

# HALIL METE SONER

ORCID: 0000-0002-0824-180



## ACADEMIC EXPERIENCE

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- 2019 – present Princeton University Princeton, NJ  
*Professor*  
Department of Operations Research and Financial Engineering.  
Program in Computational and Applied Mathematics.  
Bendheim Center for Finance.
- 2009–2019 ETH Zürich Zürich  
*Professor Emeritus, 2019*  
*Professor of Mathematics, 2009-2019*  
*Chair of Department of Mathematics, August 2017-Feb. 2019*  
*Vice Chair, August 2015-July 2017*  
*Senior Chair, Swiss Finance Institute, 2010-2019*
- 2007–2009 Sabancı University Istanbul, Turkey  
*Işık İnselbağ Professor*
- 2000–2007 Koç University Istanbul, Turkey  
*Professor of Mathematics and Finance*  
*Dean of College of Economics and*  
*Business Administration, 2002-2007*
- 1998–2000 Princeton University Princeton, NJ  
*Paul M. Whythes '55 Professor of Finance and Engineering*  
Department of Operations Research and Financial Engineering.  
Program in Applied and Computational Mathematics.  
Bendheim Center for Finance.
- 1986–1998 Carnegie Mellon University Pittsburgh, PA  
*Professor of Mathematics*
  - Prof., 1992, Associate Prof., 1990, Assistant Prof., 1986.
- 1985–1986 Institute for Math. and App. Minneapolis, MN  
*Research Associate*

## EDUCATION

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- 1981–1985 Brown University Providence, RI
  - Ph.D., Applied Mathematics, 1986.
  - M.Sc., Applied Mathematics, 1983.
- 1977–1981 Bogazici University Istanbul, Turkey
  - B.Sc., Electrical Engineering.
  - B.Sc., Mathematics.

## AWARDS AND HONORS

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- SIAM Fellow, Class of 2015.
- Alexander von Humbolt Foundation Research Award, 2014.
- European Research Council Advanced Grant: Dec. 2008 - Nov. 2013.
- Invited Speaker, Bachelier Finance Society, Dublin 2018, and Tokyo 2006.
- Invited Speaker, European Mathematical Congress July 2008, Amsterdam and July 2016, Berlin.
- Plenary Speaker, SIAM Conf. on Control and Its App., July 2015, Paris.
- Plenary Speaker, INFORMS, June 2015, Istanbul .
- Plenary Speaker, SIAM Meeting on Financial Engineering, and Topical Speaker, SIAM Annual Meeting, June 2006, Boston, MA
- Turkish Science and Technology Foundation Science Award, 2002.
- Paul M. Whythes '55 Professor of Finance and Engineering, Princeton University, 1998-2000.

## SERVICE TO ACADEMIC COMMUNITY

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- During 2011-2016, Soner has been the Executive Secretary of the *Bachelier Finance Society*.
- Currently Soner is an associate editor for
  - SIAM Journal of Mathematical Finance,
  - Mathematics and Financial Economics,
  - Interfaces and Free Boundaries,
  - Mathematics of Operations Research.
  - In the past he has served in the editorial boards of: Journal of European Mathematical Society, Annals of Applied Probability, SIAM Journal on Control and Optimization, SIAM Journal on Mathematical Analysis, Applied Mathematics and Optimization, Mathematical Methods in Operations Research, and ESAIM: Control, Optimisation and Calculus of Variations.
- He has organized many workshops and several large conferences.

## RESEARCH SUPPORT

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Funding in Switzerland since 2009 consists of

- Swiss National Science Foundation Grant; 2017-2021 for the amount 1,041,562 CHF.
- Swiss National Science Foundation Grant; 2014-2017 for the amount 711,740 CHF.
- Swiss National Science Foundation Grant; 2011-2014 for the amount 171,647 CHF.
- Swiss Finance Institute; 2009-present; annually 100,000 CHF.
- European Research Foundation; 2008-2013 for the amount 880,000 Euro.
- ETH Foundation; 2009-2019 (joint with Schweizer and Teichmann) for 5,000,000 CHF.

