

The Bendheim Center for Finance

Annual Report
2009

Princeton University

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In Memoriam: Robert Austin Bendheim, 1916-2009

The Bendheim Center for Finance is saddened to report that Robert A. Bendheim died on August 21 at age 93. Bob graduated from Princeton in 1937. As many of you know, Bob and his family have been great friends of the University and have had a major impact on its missions of teaching and research and in promoting a deeper understanding of the forces that shape our national and international destiny.

His thoughtful philanthropy at Princeton focused mainly on the areas of economics and public policy – from Bendheim Hall, which houses faculty from the departments of Economics, Political Science and the Woodrow Wilson School, to an endowed professorship in Economics and Public Affairs, to the Bendheim-Thoman Center for Child Wellbeing and Development, the Bendheim Center for Finance, and most recently, to the Robert Bendheim and Lynn Bendheim Thoman Chair in Neuroscience, which is a fitting combination of his two lifelong interests in medical research and higher education.

In fact, Bob and his family have been so generous to the University that in order to get our mail delivered correctly we had at one point to produce a map of what we called the "Bendheim subdivision" of the Princeton campus to distribute to the UPS and Fedex drivers! Between Bendheim halls, different centers, professors, and so on, the poor drivers were hopelessly lost.

Very close to his heart, though, was the Bendheim Center for Finance, launched through his generosity in 1997 with the express purpose of establishing at Princeton a leading center of education, scholarship and public leadership in the field of finance.

Without Bob's leadership, I am convinced that the study of finance would not have been able to occupy at Princeton the important place that it does today, at a particularly critical time in the nation's and the world's economic history.

Bob knew better than anyone that research had to be relevant. He took particular pride in the fact that Ben Bernanke, with whom he had many of the early discussions that led to the establishment of the Bendheim Center for Finance, was called to public service. Today, he would have been pleased to know that our colleague Alan Krueger, the Bendheim Professor of Economics and Public Affairs, is on leave from Princeton as Assistant Treasury Secretary, helping shape the nation's policy responses to the current financial crisis.

Beyond the gifts, Bob took a keen interest in nurturing the programs he helped launch. He knew how and when to get involved and really had that magic touch. The first time I met Bob, at a lunch in New York with his wife Jane, a few weeks after having been named the director of that new center, he asked whether there was anything else he could do to help get us off the ground. He meant it quite literally. At the time, the University was embroiled in difficult negotiations regarding the financing of the new home of the Bendheim Center, a former eating club, and various swaps of locations involving other eating clubs. Bob told me not to worry. He just wanted to know what we needed to make this work and he would take care of it. He picked up the phone and spoke to the President of the University at the time and other involved parties. All you need to know is that a few months later, we moved into the new home of the Center, completely renovated. Needless to say, we never heard again of the eating club swap.

A year later, it was time for us to produce our first annual report. We naturally sent a few copies to Bob's attention at the Lowenstein Foundation. The care with which Bob read these reports was famous among all the organizations that were fortunate enough to be the recipients of his generosity. A week or so later, we received a phone call from the Lowenstein Foundation requesting a few copies of the Center's annual report. We sent a few more. Then a couple weeks passed and the Foundation again requested copies. We started getting nervous. We thought that either the Foundation was

dissatisfied with what it was reading, or there must have been a problem with the batch sent from the printers, the delivery, of something of that nature. Fortunately, that wasn't the reason. I learned the real reason later from his daughter Lynn. It turned out that Bob was so happy and proud of having established this new Center that he wanted more copies to share with his closest friends!

Over the years, I regularly received letters of encouragement from him. Until recently, they were all handwritten. It was bittersweet because it was becoming obvious from his handwriting that his health was declining. The last few ones were typed and only had his name handwritten in the signature. Among his many gifts to the Center, Bob established fellowships for deserving students. So every year we would send him the CVs of the recipients. One of his letters was in response to the CVs of two students who particularly attracted his attention. He took the opportunity to reminisce about his own time as a student at Princeton in the thirties, how the material taught in courses was different, and he was (only half-jokingly I think) imagining what it would have been like for him to be a student today. It was really a lovely letter.

We'll miss him.

Yacine Aït-Sahalia

Otto A. Hack '03 Professor of Finance and Economics

Director, Bendheim Center for Finance

August 2009

Director's Introduction

The mission of Princeton University's Bendheim Center for Finance is twofold: First, to develop new courses and programs in finance that will afford exciting learning opportunities to Princeton students; and second, to establish a leading center for modern financial research. We are proud to be celebrating our 10th anniversary of the Master in Finance program.

