

CURRICULUM VITAE

Peter A. Forsyth

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University of Waterloo
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EDUCATION:

- 1977-79 Ph.D.
University of Western Ontario
London, Ontario, Canada
- 1975-77 M.Sc.
Australian National University
Canberra, Australia
- 1971-75 B.Sc.
University of Western Ontario
London, Ontario, Canada

EXPERIENCE:

- 2016 - present Distinguished Professor Emeritus
Cheriton School of Computer Science,
University of Waterloo, Waterloo, Ontario, Canada.
- 1993 - 2016 Professor
Cheriton School of Computer Science,
University of Waterloo
- 2009 - 2011 Associate Director (Computing and Infrastructure)
Cheriton School of Computer Science
University of Waterloo
- 2006 - 2008 Scientific Director
Institute for Quantitative Finance and Insurance
University of Waterloo
- 2002 - 2005 Associate (Vice) Director
Cheriton School of Computer Science
University of Waterloo

- 1995 - 1998 Director
 Institute for Computer Research
 University of Waterloo
- 1991 - 1993 Associate Chair (Graduate Studies)
 Department of Computer Science
 University of Waterloo
- 1987 - 1993 Associate Professor
 Department of Computer Science,
 University of Waterloo
- 1985 - 1987 President
 Dynamic Reservoir Systems, Calgary, Alberta, Canada.
- 1979 - 1985 Senior Simulation Scientist (and other positions)
 Computer Modelling Group, Calgary, Alberta, Canada.

Research Interests

Computational finance, numerical methods for optimal stochastic control, sparse matrix algorithms, nonlinear partial integro-differential equations.

Courses Taught

Undergraduate courses

- Introduction to Scientific Computing. Third year course covers interpolation, FFT and application to image processing and compression, numerical linear algebra, ordinary differential equations. Matlab based.
- Numerical Linear Algebra. Fourth year/graduate course covers sparse matrix data structures, basic graph theory, direct methods, ordering, iterative methods. C++ based.
- Numeric Computation for Dynamical Simulation. Fourth year/graduate course, covers numerical algorithms for solution of differential equations in the context of simulation models. Runge-Kutta, BDF methods, DAE's, application to electronic circuits.
- Applications Software Engineering. Fourth year non-specialist course covers software design, testing, maintenance, configuration control. Use of tools, case studies.

Graduate courses

- Numerical Solution of Partial Differential Equations. Finite volume, finite element methods, M-matrices, LED discretizations, shocks, flux limiters.

- Preconditioners for Sparse Matrices. GMRES, CGSTAB, QMR acceleration. Incomplete factorization, level of fill, drop tolerance, applications.
- CFD Applications. Computational methods for high speed compressible flow, incompressible Navier-Stokes, multiphase subsurface flow.
- Computational Finance. Monte Carlo methods, low discrepancy sequences, finite volume PDE methods, techniques for drift-dominated real options, path-dependent options (Asian, shout, Parisian), discrete delta, gamma hedging simulation, penalty methods for American options.

Short courses

- Real options and finance: optimal stochastic control formulation and solution techniques. Seven hours of lectures, co-taught with Margaret Insley. Coruna, Spain, 2015.
- Numerical methods for Hamilton Jacobi Bellman equations in finance. This research level mini-course (eight hours of lectures) has been given in Singapore (2009), the Netherlands (2010), Vienna (2012), Coruna (Spain, 2012), Singapore (2013), Amsterdam (2015).
- Numerical PDE methods for path dependent options. Two day short course, combines lectures and Matlab exercises. Co-taught with Ken Vetzal. This course has been given in New York City (2001, 2003, 2004, 2005), Tokyo (2001), Toronto (2002), Ithaca, NY (2001, 2002) and Waterloo (2006, 2007, 2009, 2010).
- Convertible bonds: pricing theory and algorithms. One day short course, lectures and software demonstrations. Co-taught with Ken Vetzal, Elie Ayache. Given in New York City (2003), Paris (2004).

Commercially Developed Software

Dynamic Reservoir Simulator (developed with P.H. Sammon, A. Behie). Black oil reservoir simulation model for primary production, waterflooding, and coning. Duke Energy currently supports and markets this software. This package has been purchased by over thirty petroleum companies.

IMEX (developed with A. Behie, P.H. Sammon). Adaptive implicit black oil model. This code continues to be marketed and supported by the Computer Modelling Group, Calgary. Over 200 licenses sold.

Licensed Software Developed at Waterloo

WATSIT (developed with J. Kightley, S. Clift, E. D’Azevedo). Iterative sparse matrix solution package. This library has been purchased by such organizations as: HydroGeoLogic Inc. (Herndon, VA), Westinghouse Hanford (Richland, WA), Boeing (Seattle),

Los Alamos National Laboratory, Lawrence Berkeley National Laboratory, Sandia National Laboratory, Phillips Petroleum (Bartlesville), TRW Safety Systems (Los Vegas), Desert Research Institute (Los Vegas), and Atomic Energy of Canada (Pinawa). This software has also been distributed to a number of academic sites.

PCG5 This sparse iterative solver is embedded in simulation software (Visual Modflow, Modflow Surfact) developed by HydroGeoLogic Inc (Herndon, VA). Since 2005, about 100 licenses have been sold.

Consulting Experience

Research related consulting for such organizations as: Aquanty Inc. (Waterloo), TGINet/Cornell (Tokyo), SunLife of Canada, NOVA Corporation (Calgary), the Electric Power Research Institute (Mountain View, CA), Smithville Bedrock Remediation Corporation (Smithville Ont.), Los Alamos National Laboratory, Phillips Petroleum (Bartlesville), US Environmental Protection Agency, Oak Ridge National Laboratory, Lawrence Berkeley National Laboratory, NASA ICASE (Langley, VA), and HydroGeoLogic (Herndon, VA).

Editorial Boards

- Journal of Computational Finance (Editor-in-Chief, 2008-2013, Associate Editor, 2003-2008, 2013-)
- Applied Mathematical Finance (Associate Editor, 2004-)
- Encyclopedia of Quantitative Finance (section co-editor (with D. Lamberton), PDEs and Numerical Methods, 2007-2008).
- Applied Numerical Mathematics (guest co-editor, special issue on Iterative Methods, 2008).
- Advances Water Resources (Associate Editor, 1998-2001)

Recent Research Service

- Member, organizing committee, SIAM Conference on Financial Mathematics and Engineering, Austin, 2016.
- Member, MITACS Research Management Committee (2008-11).
- Scientific Director, Institute for Quantitative Finance and Insurance (Waterloo, now WATRISQ, 2006-2008).
- Member of organizing committee, Fields Institute numerical analysis year (2001-2002).
- NSF Panel member (*Computational Mathematics* (2001)).
- Grant selection committee member, CITO, *Modelling and simulation*, 1998-2000.

