# Shi-Jie Deng

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H. Milton Stewart School of Industrial and Systems Engineering
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## EMPLOYMENT

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|---|---|
| August 2006 – present | Associate Professor, H. Milton Stewart School of Industrial and Systems Engineering, **Georgia Institute of Technology**. |
| Aug. 1999 – Aug. 2006 | Assistant Professor, School of Industrial and Systems Engineering, **Georgia Institute of Technology**. |
| June 2006 | Visiting Scholar, Systems Engineering and Engineering Management Department, **Chinese University of Hong Kong**. |
| Apr. 2004 – May 2004 | Visiting Scholar, Systems Engineering and Engineering Management Department, **Chinese University of Hong Kong**. |
| Feb. 2004 - Apr. 2004 | Visiting Assistant Professor, Industrial Engineering and Operations Research Department, **University of California, Berkeley** and **University of California Energy Institute**. |
| June 2002 - July 2002 | Visiting Scholar, Systems Engineering and Engineering Management Department, **Chinese University of Hong Kong**. |
| May 2002 - June 2002 | Visiting Assistant Professor of The Logistics Institute – Asia Pacific, **National University of Singapore**. |
| December 2001 | Visiting Assistant Professor, Guanghua School of Management, **Peking University**. |
| June 2001 - July 2001 | Visiting Assistant Professor of The Logistics Institute – Asia Pacific, **National University of Singapore**. |

## EDUCATION

Ph.D. **University of California at Berkeley**, Dept. of Industrial Engineering and Operations Research, July 1999.
**Dissertation**: "Financial Methods in Competitive Electricity Markets"
**Principal Advisor**: Shmuel Oren
**Other Advisors**: Darrell Duffie, George Shanthikumar, Pravin Varaiya

M.S. **University of Minnesota, Minneapolis**, Department of Mathematics, June, 1993.
B.Sc. **Peking University, Beijing, P.R.China**, Applied Mathematics, July, 1991.

## RESEARCH INTERESTS

- Financial Asset Pricing and Real Options Valuation
- Financial Engineering Applications in Energy Commodity Markets
- Transmission Pricing in Electric Power Systems
- Applications of Contract Theory in Supply Chain Modeling
- Stochastic Modeling and Simulation

## INDUSTRIAL EXPERIENCE

June 2003 **Consultant**, *Constellation Power Source*, Baltimore, MD, USA.
Delivered two seminars on electricity price modeling and financial transmission right valuation.

June 1999 **Consultant**, *PowerEx (B.C. Hydro)*, Vancouver, B.C., Canada.

Delivered a workshop (w. Mohamed) on price spikes in the deregulated electricity markets in the US.

June 1998 - Aug. 1998 **Consultant**, *Electric Power Research Institute (EPRI),* Palo Alto, CA
Performed market penetration analysis for load profile pricing of electricity.

July 1998 - Sept. 1998 **Consultant**, *Pacificorp,* Portland, OR
Developed a new methodology of option value based valuation of electric power generation assets and various supply/purchase contracts.

June 1997 - Sept. 1997 **Associate**, *Edison Enterprises,* City of Industry, CA
Implemented energy product pricing, designed hedging strategy and performed risk management analysis.

June 1995 - Aug. 1995 **Graduate Student Intern**, *IBM T.J. Watson Research Center*, Yorktown, NY
Developed Large Scale Linear Programming Model for Semiconductor Tool Capacity Planning.

## PUBLICATIONS

[1] S.J. Deng and S. S. Oren (2001). "Priority Network Access Pricing for Electric Power," *Journal of Regulatory Economics*, 19(3) July: 239-270.

[2] S.J. Deng, B. Johnson, and A. Sogomonian (2001). "Exotic Electricity Options and the Valuation of Electricity Generation and Transmission Assets," *Decision Support Systems*, (30)3, pp.383-392.

[3] "Online Exchange Markets and Their Impacts on Electronics Supply Chains: A Perspective from the Electronics Manufacturing Service Industry," *TLI-AP Technical Report*, Georgia Tech, August, 2001.

[4] "Electronics Manufacturing Service Industry," joint with E.Barnes, J. Dai, D. Dawn, *TLI-AP Technical Report*, Georgia Tech, August, 2000.

