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1. Education

- Ph.D. (Management) University of California, 1986.
- Coursework in the Master's program (Statistics) Vrije Universiteit Brussel, 1982-1983.
- Doctorandus (Applied Economics) Universitaire Faculteiten Sint Ignatius, 1981-1982 (summa cum laude).
- Licenciaat (Applied Economics) Universitaire Faculteiten Sint Ignatius, 1977-1981 (cum laude).

2. Appointments (Academic – Research & Teaching)

Primary:

William D. Hacker Professor of Economics and Management and Professor of Finance, *California Institute of Technology*

Other and Past:

- Honorary Professorial Fellow, *University of Melbourne*, 2012-15.
- Fellow, *Center for Engineering Social and Economic Institutions*, University of Zurich, Switzerland, 2012-.
- Affiliate Faculty, *Theoretical Research in Neuroeconomic Decision-Making (TREND)*, *University of Southern California*, 2012-.
- Swiss Finance Institute Professor of Finance, *EPFL (Swiss Federal Institute of Technology Lausanne)*, 2009-2012 (part-time).
- Swiss Finance Institute Professor of Finance, *EPFL (Swiss Federal Institute of Technology Lausanne)*, 2007-2009 (tenured).
- Swiss Finance Institute Visiting Professor, HEC, *Université de Lausanne*, July 2006-7 (on sabbatical from Caltech).
- Member of the faculty of the *Computation and Neural Systems Program*, *California Institute of Technology*, Since 2006.

- Fellow, Center of Excellence, *Kobe University* (Japan), March 2006.
- Guest Professor, *University of Zurich*, April 2004.
- William D. Hacker Professor of Economics and Management, *California Institute of Technology*, Since 2003.
- Leif Johansen Distinguished Visiting Scholar, *Norwegian School of management*, Oslo, Norway, June 1999.
- Research Fellow, *Centre for Economic Policy Research* (CEPR), London, Since 1999.
- Professor of Finance, *California Institute of Technology*, Since 1998 (On Leave, 2007-9).
- Associate Professor of Finance (with tenure), *California Institute of Technology*, 1994-1998 (On Leave, 1994-5).
- Visiting Associate Professor of Finance, *Yale School of Management*, Winter 1998.
- Research Professor (Center for Economic Research) and Professor of Investments Analysis (Department of Economics) at *Tilburg University*, The Netherlands, 1994-96.
- Assistant Professor of Finance, *California Institute of Technology*, 1990-1994.
- Assistant Professor of Finance, *Carnegie Mellon University*, 1987-1990.
- Postdoctoral Research Fellow, *Carnegie Mellon University*, 1986-1987.

3. Appointments (Academic - Administrative)

- Director, *Ronald and Maxine Linde Institute of Economic and Management Sciences*, California Institute of Technology, 2011-12.
- Chair, Search Committee, Swiss Finance Institute (six) professorial positions in finance, *Ecole Polytechnique Fédérale Lausanne*, 2007-9.
- Co-Interim-Dean (with Chris Tucci and Ralf Seifert), College of Management, *Ecole Polytechnique Fédérale Lausanne*, 2/2008-8/2008.
- Program Chair (and Developer), Master in Financial Engineering, *Ecole Polytechnique Fédérale Lausanne*, 2007-8.
- Chair (“Dean” elsewhere), Division of The Humanities and Social Sciences, *California Institute of Technology*, July 2006-May 2007.
- Executive Officer, Social Sciences, *California Institute of Technology*, 2002-2005.

4. Current Research Interests

Experimental finance in general and decision neuroscience in particular (“neuroeconomics”), focusing on decision making under uncertainty, where uncertainty is generated either by unintentional (“play against nature”) or intentional sources (“strategic uncertainty,” “winner's curse” in markets with insiders); and implications for design of optimal mechanisms (e.g., to foster intellectual discovery; to ensure loan and insurance markets provide optimal allocations). Further work looks at convergence of markets to competitive equilibrium, a maintained hypothesis in the analysis of field data, but for which there is no theoretical foundation and little empirical support.

