-valued risk measures." *Meeting on Dynamic Multivariate Programming*, Vienna, Austria, March 12-16, 2018.
- "A time dynamic Eisenberg-Noe financial contagion model." *Joint Mathematics Meeting*, San Diego, CA, January 10-13, 2018.
- "Financial contagion in a multilayer network." *INFORMS Annual Meeting*, Houston, TX, October 22-25, 2017.
- "Contagion in a multi-layered financial network." *Measurement and Control of Systemic Risk*, Montreal, QC, CAN, September 26-28, 2017.
- **Keynote Address:** "Applications of set and vector optimization in finance." *Set Optimization and Abstract Convexity with Applications in Statistics, Game Theory, Economics, Finance*, Bruneck-Brunico, Italy, June 30-July 1, 2017.
- "Risk measures for the power grid." *Forecasting and Risk Evaluation for Renewable Energy*, Paris, France, June 7-9, 2017.
- "A dynamic Eisenberg-Noe model of financial contagion." *Mathematical Finance, Probability, and Partial Differential Equations Conference*, New Brunswick, NJ, May 17-19, 2017.
- "An equilibrium network model for financial contagion with illiquid assets." *AMS Sectional Meeting*, Bloomington, IN, April 1-2, 2017.

- "Financial contagion with multiple illiquid assets." *Western Conference in Mathematical Finance*, Seattle, WA, March 24-25, 2017.
- "An extension of the Eisenberg-Noe network model with fire sales." *SIAM Southeastern Atlantic Section*, Tallahassee, FL, March 18-19, 2017.
- "Scalarizations of set-valued risk measures." *SIAM Conference on Financial Mathematics & Engineering*, Austin, TX, November 17-19, 2016.
- "Scalarizations and dynamic programming in set optimization and finance." *Set Optimization for Applications*, Vienna, Austria, September 19-23, 2016.
- "Systemic risk measures for network models." *Eastern Conference on Mathematical Finance*, Worcester, MA, March 18-20, 2016.
- "A recursive algorithm for set-valued risk measures and relation to set-valued Bellman's principle." *Joint Mathematics Meeting*, Seattle, WA, January 6-9, 2016.
- "Systemic risk measures." *INFORMS Annual Meeting*, Philadelphia, PA, November 1-4, 2015.
- "Multiportfolio time consistency of multivariate dynamic risk measures and equivalent formulations." *AMS Sectional Meeting*, Chicago, IL, October 2-4, 2015.
- "Computation of dynamic multivariate risk measures and a relation to a set-valued Bellman's Principle." *Joint Mathematics Meeting*, San Antonio, TX, January 9-13, 2015.
- "Systemic risk measures for financial networks." *Regulating Systemic Risk: Insights from Mathematical Modeling*, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, December 15-19, 2014.
- "Risk measures for financial networks." *SIAM Conference on Financial Mathematics & Engineering*, Chicago, IL, November 13-15, 2014.
- "A set-valued Bellman's principle." *Set Optimization Meets Finance*, Bruneck-Brunico, Italy, September 8-12, 2014.
- "Set-valued models in finance." *Set Optimization Meets Finance*, Bruneck-Brunico, Italy, September 8-12, 2014.
- "Systemic risk measurement and individual capital requirements." *8th World Congress: Bachelier Finance Society*, Brussels, Belgium, June 2-6, 2014.
- "Set-valued risk measures and systemic risk." *Workshop on Risk Management and Risk Measures*, Hannover, Germany, May 28, 2014.
- "Set optimization for financial risk measures." *Joint Mathematics Meeting*, Baltimore, MD, January 15-18, 2014.
- "Time consistency of risk measures in markets with transaction costs." *Joint Mathematics Meeting*, Baltimore, MD, January 15-18, 2014.
- "Set-valued risk measures and their application to systemic and liquidity risk." *Workshop Hannover - Oldenburg*, Hannover, Germany, November 29-30, 2013.
- "Risk measure scalarization and time consistency in illiquid markets." *Princeton-Humboldt Conference*, Princeton, NJ, November 1-2, 2013.
- "Set-valued dynamic risk measures." *International Symposium on Mathematical Programming*, Berlin, Germany, August 19-24, 2012.
- "Set-valued dynamic risk measures." *Set Optimization Meets Finance*, Lutherstadt Wittenberg, Germany, August 17-19, 2012.
- "Time consistency in markets with transaction costs." *Oxford-Princeton Workshop*, Princeton, NJ, April 27-28, 2012.