[5] "Pricing Electricity Derivatives under Alternative Stochastic Spot Price Models," *Proceedings of the Thirty-Third Hawaii International Conference on System Sciences*, Hawaii, January, 2000.

[6] S.J. Deng and S.S. Oren (2003). "Incorporating Operational Characteristics and Startup Costs in Option-Based Valuation of Power Generation Capacity," *Probability in the Engineering and Informational Sciences (PEIS)*, 17 (2), pp.155-181.

[7] S.J. Deng and W.J. Jiang (2004). "Quantile-Based Probabilistic Models with an Application in Modelling Electricity Prices," in *Modelling Prices in Competitive Electricity Markets*, D. Bunn (editor), John Wiley & Sons, Inc, Chapter 7, 161-176. (Reviewed by the editor.)

[8] S.J. Deng and S.S. Oren (2005). "Valuation of Electricity Generation Capacity," in *Applications of Stochastic Programming*, S.W. Wallace and W.T. Ziemba (editors), SIAM, Chapter 31, 655-667. (Refereed)

[9] S.J Deng (2005). "Valuation of Investment and the Opportunity to Invest in Power Generation Assets with Spikes in Power Prices," *Managerial Finance*, 31 (6), 94-114.

[10] H. Sun, S.J. Deng, A.P. Meliopoulos, G. Cokkinides, G. Stefopoulos, and T. Mount (2005). "A Probabilistic Analysis of Transmission Right Valuation Under Market Uncertainty," *International Energy Journal*, Vol. 6, No.1, part IV, pp.1-14.

[11] S.J Deng and W.J. Elmaghraby (2005) "Supplier Selection via Tournaments," *Production and Operations Management*, Vol. 14, No. 2, pp. 252-276.

[12] S.J Deng and W.J. Jiang (2005). "Levy Process Driven Mean-reverting Electricity Price Model: a Marginal Distribution Analysis," *Decision Support Systems*, Vol.40, Issues 3-4 , October, pp.483-494.

[13] S.J. Deng, H. Sun, and A.P. Meliopoulos (2005). "Impact of Market Uncertainty on Congestion Revenue Right Valuation," *Journal of Energy Engineering*, Vol. 131, No. 2, August, pp.139-156.

[14] S.J Deng and S.S. Oren (2006). "Electricity Derivatives and Risk Management," *Energy, The International Journal*, Vol.31, Issues 6-7 , May-June, pp. 940-953.

[15] Y. Oum, S.S. Oren, and S.J. Deng (2006). "Hedging Quantity Risks with Standard Power Options in a Competitive Wholesale Electricity Market," *Naval Research Logistics*, 53: 697-712.

[16] S.J. Deng and Z. Xia (2006). "A Real Options Approach for Pricing Electricity Tolling Agreements," *International Journal of Information Technology & Decision Making*, Vol. 5, No. 3, 421-436.

[17] N.H. Chan, S.J. Deng, L. Peng, and Z. Xia (2007). "Interval Estimation of Value-at-Risk Based on GARCH with Heavy Tailed Innovations," *Journal of Econometrics*, Vol.137, pp. 556-576.

## CONFERENCE PRESENTATIONS

### Conference (invited or sponsored) presentations

[1] S.J. Deng, B. Johnson, and A. Sogomonian (1998). "Exotic Electricity Options: Pricing and Asset Valuation," the Chicago Risk Management Conference, Chicago, May. (Also presented at the INFORMS Fall 1998 Conference, Seattle, October 25-28, 1998; The Thirty-second Hawaii International Conference on System Sciences, Hawaii, January, 1999.)

[2] S.J. Deng and S.S. Oren (1998). "Priority Network Access Pricing for Electric Power," the Third Annual POWER Conference, Berkeley, March. (Also presented at the IAEE Conference, San Francisco, September, 1997; The INFORMS Spring 1998 Conference, Montreal, April 26-29, 1998; Bulk Power System Dynamics and Control IV - Restructuring, Santorini, Greece, August, 1998.)