- Director, Insitute for Computer Research (Waterloo, 1995-1998). Organized over twenty-five short courses with industrial participants; also coordinated Waterloo submissions to ORDCF and CFI related to Bell Canada University Laboratory research initiative (total funding received from Bell, ORDCF and CFI in excess of \$20 million over three years).
- Workshops, Conferences Co-organized
 - Conference on Computational Methods in Finance, University of Waterloo, July, 2007
 - Workshop on Real Options in Telecommunications, University of Waterloo, May 2003
 - Workshop on Computational Methods and Applications in Finance, Fields Institute, University of Toronto, February 2002

Graduate Student Supervision

PhD

K. Ma (2015)	S. Clift (2007)
S.T. Tse (2012, co-supervisor J. Wan)	Y. d'Halluin (2004)
Y. Huang (2011)	H. Windcliff (2003)
J. Wang (2010)	D. Pooley (2003)
Z. Chen (2008)	R. Zvan (2000, co-supervisor K. Vetzal)
A. Belanger (2008, co-supervisor G. Labahn)	A. Unger (1995, co-supervisor E. Sudicky)
S. Kennedy (2007, co-supervisor G. Labahn)	

MMath

C. Shan (2014, co-supervisor G. Labahn)	B. Wang (2010)
J. Lippa (2013, co-supervisor G. Labahn)	J. Aquan-Asee (2009, co-supervisor G. Labahn)
A. Asare (2013, co-supervisor G. Labahn)	M. Yu (2007)
P. Azimzadeh (2013)	J. Kraus (2007, TU Munich, co-supervisors, Zagst, Grau)
H. Su (2013, co-supervisor G. Labahn)	L. Xiao (2006, co-supervisor, K. Vetzal)
M. Ma (2013, co-supervisor G. Labahn)	J. Wang (2005)
X. Peng (2013)	P. Lizak (2004)
Z. Wang (2012, co-supervisor G. Labahn)	A. Grau (2003)
X. Guan (2012)	C. Cheng (2002)
C. Morley (2011, co-supervisor G. Labahn)	M.C. Lam (2002)
J. Babbín (2011, co-supervisor G. Labahn)	W. Morland (2001)
D. Fagnan (2011, co-supervisor G. Labahn)	H. Windcliff (2000)
Y. Sohrabi (2011)	Y. d'Halluin (2000, co-supervisor G. Labahn)
W. Xiao (2010)	
D. Saraph (2010, co-supervisor G. Labahn)	

M. Fitzgerald(1999)	S. Clift (1993)
D. Pooley(1999, co-supervisor R.B. Simpson)	Y. Qian (1993)
L. Wang (1998)	J. Dickinson (1993)
T. Zvi (1998)	P. Chin (1991, co-supervisor W.L. Seward)
E. Carr (1997)	M.C. Kropinski (1990)
S. Friedman (1996)	F.W. Letniowski (1989)
H. Li (1996)	T. Natalisa (1988)
R. Zvan (1996)	W.S. Nugroho (1988)
B.Y. Shao (1994)	

Students Currently Supervised

Pieter van Staden (joint with Dang) (PhD)
 Bangyao Xu (joint with Labahn) (MMath)

PhD Examining Committees

N. Leung(CS, Toronto) 2017.	A. Borji (ECE) 2004.
F. Cong (Mathematics, Delft) 2016.	W. Annable (Earth Sciences) 2003.
B. Kimmel (CS) 2016.	Y. Wang (ECE) 2000.
A. Rajabi (CS) 2016.	V. Van (ECE) 1999.
S. Amarala (CS) 2015.	J. VanderKwaak (Earth Sciences) 1999.
O. Ardakanian (CS) 2015.	P. Zwart (Mechanical Engineering) 1999.
M. Ruijter (Mathematics, Delft) 2015.	J. Grad (Applied Mathematics) 1997.
K. Zhou (Systems Engineering, CUHK) 2014.	K. MacQuarrie (Earth Sciences) 1997.
A. Tayal (CS) 2014.	L. Zhang (Earth Sciences) 1997.
K. Miller (Applied Mathematics) 2012.	I. Murray (Applied Math) 1994.
J. Witte (Mathematics, Oxford) 2012.	M. Ibaraki (Earth Sciences) 1994.
H.T. Hwang (Earth Sciences) 2012.	C. Mendoza (Earth Sciences) 1992.
V. Surkov (CS, Toronto) 2009.	R. Heywood (Mechanical Engineering) 1992.
A. Rohani (ECE) 2006.	R. Therrien (Earth Sciences) 1992.
H. Li (Mathematics, Calgary) 2006.	A. Bajor (Chem. Eng.,Toronto) 1990.
R. Maji (Earth Sciences) 2005.	S. Ormiston (Mechanical Engineering) 1990.
M. Steigleider (CS) 2005.	W. Drennan (Applied Mathematics) 1988.
M. Ayatollah (ECE) 2004.	E. Fraga (CS) 1988.
K. Lau (Computer Science, UHKST) 2004.	

Administrative Duties

Member, Business at Waterloo Committee (2016)
 Member, School Advisory Committee on Appointments (2015-2016)
 Member, Director Search Committee, School of Accounting and Finance (2015)
 Member, UW Pension and Benefits Committee (2014-2016)

Member, UW Registered Pension Plan Investment Committee (2014-2016)
 Member, Faculty Association Academic Freedom and Tenure Committee (2012-2016)
 Member, School Advisory Committee on Appointments (2011-2012)
 Member, CS Graduate Committee (2011-14)
 Member, University Senate (2010-2012)
 Member, University Committee on Information Systems and Technology (2009-10).
 Chairman, CS Computing Facility Committee (2009-2011).
 Member, Engineering Faculty Promotion and Tenure Committee (2007-08).
 Scientific Director, Institute for Quantitative Finance and Insurance (2006-2008).
 Associate Director, Computing and Financial Management Program (2005-2008).
 Member, School of Computer Science Promotion and Tenure Committee (2005-07, 2009-10).
 Member, School of Computer Science Director Selection Committee (2005).
 Member, Dean of Mathematics Selection Committee (2004-2005).
 Member, University Senate (2004-2007).
 Associate Director, School of Computer Science (2002-2005).
 Member, External Relations Committee (2002-2005).
 Member, CS Computing Facility Committee (2002-2005).
 Member, CS Budget Committee (2002-2005).
 Member, Science Faculty Promotion and Tenure Committee (2001-2002).
 Member, Computer Science Governance Committee (2001).
 Member, Eyton Chair selection Committee (2000-2001).
 Member, Mathematics Faculty Promotion and Tenure Committee (1998-2001)
 Member, Graduate Committee (CS) (1997-2002)
 Member, Engineering Faculty Promotion and Tenure Committee, (1996-97)
 Member, Chair selection Committee (CS), (1996-1997).
 Member, Promotion and Tenure Committee(CS) (1995-97)
 Director, Institute for Computer Research (1995-98)
 Associate Chairman, Graduate Studies (1991 - 1993)
 Chairman, Graduate Committee (CS) (1991 - 1993)
 Member, Promotion and Tenure Committee (CS) (1991 - 1992)
 Member, Graduate Committee (CS) (1990-91)
 Chairman, PhD Comprehensive Committee (1989-90)
 Member, PhD Comprehensive Committee (1988-89)
 Member, Curriculum Committee, (1987-90)
 Member, Graduate Committee (Applied Mathematics) (1987-90)

Research Grants

2017-2022 NSERC Discovery grant. \$43,000/year.

2016-2018 Global Risk Institute. A multi-period mean-variance approach to risk and return in climate change policy. \$60,000 per year (with M. Insley (PI)).

2013-2016 Global Risk Institute. Long-horizon and longevity risks in insurance. \$188,000 per year (with K.S. Tan (PI), T. Coleman, M. Hardy, J. Li).

2012-2015 NSERC Collaborative Research and Development (CRD). Matching for Scotiabank grant. \$38,000 per year (co-PI with G. Labahn).