Given the dynamic market conditions of the past few years, this continues to be one of the most exciting times for research and study of finance, although an extremely challenging time for our students seeking jobs and internships, as well as many of our alumni. In times like these, we especially appreciate the critical support of our Advisory Council and our Corporate Affiliates.

Under the aegis of the Bendheim Center for Finance (BCF), Princeton's existing finance curriculum has been expanded and improved, and two academic programs have been created: An Undergraduate Certificate in Finance in 1999 and a Master in Finance in 2001. Center-affiliated faculty teach in both programs as well as in a variety of contexts in their home departments across the University. By bringing together outstanding scholars from a wide variety of disciplines in a well-equipped setting that encourages dialogue and interaction, the BCF is an ideal environment in which to conduct significant research in finance. It also serves as a major venue where the world's leading experts in finance from academia, government, and the private sector can meet regularly to exchange views and information.

Proximity to Wall Street and other important centers of private-sector financial research provide an additional source of intellectual stimulation and interchange for the BCF. Students are able to explore both internships and permanent job opportunities in a wide variety of finance-related areas. The BCF also encourages students at all levels to conduct finance-related research at the University by providing such services as funding senior thesis projects, acting as a clearinghouse and major source of data, and providing expert faculty advisers.

The scholars in the BCF are chosen for their ability to deploy cutting-edge methodologies to a wide range of finance-related topics, from stock-price determination and public policy toward financial markets to the role of financial institutions in economic growth. The center supports these leading scholars by encouraging their individual, collaborative, and multidisciplinary research and by providing facilities (including computer and data support), research assistance, financial resources, and venues for the exchange of ideas (such as weekly seminars and conferences). The University's existing strengths in areas such as economics, mathematics and statistics, operations research, computer science, psychology, and public policy provide a serious disciplinary basis for this research, leveraging our resources to produce a truly distinguished program. To promote maximum interchange among disciplines, all center faculty have appointments in regular University departments as well as in the BCF.

Faculty

Faculty matters continue to represent the main challenge faced by the BCF, but 2008–09 was a successful recruiting year for us. We hired a new Assistant Professor in Finance, David Sraer, through the Economics Department. David received his Ph.D. in Economics from the Toulouse School of Economics in 2007. His research interests are in corporate finance, organization theory and industrial organization. He will help solve a long-standing "hole" in our teaching expertise in corporate finance. We also hired Ramon van Handel as an Assistant Professor through the ORFE Department. His research interests are in stochastics and mathematical finance.

BCF-affiliated faculty received many honors this past year. Paul Krugman won the Nobel Prize for his analysis of trade patterns and location of economic activity. In addition, Harrison Hong was awarded the 2009 Fischer Black Prize by the American Finance Association; Markus Brunnermeier won the

Bernácer Prize, awarded annually to a European economist under 40; and Jianqing Fan received a Guggenheim Fellowship.

Ph.D. Students

Four Ph.D. students advised by BCF faculty received their Ph.D.s in Economics in 2009:

- Dante Amengual, whose thesis studied latent variables models in econometrics with applications to stochastic volatility models. He accepted a position as an Assistant Professor of Economics at CEMFI in Madrid.
- Francesco Bianchi, whose thesis is titled “Three Essays in Microeconometrics,” accepted a position as an Assistant Professor of Finance at Duke University.
- Ing-Haw Cheng, whose thesis “Essays in Corporate Governance and Capital Markets” studied how corporate fraud arises through interactions in corporate governance at competing firms, and how capital market conditions affect corporate policies. He accepted a position as an Assistant Professor of Finance at the University of Michigan’s Ross School of Business.
- Konstantin Milbradt, whose thesis deals with financial market frictions, focuses on the incentives of financial institutions in the face of regulatory or contractual frictions. He accepted a position as Assistant Professor at MIT, Sloan School of Business.

Undergraduate Certificate in Finance

Now in its 11th year, the Undergraduate Certificate in Finance (UCF) continues to do extremely well, attracting large numbers of students. We enrolled 78 juniors from the Class of 2011. In previous years, the numbers were: Class of '00: 61, '01: 82, '02: 85, '03: 122, '04: 113, '05: 126, '06: 158, '07: 154, '08: 105, '09: 120, '10: 79 . This brings our total number of undergraduate students in the program (juniors and seniors) to 157 this year.