Funding in Turkey consisted of individual grants and a large network grant for 2,000,000 TL from the Turkish National Science Foundation, TUBITAK.

Funding in the USA during the period 1986-2000 was obtained from the NSF, Army Research Office and Air Force Office of Research.

## RESEARCH TEAM

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Soner has supervised 11 graduate students, 12 postdoctoral fellows at ETH and 7 CMU.

### Post-doctoral fellows at ETH:

- [Prof. Chen Yang](#), (2017-2019), The Chinese University of Hong Kong.
- [Prof. Matteo Burzoni](#), (2016-2019), University of Milano.
- [Prof. Ibrahim Ekren](#), (Sept. 2014- Sept. 2017), University of Michigan.
- [Prof. Ariel Neufel](#), (2017- 2018), NTS, Singapore
- Dr. Ludovic Moreau (Oct. 2012-Oct. 2014), Ernst & Young, Paris, France.
- [Prof. Anja Richter](#) (Jan. 2013-Aug. 2013), Baruch College, New York, USA.
- [Dr. Marcus Wunsch](#) (Jan. 2013-Aug. 2013), UBS, Zurich.
- [Prof. Yan Dolinsky](#) (Feb. 2010-Sept. 2012), Dept of Statistics, Hebrew University, Israel.
- [Prof. Marcel Nutz](#), (Oct. 2010-Sept. 2011), Dept of Statistics, Columbia University,, USA.
- [Dr. Gilles-Edouard Espinosa](#) , Sept. 2010-Feb. 2011), ENPC (Cermics), Paris, France.
- [Prof. Idriss Kharroubi](#), (Jan. 2010-June 2010), University of Paris IX, Dauphine, France.
- [Prof. Alexandre Roch](#) (Sept. 2009-July 2010), ESG UQAM, Montreal, Canada.

### Graduate Students:

- Vincenzo Ignazio, (joint supervision with Prof. Da. Lio), (ETH, 2020).
- Dr. Matti Kiiski, (ETH 2019). University of Manheim.
- Dr. Max Reppen, (ETH 2018), Princeton.
- [Dr. Sebastian Herrmann](#) (joint supervision with Prof. Schweizer), (ETH, 2016), Manchester.
- [Dr. Mario Sikic](#), (ETH 2016), University of Zurich.
- [Dr. Albert Altarovici](#), (ETH, 2015), Palantir, CA, USA.
- Dr. Mirjana Vukelja, (ETH, 2014), UBS, Zurich.
- [Prof. Erdiç Akyildirim](#), (Swiss Finance Institute, 2013), Akdeniz Uni., Antalya, Turkey.
- [Dr. Selim Gökay](#) (ETH, 2011) UBS, Zurich.
- Dr. Feyzullah Egriboyun (Carnegie Mellon, 2000).
- [Prof. Dmitry Golovaty](#) (Carnegie Mellon, 1995) University of Akron, OH, USA.

## SELECTED PRESENTATIONS

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Complete list can be found in [Soner's web page](#).