5. Grants (Post-doctoral Only)

- *National Science Foundation*, for the project “US-German Collaboration: Computational and Neural Mechanisms of Inference over Decision-Structure,” 2012-15, joint with John O’Doherty (Caltech) and Jan Gläscher (University Medical Center Hamburg).
- *National Science Foundation*, for the project “Market Bubbles As Expression Of Social Norms: Experiments,” 2011-13, Grant #SES-1061824.
- *Swiss National Science Foundation*, for the SystemX.ch project “Neural Correlates of Collective Decision Making: From Molecules to Minds,” 2008-12 (co-PI).
- *Swiss National Science Foundation*, NCCR Finrisk 3rd Phase, for the project “Behavioural Finance,” 2008-13 (with Ernst Fehr and Thorsten Hens).
- *Inquire Europe*, for the project “Will Equilibrium-Induced Predictability Survive Undoing By The Uninitiated And Skeptical?,” 2006-8.
- *Moore Foundation* grant to Caltech, for the project “Experimentation with Large, Diverse and Interconnected Socio-Economic Systems,” 2006-11.
- *National Science Foundation*, for the project “Experiments on Information and Information Processing in Financial Markets,” 2006-11, Grant #SES-0616431.
- *National Science Foundation*, for the project “How Asset Markets Assist Complex Problem Solving: Identifying The Cues Through Neurocorrelates,” 2005-2010, Grant #SBE-0527491.
- *National Science Foundation*, for the project “The Evolution of Prices and Allocations in Markets: Theory and Experiment,” 2003-2006, Grant #SES-0317715.
- *National Science Foundation*, for the project “Perfectly Rational Markets, Imperfectly Rational Traders: Theory and Experiment,” 2000-2003, Grant #SES-0079374
- Grant to support research on financial markets from the *R. G. Jenkins Family Fund of the Fidelity Investments Charitable Gift Fund*.
- Research Grant from *State Street Bank* to Caltech for the Proposal “Assessing The Severity of the Absence of 'Packaging' Possibilities At the NYSE Open,” 1999.
- Research Grant, “Participation of Boundedly Rational Agents in Financial Markets: Effects on Speculation, Trading Volume and Price Volatility,” *European Union*, Grant #ERB4001GT950936, 1995-6.
- Grant, “Local Parametric Analysis of Hedging In Discrete Time,” *Royal Dutch Academy of Sciences*, 1995.
- Research Grant from *First Quadrant* to Caltech for the Proposal “Forecasting Non-Stationary Financial Return Data,” August 93-July 94.
- *Standard Oil Research Chair Award*, Summer 1987.

6. Honors and Awards

- Lloyd’s *Science of Risk 2011 Prize* for “Hedging your bets by learning about reward correlations in the human brain,” published in *Neuron*.
- *Economic Theory Fellow, Society for The Advancement of Economic Theory* (elected 2011)
- *Fellow of The Econometric Society* (elected 2010)
- *Review of Finance 2004 GSAM Best Research Paper Award* for the paper “Basic Principles of Asset

- Pricing Theory: Evidence From Large-Scale Experimental Financial Markets.”
- *Journal of Financial Markets* 2003 Best Paper Award for the paper “Excess Demand and Equilibration in Multi-Security Financial Markets: The Empirical Evidence.”
 - *Mathematical Finance* 1993 Best Paper Award (Third Prize) for the paper “A Test of a General Equilibrium Stock Option Pricing Model.”

7. Keynote Lectures (Last Five Years Only)

- Keynote Speaker, *Third Behavioral Finance and Capital Markets Conference*, Adelaide (Australia), August 2013.
- Keynote Speaker, *World Meetings of the Economic Science Association*, Zurich, July 2013.
- “The Neurobiology Behind Human Decision Making,” *2013 Finance Down Under Conference*, Melbourne (Australia), March 2013.
- “The human brain behind financial skill,” *Joint Symposium, National Taiwan University, National Chengchi University, National Yang-Ming University*, Taipei (Taiwan), March 2012.
- “The human brain behind financial skill.” *Second Miami Behavioral Finance Conference*, December 2012.
- “The human brain behind financial skill.” *Swiss Finance Institute Annual Meeting*, November 2011.
- “Double-Sided Markets,” *C-Suite Lunch Talk*, Australian Graduate School of Management, University of New South Wales, April 2011.
- “Neurobiological Foundations of Decision Making under Uncertainty,” *Finance Down Under: Building on the Best from the Cellars of Finance*, University of Melbourne, Australia, March 2011.
- “Experimental Finance,” *Finance Down Under: Building on the Best from the Cellars of Finance*, University of Melbourne, Australia, March 2011.
- “Market Bubbles and Crashes as an Expression of Tension between Social and Individual Rationality: Theory and Experiments,” *WISE International Workshop on Experimental Economics and Finance*, Xiamen University, China, December 2010.
- “Experiments on Market Dynamics,” *Experimental Finance 2010 Conference*, University of Gothenburg, Sweden, October 2010.
- “What Decision Neuroscience Teaches Us about Financial Decision Making,” *Marian Miner Cook Athenaeum Lecture*, Claremont McKenna College, March 2010.
- “Neuroscience and Decision Making,” at: *A Birdseye View of Finance: Past, Present, and Future Frontiers*, Conference organized in honor of Haim Levy, Jerusalem, August 2009.
- “Experimenting With Financial Markets,” Austrian Central Bank, June 2009.
- “Strategic Uncertainty In Games and Markets: A Neuroeconomic Perspective,” at: *5th International Meeting On Experimental And Behavioral Economics*, Granada (Spain), April 2009.
- “Potential Policy Implications of Neuroeconomics,” at: *The Social Brain*, symposium organized by the Royal Academy of Arts, Manufacture and Commerce (RSA) and the Wellcome Trust, London, January 2009.
- “Decision Making under Uncertainty: Risk and Risk Learning,” *Building Bridges in Medical Sciences*, Cambridge University Medical School, November 2008.
- “The Neuroeconomics of Decision Making,” *World Economic Forum*, Geneva, September 2008.

