

PETER P. CARR

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WORK EXPERIENCE

Consultant, Jane Street Capital, Jan. 2016 to present
Managing Director, Global Head of Market Modeling, Morgan Stanley, April 2010 to March 2016
– Responsible for models in interest rates, currencies, EM, credit, commodities, and XVA
– Managing over 60 people in 5 offices worldwide
– Oversaw expansion of Budapest team and establishment of Beijing/Shanghai office
Head of Quantitative Financial Research, Bloomberg LP, May 2003 to March 2010
Principal, Banc of America Securities, Jan. 1999 to May 2001
Vice President, Morgan Stanley, Feb. 1996 to Dec. 1998
Assistant Professor of Finance, Cornell University, July 1988 to June 1996.

EDUCATION

PhD. Finance, University of California, Los Angeles, Sept. 1989
M.B.A. Accounting/Finance, University of Toronto, June 1983
BCom., Accounting/Economics, University of Toronto, June 1981.

AWARDS

Institutional Investor Tech 50, 2011 to 2014
IAQF/Sungard Financial Engineer of the Year 2010
ISA Medal for Science, University of Bologna, 2008
Cutting Edge Research, Wilmott Magazine, 2004
Quant of the Year, Risk Magazine, 2003

BOARDS/COMMITTEES

Executive Director of Math Finance Program, NYU Courant Institute since May 2003
Trustee for the Museum of Mathematics since 2011
Co-Treasurer of the Bachelier Finance Society since 1996
Co-organizer of Bachelier Finance Society 2016 Meeting since 2014
Worldquant University Board since March 2015
Global Risk Initiative Research Advisory Committee since Jan 2016

REFEREED ACADEMIC PUBLICATIONS

1. “Analyzing Volatility Risk and Risk Premium in Option Contracts: A New Theory”, (with L. Wu), *Journal of Financial Economics*, forthcoming.

2. “Leverage Effect, Volatility Feedback, and Self-Exciting Market Disruptions”, (with L. Wu), *Journal of Financial and Quantitative Analysis*, forthcoming.
3. ”Optimal Rates from Eigenvalues”, (with P. Worah), *Finance Research Letters*, forthcoming.
4. “Local Variance Gamma and Explicit Calibration to Option Prices”, (with S. Nadtochiy), *Mathematical Finance*, forthcoming.
5. “Hedging Insurance Books” (With D. Madan M. Malamed, and W. Schoutens) *Insurance Mathematics and Economics*, forthcoming.
6. “Static Hedging of Standard Options”, (with L. Wu), *Journal of Financial Econometrics*, 2014, 12(1), 3–46.
7. “On the hedging of options on exploding exchange rates”, (with J. Ruf and T. Fisher), *Finance and Stochastics*, 2014, **18**, 1.
8. “Joint modeling of VIX and SPX options at a single and common maturity with risk management applications”, (with D. Madan), *IIE Transactions*, **46**, 11, 2014.
9. Variation and Share-Weighted Variation Swaps on Time-Changed Lévy Processes, (with R. Lee), *Finance and Stochastics*, **7**, 4 , 2013, 685–716.
10. Why are quadratic normal volatility models analytically tractable?, (with J. Ruf and T. Fisher), *SIAM Journal on Financial Mathematics*, 2013, 4.
11. “Using Pseudo-Parabolic and Fractional Equations for Option Pricing in Jump Diffusion Models”, (with A. Itkin), *Computational Economics*, **40**, 1, Jun., 2012, 63–104.
12. “Variance Swaps on Time-Changed Lévy Processes”, (with R. Lee), *Finance and Stochastics*, Apr. 2012, 335-355.
13. “Static Hedging under Time-Homogeneous Diffusions”, (with S. Nadtochiy), *SIAM Journal on Financial Mathematics*, **2**, 1, Dec., 2011, 794–838,
14. “Explicit Constructions of Martingales Calibrated to Given Implied Volatility Smiles”, (with L. Cousot), *SIAM Journal on Financial Mathematics*, **3** 1, 2012, 182–214.
15. “Factor Models for Option Pricing”, (with D. Madan), *Asia-Pacific Financial Markets*, Nov. 2011, 1-11.
16. “Jumps without Tears: A New Splitting Technology for Barrier Options”, (with A. Itkin), *International Journal of Numerical Analysis and Modeling*, **8**, 4, 2011, 667–704.
17. “Static Hedging under Time-Homogeneous Diffusions”, (with S. Nadtochiy), *SIAM Journal of Financial Mathematics*, **2**, 1, Jan. 2011, 794–838.