2011-2014 Scotiabank. Implied Volatility Surfaces, Local Volatility Models and Low Dimensional Hedging Strategies for Arithmetic and Geometric Baskets. \$25,000/year (co-PI with G. Labahn).

2010-2015 NSERC Discovery grant. \$40,000/year. (Deferred to end in 2017).

2009-2012 Credit Suisse Research Grant \$70,200/year (co-PI with Y. Li and A. Heunis).

2008-2011 Tata Consultancy Services Research Grant. \$25,000/year (co-PI with G. Labahn).

2006-2011 Morgan Stanley Equity Market Microstructure Research Grant. \$20,000/year.

2005-2010 NSERC Discovery grant. \$64,000/year.

2003-2005 ITO33, Paris. Numerical methods for jump diffusion and jump volatility models, \$23,000/year (co-PI with K. Vetzal).

2001-2005 NSERC Discovery grant. \$57,000/year.

2000-2003 Bell Canada University Labs. Computational Finance: Real options, telecommunications, and corporate finance \$135,000/year (co-PI) (with K. Vetzal(co-PI), P. Boyle, G. Labahn, K.S. Tan).

1999-2002 NSERC Strategic, Royal Bank. Computational Finance: algorithms for option pricing and hedging. \$128,000/year (PI) (with K. Vetzal, P. Boyle, G. Labahn).

1998-2001 NSERC Strategic. New computational approaches for modelling surface groundwater systems. \$131,000/year (with E. Sudicky (PI), E. Frind, N. Kouwen, D. Rudolph, R. Soulis, J. Sykes, H. Whiteley).

1998-2000 CITO. Computational support for modelling in Engineering & Finance.\$50,000 /year (with W.P. Tang, R.B. Simpson, A. George, P. Boyle, K. Vetzal).

1997-2001 NSERC operating grant. \$45,000/year.

1996-98 Smithville Environmental Restoration Project, ITRC and WCGR. Simulation of DNAPL contaminants in fractured rock. \$60,000/year (with E. Sudicky).

1995-1998 US EPA. Simulation of groundwater flow at the Smithville site. \$80,000/year (with E. Sudicky (PI), K. Novakowski).

1995-1998 Information Technology Research Center. Research into numerical solution of partial differential equations. \$75,000/year (with A. George, R. Simpson, W.P. Tang).

1995 Haley and Aldrich (Boston), Gartner-Lee (Markham), Waterloo Center for Groundwater Research. Simulation and video animation of NAPL extraction methods. \$29,000 (with E. Sudicky).

- 1995** Solvents in Groundwater Consortium. Simulation of vacuum extraction methods for VOC's. \$20,000 (with E. Sudicky).
- 1994** Waterloo Center for Groundwater Research. Visualization of DNAPL contamination. \$13,600 (with E. Sudicky).
- 1994** NSERC Equipment Grant. Video recording equipment for scientific visualization. \$42,000 (with R.H. Bartels).
- 1993** Solvents in Groundwater Consortium. Three dimensional simulation of NAPL contamination. \$19,000 (with E. Sudicky).
- 1993-1995** Information Technology Research Center. Research into numerical solution of partial differential equations. \$40,000/year (with R. Simpson, W.P. Tang).
- 1993-1997** NSERC operating grant. \$28,000/year.
- 1990-1993** NSERC operating grant. \$25,000/year.
- 1988-1990** NSERC operating grant. \$23,000/year.
- 1988-1992** Information Technology Research Center. Research into numerical solution of partial differential equations. \$80,000/year (with R. Simpson, W.P. Tang, W.L. Seward).
- 1985** Energy Mines and Resources. Development of new software technology for reservoir simulation. \$80,000 (with A. Behie, P. Sammon).

List of Research Contributions - Peter A. Forsyth

Refereed Journal Publications

1. K.L. Miller, S.J. Berg, J.H. Davison, E.A. Sudicky, P.A. Forsyth, "*Efficient uncertainty quantification in fully-integrated surface and subsurface hydrologic simulations,*" *Advances in Water Resources* 111 (2018) 381-394.
2. P.A. Forsyth and K.R. Vetzal "*Dynamic mean variance asset allocation: tests for robustness,*" *International Journal of Financial Engineering* 4:2 (2017) 1750021 (electronic).
3. P.A. Forsyth and K.R. Vetzal, "*Robust asset allocation for long-term target-based investing,*" *International Journal of Theoretical and Applied Finance* 20:3 (2017) 1750017 (electronic).
4. K. Ma, P.A. Forsyth "*An unconditionally monotone numerical scheme for the two factor uncertain volatility model,*" *IMA Journal of Numerical Analysis* 37 (2017) 905-944.

5. D.M. Dang, P.A. Forsyth, K.R. Vetzal, “*The 4% strategy revisited: A pre-commitment optimal mean-variance approach to wealth management,*” *Quantitative Finance* 17 (2017) 335-351.
6. P. Azimzadeh, P.A. Forsyth, “*Weakly chained matrices and impulse control,*” *SIAM Journal on Numerical Analysis* 54 (2016) 1341-1364.
7. C. Reisinger, P.A. Forsyth, “*Piecewise constant policy approximations to Hamilton-Jacobi-Bellman equations,*” *Applied Numerical Mathematics* 103 (2016) 27-47.
8. K. Ma, P.A. Forsyth, “*Numerical solution of the Hamilton-Jacobi-Bellman formulation for continuous time mean variance asset allocation under stochastic volatility,*” *Journal of Computational Finance* 20:1 (2016) 1-37.
9. D.M. Dang, P.A. Forsyth, Y. Li, “*Convergence of the embedded mean-variance optimal points with discrete sampling,*” *Numerische Mathematik* 132 (2016) 271-302.
10. D.M. Dang, P.A. Forsyth, “*Better than pre-commitment mean-variance portfolio allocation strategies: a semi-self-financing Hamilton-Jacobi-Bellman equation approach,*” *European Journal of Operational Research* 250 (2016) 827-841.
11. P. Azimzadeh, P.A. Forsyth, “*The existence of optimal bang-bang controls for GMxB contracts,*” *SIAM Journal on Financial Mathematics* 6 (2015) 117-139.
12. H.-T. Hwang, Y.-J. Park, E.A. Sudicky, P.A. Forsyth “*A parallel computational framework to solve flow and transport in integrated surface-subsurface hydrologic systems,*” *Environmental Modelling and Software* 61 (2014) 39-58.
13. P.A. Forsyth, K.R. Vetzal “*An optimal stochastic control framework for determining the cost of hedging of variable annuities,*” *Journal of Economic Dynamics and Control* 44 (2014) 29-53.
14. S.T. Tse, P.A. Forsyth, Y. Li, “*Preservation of scalarization optimal points in the embedding technique for continuous time mean variance optimization,*” *SIAM Journal on Control and Optimization* 52 (2014) 1527-1546.
15. D.M. Dang, P.A. Forsyth “*Continuous time mean-variance optimal portfolio allocation under jump diffusion: a numerical impulse control approach,*” *Numerical Methods for Partial Differential Equations* 30 (2014) 664-698.
16. J. Babbin, P.A. Forsyth, G. Labahn, “*A comparison of iterated optimal stopping and local policy iteration for American options under regime switching,*” *Journal of Scientific Computing* 58 (2014) 409-430.
17. S.T. Tse, P.A. Forsyth, J.S. Kennedy, H. Windcliff, “*Comparison between the mean variance optimal and mean quadratic variation optimal trading strategies,*” *Applied Mathematical Finance* 20 (2013) 415-449.