- “Neurobiological Foundations of Perception and Decision under Uncertainty,” 2008 International Economic Science Association Conference, California Institute of Technology, June 2008.
- “Neurobiological Foundations of Perception and Decision under Uncertainty,” Fourth Asia Pacific Meeting of the Economic Science Association, National University of Singapore, February 2008.
- “Neurobiological Foundations of Perception and Decision under Uncertainty,” 9th Biennial Symposium “Neuroeconomics: Decision Making and the Brain,” New York University Center for Neural Science, January 2008.
- “The Neuroeconomics of Decision Making,” 30th Annual Meeting of Japan Neuroscience Society. September 2007.
- “The Neuroeconomics of Decision Making,” Second ESA Asia-Pacific Regional Meeting, Osaka (Japan), February 2007.

8. Professional Activities

- *Society for Neuroeconomics*, Board member (2007-), President (2011-2).
- *Society for Experimental Finance*, Founding member (2011).
- *Neuroeconomics Symposium*, Co-Organizer (APESA, Singapore, February 2008).
- *Neuro-Finance Symposium*, Co-Organizer (Zurich, Switzerland, July 2007).
- *European Neuroeconomics Association*, Member of the Scientific Council (2009-).
- *European Finance Association*, Director, Executive Committee, 2010-12.
- *Economic Science Association*, Officer (Section Head, Finance; 2004-2005).
- *American Finance Association*, member of the 2002 Nominating Committee.
- *Co-Editor: Review of Finance* (2005-2009).
- *Ad-hoc Acting Editor: Journal of Finance*.
- *Member of Review Panels*, European Research Council Advanced Grants (2008-9); National Science Foundation (2010-11).
- *Associate Editor: Review of Financial Studies* (1994-7), *Journal of Financial Markets* (1997-), *Journal of Financial Econometrics* (2001-2012), *Mathematical Finance* (2002-5), *Review of Finance* (2003-5; 2009-), *Annals of Finance* (2004-2007), *Foundations and Trends in Economic Theory* (2006-), *Journal of Neuroscience, Psychology and Economics* (2009-11), *Algorithmic Finance* (2010-), *Frontiers in Decision Neuroscience* (2010-).
- *Referee: American Economic Review*, *The American Journal of Psychiatry*, *Behavioral and Brain Sciences*, *Cerebral Cortex*, *Cognition*, *Current Biology*, *Econometrica*, *Economic Journal*, *Economics Letters*, *Economic Theory*, *European Economic Review*, *Finance*, *Frontiers in Behavioral Neuroscience*, *International Economic Review*, *Journal of The American Statistical Association*, *Journal of Business*, *Journal of Business and Economic Statistics*, *Journal of Econometrics*, *Journal of Economic Behavior and Organization*, *Journal of Economic Dynamics and Control*, *Journal of Empirical Finance*, *Journal of Experimental Psychology*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of Financial and Quantitative Analysis*, *Journal of International Money and Finance*, *Journal of Money, Credit and Banking*, *Journal of Neuroscience, Psychology, and Economics*, *Journal of Political Economy*, *Management Science*, *NeuroImage*, *Neuron*, *PLoS (Biology; Computational Biology; Neuroscience and Psychiatry)*, *Philosophical Transactions B of the Royal*

Society (Biological Sciences), Proceedings of the National Academy of Sciences, Psychological Science, Rand Journal of Economics, Review of Economics and Statistics, Review of Economic Studies, Review of Financial Studies, Science, Utah Winter Finance Conference, Western Finance Association.