18. “A Simple Robust Link Between American Puts and Credit Protection”, (with L. Wu) *Review of Financial Studies*, **24**, 2, 2011, 473–505.
19. “Multi-Asset Stochastic Local Variance Contracts”, (with P. Laurence), *Mathematical Finance*, **21**, 1, Jan. 2011, 2152.
20. “Pricing Swaps and Options on Quadratic Variation Under Stochastic Time Change Models: Discrete Observations Case,” (with A. Itkin), *Review of Derivatives Research*, Springer, **13** 2, July, 2010, 141–176.
21. “Time Changed Markov Processes in Unified Credit-Equity Modeling”, (with R. Mendoza-Arriaga and V. Linetsky), *Mathematical Finance*, **20**, 2010, 527569.
22. “A Class of Lévy Process Models with almost exact calibration of both barrier and vanilla FX options”, (with J. Crosby), *Quantitative Finance*, May 2010, 1-22.
23. “Options on Realized Variance and Convex Orders”, (with H. Geman, D. Madan, and M. Yor) *Quantitative Finance*, April 2010, 1-10.
24. “Hedging Variance Options on Continuous Semimartingales”, (with R. Lee), *Finance and Stochastics*, **14**, 2, Feb. 2010, 179–207.
25. “Local Volatility Enhanced by a Jump to Default”, (with D. Madan), *SIAM Journal on Financial Mathematics*, **1**, Jan. 2010 2–15.
26. “Volatility Derivatives”, (with R. Lee), *Annual Review of Financial Economics*, Volume 1, Dec. 2009.
27. “Put-Call Symmetry: Extensions and Applications”, (with R. Lee), *Mathematical Finance*, **19**, 4, Oct. 2009, 523–560.
28. “Stock Options and Credit Default Swaps: A Joint Framework for Valuation and Estimation”, (with L. Wu), *Journal of Financial Econometrics*, July 2009, 1–41.
29. “Variance Risk Premia” (with L. Wu), *Review of Financial Studies*, **22**, March, 2009.
30. “On the qualitative effect of volatility and duration on prices of Asian options”, (with C. Ewald, and Y. Xiao), *Finance Research Letters*, Sept. 2008.
31. “Stochastic Risk Premiums: Stochastic Skewness in Currency Options, and Stochastic Discount Factors in International Economics”, (with L. Wu and G. Bakshi), *Journal of Financial Economics*, **87**, 132–156.
32. “Stochastic Skew for Currency Options” (with L. Wu), *Journal of Financial Economics*, 2007, **86** 1, 213–247.
33. “A New Approach for Option Pricing Under Stochastic Volatility” (with J. Sun), *Review of Derivatives Research*, **10**, 2, 87–150.

34. "On the Numerical Valuation of Option Prices in Jump Diffusion Processes", (with A. Mayo), *The European Journal of Finance*, 2007, **13** 4, 353–372.
35. "Theory and Evidence on the Dynamic Interactions Between Sovereign Credit Default Swaps and Currency Options", (with L. Wu), *Journal of Banking and Finance*, **31**, 8, 2007, 2383-2403.
36. "Self-Decomposability and Option Pricing", (with D. Madan, H. G eman, and M. Yor), *Mathematical Finance*, **7**, 1, 2007, 31–57.
37. "A Jump to Default Extended CEV Model: An Application of Bessel Processes", (with V. Linetsky), *Finance and Stochastics*, 2006, **10**, 303-330.
38. "Generating Integrable One Dimensional Driftless Diffusions" (with P. Laurence and T. Wang), *Comptes Rendus de l'Acad mie des Sciences*, 343, **6**, Sept. 2006, 393-398.
39. "A Note on Sufficient Conditions for No Arbitrage", (with D. Madan), *Finance Research Letters*, 2005, **2**, 3.
40. "Pricing Options on Realized Variance", (with D. Madan, H. G eman, and M. Yor), *Finance and Stochastics*, IX, 4.
41. "From Local Volatility to Local L evy Models", (with D. Madan, H. G eman, and M. Yor), *Quantitative Finance*, October 2004, **4**, 5, 581–588.
42. "Time-Changed L evy Processes And Option Pricing", (with L. Wu), *Journal of Financial Economics*, January 2004, **71**, 1, 113–141.
43. "Bessel Processes, The Integral of Geometric Brownian Motion, and Asian options", (with M. Schr oder), *Theory of Probability and its Applications*, 2004, **48**, 3, 400–425.
44. "What Type of Process Underlies Options: A Simple Robust Test" (with L. Wu), *Journal of Finance*, December 2003, **68**, 6, 2581–2610.
45. "Stochastic Volatility for L evy Processes", (with H. G eman, D. Madan, and M. Yor), *Mathematical Finance*, July 2003, 345–382.
46. "The Finite Moment Logstable Process And Option Pricing", (with L. Wu), *Journal of Finance*, April 2003, 753–778.
47. "The Fine Structure of Asset Returns: An Empirical Investigation", (with H. G eman, D. Madan, and M. Yor), *Journal of Business*, **75**, 2002, 2, 305–32.
48. "Pricing and Hedging in Incomplete Markets", (with H. G eman and D. Madan), *Journal of Financial Economics*, **62**, 2001, 131–167.
49. "Optimal Positioning in Derivative Securities," (with D. Madan), 2001, *Quantitative Finance*, **1**, 1, 19–37.