18. Y. Huang, P.A. Forsyth, G. Labahn, “*Inexact arithmetic considerations for direct control and penalty methods: American options under jump diffusion*,” Applied Numerical Mathematics 72 (2013) 33-51.
19. P.A. Forsyth, J.S. Kennedy, S.T. Tse, H. Windcliff, “*Optimal trade execution: a mean quadratic variation approach*,” Journal of Economic Dynamics and Control 36 (2012) 1971-1991.
20. Y. Huang, P.A. Forsyth, G. Labahn, “*Combined fixed point and policy iteration for HJB equations in finance*,” SIAM Journal on Numerical Analysis 50 (2012) 1849-1860.
21. Y. Huang, P.A. Forsyth, G. Labahn, “*Iterative methods for the solution of a singular control formulation of a GMWB pricing problem*,” Numerische Mathematik 122 (2012) 133-167.
22. J. Wang and P.A. Forsyth, “*Comparison of mean variance like strategies for optimal asset Allocation problems*.” International Journal of Theoretical and Applied Finance 15:2 (2012) (33 pages: DOI: 10.1142/S0219024912500148).
23. I. Huang and P.A. Forsyth, “*Analysis of a penalty method for pricing a Guaranteed Minimum Withdrawal Benefit (GMWB)*.” IMA Journal on Numerical Analysis 32 (2012) 320-351.
24. Y. Huang, P.A. Forsyth, G. Labahn, “*Methods for American options under regime switching*,” SIAM Journal on Scientific Computing 33 (2011) 2144-2168.
25. P.A. Forsyth, “*A Hamilton Jacobi Bellman approach to optimal trade execution*.” Applied Numerical Mathematics 61 (2011) 241-265.
26. J. Wang and P.A. Forsyth, “*Continuous time mean variance asset allocation: a time consistent strategy*.” European Journal of Operational Research 209 (2011) 184-201.
27. Z. Chen, P.A. Forsyth “*Implications of a regime-switching model on natural gas storage valuation and optimal operation*,” Quantitative Finance 10 (2010) 159-176.
28. J. Wang, P.A. Forsyth. “*Numerical solution of the Hamilton Jacobi Bellman Formulation for continuous time mean variance asset allocation*.” Journal of Economic Dynamics and Control 34 (2010) 207-230.
29. A. C. Belanger, P.A. Forsyth, G. Labahn, “*Valuing the guaranteed minimum death benefit clause with partial withdrawals*,” Applied Mathematical Finance 16 (2009) 451-496.
30. J.S. Kennedy, P.A. Forsyth, K.R. Vetzal, “*Dynamic hedging under jump diffusion with transaction costs*,” Operations Research 57 (2009) 541-559.
31. Y. Huang, P.A. Forsyth, K.R. Vetzal, “*Valuing guarantees on spending funded by endowments*,” Canadian Applied Mathematics Quarterly 17 (2009) 661-702.

32. Z. Chen, K.R. Vetzal, P.A. Forsyth, “*The effect of modelling parameters on the Value of GMWB Guarantees*,” Insurance: Mathematics and Economics 43 (2008) 165-173.
33. A.C. Belanger, P.A. Forsyth, “*Infinite reload options: pricing and analysis*,” Journal of Computational and Applied Mathematics 222 (2008) 54-81.
34. Z. Chen, P.A. Forsyth, “*A Numerical scheme for the impulse control formulation for pricing variable annuities with a Guaranteed Minimum Withdrawal Benefit (GMWB)*,” Numerische Mathematik 109 (2008) 535-569.
35. S.S. Clift, P.A. Forsyth, “*Numerical solution of two asset jump diffusion models*,” Applied Numerical Mathematics 58 (2008) 743-782.
36. J. Wang, P.A. Forsyth, “*Maximal use of central differencing for Hamilton-Jacobi-Bellman PDEs in Finance*,” SIAM Journal on Numerical Analysis 46 (2008) 1580-1601.
37. Y.S. Wu, P.A. Forsyth, “*Efficient schemes for reducing numerical dispersion in modeling multiphase transport through porous and fractured Media*,” Vadose Zone Journal 7 (2008) 340-349.
38. Z. Chen, P.A. Forsyth, “*A semi-Lagrangian approach for natural gas storage valuation and optimal operation*,” SIAM Journal on Scientific Computing 30 (2007) 339-368.
39. P.A. Forsyth, G. Labahn, “*Numerical methods for controlled Hamilton-Jacobi-Bellman PDEs in finance*,” Journal of Computational Finance 11:2 (2007/2008: Winter) 1-44.
40. I.R. Wang, J.W.I. Wan, P.A. Forsyth, “*Robust numerical valuation of European and American options under the CGMY process*,” Journal of Computational Finance 10:4 (2007: Summer) 31-69.
41. H. Windcliff, J. Wang, P.A. Forsyth, K. Vetzal, “*Hedging with a correlated asset: solution of a nonlinear pricing PDE*,” Journal of Computational and Applied Mathematics 200 (2007) 86-115.
42. Y. d’Halluin, P.A. Forsyth, K.R. Vetzal, “*Wireless network capacity investment*,” European Journal of Operational Research 176 (2007) 584-609.
43. C. He, J.S. Kennedy, T. Coleman, P.A. Forsyth, Y. Li, K. Vetzal, “*Calibration and hedging under jump diffusion*,” Review of Derivatives Research 9 (2006) 1-35.
44. H. Windcliff, P.A. Forsyth, K.R. Vetzal, “*Numerical methods and volatility models for valuing cliquet options*,” Applied Mathematical Finance 13 (2006) 353-386.
45. H. Windcliff, P.A. Forsyth, K.R. Vetzal, “*Pricing methods and hedging strategies for volatility derivatives*,” Journal of Banking and Finance 30 (2006) 409-431.

