Thomas Lee

Email: thomaslee1911@gmail.com | Phone: 215-680-8230
Website: thomaslee1911.github.io | Address: 85 Seaport Blvd. Unit 320, Boston, MA 02210

EDUCATION

University of Pennsylvania, Philadelphia, PA
School of Engineering and Applied Sciences
2016-2017   M.S.E. Electrical Engineering
2013-2017   B.A.S. Computer Science

The Wharton School
2013-2017   B.S. Economics (Concentrations: Statistics, Finance)
Honors: Summa Cum Laude (for B.A.S. and B.S.), IEEE-Eta Kappa Nu

PROFESSIONAL EXPERIENCE

Boston Energy Trading and Marketing, Mitsubishi Corp., Boston, MA
2020-   *Senior Trading Analyst, Congestion Trading*
2018-2020   *Senior Trading Analyst, Energy Trading*

Energy Systems Modeling: Used power flow analysis and graph clustering to manage proprietary portfolio of financial transmission rights (FTR) in PJM. Built fundamental supply-demand models and probabilistic valuation framework for power and gas futures; executed CAISO strategy and achieved >4 annualized Sharpe ratio in live trading. Developed the core LP formulation for company's energy storage optimization framework now used for fleet of operating and future battery assets. Used MIP unit commitment model to analyze solar impact on CAISO prices including ramping effects.

Weather Modeling: Conceived and researched an original copula-based, hourly-resolution stochastic weather generator (SWG) with correlations across time, locations, and weather variables, and between forecast and climatological horizons. This framework is now used in Monte Carlo valuations of load and generation structured transactions.

AQR Capital Management, Greenwich, CT
2017-2018   *Quantitative Analyst, Global Asset Allocation*
2016   *Quantitative Research Intern, Global Asset Allocation*

Updated global macro investment signals using commodity trade data, including energy supply shifts e.g. new US shale resources. Researched structural relationships of currency pairs' option-implied correlations and forecast accuracy for risk modeling in currency strategies. Derived new closed-form portfolio optimization solution using linear algebra, and conducted empirical investment research, leading to published journal paper:
 "**Optimal Currency Hedging for International Equity Portfolios**"
Jacob Boudoukh, Matthew Richardson, Ashwin Thapar, Franklin Wang.
Financial Analysts Journal. Aug 2019.

Kleinman Center for Energy Policy, University of Pennsylvania
2017-2018   *Research Fellow*
2016-2017   *Research Assistant, Energy Storage Research*
Investigated electricity market design related to energy storage investment and price signals. Published research articles and presented findings. Participated in Raab Associates' *Energy Policy Roundtable in the PJM Footprint* conferences.

RESEARCH

(Work in Progress)

"A Dynamic Programming Approach for Estimating Market Scalability of Energy Storage Arbitrage with Price Impact and Renewables Growth"

Energy arbitrage at a large scale faces diminishing returns in the wholesale market. Analytic solutions are solved for stylized price functions, under the social planner, monopoly, and Cournot oligopoly cases of storage ownership. An efficient dynamic programming method is developed to quantify the scalability of energy arbitrage profitability as a function of both storage and renewables deployment, while incorporating realistic electricity supply stacks that can be both nonlinear and non-convex. A numerical market sizing study is applied for energy storage in CAISO.

"A Market for Primary Frequency Response? The Role of Renewables, Storage, and Demand."
Kleinman Center for Energy Policy. Working Paper. June 2018.
Distinguished between capability and provision for the essential reliability service of primary frequency response, quantified impact of renewables on headroom provision based on a simplified economic dispatch model, and discussed potential market design considerations. Invited to present research at 2019 *Carnot Prize Student Colloquium* to audience including former FERC Commissioner Cheryl LaFleur.

"Optimizing Electricity Generation Portfolios with Intermittency: Does Delayed Externality Pricing Cause Lock-in Regret?"
Senior Capstone Thesis. December 2017.
The irreversibility of sunk cost capital assets may lead to suboptimal infrastructure path dependence, even after an externality pricing scheme is introduced. Derived the closed-form conditions for carbon lock-in to exist in the presence of renewable energy. Built an hourly-resolution capacity expansion model to quantify the extent that ongoing natural gas combined cycle buildout in the PJM system may contribute to carbon lock-in. Presented findings during session of *Energy Economics & Finance Seminar* (May 2018) organized by Professor Arthur van Benthem.

"Energy Storage in PJM: Exploring Frequency Regulation Market Transformation."
Kleinman Center for Energy Policy. Research Paper. July 2017.
Reviewed the power engineering and regulatory background of frequency regulation, and quantified economic and system reliability impacts of PJM's "Regulation D" market design and subsequent revisions. Assessed implications for energy storage projects. Presented findings at 2017 *Carnot Prize Student Colloquium* to audience including former EPA Administrator Gina McCarthy.

TEACHING ASSISTANT EXPERIENCE

2016	Introduction to Machine Learning (CIS 419/519)
	Formulated exam questions, graded and held weekly office hours for programming assignments. Python-based course covering topics including supervised learning algorithms, neural networks, and reinforcement learning.

LEADERSHIP

2019-	**Young Professionals in Energy Boston Chapter**
	Programming Committee
	Initiated and organized panel on offshore wind in the US Northeast, including panelists from Orsted and MHI Vestas. Organized ISO New England control room site visit.
2016-2017	**Trustees Social Responsibility Advisory Committee**, University of Pennsylvania
	Student Representative
	One of 12 voting members advising Trustees on endowment resolutions. Successfully negotiated adoption of first Greenhouse Gas Emissions proxy voting guideline in 2017.