10/2019	Plenary Speaker, 4th Eastern Conf. on Math. Finance,	Boston, USA
12/2018	Plenary Speaker, 6 <sup>th</sup> Asian Quantitative Finance Conference,	Guangzhou, China
9/2017	2 <sup>nd</sup> Tosun Terzioglu Memorial Talk, Turkish Math Society	Istanbul, Turkey
9/2017	Inagurial Talk, SFB 1288	Bielefeld, Germany
7/2017	Plenary Speaker, INdAM Workshop in honor of P. Cannarsa,	Rome, Italy
7/2017	Pleanray Speaker, Congress of Free Boundaries	Shanghai, China
6/2016	Invited Speaker, 7th European Congress of Mathematics,	Berlin, Germany
3/2016	Invited talk, Workshop on Stochastic Systems,	Rio De Janerio, Brasil
6/2015	Plenary Speaker, SIAM Con. on Control and Its App.,	Paris, France
6/2015	Plenary Speaker, INFORMS App. Prob. Conf.,	Istanbul, Turkey
4/2013	Nomura Seminar	Oxford, England
9/2012	Invited Speaker, Workshop on Mathematical Finance	Yerevan, Armenia
7/2012	Summer School on Mathematical Finance	Lisbon, Portugal
8/2011	Summer School on Mathematical Finance	Zurich, Switzerland
7/2010	Invited Talk, Workshop in honor of W. Schachermayer	Vienna, Austria
6/2010	Invited Talk, Workshop in honor of S. Ustunel	Paris, France
4/2010	Inaugural Talk, ETH	Zurich, Switzerland
7/2008	Invited Talk, 5th European Congress of Mathematics	Amsterdam,
7/2007	Invited Talk, Workshop in honor of L. Tartar	Paris, France
6/2007	Invited Talk, Giordana Indham	Pisa, Italy
8/2006	Plenary Speaker, Bachelier Meeting	Tokyo, Japan
7/2006	Plenary Speaker, SIAM Annual Meeting	Boston, MA, USA
4/2003	Cattedra Galileiana, Scuola Normale	Pisa, Italy
9/2000	Plenary Talk, Ulusal Matematik Sempozyumu	Istanbul, Turkey
7/2000	CIR-CIME Summer Course on Evolving Interfaces	Madeira, Portugal
1/1999	Annual AMS Meeting, Short course on control	San Antonio, TX, USA
6/1997	Plenary Talk, Meeting on Free Boundaries	Crete, Greece
1/1997	Main Speaker, "Recent Advances in Continuum Mechanics"	Trento, Italy
11/1996	Clifford Lectures, Georgia Tech.	Atlanta, GA, USA
8/1995	Main Speaker, CRM Summer School	Banff, Canada
6/1995	Main Speaker, CIME Summer School on Viscosity Solutions	Florence, Italy
4/1995	Plenary Lecture, Annual SIAM Meeting on Control	St.Louis, MS, USA
7/1994	Main Speaker, "Mechanics and Nonlinear Analysis"	Rome, Italy
8/1992	Main Speaker, CRM Summer School	Montreal, Canada
1/1991	Lecture Series, Techion	Haifa, Israel

## PUBLICATIONS

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An up to date list can be found in the [web page](#) of Soner or in [scholar google](#).

### Books:

[Controlled Markov Processes and Viscosity Solutions](#), 2nd edition, (with W.H. Fleming) Springer-Verlag, (2005).

[Stochastic Optimal Control in Finance](#), Cattedra Galileiana 2003, in Scuola Normale, Pisa.

### Preprints:

100. [Viability and arbitrage under Knightian uncertainty](#), (with Matteo Burzoni and Frank Riedel), arXiv:1707.03335v1, (2017).

99. [Discrete dividend payments in continuous time](#), (with Jussi Keppo and Max Reppen), Mathematics of Operations Research, (2018), accepted for publication.

### 2020:

98. [Martingale Optimal Transport Duality](#), (with Patrick Cheridito, Matti Kiiski and David Proemel), Mathematische Annalen, (2020), forthcoming.

97. [Conditional Davis prices](#), (with Kasper Larsen and Gordan Zitkovic), Finance & Stochastics, (2020), forthcoming.

96. [Dividends with random profitability rate](#), (with Max Reppen and Jean-Charles Rochet), Mathematical Finance, 30/1, 228—259, (2020).

### 2019:

95. [Second order stochastic target problems with generalized market impact](#), (with Bruno Bouchard, Gregoire Loeper and Chao Zhou), SIAM J. Control and Optimization, 57/6, 4125–419, (2019).

### 2018:

94. [Constrained optimal transport](#), (with Ibrahim Ekren), arXiv:1610.02940v1, Archive for Rational Mechanics, 227/3, 929-965, (2018).

### 2017:

93. [A primer on portfolio choice with small transaction costs](#), (with Johannes Muhle-Karbe and Max Reppen), arXiv:1612.01302v1, Annual Review of Financial Economics, 9, 301-331 (2017).

92. [Optimal consumption and investment with fixed and proportional transaction costs](#), (with Albert Altarovici and Max Reppen), arXiv:1610.03958, SIAM J. Control and Optimization, 55,1673–1710, (2017).