50. “The Valuation of Executive Stock Options in an Intensity-Based Framework”, (with V. Linetsky), *European Finance Review*, **4**, 2000, 211-230.
51. “Optimal Investment in Derivative Securities,” (with D. Madan and X. Jin), *Finance and Stochastics*, **5**, 1, 33-60.
52. “The Variance Gamma Process and Option Pricing”, 1998, (with D. Madan), *European Finance Review*, **2**, 79–105.
53. “Static Hedging of Exotic Options,” June 1998, (with K. Ellis and V. Gupta), *Journal of Finance*, 1165-90. Reprinted in Quantitative Analysis of Financial Markets, M. Avellaneda, ed., 152–176.
54. “Randomization and the American Put,” 1998, *Review of Financial Studies*, **11**, 3, 597–626.
55. “Alternative Characterizations of American Put Options,” (with R. Jarrow and R. Myneni), *Mathematical Finance*, April 1992, 87–105.
56. “The Stop-Loss Start-Gain Strategy and Option Valuation,” (with R. Jarrow), *Review of Financial Studies*, Fall 1990, 469–92.
57. “The Valuation of Sequential Exchange Opportunities,” *Journal of Finance*, Dec. 1988, 1235–56.
58. “A Note on the Pricing of Commodity-Linked Bonds,” *Journal of Finance*, Sept. 1987, 1071–76.

REFEREED INDUSTRY PUBLICATIONS

1. “Adjusting Exponential Levy Models Towards the Simultaneous Calibration of Market Prices for Crash Cliquets”, (with D. Madan and A. Khanna), *Journal of Computational Finance*, forthcoming.
2. “Implied Remaining Variance in Derivative Pricing”, (with J. Sun) *The Journal of Fixed Income*, Spring 2014, **23**, 4, 19–32.
3. “Markets, profits, capital, leverage and return”, (with D. Madan and J. Alvarez) *Journal of Risk*, 21, Sept. 2011
4. “A PDE approach to jump-diffusions”, (with L. Cousot), *Quantitative Finance*, **11**, 1, Jan., 2011, 33–52.
5. “Maximum Drawdown Insurance”, (with O. Hadjiladis and H. Zhou), *International Journal of Theoretical and Applied Finance*, **14**, 8, 2011, 1195–1230.
6. “Semi-static Hedging of Barrier Options Under Poisson Jumps”, *International Journal of Theoretical and Applied Finance*, **14**, 7, 2011, 1091–1111.
7. “Risk, Return, and Ross Recovery”, (with J. Yu), *Journal of Derivatives*, Fall, 2012, **20**, 1 38–59.
8. “Markets, Profits, Capital, Leverage and Return”, (with D. Madan and J. J. Vicente Alvarez) *Journal of Risk*, **14**, 1, Fall, 2011, 95–122.

9. “Saddlepoint Methods for Option Pricing”, (with D. Madan), *Journal of Computational Finance*, **13**, 1, Fall, 2009, 49–61
10. “Hedging Under the Heston Model with Jump-To-Default”, (with W. Schoutens), *International Journal of Theoretical and Applied Finance*, June 2008, 1–12.
11. “Volatility and Variance: Options via Swaps”, (with R. Lee), *Risk*, May 2007, 76–83.
12. “A Tail of Two Indices”, (with L. Wu), *Journal of Derivatives*, Spring 2006, 13–29.
13. “The Forward PDE for European Options on Stocks with Fixed Fractional Jumps”, (with A. Javaheri), *International Journal of Theoretical and Applied Finance*, March 2005, **8**, 2, 239–53.
14. “Corridor Variance Swaps”, (with K. Lewis), *Risk*, February 2004, 67–72.
15. “Why Be Backward: Forward Equations for American Options”, (with A. Hirska), *Risk*, January 2003, 103–107.
16. “Black Scholes Goes HyperGeometric”, (with C. Albanese, G. Campolieti, and A. Lipton), *Risk*, Dec. 2001, 99-103.
17. “Commodity Covariance Contracting”, (with T. Corso), 2001, *Energy & Power Risk Management*, **4**, 42–5.
18. “Deriving Derivatives of Derivative Securities,” 2001, *Journal of Computational Finance*, **4**, 2, 5-30.
19. “Going with the Flow”, (with A. Lipton and D. Madan), *Risk*, Aug. 2000, 85–89. Reprinted as “An Alternative Approach for Valuing Continuous Cash Flows”, in *Quantitative Analysis in Financial Markets, Volume III*, M. Avellaneda, ed., 110–30.
20. “Option Pricing and the Fast Fourier Transform,” July 1999, (with D. Madan), *Journal of Computational Finance*, 61–73.
21. “Static Hedging of Timing Risk,” April 1999, (with J. Picon), *Journal of Derivatives*, 57–66.
22. “Currency Covariance Contracting,” Feb. 1999, (with D. Madan), *Risk*, 47–51.
23. “Towards a Theory of Volatility Trading”, (with D. Madan), *Volatility*, Risk Publications, R. Jarrow, ed., 417–427. Reprinted in *Option Pricing, Interest Rates, and Risk Management*, Musiella, Jouini, Cvitanic, ed., Cambridge University Press, 2001, 458–476.
24. “Breaking Barriers”, (with A. Chou), *Risk*, Sept. 1997, 139–145. Reprinted in *Hedging with Trees*, Risk Publications, R. Jarrow ed., 31–38.
25. “American Options: A Comparison of Numerical Methods”, (with F. AitSahlia), in *Numerical Methods in Finance*, L.C.G. Rogers and D. Talay, ed. Cambridge University Press, 1997, 67–87.