46. Y. d'Halluin, P.A. Forsyth, G. Labahn, "A semi-Lagrangian approach for American Asian options under jump diffusion," *SIAM Journal on Scientific Computing* 27 (2005) 315-345.
47. Y. d'Halluin, P.A. Forsyth, K.R. Vetzal, "Robust numerical methods for contingent claims under jump diffusion processes," *IMA Journal on Numerical Analysis* 25 (2005) 87-112.
48. H. Windcliff, P.A. Forsyth, K.R. Vetzal, "Analysis of the stability of the linear boundary condition for the Black-Scholes equation," *Journal of Computational Finance*, 8:1 (Fall, 2004) 65-92.
49. Y. d'Halluin, P.A. Forsyth, G. Labahn, "A penalty method for American options with jump diffusion processes," *Numerische Mathematik*, 97:2 (2004) 321-352.
50. R. Zvan, P.A. Forsyth, K.R. Vetzal, "Negative coefficients in two factor option pricing models," *Journal of Computational Finance*, 7:1 (Fall, 2003) 37-73.
51. E. Ayache, P.A. Forsyth, K.R. Vetzal, "The valuation of convertible bonds with credit risk," *Journal of Derivatives*, 11 (Fall, 2003) 9-29.
52. D.M. Pooley, K.R. Vetzal, P.A. Forsyth "Remedies for non-smooth payoffs in option pricing," *Journal of Computational Finance*, 6:4 (Summer, 2003) 25-40.
53. D.M. Pooley, P.A. Forsyth, K.R. Vetzal, "Numerical convergence properties of option pricing PDEs with uncertain volatility," *IMA Journal on Numerical Analysis*, 23 (2003) 241-267.
54. H. Windcliff, K.R. Vetzal, P.A. Forsyth, A. Verma, T. Coleman, "An object oriented framework for valuing shout options on high-performance architectures," *Journal of Economic Dynamics and Control*, 27 (2003) 1133-1161.
55. P.A. Forsyth, K.R. Vetzal, R. Zvan, "Convergence of Lattice and PDE methods for valuing path dependent options using interpolation," *Review of Derivatives Research*, 5 (2002) 273-314.
56. Y. d'Halluin, P.A. Forsyth, K.R. Vetzal, "Managing telecommunication networks under uncertainty," *IEEE/ACM Transactions on Networking*, 10 (2002) 579-588.
57. H. Windcliff, P.A. Forsyth, M.K. Le Roux, K.R. Vetzal, "Understanding the behaviour and hedging of segregated funds offering the reset feature," *North American Actuarial Journal*, 6 (2002) 107-125.
58. P.A. Forsyth, K.R. Vetzal, "Quadratic convergence for valuing American options using a penalty method," *SIAM Journal on Scientific Computing*, 23 (2002) 2095-2122.
59. Y. d'Halluin, P.A. Forsyth, K.R. Vetzal, G. Labahn, "A numerical PDE approach for pricing callable bonds," *Applied Mathematical Finance*, 8 (2001) 49-77.

60. H.A. Windcliff, P.A. Forsyth, K.R. Vetzal, "*Valuation of segregated funds: shout options with maturity extensions,*" Insurance: Mathematics and Economics, 29 (2001) 1-21.
61. H. Windcliff, P.A. Forsyth, K.R. Vetzal, "*Shout options: a framework for pricing contracts which can be modified by the investor,*" Journal of Computational Applied Mathematics, 134 (2001) 213-241.
62. R. Zvan, P.A. Forsyth, K.R. Vetzal, "*A finite volume approach for contingent claims valuation,*" IMA Journal on Numerical Analysis 21 (2001) 703-731.
63. Y.S. Wu, P.A. Forsyth, "*On the selection of primary variables in the numerical formulation for modelling multiphase flow in porous media,*" Journal of Contaminant Hydrology, 48 (2001) 277-304.
64. P.A. Forsyth, K.R. Vetzal, "*Implicit solution of uncertain volatility/transaction cost option pricing models with discretely observed barriers,*" Applied Numerical Mathematics 36 (2001) 427-445.
65. D. Pooley, P.A. Forsyth, K.R. Vetzal, R.B. Simpson, "*Unstructured meshing techniques for two asset barrier options,*" Applied Mathematical Finance 7 (2000) 33-60.
66. R. Zvan, K.R. Vetzal, P.A. Forsyth, "*PDE methods for pricing barrier options,*" J. Economic Dynamics and Control 24 (2000) 1563-1590.
67. R.G. McLaren, P.A. Forsyth, E.A. Sudicky, J.E. VanderKwaak, F.W. Schwartz, J.H. Kessler, "*Flow and transport in fractured Tuff at Yucca Mountain: numerical experiments on fast fracture flow mechanisms,*" Journal of Contaminant Hydrology 43 (2000) 211-238.
68. R. Zvan, P.A. Forsyth, K.R. Vetzal, "*Discrete Asian barrier options,*" Journal of Computational Finance 3 (Fall, 1999) 41-68.
69. K.R. Vetzal, P.A. Forsyth, "*Discrete Parisian and delayed barrier options: A general numerical approach,*" Advances in Futures Options Research 10 (1999) 1-16.
70. P.A. Forsyth, K.R. Vetzal, R. Zvan, "*A finite element approach to the pricing of discrete lookbacks with stochastic volatility,*" Applied Mathematical Finance 6 (1999) 87-106.
71. E. Graham, P.A. Forsyth, "*Preconditioned conjugate gradient methods for very ill-conditioned three dimensional linear elasticity problems,*" International Journal on Numerical Methods in Engineering 44 (1999) 77-98.
72. K.J. Slough, E.A. Sudicky, P.A. Forsyth, "*Numerical simulation of multiphase flow and phase partitioning in discretely fractured geologic media,*" Journal of Contaminant Hydrology 40 (1999) 107-136.

73. K.J. Slough, E.A. Sudicky, P.A. Forsyth, “*Grid refinement for modelling multiphase flow in discretely-fractured porous media,*” *Advances in Water Resources* 23 (1999) 261-269.
74. R. Zvan, P.A. Forsyth, K.R. Vetzal, “*Penalty methods for American options with stochastic volatility,*” *Journal of Computational and Applied Mathematics* 91 (1998) 199-218.
75. R. Zvan, P.A. Forsyth, K.R. Vetzal, “*Robust numerical methods for PDE models of Asian options,*” *Journal of Computational Finance*, 1 (Winter, 1998) 39-78.
76. P.A. Forsyth, A.J. Unger, E. Sudicky, “*Nonlinear iteration methods for nonequilibrium multiphase subsurface flow,*” *Advances in Water Resources* 21 (1998) 433-451.
77. P.A. Forsyth, E. Sudicky, “*Discrete wellbore simulations of pump and treat strategies for remediation of LNAPL contaminated aquifers,*” *Journal of Contaminant Hydrology* 31 (1998) 57-81.
78. A.J. Unger, P.A. Forsyth, E. Sudicky, “*Influence of alternative dissolution models and subsurface heterogeneity on DNAPL disappearance times,*” *Journal of Contaminant Hydrology* 30 (1998) 217-242.
79. P.A. Forsyth, M.C. Kropinski, “*Monotonicity considerations for saturated-unsaturated subsurface flow,*” *SIAM Journal on Scientific Computing* 18 (1997) 1328-1354.
80. H. Jiang, P.A. Forsyth, “*Robust numerical methods for Transonic flows,*” *International Journal on Numerical Methods in Fluids* 24 (1997) 457-476.
81. P.A. Forsyth, H. Jiang, “*Nonlinear iteration methods for high speed laminar compressible Navier-Stokes equations,*” *Computers & Fluids* 26 (1997) 249-268.
82. Y.S. Wu, P.A. Forsyth, H. Jiang, “*A consistent approach for applying numerical boundary conditions for multiphase subsurface flow,*” *Journal of Contaminant Hydrology* 23 (1996) 157-184.
83. Q. Fan, P.A. Forsyth, J. McMacken, W.P. Tang, “*Performance issues for iterative solvers in device simulation,*” *SIAM Journal on Scientific Computing* 17 (1996) 100-117.
84. A. Unger, P.A. Forsyth, E. Sudicky, “*Variable weighting methods for multiphase, multicomponent flow,*” *Advances in Water Resources*, 19 (1996) 1-27.
85. H. Jiang, P.A. Forsyth, “*Robust linear and nonlinear strategies for solution of the transonic Euler equations,*” *Computers & Fluids*, 24 (1995) 753-770.
86. A. Unger, E. Sudicky, P.A. Forsyth, “*Mechanisms for controlling air sparging for remediation of heterogeneous formations contaminated by dense non-aqueous phase liquids,*” *Water Resources Research* 31 (1995) 1913-1925.