91. [Convex duality with transaction costs](#), (with Yan Dolinsky), arXiv:1502.01735, Mathematics of Operations Research, 42/2,448–471, (2017).

90. [Trading with small impact](#), (with L. Moreau and J. Muhle-Karbe), arXiv:1402.5304, Mathematical Finance, 27/2,350–400, (2017).

89. [Hedging with temporary price impact](#), (with Peter Bank and Moritz Voss), arXiv:1510.03223v1, Mathematics and Financial Economics, 11, 215–229,(2017).

### 2016:

88. [Utility maximization in an illiquid market in continuous time](#), (with M. Vukelja), Mathematical Methods in Operations Research, 84/2, 285–321,(2016).

87. [Hedging under an expected loss constraint with small transaction costs](#), (with B. Bouchard and L. Moreau), arXiv:1309.4916, SIAM Journal on Math. Fin., 7/1, 508–551,(2016).
86. [Facelifting in utility maximization](#), (with K. Larsen and G. Zitkovic), arXiv:1404.2227, Finance and Stochastics, 20/1, 99–121, (2016).

**2015:**

85. [Martingale optimal transport in the Skorokhod space](#), (with Y. Dolinsky), Stochastic Processes and Applications, 125/10, 3893–3931, (2015).
- Erratum:** [Corrigendum to "Martingale optimal transport in the Skorokhod space"](#) (with Yan Dolinsky), Stochastic Processes and Applications, (2016).
84. [Asymptotics with fixed transaction costs](#), (with A. Altarovici and J. Muhle-Karbe), Finance and Stochastics, 19 (2), 363–414, (2015).
83. [Homogenization and asymptotics for small transaction costs - the multi-dimensional case](#), (with D. Possamai and N. Touzi), Communications in PDEs, (2015).

**2014:**

82. [Robust hedging with proportional transaction costs](#), (with Y. Dolinsky), Finance and Stochastics, 18 (2), 327–347, (2014).
81. [Approximating stochastic volatility by recombinant trees](#), (with E. Akyildirim and Y. Dolinsky), Annals of Applied Probability, 24/5, 2176–2205, (2014).
80. [Optimal dividend policy with random interest rates](#), (with E. Akyildirim, I.E. Guney and J.C. Rochet), Journal of Mathematical Economics, 51, 93–101, (2014).
79. [Martingale optimal transport and robust hedging in continuous time](#), (with Y. Dolinsky), Probability Theory and Related Fields, 160 (1–2), 391–427, (2014).
78. [Hedging in an Illiquid Binomial Market](#), (with S. Gökay), Nonlinear Analysis. Real World Applications, 16, 1–16, (2014).

**2013:**

77. [Homogenization and asymptotics for small transaction costs](#), (with N. Touzi), SIAM Journal on Control and Optimization, 51/4, 2893–2921, (2013).
76. [Resilient price impact of trading and the cost of illiquidity](#), (with A.F. Roch), International Journal on Theoretical and Applied Finance, 16/6, (2013).
75. [Utility maximization in an illiquid market](#), (with M. Vukelja), Stochastics - special issue in memory of M. Taksar, 85/4, 692–706, (2013).
74. [Dual Formulation of Second Order Target Problems](#), (with N. Touzi and J. Zhang), Annals of Applied Probability, 23/1, 308–347, (2013).
73. [Vortex density models for superconductivity and superfluidity](#), (with S. Baldo, R.L. Jerrard, G. Orlandi), Communications in Mathematical Physics, 318/1, 131–171, (2013).
72. [Duality and Convergence for Binomial Markets with Friction](#), (with Y. Dolinsky), Finance and Stochastics, 17 (3), 447–475, (2013).

**2012:**

71. [Convergence of Ginzburg-Landau functionals in 3-d superconductivity](#), (with S. Baldo, R.L. Jerrard, G. Orlandi), Archive for Rational Mechanics and Analysis, 205/3, 699–752, (2012).
70. [Liquidity in a Binomial market](#), (with S. Gökay), Mathematical Finance, 22/2, 250–276, (2012).
69. [Large liquidity expansion for super-hedging costs](#), (with D. Possamai and N. Touzi),

Asymptotic Analysis, 79, Issue: 1-2, 45–64, (2012).