The success of the program has been overwhelming, especially in light of our limited resources for senior thesis advising. The large size of the UCF has stretched our limited advising resources. In conjunction with the Dean of the College, we now have tougher admission requirements in order to cap the size of the program at a more manageable level. Specifically, a minimum B+ average in the three prerequisite courses (mathematics, statistics, and microeconomics) and a minimum grade of B in each of them will be required for economics (ECO) and operations research and financial engineering (ORF) majors. Once admitted, a minimum B average computed over the two core courses ECO 362 and 363, the three elective courses, and the independent work will be required of all students to earn the certificate. We set these cutoffs based on grade data from previous classes, with the objective of limiting the number of UCF students to approximately 80, of which we expect about two-thirds to major in the ECO or ORF departments. We designed the tougher criteria for ECO and ORF students specifically to avoid “crowding out” the non-ECO/ORF majors from the UCF. With these new requirements in place, the program’s reduced size provides an even better experience for students and faculty alike.

We awarded 88 Undergraduate Certificates in Finance at graduation this year. (Some students admitted into the program at the end of their sophomore year fail to complete all the requirements of the certificate by the end of their senior year, hence the difference between the number of students admitted and the number of certificates granted.) This year, for the second time in three years, one of our UCF students, Holger Staude, received the honor of Class Valedictorian. This honor is awarded by faculty vote to one of the highest-ranking candidates for the bachelor degree. Special qualifications as well as scholastic standing are taken into account when awarding this honor. Vittal Kadapakkam was the recipient of the Birch Family Prize, which was presented at our Class Day ceremonies. This prize was established in 2004 by William D. Birch Jr. '64 and William Marco Birch '92. This is the fourth year we were able to present it to a graduating senior with the highest grade point average in course work related to the Undergraduate Certificate in Finance. The Kathleen Traynor Research Fund was awarded for the first time to the graduating female senior with the highest GPA in UCF coursework, Yuhang Wang.

Students earning the UCF are drawn from a wide cross-section of departments on campus, 14 in total for the Class of 2009. In addition, UCF students are an extremely talented subgroup of the already high-achieving Princeton classes. They continue to receive a high proportion of the prizes awarded by their respective departments. 10 UCF students received departmental prizes (one receiving three prizes); one UCF student received three athletic awards; 12 UCF students were elected to Phi Beta Kappa Society; 31 UCF students were elected to membership in Society of Sigma Xi; 10 UCF students were elected to membership in Tau Beta Pi National engineering Society; and finally 52 UCF students received academic honors (21 cum laude, 20 magna cum laude, and 11 summa cum laude). 34 of our UCF students earned Certificates in Proficiency from 14 other departments/programs.

Master in Finance

The seventh full class of the center's Master in Finance (MFin) graduated in June 2009. Reflecting the interdisciplinary nature of the BCF, the MFin program is noteworthy in producing students with extensive training in both quantitative methods (drawing on the strengths of our engineering, computer science, mathematics, and other departments) and in economics. This set of skills makes our master's students highly sought after in the job market. The program is designed to be completed in four semesters, but students with strong backgrounds are often able to finish in one year.

Because business schools do not generally offer so specialized a program, or expect their students to have such a strong mathematical background, Princeton's MFin offers students a significant advantage in obtaining coveted positions in sales and trading, asset management, investment banking, quantitative strategies, risk management, research, consulting and technology. BCF faculty also benefit from the program because it provides a forum in which they can develop an active intellectual interchange with leading private-sector financial researchers and practitioners.

Years of heavy investment in the placement of our graduating students continue to pay off. The networking efforts of our director of corporate relations, the strong support from our Corporate Affiliates Program and Advisory Council, and the success enjoyed by our previous graduating classes have been reflected in a strong demand for our 2009 graduates, with 95 percent accepting permanent employment in financial firms in the midst of a job market that continues to be extremely challenging given the topsy-turvy markets resulting from the financial crisis. In addition, our first-year students all accepted offers of summer internships. While costly in the short run in terms of faculty and staff involvement, in the long run, a successful placement record is critical to maintain our program's leading position.

We repeated in September 2008 our three-day "boot camp" introductory program, which was introduced in 2003 for the incoming students prior to the beginning of classes, and will continue to do so in future years. The camp focuses on a refresher of various finance topics, the types of careers for which the MFin degree prepares students, and some useful information and interviewing skills such as mock interviews with returning Bendheim alumni.