[3] S.J. Deng (1999). "Stochastic Models of Energy Commodity Prices and Their Applications: Mean-reversion with Jumps and Spikes," the Fourth Annual POWER Conference, Berkeley, March. (Also presented at EPRI Workshop on Applications of Planning under Uncertainty, Palo Alto, July 12-16, 1999; the Second Annual Conference on Computational and Quantitative Finance, New York, September 27-28, 1999; The 15th Triennial Conference of IFORS, Beijing, P. R. China, August, 1999.)

[4] S.J. Deng and S.S. Oren (1999). "Incorporating Physical Constraints & Startup Costs in Option-Based Valuation of Power Generation Capacity," EPRI Workshop on Applications of Planning under Uncertainty, Palo Alto, July 12-16. (Also presented at the 15th Triennial Conference of IFORS, Beijing, China, August, 1999; The INFORMS Fall 1999 Conference, Philadelphia, November 7-10.)

[5] S.J. Deng (2000). "An Option-based Approach to Real Asset Valuation through Simulation," the INFORMS Spring 2000 Conference, Salt Lake City, May 7-10. (Also presented at the International INFORMS Conference, Maui, June 17-20, 2001.)

[6] S.J. Deng (2000). "Pricing Electricity Derivatives under Alternative Stochastic Models and Its Applications," invited presentation at the Stochastic Network Conference at the University of Wisconsin, Madison, June 19-24. (Also presented at the Energy Derivative Conference organized by the University of Waterloo, Toronto, May 29, 2000; The Thirty-third Hawaii International Conference on System Sciences, Hawaii, January, 2000.)

[7] S.J. Deng and W.J. Elmaghraby (2000). "Dual Sourcing with Tournament as a Supplier Selection Mechanism," Manufacturing and Service Operations Management (MSOM) Conference, Ann Arbor, Michigan, June. (Also presented at INFORMS Fall 2000 Conference, San Antonio, Nov. 5-8.)

[8] S.J. Deng and W.J. Jiang (2000). "An Inverse-Quantile Function Approach for Modeling Electricity Price," the INFORMS Fall 2000 Conference, San Antonio, Nov. 5-8. (Also presented at the 35th Hawaii International Conference on System Sciences, Hawaii, January, 2002.)

[9] S.J. Deng (2001). "Online Exchange Markets and Their Impacts on Electronics Supply Chain: the Case with Electronics Manufacturing Service Industry," 1st China-US Advanced Workshop on E-commerce, Xi'an, May 27-30.

[10] S.J. Deng, W.J. Jiang, and Z. Xia (2001). "Alternative Statistical Specifications of Commodity Price Distribution with Fat Tail," the 5th International Conference on Optimization: Techniques and Applications, Hong Kong, December.

[11] S.J. Deng and S. Hackman (2002). "Strategic Warehouse Design: a Real Options Analysis," International Conference on Global Supply Chain, Beijing, China, August. (Also presented at the INFORMS Annual Meetings, Atlanta, GA, October 19-22, 2003.)

[12] S.J. Deng and W.J. Jiang (2002). "A Class of Non-Gaussian GARCH Models," INFORMS Annual Meetings, San Jose, November 17-20.

[13] S.J. Deng and Z. Xia (2003). "Pricing and Hedging Structured Energy Supply Contracts as Real Options: the case with Tolling Agreements," IEEE Power Engineering Society General Meeting, Toronto, Canada, July 13-17. (Also presented at the International Conference on "Modeling, Optimization, and Risk Management in Finance", Gainesville, FL, March 5-7, 2003; the INFORMS Annual Meetings, Atlanta, GA, October 19-22, 2003.)

[14] S.J. Deng (2003). "Valuation of Investment and the Opportunity to Invest in Power Generation Assets with Spikes in Power Prices," Midwest Finance Association 52nd Annual Meeting, St. Louis, MO, March 27-29.

[15] S.J. Deng and Y. Feng (2003). "Optimal Hedging of Electric Power Supply Contracts under Default Risk," the INFORMS Annual Meetings, Atlanta, GA, October 19-22.