68. [Superhedging and Dynamic Risk Measures under Volatility Uncertainty](#), (with M. Nutz), SIAM Journal on Control and Optimization, 50/4, 2065–2089, (2012).

67. [Wellposedness of Second Order Backward SDEs](#), (with N. Touzi and J. Zhang), Probability Theory and Related Fields, 153, 149–190, (2012).

66. [Weak Approximation of G-Expectations](#), (with Y. Dolinsky and M. Nutz), Stochastic Processes and their Applications, 122 (2), 664–675, (2012).

#### 2011:

65. [Martingale Representation Theorem for the G-expectation](#), (with N. Touzi and J. Zhang), Stochastic Processes and their Applications, 121 (2), 265–287, (2011).

64. [Quasi-sure stochastic analysis through aggregation](#), (with N. Touzi and J. Zhang), Electronic Journal of Probability, (Article Number: 67), 16, 1844–1879, (2011).

#### 2010:

63. [Option hedging for small investors under liquidity costs](#), (with U. Çetin and N. Touzi), Finance and Stochastics, 14 (3), 317–341, (2010).

62. Optimal investment strategies with a reallocation constraint, (with F. Egriboyun), Mathematical Methods of Operations Research, 71(3), 551–585, (2010).

61. [Merton problem with taxes: characterization, computation and approximation](#), (with I. Ben-Tahar and N. Touzi), SIAM Journal on Financial Mathematics, 1, 366–395, (2010).

#### 2009:

60. [The dynamic programming equation for second order stochastic target problems](#), (with N. Touzi), SIAM Journal on Control and Optimization, Vol. 48, No. 4, 2344–2365, (2009).

#### 2007:

59. [Stochastic representations for nonlinear parabolic PDEs](#), survey article, (2007).

58. [The dynamic programming equation for the problem of optimal investment under capital gains taxes](#), (with I. Ben-Tahar and N. Touzi), SIAM Journal on Control and Optimization, 48(5), 1779–1801, (2007).

57. [Second order backward stochastic differential equations and fully non-linear parabolic PDEs](#), (with P. Cheridito, N. Touzi, and N. Victoir), Comm. on Pure and Applied Math., 60 (7): 1081–1110 (2007).

56. [Hedging under Gamma constraints by optimal stopping and face-lifting](#), (with N. Touzi), Mathematical Finance, 17 (1): 59–79 (2007).

#### 2005:

55. [Small time path behavior of double stochastic integrals and applications to stochastic control](#), (with P. Cheridito and N. Touzi), Annals of Applied Probability, 15/4, 2472–2495, (2005).

54. [The multi-dimensional super-replication problem under gamma constraints](#), (with P. Cheridito and N. Touzi), Annales de l'Institut Henri Poincaré Analyse Nonlinéaire, 22 (5): 633–666 (2005).

#### 2004:

53. Stochastic Control for a Class of Random Evolution Models, (with M.-O. Hongler and L. Streit), Applied Mathematics and Optimization, 49: 113–121 (2004).

**2003:**

52. [A stochastic representation for mean curvature type flows](#), (with N. Touzi), Annals of Probability, 31/3, 1145–1165, (2003).

**2002:**

51. [Limiting behavior of the Ginzburg-Landau energy](#), (with R.L. Jerrard), J. Functional Analysis, 192, 524–561, (2002).

50. [A stochastic representation for level set equations](#), (with N. Touzi), Communications in PDEs, 27(9&10), 2031–2053, (2002).

49. [Dynamic programming for stochastic target problems and geometric flows](#), (with N. Touzi), Journal of European Mathematical Society, 4/3, 201–236, (2002).

48. [The Jacobian and the Ginzburg-Landau energy](#), (with R.L. Jerrard), Calculus of Variations, 14, 151–191, (2002).