87. S. Panday, P.A. Forsyth, R. Falta, Y.S. Wu, P.S. Huyakorn, "*Considerations for robust compositional simulation of subsurface NAPL contamination and remediation,*" Water Resources Research 31 (1995) 1273-1289.
88. P.A. Forsyth, Y.S. Wu, K. Pruess, "*Robust numerical techniques for saturated-unsaturated flow with dry initial conditions in heterogeneous media,*" Advances in Water Resources 18 (1995) 25-38.
89. P.A. Forsyth, "*Three dimensional modelling of steam flush for DNAPL site remediation,*" International Journal on Numerical Methods in Fluids 19 (1994) 1055-1082.
90. J.K. Dickinson, P.A. Forsyth, "*Preconditioned conjugate gradient methods for three dimensional linear elasticity,*" International Journal on Numerical Methods in Engineering 37 (1994)2211-2234.
91. S.S. Clift, P.A. Forsyth, "*Linear and non-linear iterative methods for the incompressible Navier-Stokes equations,*" International Journal Numerical Methods in Fluids 18 (1994) 229-256.
92. P.A. Forsyth, "*A positivity preserving method for simulation of steam injection for NAPL site remediation,*" Advances in Water Resources 16 (1993) 351-370.
93. P. Chin, P.A. Forsyth, "*Comparison of GMRES and CGSTAB accelerations for incompressible viscous flow,*" Journal of Computational and Applied Mathematics 46 (1993) 415-426.
94. E.F. D'Azevedo, P.A. Forsyth, W.P. Tang, "*Drop tolerance preconditioning for incompressible viscous flow,*" International Journal of Computational Mathematics 44 (1992) 301-312.
95. E.F. D'Azevedo, P.A. Forsyth, W.P. Tang, "*Towards a cost effective high order ILU preconditioner,*" BIT 32 (1992) 442-463.
96. P. Chin, E.F. D'Azevedo, P.A. Forsyth, W.P. Tang, "*Preconditioned conjugate gradient methods for the incompressible Navier-Stokes equations,*" International Journal on Numerical Methods in Fluids 15 (1992) 273-295.
97. E.F. D'Azevedo, P.A. Forsyth, W.P. Tang, "*Ordering methods for preconditioned conjugate gradient methods applied to unstructured grid problems,*" SIAM Journal on Matrix Analysis and Applications 13 (1992) 944-961.
98. P.A. Forsyth, B.Y. Shao, "*Numerical simulation of gas venting for NAPL site remediation,*" Advances in Water Resources 14 (1991) 354-367.
99. F.W. Letniowski, P.A. Forsyth, "*A control volume finite element method for three dimensional NAPL contamination problems,*" International Journal on Numerical Methods in Fluids 13 (1991) 955-970.

100. P.A. Forsyth, "*A control volume finite element approach for NAPL groundwater contamination*," SIAM Journal on Scientific and Statistical Computing 12 (1991) 1029-1057.
101. P.A. Forsyth, R.B. Simpson, "*A two phase, two component model for natural convection in a porous medium*," International Journal on Numerical Methods in Fluids 12 (1991) 655-682.
102. P.A. Forsyth, "*A control volume finite element method for local mesh refinement in reservoir simulation*," Society of Petroleum Engineers Journal on Reservoir Engineering 5 (1990) 561-566.
103. P.A. Forsyth, "*Radioactive waste disposal heating effects in unsaturated fractured rock*," Numerical Heat Transfer: Part A 17 (1990) 29-51.
104. P.A. Forsyth, "*Adaptive implicit criteria for two phase flow with gravity and capillary pressure*," SIAM Journal on Scientific and Statistical Computing, 10 (1989) 227-252.
105. P.A. Forsyth, "*Simulation of non-aqueous phase groundwater contamination*", Advances in Water Resources, 11 (1988) 74-83.
106. P.A. Forsyth, "*Comparison of single phase and two phase numerical model formulation for saturated-unsaturated groundwater flow*", Computer Methods in Applied Mechanics and Engineering, 69 (1988) 243-259.
107. P.A. Forsyth, P.H. Sammon, "*Quadratic convergence of cell centered grids*", Applied Numerical Mathematics, 4 (1988) 377-394.
108. A. Behie, P.A. Forsyth, P.H. Sammon, "*Adaptive implicit methods applied to thermal simulation*," Society of Petroleum Engineers Journal on Reservoir Engineering, 2 (1987) 596-598.
109. P.A. Forsyth, P.H. Sammon, "*Local mesh refinement and modelling of faults and pinchouts*", Society of Petroleum Engineers Journal on Formation Evaluation, 1 (1986) 275-286.
110. P.A. Forsyth, P.H. Sammon, "*Practical considerations for adaptive implicit methods in reservoir simulation*", Journal of Computational Physics, 62 (1986) 265-281.
111. A. Behie, D. Collins, P.A. Forsyth, P.H. Sammon, "*Fully coupled multi-block wells in oil reservoir simulation*", Society of Petroleum Engineers Journal, 25 (1985) 535-542.
112. A. Behie, P.A. Forsyth, "*Incomplete factorization methods for fully implicit simulation of enhanced oil recovery*", SIAM Journal on Scientific and Statistical Computing, 5 (1984) 543-561.

113. A. Behie, D. Collins, P.A. Forsyth, "*Incomplete factorization methods for three dimensional non-symmetric problems*", Computer Methods in Applied Mechanics and Engineering, 42 (1984) 287-299.
114. P.H. Sammon, P.A. Forsyth, "*Instability in the Runge-Kutta method applied to reservoir simulation*", BIT, 24 (1984) 373-379.
115. P.A. Forsyth, P.H. Sammon, "*Gas phase appearance and disappearance in fully implicit black oil simulation*", Society of Petroleum Engineers Journal, 24 (1984) 505-507.
116. L.X. Nghiem, P.A. Forsyth, A. Behie, "*A fully implicit hydraulic fracture model*", Journal of Petroleum Technology, 36 (1984) 1191-1198.
117. A. Behie, P.A. Forsyth, "*Multi-grid solution of the pressure equation in reservoir simulation*", Society of Petroleum Engineers Journal, 23 (1983) 623-632.
118. A. Behie, P.A. Forsyth, "*Multi-grid solution of three dimensional problems with discontinuous coefficients*", Applied Mathematics and Computation, 13 (1983) 229-240.
119. A. Behie, P.A. Forsyth, "*Comparison of fast iterative methods for symmetric systems*", IMA Journal on Numerical Analysis, 3 (1983) 41-63.
120. P.A. Forsyth, B. Rubin, P.K.W. Vinsome, "*Elimination of the constraint equation and modelling of problems with a non-condensable gas in steam simulation*", Journal of Canadian Petroleum Technology, 20 (1981) 63-68.
121. P.A. Forsyth, H. Rasmussen, "*High order perturbation solution of the electrochemical smoothing problem*", Journal of Computational and Applied Mathematics, 6 (1980) 37-42.
122. P.A. Forsyth, H. Rasmussen, "*Comparison of a variational inequality and front tracking solution of an electrochemical machining problem*", Utilitas Mathematica, 17 (1980) 3-15.
123. P. A. Forsyth, H. Rasmussen, "*A Kantorovich method of solution of time dependent electrochemical machining problems*", Computer Methods Applied Mechanics and Engineering, 23 (1980) 129-141.
124. P.A. Forsyth, H. Rasmussen, "*On the boundary conditions for wind driven lake circulation models*", Applied Mathematical Modelling, 4 (1980) 139-141.
125. P.A. Forsyth, H. Rasmussen, "*Perturbation solutions for steady direct and inverse electrochemical machining problems*", Letters in Applied Engineering Science, 17 (1979) 807-810.
126. P.A. Forsyth, H. Rasmussen, "*Solution of time dependent electrochemical machining problems by a coordinate transformation*", Journal of the IMA 24 (1979) 411-424.