Invited Seminar Presentations

- "Illiquidity and financial contagion in a multilayered financial network." Department of Finance and Risk Engineering, Tandon School of Engineering, New York University, November 29, 2018.
- "Dynamic clearing and contagion in an Eisenberg-Noe framework." Mathematical Finance Internal Seminar, Department of Mathematics, Oxford University, Oxford, UK, October 18, 2018.
- "Pricing debt in interbank networks under comonotonic endowments." Joint Risk & Stochastics and Financial Mathematics Seminar, Department of Mathematics, London School of Economics, London, UK, October 4, 2018.

- "Moving scalarizations for time consistency in dynamic multivariate problems in finance." Probability Seminar, Department of Mathematics, University of Southern California, Los Angeles, CA, September 28, 2018.
- "Pricing debt in an Eisenberg-Noe network under comonotonic endowments." Applied Probability and Risk Seminar, Department of Industrial Engineering and Operations Research, Columbia University, New York, NY, September 20, 2018.
- "Systemic risk with multi-currency obligations." Brownbag Seminar, Department of Finance, Boston University, Boston, MA, September 12, 2018.
- "Financial contagion and systemic risk." Financial Math Seminar, Department of Applied Mathematics and Statistics, Johns Hopkins University, Baltimore, MD, October 17, 2017.
- "Systemic risk measures and financial network models." Finance and Stochastics Seminar, Mathematical Finance Section, Imperial College London, London, UK, February 1, 2017.
- "Extensions of the Eisenberg & Noe Financial Contagion Model." Networks Seminar, Department of Statistics and Applied Probability, University of California, Santa Barbara, CA, January 13, 2017.
- "Set-valued risk measures for systemic risk." Financial Mathematics and Actuarial Research Seminar, Department of Statistics and Applied Probability, University of California, Santa Barbara, CA, January 9, 2017.
- "Measuring the risk of the power grid." Power & Energy Systems Seminar, Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, IL, October 10, 2016.
- "Systemic Risk and Financial Network Models." Mathematical Finance and Probability Seminar, Department of Mathematics, Rutgers University, New Brunswick, NJ, April 19, 2016.
- "Set-valued risk measures and Bellman's principle." Math Finance Colloquium, Department of Mathematics, University of Southern California, Los Angeles, CA, March 7, 2016.
- "Multivariate dynamic risk measures: properties and computation." Computational Finance Seminar, Department of Statistics, Purdue University, West Lafayette, IN, February 16, 2016.
- "Financial network models and systemic risk measurement." Department of Mathematics, Lehigh University, Bethlehem, PA, November 4, 2015.
- "A recursive algorithm for set-valued risk measures." Institute of Probability and Statistics, Leibniz Universität Hannover, Hannover, Germany, November 27, 2013.
- "Time consistency of multivariate dynamic risk measures." Institute of Probability and Statistics, Leibniz Universität Hannover, Hannover, Germany, November 13, 2013.
- "Set-valued risk measures: risk management with transaction costs." Department of Electrical & Systems Engineering, Washington University in St. Louis, St. Louis, MO, April 12, 2012.

Public Outreach Presentations

- "Fictionomics: Real Analysis of Fictional Worlds." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, July 25, 2018.
- "Fictionomics: Real Analysis of Fictional Worlds." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, June 12, 2018.
- "Fictionomics: Real Analysis of Fictional Worlds." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, July 26, 2017.
- "Harry Potter and the Goblin Bank of Gringotts." *Set Optimization and Abstract Convexity with Applications in Statistics, Game Theory, Economics, Finance*, Bruneck-Brunico, Italy, June 30-July 1, 2017.
- "Fictionomics: Real Analysis of Fictional Worlds." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, June 21, 2017.
- "On the Operational Costs of the Empire." *Star Wars Day*, St. Louis Public Library, St. Louis, MO, May 4, 2017.
- "The Economics of *Star Wars*: How the Empire Collapses." *Introduction to Systems Science and Engineering Guest Lecture*, Washington University in St. Louis, St. Louis, MO, April 5, 2017.
- "Harry Potter and the Goblin Bank of Gringotts." *JGrads Nerd Night*, St. Louis, MO, January 19, 2017.