47. [Stochastic target problems and dynamic programming](#), (with N. Touzi), SIAM Journal on Control and Optimization, 41, 404–424, (2002).

46. [Function of higher bounded variations](#), (with R.L. Jerrard), Indiana University Mathematics Journal, 51/3, 645–677, (2002).

**2000:**

45. [Super-replication under Gamma constraints](#), (with N. Touzi), SIAM Journal on Control and Optimization, 39(1), 73–96, (2000).

**1999:**

44. [Rectifiability of the distributional Jacobian for a class of functions](#), (with R.L. Jerrard), C.R. Acad. Sci. Paris, t. 329, Serie I, 983–688, (1999).

43. [Scaling limits and regularity for a class of Ginzburg-Landau systems](#), (with R.L. Jerrard), Annales L'Institute Henry Poincare, 16/4, 423–466, (1999).

**1998:**

42. [Backward SDEs with constraints on the gains process](#), (with J. Cvitanic and I. Karatzas), Annals of Probability, 26, 1522–1551, (1998).

41. [Dynamics of Ginzburg-Landau vortices](#), (with R.L. Jerrard), Arc. Rat. Mech. An., 142, 185–206, (1998).

40. [Regularity and convergence of crystalline motion](#), (with K. Ishii), SIAM Math. Analysis, 30, 19–37, (1998).

39. [Optimal replication of contingent claims under portfolio constraints](#), (with M. Broadie and J. Cvitanic), Review of Financial Studies, 11, 59–79, (1998).

38. [Option pricing with transaction costs and a nonlinear Black-Scholes equation](#), (with G. Barles), Finance and Stochastics, 2, 369–397, (1998).

**1997:**

37. [A measure theoretic approach to higher co-dimension mean curvature flow](#), (with L. Ambrosio), dedicated to Ennio de Giorgi, Ann. Scuola Normale, 25, 27–49, (1997).

36. [Ginzburg-Landau equation and motion by mean curvature, I: convergence](#), Journal of Geometric Analysis, 7, 437–475, (1997).

35. [Ginzburg-Landau equation and motion by mean curvature, II: development of the](#)



[interface](#), Journal of Geometric Analysis, 7, 476–491, (1997).

34. [Hedging in incomplete markets with HARA utility](#) (with D. Duffie, W. Fleming, and T. Zariphopoulou), J. Economic Dynamics and Control, 21, 753–782, (1997).

1996:

33. [Level set approach to mean curvature flow in arbitrary codimension](#), (with L. Ambrosio), Journal of Differential Geometry, 43, 693–737, (1996).

32. [Three-phase boundary motions under constant velocities. I: The vanishing surface tension limit](#), (with F. Reitich), Proc. Royal Soc. Edinburgh, 126A, 837–865, (1996).

31. [Heavy traffic convergence of a controlled, multi-class, queuing system](#), (with L.F. Martins and S.E. Shreve), SIAM J. Cont. Opt., 34/6, 2133–2171, (1996).

1995:

30. [Convergence of the phase field equations to the Mullins-Sekerka problem with a kinetic undercooling](#), Arc. Rat. Mech. An., 131, 139–197, (1995).

29. [There is no nontrivial hedging portfolio for option pricing with transaction costs](#), (with S.E. Shreve and J. Cvitanic), Annals of Applied Prob., 5/2, 327–355, (1995).

28. [Anisotropic planar motion of an interface relaxed by the formation of infinitesimal wrinkles](#), (with M. Gurtin and P.E. Souganidis), J. Diff. Equations, 119/1, 54–108, (1995).

1994:

27. [Optimal investment and consumption with transaction costs](#), (with S.E. Shreve), Annals of Applied Probability, 14/3, 609–693, (1994).

1993:

26. [Motion of a set by the curvature of its boundary](#), J. Differential Equations, 101, 313–372, (1993).

25. On the propagation of singularities of semi-convex functions, (with L. Ambrosio and P. Cannarsa), An. Scuola Normali Pisa, Serie IV, Vol. XX, 597–616, (1993).

24. [A dynamic programming approach to nonlinear boundary control problems of parabolic type](#), (with P. Cannarsa and F. Gozzi), J. Functional Analysis, 117/1, 25–61, (1993).