127. P.A. Forsyth, S. Marcelja, D.J. Mitchell, B.W. Ninham, “*Ordering of colloidal systems*”, *Advances in Colloid Interface Science*, 9 (1978) 37-60.
128. P.A. Forsyth, S. Marcelja, D.J. Mitchell, B.W. Ninham, “*Onsager transition in a hard plate fluid*”, *Journal of the Chemical Society Faraday Transactions II*, 73 (1977) 84-88.
129. P.A. Forsyth, S. Marcelja, D.J. Mitchell, B.W. Ninham, “*Phase transitions in a charged lipid membrane*”, *Biochemica Biophysica Acta*, 469 (1977) 335-344.
130. M.A.H. Nerenburg, P.A. Forsyth, J.A. Blackburn, “*Excitation of cavity modes in rectangular Josephson Junctions*”, *Journal of Applied Physics*, 47 (1976) 4148-4150.
131. J.A. Blackburn, M.A.H. Nerenburg, P.A. Forsyth, “*Effect of phase dependent conductivity on inductive weak links*”, *Journal of Applied Physics*, 44 (1975) 5315-5316.

Refereed Book Chapters

1. P. Azimzadeh, P.A. Forsyth, K.R. Vetzal “*Hedging costs for variable annuities under regime-switching*,” Chapter 6, pages 133-166, *Hidden Markov Models in Finance: Volume II*, Springer International Series in Operations Research and Management. Edited by R. Mamon and R. Elliot, 2014.
2. P.A. Forsyth, K. Vetzal, “*Numerical methods for non-linear PDEs in finance*,” Chapter 22, pages 503-528, *Handbook of Computational Finance*, Edited by J.C. Duan, J. Gentle, W. Hardle, Springer, 2012.
3. Z. Chen, P.A. Forsyth, “*Pricing hydroelectric power plants with/without operational restrictions: a stochastic control approach*” in *Nonlinear Models in Mathematical Finance*, Edited by M. Ehrhardt, Nova Science Publishers, 2008, pages 253-281.
4. P. Forsyth, K. Vetzal, H. Windcliff, “*Hedging segregated fund guarantees*,” in *The Pension Challenge: Risk Transfers and Retirement Income Security*, Edited by Olivia Mitchell and Kent Smetters, Oxford University Press (2003), pages 214-237.
5. D.M. Pooley, P.A. Forsyth and K.R. Vetzal, “*Two factor option pricing with uncertain volatility*”, in *Computational Science and its Applications - ICCSA 2003*, Edited by V. Kumar et al., Springer-Verlag Lecture Notes in Computer Science (2003), Volume 2669, 158-167.
6. H. Windcliff, P.A. Forsyth, K.R. Vetzal, W.J. Morland, “*Simulations for hedging financial contracts with optimal decisions: a case study*,” pages 269-294, in *Computational Methods in Decision-making, Economics and Finance*, Edited by E. Kontoghiorches, B. Rustem, S. Siokos, Kluwer Series in Applied Optimization, Kluwer, Amsterdam, 2002.

Articles submitted to refereed journals

P.A. Forsyth and K.R. Vetzal, “*Optimal asset allocation for retirement savings: deterministic vs. adaptive strategies*,” (submitted to Operations Research, 2018, 28 pages).

P.A. Forsyth and G. Labahn, “ *ϵ -Monotone Fourier methods for optimal stochastic control in finance*,” (submitted to Journal of Computational Finance, 2017, 33 pages).

P. van Staden, D-M. Dang and P.A. Forsyth, “*Time-consistent mean-variance portfolio optimization: a numerical impulse control approach*,” (submitted to the Journal of Economic Dynamics and Control, 2017, 28 pages).

Professional Publications

Y. d’Halluin, D.M. Pooley, P.A. Forsyth, “*No fear of jumps*,” Wilmott Magazine, January, 2004, 62-70.

E. Ayache, P.A. Forsyth, K.R. Vetzal, “*Next generation models for convertible bonds with credit risk*,” Wilmott Magazine, December, 2002, 68-77.

Y. d’Halluin, P.A. Forsyth, K.R. Vetzal, “*When best to invest*,” Capacity, November, 2001, 40-42.

Y. d’Halluin, P.A. Forsyth, K.R. Vetzal, “*A question of demand*,” Capacity, October, 2001, 39-41.

Y. d’Halluin, P.A. Forsyth, K.R. Vetzal, “*The right tool for the right job*,” Capacity, September, 2001, 42-44.

K.J. Slough, E.A. Sudicky, P.A. Forsyth, “*Importance of rock matrix entry pressure on DNAPL migration in fractured geologic materials*,” Groundwater 37 (March-April, 1999) 237-244.

R. Zvan, K.R. Vetzal, P.A. Forsyth, “*Swing low, swing high*,” RISK 11 (March, 1998) 71-75. Also, reprinted in *Hedging with Trees*, Edited by M. Broadie and P. Glasserman, Risk Books, New York, 1998.

A. Behie, P.A. Forsyth, P.H. Sammon, “*Small operators can now model fields*”, Oil and Gas J., March 31, 1986.

Conference Proceedings

- Y. d'Halluin, P.A. Forsyth, K.R. Vetzal, "*Wireless Network Capacity Investment*," 7th Annual International Conference on Real Options, Washington, 2003, 22 pages.
- A. Grau, P.A. Forsyth, K.R. Vetzal, "*Convertible bonds with call notice periods*," IASTED conference on Financial Engineering and Applications, Banff, 2003, 19 pages.
- H. Windcliff, P.A. Forsyth, K.R. Vetzal, "*Hedging Segregated Fund Guarantees*," Pension Research Council Symposium, Wharton School, April, 2002.
- Y. d'Halluin, P.A. Forsyth, K.R. Vetzal, "*Managing telecommunication networks under uncertainty*," Berlin Internet Economics Workshop, May, 2001.
- H. Windcliff, K.R. Vetzal, P.A. Forsyth, "*Shout options: valuing the reset feature in segregated funds*," Northern Finance Association Meeting, Calgary, 1999.
- P.A. Forsyth, K.R. Vetzal, R. Zvan, "*Convergence of Lattice and PDE methods for Asian options*." 9th Annual Derivatives Securities Conference, Boston, 1999
- R. Zvan, P.A. Forsyth, K.R. Vetzal, "*PDE methods for pricing Barrier options*," 8th Annual Derivatives Securities Conference, Boston, 1998.
- R. Zvan, P.A. Forsyth, K.R. Vetzal, "*A general finite element approach for PDE option pricing models*", Computational and Quantitative Finance, New York, 1998.
- R. Zvan, P.A. Forsyth, K.R. Vetzal, "*A finite element approach for option pricing models*", Quantitative Finance 98, Sydney, 1998.
- R. Zvan, P.A. Forsyth, K.R. Vetzal, "*PDE methods for barrier options*," Quantitative Methods in Finance, Sydney, August, 1997.
- P.A. Forsyth, R. Zvan, K.R. Vetzal, "*A general finite element approach for PDE option pricing*," Numerical Methods in Finance, Toronto, May, 1997.
- K.J. Slough, E.A. Sudicky, P.A. Forsyth, "*Simulation of NAPL migration and persistence in the overburden and fractured bedrock at Smithville, Ontario*," Paper 97-A606, Air and Waste Management Annual Meeting, Toronto, June, 1997.
- R. Zvan, P.A. Forsyth, K.R. Vetzal, "*Robust PDE methods for path dependent options*," First Annual Computational Finance Conference, Stanford, August, 1996.
- P.A. Forsyth, H. Jiang, "*Full Newton solution of the Euler equations: an object oriented approach*," CFD95, Banff, June, 1995.