- *Reviewer of Grant Applications*: national (U.S., Canada, Switzerland, U.K, Belgium, France, Germany) and international (European Union) public, and private (e.g., AXA) foundations.
- *Member*: American Finance Association, Association for Psychological Science, Econometric Society, Economic Science Association, European Finance Association, Society for Neuroeconomics, Society for Neuroscience, Society for the Promotion of Financial Studies, Western Finance Association.

9. Research: Articles, Books, Papers (Per Topic)

9.1 Asset Pricing Theory

Published

Articles:

1. "Common Nonstationary Components of Asset Prices," *Journal of Economic Dynamics and Control* 12 (No. 2/3): June/September 1988.
2. "A General Equilibrium Model of Changing Risk Premia: Theory and Tests," with Richard C. Green, *Review of Financial Studies* 2 (4): 1989, 467-493.
3. "Tax-Induced Intertemporal Restrictions on Security Returns," with Robert Dammon, *Journal of Finance* 49, no. 4 (1994): 1347-1372.
4. "Speculative Behavior and the Functioning of Financial Markets: Discussion," (in Spanish), *Moneda y Credito* 200 (1995): 39-44.
5. "Expectations and Learning in Iowa," with Oleg Bondarenko, *Journal of Banking and Finance* 24 (2000), 1535-1555.
6. "An Exploration of Neo-Austrian Theory Applied To Financial Markets," with Harald Benink, *Journal of Finance* 54 (2001), 1011-1028.
7. "Prices and Allocations in Financial Markets: Theory, Econometrics, and Experiments," with Charles Plott and William Zame, *Econometrica*, 75 (2007), 993-1038.
8. "Equilibrium Asset Pricing Under Heterogeneous Information," with Bruno Biais and Chester Spatt, *Review of Financial Studies* 23 (2010), 1503-43.
9. "Modeling Price Pressure in Financial Markets," with Elena Asparouhova, *Journal of Economic Behavior and Organization* 72 (2009) 119-130.
10. "Ambiguity in Asset Markets: Theory and Experiment," with Paolo Ghirardato, Serena Guarnaschelli and William Zame, *Review of Financial Studies* 23 (2010) 1325-59.

Books:

The Paradox of Asset Pricing (Princeton: Princeton University Press, 2002; Paperback version appeared 2005; Asian version appeared 2007).

Unpublished

1. “Has the Cross-Section of Average Returns Always Been The Same? Evidence from Germany, 1881-1913,” with Caroline Fohlin, Caltech Social Science Working Paper 1084: 2000.
2. “Price Formation in Continuous Double Auctions, with Implications for Finance,” with Elena Asparouhova and John Ledyard, 2011 (presented at 2009 SAET Conference, Ischia, Italy; presented at the Australian School of Business, University of New South Wales; revise-and-resubmit).
3. “Asset Pricing and Asymmetric Reasoning,” with Elena Asparouhova, Jon Eguia and William Zame, 2012 (presented at 2009 SAET Conference, Ischia, Italy; revised-and-resubmitted to *Journal of Political Economy*).
4. “Market Bubbles and Crashes as an Expression of Tension between Social and Individual Rationality: An Experiment,” with Elena Asparouhova, and Anh Tran, 2011 (presented at the 2010 Conference in Experimental Finance, Gothenburg, Sweden, keynote presentation at the 2010 Conference in Experimental Economics and Finance, Xiamen, China, and presented at UCLA, the University of Technology Sydney and the University of Utah).
5. “Competition in Portfolio Management: Theory and Experiment,” with Elena Asparouhova, Jernej Copic, Brad Cornell, Jaks Cvitanic and Debrah Meloso, 2011 (presented at the *World Conference on Mathematical Finance, USC*, May 2011; revise-and-re-submit from *Management Science*).