[16] S.J. Deng and S.S. Oren (2003). "Using Swing Options for Managing Intrazonal Congestion Risk," Joint Euro/International INFORMS, Istanbul, Turkey, July. (Also presented at the Conference on Risk Management in Regional Electricity Markets in China, Nanjing, China, May 2004.)

[17] S.J. Deng, S.S. Oren, and A.P. Meliopoulos (2004). "The Inherent Inefficiency of the Point-to-Point Congestion Revenue Right Auction," INFORMS Annual Meetings, Denver, CO, October 24-27.

[18] H. Sun, S.J. Deng, A.P. Meliopoulos, G. Cokkinides, G. Stefopoulos, and T. Mount (2004). "A Probabilistic Analysis of Transmission Right Valuation Under Market Uncertainty," International Conference on Electric Supply Industry in Transition: Issues and Prospects for Asia, Asian Institute of Technology, Thailand, January 14-16.

[19] N.H. Chan, S.J. Deng, W.J. Jiang, L. Peng, and Z. Xia (2004). "Heavy-tailed GARCH Models: Pricing and Risk Management Applications in Electric Power Markets," invited presentation at IMA Workshop on Control and Pricing in Communication and Power Networks, Institute for Mathematics and Its Applications (IMA), Minneapolis, MN, March 8-13. (Also presented at the NSF workshop on Applied Mathematics for Deregulated Electric Power Systems: Optimization, Control, and Computational Intelligence, Arlington, VA, November 3-4, 2003.)

[20] S.J. Deng, H. Sun, and A.P. Meliopoulos (2004). "Impact of Bulk Power System Reliability Constraints on Power Market Price Volatility," IREP Symposium 2004 VI: Bulk Power Systems Dynamics and Control Symposium, Cortina D'Ampezzo, Italy, August 22-27.

[21] S.J. Deng, H. Sun, and A.P. Meliopoulos (2004). "Analyzing the Impact of Bulk Power System Reliability Constraints on Power Market Price Volatility," the 8th International Conference on Probabilistic Methods Applied to Power System (PMAPS), Ames, IA, September 12-16.

[22] S.J. Deng (2004). "A Semi-Dynamic Approach for Valuing and Hedging Options on Two Assets with Continuous Payout," the International Workshop on Math Finance and Insurance, Yellow Mountain, China, May 24-31. (Also presented at the INFORMS Annual Meetings, Denver, CO, October 24-27, 2004.)

[23] S.J. Deng and S. Lee (2004). "American-style Options Pricing by Adaptive Simulation," the INFORMS Annual Meetings, Denver, CO, October 24-27. (Also presented at the Conference on Risk Management and Quantitative Approaches in Finance, Gainesville, FL, April 6-8, 2005.)

[24] S.J. Deng and Y. Feng (2004). "Pricing and Hedging of Energy Supply Contracts with Quantity Risk," the INFORMS Annual Meetings, Denver, CO, October 24-27.

[25] S.J. Deng and H.J. Sim (2005). "Optimal Capacity Investment with Partial Reversibility under Oligopolistic Competition," the International Conference of Management Science and Applications (ICMSA 2005), Chengdu, China, June 20-22.

[26] S.J. Deng (2005). "Pricing American-style Options and Structured Energy Contracts by Adaptive Simulation," the 12th Annual CAP Workshop on Derivative Securities and Risk Management, Columbia University, New York City, October 28, 2005.

[27] S.J. Deng and Y.Y. Feng (2005). "Optimal Production Planning under Incentives for Interruptible Electricity Supply," the INFORMS Annual Meetings, San Francisco, CA, November 13-16.

[28] S.J. Deng and D.J. Wu (2005). "Pricing Options Contracts: A Continuous-Time Model," the INFORMS Annual Meetings, San Francisco, CA, November 13-16.

[29] Y. Oum, S.S. Oren and S.J. Deng (2005). "Hedging Quantity Risks with Standard Power Options in a Competitive Wholesale Electricity Market," the INFORMS Annual Meetings, San Francisco, CA, November 13-16. (Also presented at the 11th Annual POWER Conference, Berkeley, March, 2006.)