23. [Front propagation and phase field theory](#), (with G. Barles and P.E. Souganidis), SIAM J. Cont. Opt., 2/31, special issue dedicated to W. Fleming, 439–469, (1993).

22. [Singular perturbations in manufacturing](#), SIAM J. Cont. Opt., 31, 132–146, (1993).

21. Uniqueness and singularities of rotationally symmetric surfaces moving by mean curvature, (with P.E. Souganidis), Comm. in PDE, 18, 859–894, (1993).

1992:

20. [Phase transitions and generalized motion by mean curvature](#), (with L.C. Evans and P.E. Souganidis), Comm. in Pure and Applied Math., 65, 1097–1123, (1992).

19. Turnpike Sets and Their Analysis in Stochastic Production Planning Problems, (with S.P. Sethi,

Q. Zhang, and J. Jiang), Mathematics of Operations Research, 17, 4, 932–950, (1992).

18. Some remarks on the Stefan problem with surface structure, (with M.E. Gurtin), Quarterly of Applied Math., 50, 291–303 (1992).

**1991:**

17. Optimal investment and consumption with two bonds and transaction costs, (with S.E. Shreve and G.-L. Xin), *Mathematical Finance*, 1/3, 53–84, (1991).

16. A boundary value problem for Hamilton-Jacobi equations in Hilbert spaces, (with P. Cannarsa and F. Gozzi), *Applied Mathematics and Optimization*, 24, 197–220, (1991).

15. [A free boundary problem related to singular stochastic control: parabolic case.](#) (with S.E. Shreve), *Comm. PDE*, 16, 373–424, (1991).

14. An asymptotic analysis of hierarchical control of manufacturing systems, (with J. Lehoczky, S. Sethi, and M. Taksar), *Math. O.R.*, 16/3, 596–608, (1991).

**1990:**

13. [A viscosity solution approach to the asymptotic analysis of queueing systems](#), (with P. Dupuis and H. Ishii), *Annals of Probability*, 18/1, 226–255, (1990).

**1989:**

12. [Asymptotic expansions for Markov processes with Levy generators](#), (with W. Fleming), *Applied Mathematics Optimization*, 19, 203–223, (1989).

11. [Generalized one-sided estimates for solutions of Hamilton-Jacobi equations and applications](#), (with P. Cannarsa), *Nonlinear Analysis, Theory, Methods*, 13/3, 305–323, (1989).

10. [Regularity of the value function of a two-dimensional singular stochastic control problem](#), (with S.E. Shreve), *SIAM J. Cont. Opt.*, 27/4, 876–907, (1989).

**1988:**

9. Mixing Markov chains and their images, (with M. Barnsley and M. Berger), *Probability in Eng. and Inf. Sci.*, 387–414, (1988).

8. [Random walks generated by affine mappings](#), (with M. Berger), *J. Theoretical Probability*, 1/3, 239–254, (1988).

7. [On the Hamilton-Jacobi equations in Banach spaces](#), *J.O.T.A.*, 57/3, 429–437, (1988).

**1987:**

6. A remark on the large deviations of an ergodic Markov process, (with W. Fleming and S.-J. Sheu), *Stochastics*, 22, 187–199, (1987).

5. [An optimal stochastic production planning problem with randomly fluctuating demand](#), (with W. Fleming and S. Sethi), *SIAM J. Cont. Opt.*, 25, 1494–1502, (1987).

4. [On the singularities of the viscosity solutions to Hamilton-Jacobi equations](#), (with P. Cannarsa), *Indiana University Mathematics Journal*, 36/3, 501–524, (1987).

**1986:**

3. [Optimal Control with state-space constraint II](#), *SIAM J. Cont. Opt.*, 24/3, 1110–1122, (1986).

2. [Optimal Control with state-space constraint I](#), *SIAM J. Cont. Opt.*, 24/3, 552–562, (1986).

**1985:**

1. [Optimal control of a one-dimensional storage process](#), *Appl. Math. Opt.*, 13, 175–191, (1985).