9.2 Experimental Finance (See Also Asset Pricing Theory)**Published**

1. “Price Discovery in Financial Markets: The Case of the CAPM,” Bossaerts, P., D. Kleiman, and C. Plott [2000], in Charles R. Plott, *Collected papers on the Foundations of Experimental Economics and Political Science: Information, Finance and General Equilibrium*, vol. 3, Edwin Elgar Publishers, 2004.
2. “Experiments With Financial Markets: Implications For Asset Pricing Theory,” *The American Economist*, Spring 2001. Reprint in *Shifting Paradigms, New Directions in Economics*, Cambridge, UK: Cambridge University Press (2004).
3. “The CAPM in Thin Experimental Financial Markets,” with Charles Plott, *Journal of Economic Dynamics and Control*, 26 (2002), 1093-1112.
4. “Inducing Liquidity in Thin Financial Markets Through Combined-Value Trading Mechanisms,” with Leslie Fine and John Ledyard, *European Economic Review*, 46 (2002), 1671-95.
5. “Excess Demand and Equilibration In Multi-Security Financial Markets: The Empirical Evidence,” with Elena Asparouhova and Charles Plott, *Journal of Financial Markets* 6 (2003), 1-22.
6. “Basic Principles of Asset Pricing Theory: Evidence From Large-Scale Experimental Financial Markets,” with C. Plott, *Review of Finance* 8 (2004), 135-169.
7. “Asset Pricing,” in *Handbook of Experimental Economics Results*, Charles R. Plott and Vernon L. Smith, eds., Amsterdam: North-Holland (2008).
8. “From Market Jaws to the Newton Method: The Geometry of How a Market Can Solve Systems of Equations,” with Charles R. Plott; in *Handbook of Experimental Economics Results*, Charles Plott and Vernon L. Smith, eds, Amsterdam: North-Holland (2008).
9. “Risk Aversion in Laboratory Asset Markets,” with William Zame, in: *Risk Aversion in Experiments*,

Ed. J. Cox and G. Harrison, Greenwich, CT: JAI Press, Research in Experimental Economics, Volume 12, 2008.

10. "Promoting Intellectual Discovery: Patents vs. Markets," with Jernej Copic and Debrah Meloso, *Science*, 323 (2009), 1335-1339.
11. "The Experimental Study of Asset Pricing Theory," *Foundations and Trends in Finance* 2009 (3), 289-361.
12. "Excessive Volatility Is Also A Feature Of Individual Level Forecasts," with A. Nursimuli, *Journal of Behavioral Finance*, forthcoming.
13. "The Speed of Information Revelation and Eventual Price Quality in Markets with Insiders," with Cary Frydman and John Ledyard, *Review of Finance*, forthcoming.

Unpublished

1. "Prices and Allocations in Dynamically Complete Markets: Experimental Evidence," with Debrah Meloso and William Zame, 2011 (SURF project Summer 2011).
2. "Experiments with the Lucas Asset Pricing Model," with Elena Asparouhova, Nilanjan Roy and William Zame, 2011 (presented at Hong Kong University of Science and Technology, Cheung Kong Graduate School of Business, Xiamen University, Claremont Colleges, UCLA-Finance, at the 12th Conference on Theoretical and Experimental Macroeconomics, Barcelona, June 2012, and the Society for Financial Econometrics/Fundação Getulio Vargas Conference on Asset Pricing and Portfolio Allocation in the Long Run, December 2012; to be presented at the Conference on Finance and Expectational Coordination, NYU, February 2013, at the 2013 Down Under Finance Conference in Melbourne (Australia) in March 2013, at the 28th NBER Annual Conference on Macroeconomics, April 2013, at Pennsylvania State University and at Purdue University)

9.3 Decision Neuroscience and Neuroeconomics

Published

1. "Neural Differentiation of Expected Reward and Risk in Human Subcortical Structures," with Kerstin Preuschoff and Steve Quartz, *Neuron* 51 (2006), 381-390.
2. "The Role of Ventromedial Prefrontal Cortex in Abstract State-Based Inference During Decision Making in Humans," with Alan Hampton and John O'Doherty, *The Journal of Neuroscience* 26 (2006), 8360-8367.
3. "Decision Making in Financial Markets," in: *Encyclopedia of Neuroscience*, Eds. L. Squire, T. Albright, F. Bloom, F. Gage and N. Spitzer, Elsevier, 2009, 339-346.
4. "Adding Prediction Risk to the Theory of Reward Learning," with Kerstin Preuschoff, *Annals of the New York Academy of Sciences*, 1104 (2007), 135-146.
5. "Neural Antecedents of Financial Decisions," with B. Knutson, *Journal of Neuroscience*, 2007, 27(31): 8174-8177.
6. "Towards a Mechanistic Understanding of Human Decision Making: Contributions of Functional