[30] S.J. Deng, J.F. Huang, Y.Q. Li (2006). "Option Pricing by Fast Convolution Transform", the International Workshop on Math Finance and Insurance, Lijiang, China, May 27- June 3, 2006. (Also presented at the INFORMS Annual Meetings, Pittsburg, PA, November, 2006; Georgia Tech Quant. & Comput. Finance Seminar Series, March 15, 2007.)

[31] S.J. Deng, Y. Shen, H. Sun (2006). "Stochastic Co-optimization for Hydroelectric Power Generation Scheduling in Multi-Markets", International INFORMS, Hong Kong, China, June 25-28, 2006. (Also presented at the INFORMS Annual Meetings, Pittsburg, PA, November, 2006.)

**Invited seminars**

[1] "Stochastic Models of Electricity and Their Applications," the Simon School, University of Rochester, April 28, 2000. (Also presented at the Research Department, Enron Corp, July 2000; The Financial Mathematics Department, Peking University, December 2000.)

[2] "Supplier Selection via Tournament," Guanghua School of Management, Peking University, December 2000. (Also presented at the Economic and Management School, Tsinghua University, Dec. 2000; Service Management Institute, Sichuan University, June, 2004.)

[3] "Online Exchange Markets and Their Impacts on Electronics Supply Chain: the Case with Electronics Manufacturing Service Industry," TLI-AP/Decision Science Dept., National University of Singapore, June 2001. (Also presented at the School of Economics and Management, Tsinghua University, June 1, 2001; Guanghua School of Management, Peking University, June 4, 2001.)

[4] "Financial Engineering Applications in Energy Markets," Academy of Mathematics and System Science, Chinese Academy of Science, Beijing, June, 2001. (Also presented at the Computational Science Dept., National University of Singapore, July 2001; Financial Engineering Center, National University of Singapore, May 2002.)

[5] "On the Role of a Spot Market in a Two-Echelon Supply Chain," Guanghua School of Management, Peking University, December, 2001.

[6] "Incorporating Physical Constraints & Startup Costs in Option-Based Valuation of Power Generation Capacity," Industrial and Operational Engineering Department, University of Michigan, Ann Arbor, January, 2002.

[7] "Pricing Electricity Derivatives under Alternative Stochastic Models and Its Applications," Mathematical Science Center, Bell Labs, Murray Hills, March 29, 2002.

[8] "Strategic Warehouse Design: a Real Options Analysis," TLI-AP, National University of Singapore, May 2002.

[9] "Valuation of Congestion Revenue Rights based on Electric Power Market Simulation Models," Tractebel North America, Houston, February 3, 2003. (Also presented at the Power Systems Engineering Research Center (Pserc) Internet Seminar, Atlanta, April 1, 2003; Corporate Research - US, ABB Inc., Raleigh, NC, December 5, 2003.)

[10] "An Inverse-Quantile Function Approach for Modeling Electricity Price," Constellation Energy Group, June, 2003.

[11] "An AC-flow Based Electric Power Market Simulation Model and an Application in Congestion Revenue Rights Valuation," Corporate Research - US, ABB Inc., Raleigh, NC, December 5, 2003. (Also presented at the Lawrence Berkeley National Lab, Berkeley, CA, April, 2004.)

[12] "Heavy-tailed GARCH Models: Pricing and Risk Management Applications in Electric Power Markets," Guanghua School of Management, Peking University, December 2003.

[13] "The Inherent Inefficiency of the Point-to-Point Congestion Revenue Right Auction," Univ. of California Energy Institute Seminar, Berkeley, CA, February 27, 2004. (Also presented at the EEE Department, the University of Hong Kong, Hong Kong, China, May 18, 2004.)

[14] "Swing Financial Transmission Right and Transmission Risk Management," the EEE Department, the University of Hong Kong, Hong Kong, China, May 19, 2004.

[15] "Revenue Management and Its Application in the Energy Industry," Guanghua School of Management, Peking University, July 2004.

[16] "American-style Options Pricing by Adaptive Simulation," ISYE Statistics Seminar Series, Georgia Tech, September 30, 2004.

[17] "Optimal Production Planning under Incentives for Interruptible Electricity Supply," Financial Engineering Seminar Series, University of Florida, Gainesville, FL, December 13, 2005.