P.A. Forsyth, H. Jiang, “*Iterative methods for Full Newton solution of the Euler equations*,” Sixth International Symposium on Computational Fluid Dynamics, Lake Tahoe, September, 1995.

P.A. Forsyth, “*Modelling studies of gas venting and steam injection for NAPL site remediation*,” International Symposium on Engineering Hydrology, San Francisco, 1993.

E.F. D’Azevedo, P.A. Forsyth, W.P. Tang, “*Two variants of minimum discarded fill ordering*,” Iterative methods in Linear Algebra, Elsevier, 1992, 603-612, IMACS Symposium, Brussels, Belgium, 1991.

E.F. D’Azevedo, P.A. Forsyth, W.P. Tang, “*An automatic ordering method for incomplete factorization iterative solvers*,” paper SPE 21226, SPE Reservoir Simulation Symposium, Anaheim, 1991.

E.F. D’Azevedo, P.A. Forsyth, W.P. Tang, “*An ordering method for preconditioned conjugate gradient methods applied to unstructured grid problems*,” Copper Mountain Conference on Iterative Methods, 1990 (24 pages).

P.A. Forsyth, “*A control volume-finite element method for local mesh refinement*,” paper SPE 18415 presented at the Tenth SPE Symposium on Reservoir Simulation, Houston, 1989, (13 pages).

*P.A. Forsyth, P.H. Sammon, “*Local mesh refinement and modelling of faults and pinchouts*,” paper SPE 13524 presented at the Eighth SPE Symposium on Reservoir Simulation, Dallas, 1985, (12 pages).

A. Behie, P.A. Forsyth, “*Practical considerations for incomplete factorization methods in reservoir simulation*,” Paper SPE 12263 presented at the Seventh SPE Symposium on Reservoir Simulation, San Francisco, 1983, (12 pages).

*A. Behie, P.A. Forsyth, “*Multi-grid solution of the pressure equation in reservoir simulation*,” paper SPE 10492 presented at the Sixth SPE Symposium on Reservoir Simulation, New Orleans, 1982, (14 pages).

*L.X. Nghiem, P.A. Forsyth, A. Behie, “*A fully implicit hydraulic fracture model*,” paper SPE 10506 presented at the Sixth SPE Symposium on Reservoir Simulation, New Orleans, 1982 (16 pages).

Some Recent Technical Presentations/Seminars

“*Dynamic mean variance asset allocation: numerics and backtests*,” 2016, May, Oxford.

*Subsequently appeared in a refereed journal.

“Dynamic mean variance asset allocation: tests for robustness,” 2016, November, SIAM Financial Mathematics Conference, Austin.

“Overview of numerics for HJB equations,” 2015, May, Models and Numerics in Financial Mathematics, Leiden.

“Variable annuity fees: too high or too low?,” 2015, March, Global Risk Institute, Toronto.

“Better than pre-commitment mean-variance portfolio allocation strategies: a semi-self-financing Hamilton-Jacobi-Bellman equation approach,” 2015, March, Mathematical Finance Conference 2015, Frankfurt.

“Optimal Stochastic Control in Finance: Overview and Application to a Lifecycle Fund,” 2015, February, Rabobank, Utrecht

“Long term asset allocation for the patient investor,” 2015, February, University of Antwerp, Antwerp.

“Optimal Stochastic Control in Finance: HJB Equations,” 2015, January, ING, Amsterdam.

“Multiperiod mean variance asset allocation: is it bad to win the lottery?” 2014, November, SIAM Conference on Financial Mathematics, Chicago.

“Long term asset allocation for the patient investor,” 2014, November, Shell-PIMS Lunchbox Lecture, Calgary.

“Better than pre-commitment mean-variance portfolio allocation strategies: a semi-self-financing HJB equation approach,” 2014, July, Chinese University of Hong Kong, Hong Kong.

“ Multiperiod mean variance asset allocation: is it bad to win the lottery?” 2014, July, Sun Yat Sen University Workshop on Financial Engineering, Ghuangzhou.

“Better than pre-commitment mean-variance portfolio allocation strategies: a semi-self-financing HJB equation approach,” 2014, July, International Symposium on Differential Equations and Stochastic Analysis in Mathematical Finance, Sanya, China.

“Multiperiod mean variance asset allocation: is it bad to win the lottery?” 2014, May, Global Derivatives 2014, Amsterdam.

“Numerical Solution of the Hamilton-Jacobi-Bellman Formulation for Continuous Time Mean Variance Asset Allocation,” 2013, INFORMS Annual Meeting, Minneapolis.

“Optimal trade execution: mean variance or mean quadratic optimal?” 2013 IMS-FPS Workshop 2013, Singapore.

“Optimal trade execution: viscosity solutions and HJB Equations,” Global Derivatives 2013, Amsterdam.

“Optimal trade execution: mean variance optimal or mean quadratic variation optimal?” INRIA, Paris, 2012.

“Optimal trade execution: mean variance optimal or mean quadratic variation optimal?” Nomura Seminar, Oxford, 2012.

Video Presentations

A. Unger, S. Friedman, N. Konrad, P.A. Forsyth, E. Sudicky, *“Visualization of multi-phase compositional aspects of the remediation of formations contaminated by DNAPL’s,”* Geological Society of America, Annual Meeting, New Orleans, November, 1995.

P.A. Forsyth, A. Unger, S. Clift, *“Numerical simulation of air sparging and steam injection for DNAPL site remediation”*, Canadian Symposium on Computational Fluid Dynamics, Toronto, 1994.

A. Unger, E.A. Sudicky and P.A. Forsyth, *“Visualization techniques for interpreting air sparging for the remediation of formations contaminated by DNAPLs,”* Geological Society of America, Annual Meeting, Seattle, October, 1994.

S. Clift, P. A. Forsyth, A. Unger, *“Visualization of a three dimensional DNAPL spill and remediation,”* International Symposium on Engineering Hydrology, San Francisco, 1993.

Contract Research Reports

H.A. Windcliff, K.R. Vetzal, P.A. Forsyth, *“Pricing and hedging segregated funds,”* prepared for SunLife of Canada, 2000.

R. McLaren, P. Forsyth, E. Sudicky, J. VanderKwaak, F. Schwartz, J. Kessler, *“Flow and transport in fractured Tuff at Yucca Mountain: numerical experiments on fast fracture flow mechanisms,”* prepared for the Electric Power Research Institute, 1998.

K. Slough, E. Sudicky, P. Forsyth, *“Numerical simulation of DNAPL migration and persistence at Smithville, Ontario,”* prepared for Smithville Phase IV Bedrock Remediation Program, 1997.

P.A. Forsyth, "*Review of the TRAINER model design documents,*" prepared for NOVA Corporation, 1990.