- Neuroimaging,” with J. O’Doherty, *Current Directions in Psychological Science* (Special Issue on The Interface Between Neuroscience and Psychological Science), 17 (2008).
7. “Human Insula Activation Reflects Risk Predictions Errors As Well As Risk,” with Kerstin Preuschoff and Steve Quartz, *Journal of Neuroscience*, 28 (2008), 2745-2752.
 8. “Markowitz in the Brain?” with Kerstin Preuschoff and Steve Quartz, *Revue d’Economie Politique*, 2008, 75-96.
 9. “Investigating Signal Integration with Canonical Correlation Analysis of fMRI Brain Activation Data,” with A. Bruguier, K. Preuschoff and S. Quartz, *NeuroImage*, 41 (2008), 35-44.
 10. “Neural Correlates of Mentalizing-Related Computations During Strategic Interactions in Humans,” with A. Hampton and J. O’Doherty, *Proceedings of the National Academy of Sciences*, 105 (2008), 6741-6746.
 11. “The Neurobiological Foundations of Valuation in Human Decision Making under Uncertainty,” with Ming Hsu and K. Preuschoff, in: *Neuroeconomics: Decision Making and the Brain*, Ed. P.W. Glimcher, C.F. Camerer, E.Fehr, R.A. Poldrack, New York: Academic Press (2008).
 12. “Neurobiological Studies of Risk Assessment: A Comparison of Expected Utility and Mean-Variance Approaches,” with M. d’Acremont, *Journal of Cognitive, Affective and Behavioral Neuroscience* 8 (2008), 363-374.
 13. “Explicit Neural Signals Reflecting Reward Uncertainty,” with W. Schultz, K. Preuschoff, C. Camerer, M. Hsu, C.D. Fiorillo, and P. Tobler, *Philosophical Transactions of the Royal Society B: Biological Sciences*, 2008 (363), 3801-3811.
 14. “Predicting Risk in a Multiple Stimulus - Multiple Reward Environment,” with Mathieu d’Acremont and Manfred Gilli, in: *Reward And Decision Making*, ed. J.C. Dreher and L. Tremblay, Academic Press (2009).
 15. “Encoding of marginal utility across time in the human brain,” with A. Pine, B. Seymour, J. Roiser, K. Friston, H.V. Curran and Ray Dolan, *Journal of Neuroscience*, 2009 (29), 9575-9581.
 16. “Neural Correlates of Value, Risk and Risk Aversion Contributing to Decision Making under Risk,” with G. Christopoulos, P. Tobler, R. Dolan and W. Schultz, *Journal of Neuroscience* 29 (2009), 12574-83.
 17. “What Decision Neuroscience Teaches Us About Financial Decision Making,” *Annual Review of Financial Economics* 2009 (1), 383-404.
 18. “Exploring the Nature of Trading Intuition,” with Antoine Bruguier and Steve Quartz, *Journal of Finance*, 65 (2010), 1703-23.
 19. “Risk and Risk Prediction Error Signals in Anterior Insula,” *Brain Structure and Function* 214 (2010) 645-653.
 20. “A Behavioral and Neural Evaluation of Prospective Decision-Making under Risk,” with Mkael Symmonds and Ray Dolan, *Journal of Neuroscience* 2010 (30), 14380-9.
 21. “Risk, Unexpected Uncertainty, and Estimation Uncertainty: Bayesian Learning in Unstable Settings,” with Elise Payzan, *PLoS Computational Biology*, 2011 (7) doi:10.1371/journal.pcbi.1001048.
 22. “MAOA-L carriers are better at making optimal financial decisions under risk,” with Cary Frydman, Antonio Rangel and Colin Camerer, *Proceedings of The Royal Society B: Biological Sciences* 2010 doi:10.1098/rspb.2010.2304.
 23. “The Impact of Disappointment in Decision Making: Inter-Individual Differences and Electrical