26. “Two Extensions to Barrier Option Valuation,” *Applied Mathematical Finance*, Sept. 1995, 173–209.
27. “Static Simplicity”, (with J. Bowie) **Risk**, August 1994, 44-50. Reprinted in Over the Rainbow, Risk Publications, R. Jarrow, ed.
28. “A Calculator Program for Option Values and Implied Standard Deviations,” *Journal of Financial Education*, Fall 1988, 89–93.

BOOK PUBLICATIONS

1. “Forward Evolution Equations for KnockOut Options”, (with A. Hirta), Advances in Mathematical Finance (Festschrift in honor of the 60th birthday of Dilip Madan), Birkhauser Boston, July 2007, M.C. Fu, R.A. Jarrow, J.-Y. Yen, and R.J. Elliott, ed.,
2. “Real Options and the Timing and Implementation of Emission Limits Under Ecological Uncertainty”, 1999, (with J. Saphores), in Project Flexibility, Agency, and Competition, Oxford University Press, M. J. Brennan and L. Trigeorgis, ed.
3. “Learning and Exercising Options to Reduce Capital Project Risk”, 1999, (with L. Chorn), in Risk Options and Business Strategy, Risk Publications, L. Trigeorgis, ed. 279–94.
4. “Determining Volatility Surfaces and Option Values from an Implied Volatility Smile” (with D. Madan), Quantitative Analysis of Financial Markets, Vol II, M. Avellaneda, ed., 163–191.
5. “Simulating Bermudan Interest Rate Derivatives”, (with G. Yang), Quantitative Analysis of Financial Markets, Vol II, M. Avellaneda, ed., 295–316.
6. “A Discrete Time Synthesis of Derivative Security Valuation Using a Term Structure of Futures Prices,” (with R. Jarrow), in the finance volume of Handbooks in Operations Research and Management Science, R. Jarrow, V. Maksimovic, & B. Ziemba, ed., 225–249.
7. “The Valuation of American Exchange Options with Application to Real Options,” Real Options in Capital Investment: New Contributions, L. Trigeorgis, ed., 109-20,
8. “Valuing Bonds with Detachable Warrants,” Japanese Financial Market Research, 467-79, W. Bailey, Y. Hamao, & B. Ziemba, eds.

WORKING PAPERS

1. “Solving the Optimal Trading Trajectory Problem Using a Quantum Annealer”, (with 5 others)
2. “Derivatives, Diffusion, and Duality”,
3. “Model Risk, Robust Deltas, and Hedging”,
4. “FX Options in a Target Zone”, (with Z. Kakushadze).

5. “ The Game of Volatilities” (with G. Pelts).

EDITING

Associate editor for:

1. Computational Finance
2. Journal of Derivatives
3. International Journal of Theoretical and Applied Finance
4. Quantitative Finance
5. Review of Derivatives Research
6. Journal of Risk
7. Risk Letters

CONSULTING

Bank of Tokyo Mitsubishi, 2002

McKinsey & Co, 1995

Susquehanna Investment Group, 1992

Astro Gamma Inc. 1991

COURSES TAUGHT

Continuous Time Finance Capital Markets and Portfolio Theory

Introduction to Derivative Securities

Advanced Topics in Derivative Securities

Doctoral Seminars on Convex Duality, Asset Pricing Theory, and Option Pricing Theory

REFERENCES

1. Robert Engle, Michael Armellino Professor of Management and Financial Services, NYU University, Stern School.
2. Stephen A. Ross, Franco Modigliani Professor of Finance and Economics, MIT, (617) 253-8371.
3. Darrell Duffie, James I. Miller Professor of Finance, Stanford University, (415) 723-1976.