- "*Fictionomics*: Set Optimization in *Star Wars*." *Set Optimization for Applications*, Vienna, Austria, September 19-23, 2016.
- "The economics of *Star Wars*: How the Empire collapses." *Hancock Symposium*, Westminster College, Fulton, MO, September 14-15, 2016.
- "Fictionomics: Real Analysis of Fictional Worlds from *Star Wars* to *Game of Thrones*." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, July 27, 2016.
- "Financial Crisis in the *Star Wars* Galaxy: An Application of Financial Mathematics." *Mu Alpha Theta National Convention*, St. Louis, MO, July 12, 2016.
- "Fictionomics: Real Analysis of Fictional Worlds from *Star Wars* to *Game of Thrones*." *Pre-Engineering Institute Guest Lecture*, Washington University in St. Louis, St. Louis, MO, June 29, 2016.
- "The Economic Cost of Destroying the Death Star." *Rutgers Geek Week*, New Brunswick, NJ, March 30, 2016.
- "It's a Trap: *Star Wars* and Systemic Risk." *JGrads Nerd Night*, St. Louis, MO, March 3, 2016.

Minisymposium Organization

- "Systemic risk and contagion." *INFORMS Annual Meeting*, Phoenix, AZ, November 4-7, 2018.
- "Network models for systemic risk." (Joint with H. Amini) *SIAM Conference on Financial Mathematics & Engineering*, Austin, TX, November 17-19, 2016.
- *AMS Mathematical Research Community* in Financial Mathematics, Assistant Organizer, Snowbird, UT, June 14-20, 2015.

EDUCATIONAL EXPERIENCE

Director of the following programs:

- MS in Engineering Data Analytics and Statistics — March 2015 – Present
  Washington University in St. Louis
- Second Major in Financial Engineering — October 2016 – Present
  Washington University in St. Louis

Instructor in the following courses:

- Operations Research: ESE 403 — Fall 2014, Fall 2015, Fall 2016, Fall 2017, Fall 2018
  Washington University in St. Louis
- Convex Optimization and Duality Theory: ESE 513 — Spring 2016
  Washington University in St. Louis
- Convex Optimization: ESE 519 — Spring 2017, Spring 2018
  Washington University in St. Louis

Teaching Assistant in the following courses:

- Financial Risk Management: ORF 435 — Fall 2011, Fall 2012, Fall 2013
  Princeton University
- Financial Risk Management: ORF 535 — Fall 2013
  Princeton University
- Fundamentals of Engineering Statistics: ORF 245 — Fall 2010
  Princeton University
- Signals and Systems: ESE 351 — Fall 2008, Spring 2009
  Washington University in St. Louis

Additional experience:

- Member of ESE Graduate Committee — September 2016 – Present
  Washington University in St. Louis

- Member of SEAS Faculty and Staff Campaign Committee — July 2016 – Present
  Washington University in St. Louis
- Faculty Advisor for Tau Beta Pi — August 2015 – Present
  Washington University in St. Louis
- Member of ESE Undergraduate Committee — October 2014 – Present
  Washington University in St. Louis
- Senior Thesis Writing Group Supervisor — August 2013 – May 2014
  Princeton University
- Senior Thesis Writing Group Leader — September 2010 – May 2013
  Princeton University

GRADUATE ADVISEES

Past Graduate Advisees

- Alex Bernstein, M.S. 2017. Post-Completion: Ph.D. Candidate, *University of California, Santa Barbara.*

Current Graduate Advisees

- Tathagata Banerjee, *Ph.D. Candidate* (Expected Spring 2019)

SELECTED AWARDS AND HONORS

- General Prize for Outstanding Paper in Financial Mathematics and Risk Management (2018), Third Bar-Ilan Conference on Financial Mathematics
- Princeton Engineering Commendation List for Outstanding Teaching: ORF 435 (2011), Princeton University
- The David H. Levy Outstanding Senior Award – Department of Electrical and Systems Engineering (2009), Washington University in St. Louis
- The Russell R. Pfeiffer Outstanding Junior Award – Department of Electrical and Systems Engineering (2008), Washington University in St. Louis
- The Antoinette Frances Dames Award for Productive Scholarship (2007), Washington University in St. Louis