- Neuroimaging,” with Hélène Tzieropoulos, Rolando Grave de Peralta and Sara L. Gonzalez, *Frontiers in Human Neuroscience* 2010 (4), doi: 10.3389/fnhum.2010.00235.
24. “Positive temporal dependence of the biological clock implies hyperbolic discounting,” with Debajyoti Ray, *Frontiers in Decision Neuroscience* 2011 (5), doi: 10.3389/fnins.2011.00002; *Reprinted in: The Neurobiology of Choice*, Daeyeol Lee, Paul Glimcher, Julia Trommershäuser. Frontiers Media SA (Frontiers Research Topic Ebook), 2012.
 25. “The Affective Impact of Financial Skewness on Neural Activity and Choice,” with C. Wu and B. Knutson, *PLoS One* 2011 (6) doi:10.1371/journal.pone.0016838.
 26. “Differentiable Contributions of Human Amygdalar Subregions in the Computations Underlying Reward and Avoidance Learning,” with C. Prévost, J.A. McCabe, R.K. Jessup and J. O’Doherty, *European Journal of Neuroscience* 2011 (34), 1-12 (featured article).
 27. “The human prefrontal cortex mediates integration of potential causes behind observed outcomes,” with Klaus Wunderlich, Ulrik Beierholm and John O’Doherty, *Journal of Neurophysiology* 2011 (online pre-print).
 28. “Separate Encoding of Intuition-Based and Reason-Based Subjective Valuations In The Human Brain,” with Ulrik Beierholm, Cedric Anen and Steven Quartz, *NeuroImage* 2011 (58), 955-62.
 29. “Hedging your bets by learning about reward correlations in the human brain,” with Klaus Wunderlich, Mkael Symmonds and Ray Dolan, *Neuron* 2011 (71), 1141-52.
 30. “Risk, Unexpected Uncertainty, and Estimation Uncertainty: Bayesian Learning in Unstable Sttings,” *PLoS Computational Biology* 7 (1), e1001048. doi:10.1371/journal.pcbi.1001048.
 31. “Decision Making: How The Brain Weighs The Evidence,” with M. d’Acremont, *Current Biology* 2012 (22), 1641-48 (Dispatch).
 32. “Activity in inferior parietal and medial prefrontal cortex signals the accumulation of evidence in a probability learning task,” with M. d’Acremont and E. Fornari, *PLoS Computational Biology*, forthcoming.
 33. “Evidence for model-based computations in the human amygdala during Pavlovian conditioning,” with Charlotte Prévost, Dan McNamee, Ryan Jessup and John O’Doherty, *PLoS Computational Biology* 2013 (2), 2013.
 34. “Risk and Reward Preferences Under Time Pressure,” with A. Nursimulu, *Review of Finance*, forthcoming.
 35. “Testing Theories Of Investor Behavior Using Neural Data,” with Cary Frydman, Nick Barberis, Colin Camerer and Antonio Rangel, *Journal of Finance*, forthcoming.
 36. “The Neural Representation of Unexpected Uncertainty During Value-Based Decision Making,” with Elise Payzan, Simon Dunne and John O’Doherty, *Neuron*, forthcoming.
 37. “In the Mind of the Market: Theory of Mind Biases Value Computation During Financial Bubbles,” with Benedetto de Martino, John O’Doherty, Deb Ray and Colin Camerer, *Neuron*, forthcoming.
 38. “The Human Brain Encodes Event Frequencies While Forming Subjective Beliefs,” with Mathieu d’Acremont and Wolfram Schultz, *Journal of Neuroscience*, forthcoming.

Unpublished

1. “Adolescents' Decision Making In Economic Games,” with M. d’Acremont and M. Van der Linden (2009).

2. "Electroencephalographic Spatio-Temporal Signatures of Risk and Reward Processing in the Human Brain," with A. Nursimulu and M. Murray, 2011 (prepared for submission).
3. "The Chronometry of Risk Processing in the Human Brain," with Mkael Symmonds, Rosalyn Moran, Nicholas Wright, Gareth Barnes, and Ray Dolan.
4. "Experienced chimpanzees behave more game-theoretically than humans in simple competitive interactions," with Christopher Flynn Martin, Rahul Bhui, Tetsuro Matsuzawa and Colin Camerer (submitted).

9.4 Econometric Theory

Published

1. "The Econometrics of Learning in Financial Markets," *Econometric Theory* 11, no. 1 (1995): 151-189.
2. "Testing the Mean Variance Efficiency of Well-Diversified Portfolios in Very Large Cross-Sections," with Pierre Hillion, *Annales d'Economie et Statistique* 40 (1995).
3. "Filtering Returns for Unspecified Biases in Priors when Testing Asset Pricing Theory," *Review of Economic Studies* 70 (2003), 1-24.

Unpublished

1. "A Theorem On (Certain Kinds Of) Out-of-Sample Prediction Tests in Finance," 1996.
2. "On the Power of the Gibbons-Ross-Shanken Test of Optimality of a Portfolio," with Debrah Meloso, 2009.

9.5 General Equilibrium Theory

Published

"Asset Trading Volume in Infinite-Horizon Economies with Dynamically Complete Markets and Heterogeneous Agents: Comment," with William Zame, 2006, *Finance Research Letters* (3), 96-101.

Unpublished

"Rational Expectations Equilibria When Priors are Inconsistent," 1998.