[18] "Option Pricing by Fast Convolution Transform", Math Finance Seminar, Department of Mathematics, North Carolina State University, Raleigh, NC, April 7, 2006.

## HONORS AND AWARDS

1. CAREER Award, National Science Foundation, 2002.
2. Mitchel Ming-Chi Shen Graduate Award: Fall 1996.
3. Lando Fellowship, University of Minnesota: Summer 1992

## GRANTS AND CONTRACTS

1. PI: CAREER Award, National Science Foundation, $375,000, September 2002 – August 2007.
2. PI: Power System Engineering Research Center, $70,000, June 2007 – June 2009.
3. PI: Power System Engineering Research Center, $60,000, June 2005 – June 2007.
4. PI: Power System Engineering Research Center, $90,000, June 2002 – June 2005.
5. Co-PI: Singapore TLI-AP project, funded through the electronics group, $153,740. PIs: Shi-Jie Deng, Steve Hackman, Richard Serfozo, 11/2001 – 11/2002.
6. Co-PI: Singapore TLI-AP project, funded through the electronics group, $153,740. PIs: Jim Dai, Shi-Jie Deng, Richard Serfozo, Yang Wang, 11/2000 – 11/2001.
7. Co-PI: National University of Singapore/TLI-AP project, electronics group, $153,740. PIs: Jim Dai, E. Barnes, Doug Down, Shi-Jie Deng, 1/2000 – 11/2000.

## PROFESSIONAL MEMBERSHIPS AND ACTIVITIES

**Editorial Service**

*Associate Editor*

- Operations Research, January 2006 - present.

### Conference/workshop/session organization

*Program committee member*

- Organizers, Annual Georgia Tech Experience Quantitative & Computational QCF Day, March 30, 2007.
- Organizing Committee, an international workshop on interdisciplinary research in management science & engineering with emphasis on energy, environment and healthcare research, Peking University, Beijing, China, July 1-2, 2005.

*Conference cluster chair*

- Energy Natural Resources and Environment (ENRE) Cluster, INFORMS International Hong Kong 2006, Hong Kong, China, June 25-28, 2006.
- ENRE-Energy, INFORMS, San Francisco, CA, November 13-16, 2005.
- Financial Engineering, INFORMS, Atlanta, GA, October 19-22, 2003.

*Conference session chair*

- INFORMS International Hong Kong, China, June 25-28, 2006.
- The International Conference of Management Science and Applications (ICMSA 2005), Chengdu, China, June 20-22, 2005.
- INFORMS, Pittsburg, PA, Nov. 2006; San Francisco, CA, November 13-16, 2005; Denver, CO, October 24-27, 2004; Atlanta, GA, October 19-22, 2003; San Jose, CA, November 17-20, 2002; San Antonio, November 5-8, 2000.
- The 8th International Conference on Probabilistic Methods Applied to Power System (PMAPS), Ames, IA, September 12-16, 2004.

### Academic Program Director

- Co-Director, *Quantitative & Computation Finance Program (QCF)*, Fall 2006 – present.
  QCF Co-Directors jointly carry out the QCF program administrative duties including budget preparation, student admission, and outreaching efforts for establishing a high reputation in the academic and financial communities.

### Academic Program Committee

- Member, *Quantitative & Computation Finance Program (QCF) Executive Committee*, Spring 2000 – present.
  QCF Executive Committee is a six-member committee appointed by the Provost which consists of 2 faculty members from each of the 3 schools of ISyE, Management and Mathematics. It is in charge of the QCF curriculum design, budget approval, and student admission.
- ISYE representative, Campus-wide ad-hoc QCF Program Review Committee, Fall 2002.

### Professional Society Memberships

- Senior Member, IEEE, Feb. 2006 – present; member 2002 – Feb. 2006.
- Member, INFORMS, 1996 – present.
- Member, American Finance Association, 1997 – present.
- Member, Western Finance Association, 2000 – present.

## COMPUTER SKILLS

- **Operating Systems**: UNIX, MS-Windows, X-Windows.
- **Programming**: C/C++, FORTRAN 77.
- **Spreadsheets**: Excel.
- **Computational Software**: Matlab, Mathematica, AMPL.