9.6 Game Theory

Published

"Asset Prices and Volume in a Beauty Contest," with Bruno Biais, *Review of Economic Studies* 65 (1998): 307-340; *Summary* appeared in *Journal of Finance* 49, no. 3 (1994), reprinted in *Advances in Financial Modeling*, B. Biais and M. Pagano, eds., Oxford University Press, 2001.

9.7 Mechanism Design

Published

“An Optimal IPO Mechanism,” with Bruno Biais and Jean-Charles Rochet, *Review of Economic Studies* 69 (2002) 117-146.

Unpublished

“Voting to ensure existence and Pareto-optimality of insurance and loan markets,” with Michèle Itten (2009) (SURF project Summer 2011).

9.8 Mathematical Finance

Published

1. “A Test of a General Equilibrium Stock Option Pricing Model,” with Pierre Hillion, *Mathematical Finance* 3 (4): 1993.
2. “Local Parametric Analysis of Hedging in Discrete Time,” with Pierre Hillion, *Journal of Econometrics* 81 (1997).
3. “Martingale-Based Hedge Error Control,” with Bas Werker, in *Numerical Methods in Financial Mathematics*, C. Rogers and D. Talay, eds., Cambridge University Press, 1996.
4. “Local Parametric Analysis of Derivatives Pricing,” with Pierre Hillion, *Journal of Financial Markets* 6 (2003) 573-605.

Unpublished

“Arbitrage-Based Pricing When Volatility is Stochastic,” with Eric Ghysels and Christian Gouriéroux, October 1997.

9.9 Applied Econometrics

Published

1. “A New Method for Volatility Estimation with Applications in Foreign Exchange Rate Series,” with Wolfgang Härdle and Christian Hafner, in *Finanzmarktanalyse und -prognose mit innovativen quantitativen Verfahren*, G. Bol, G. Nakhaeizadeh and K.-H. Vollmer, eds., 71-84, Physica Verlag, 1996.
2. “Exchange Rates Have Surprising Volatility,” with Christian Hafner and Wolfgang Härdle, in *Time Series Analysis*, in memory of Ted Hannan, P.M. Robinson and M. Rosenblatt, eds., 2:55-72, Springer Verlag, 1996.
3. “Implementing Statistical Criteria to Select Return Forecasting Models: What Do We Learn?” with Pierre Hillion, *Review of Financial Studies* 12 (1999): 405-428.

9.10 Market Microstructure Analysis

Published

1. “Market Microstructure Effects of Government Intervention in the Foreign Exchange Market,” with Pierre Hillion, *Review of Financial Studies* 4 (3): 1991.
2. “Transaction Prices When Insiders Trade Portfolios,” *Finance* 14 (2), 1993; *Summary* appeared in *Journal of Finance* 48 (3): 1993.

9.11 Corporate Finance

Published

Articles:

“IPO Post-Issue Markets: Questionable Predilections But Diligent Learners?” with Pierre Hillion, *Review of Economics and Statistics* 83, no. 2 (2001): 1-15.

Books:

Lecture Notes in Corporate Finance, with Bernt Arne Ødegaard (Singapore: World Scientific Publishing, 2001; Second, Revised Edition 2007).

10. Development of Instruments

jMarkets 1.0 (2005), 1.5 (2006), 2.0 (2008):

Scientific project supervisor; jMarkets is a pure-Java, J2EE-compliant open-source software tool to run large-scale internet-based experiments with multiple interconnected markets (source and binary code published at <http://jmarkets.ssel.caltech.edu>); joint with Walter Yuan, Raj Advani and William Zame.

U.S. Patent 8,386,370 (Issued: 2/26/2013):

“Method and Apparatus For Providing A Market Environment,” with Walter Yuan and Raj Advani.

Flex-E-Markets (2007-):

Scientific project supervisor; “software-on-demand” tool for flexible and easy deployment of internet-based double-sided markets on low-end private computer systems

11. PhD Advisees and Postdocs

• Past students:

- ▶ *Social Science:* Kaoru Kato, Oleg Bondarenko, Serena Guarnaschelli, Elena Asparouhova, Debrah

Meloso, Ming Hsu

- ▶ *Decision Neuroscience*: Kerstin Preuschoff, Alan Hampton, Ulrik Beierholm, Antoine Bruguier, Alan Hampton, Klaus Wunderlich, Elise Payzan, Anjali Nursimulu, Cary Frydman, Yutaka Kayaba
- *Present student*: Nilanjan Roy (Experimental Finance; co-advised)
- *Postdocs (some co-mentored)*: Kerstin Preuschoff, Ulrik Beierholm, Mathieu d'Acremont, Charlotte Prévost, Yutaka Kayaba