The number of MFin applicants reached 591 in December 2008 (compared to 660 the previous year). While this slight drop might be connected to the financial crisis, a strong applicant pool still reflects the recognition that the program is gaining in the wider quantitative finance community and among the top undergraduate institutions that are providing us with applicants. It also reflects the pressure faced by employees of financial firms for whom going back to school may be an appealing option in the current environment. We intend to continue keeping the MFin program small, although we grew it slightly over the last two years for three main reasons: the first was to recognize the quality and depth of the applicant pool and avoid rejecting so many able applicants that we would be discouraging future applicants from even applying; the second was the recognition that we could accommodate the additional students in our existing MFin courses without adverse consequences or the need for additional resources; the third was to graduate a sufficient number of students each year to run an organized placement program that brings potential MFin employers to campus separately from their undergraduate recruiting operations.

We made 24 offers of admission (compared to 40 last year) and 20 will be enrolling this coming fall (compared to 30 the previous year). Our selectivity rate continues to be very high, with our program admitting about 4 percent of its applicant pool. This is a much smaller percentage than our peer programs in quantitative finance (NYU, Columbia, Carnegie-Mellon, Berkeley, Chicago, Stanford, etc.), which typically admit around 25 percent of their applicant pool, and one that is comparable to the most selective business schools. Our yield (79 percent this year) was also remarkably high, despite the absence in most cases of financial aid, which is limited to a total of 3 one-semester fellowships for one year spread across the 20 students. Overall, this is a very good sign for the continued success of our program. The high yield meant that we ended up at the high end of our target of 15 to 20 incoming students. To help the constrained budgets of the Graduate School and the University at large, we chose not to utilize this year the 4 semester fellowships normally allocated to us out of general funds.

We have continued to conduct interviews of the most promising subset of our applicant pool. This process helps us ascertain which of the strong academic candidates we had identified through their written applications also excelled in areas such as communication and leadership.

Fundraising

Looking forward, our greatest challenge will be to continue to recruit and retain top-flight faculty. Faculty recruitment and retainment is essential to our new educational initiatives and for continued expansion of course offerings. To be successful in this competitive market, we have found it necessary to make commitments to provide research support for faculty members. All of this requires active fundraising, and we continue to work closely with the Office of Development to increase the center's resources. This year we give special thanks to William Janeway '65, Walter Haydock '75 and Alfred Hurley '75 for their generous gifts to the Center.

As we had anticipated during the flush years, our Corporate Affiliates Program slowed down due to the economic environment and the budgetary challenges facing the industry. Recognizing the effect of the economic environment, we have not actively sought new contributions during the past year, but instead have focused on maintaining and developing longer term relationships as well as recruiting partnerships with a broader group of firms. The following firms have remained active in recruiting efforts and have expressed a continued interest in our program: Barclays Capital, Citadel Investments Group, Crédit Suisse, Goldman Sachs, JPMorgan Chase, UBS/Prediction Company, Citi, and Morgan Stanley.

Advisory Council

The center relies on the help and advice of prominent alumni working in the financial sector. The eighth annual meeting of the Advisory Council took place on campus on May 21-22, 2009. Our meeting format included a dinner the evening before the morning meeting. This enabled the council members to exchange ideas in a more informal setting. The agenda was centered on the placement of future master's students, fine-tuning of the Undergraduate Certificate in Finance, and the design of the benefits offered to corporate affiliates. Council members were pleased to note the continued success of the center's programs.

Conclusion

Finance is important to Princeton's continued success as an educational and research institution because of increasing demands for training in these areas by our students at all levels and because these fields have become central to research efforts in diverse disciplines, including economics. As one of the world's leading research and teaching universities, Princeton has much to offer to the future development and effective application of finance, including distinguished academic programs that can provide support in such areas as operations research, mathematics and statistics, decision science, and organizational theory. It is not Princeton's objective to create a simulacrum of a business school. Rather, our strategy is to focus on those portions of the conventional business school curriculum in which it has existing strengths, such as fields that can be solidly grounded in analytical,

discipline-based research, and emphasize interdisciplinary research. Indeed, research and teaching in finance with an essential interdisciplinary component constitutes the distinguishing feature of the BCF.

By helping to attract outstanding new faculty, encouraging and supporting the work of existing faculty, and bringing outstanding scholars and practitioners from private industry to campus, the center continues to stimulate exciting new research, dialogue, and collaboration. And through its educational programs, the center enhances the education, training, and career opportunities of many of the world's best students.

Yacine Ait-Sahalia

Otto A. Hack '03 Professor of Finance and Economics
Director, Bendheim Center for Finance
August 2009

FACULTY

DILIP ABREU is the Edward E. Matthews, Class of 1953, Professor of Finance and professor of economics. His research interests include behavioral economics and finance, economic theory, and game theory. He is a fellow of the Econometric Society and a member of its council, and a fellow of the American Academy of Arts and Sciences. He received a B.A. from Bombay University, an M.Phil. from Oxford University, and a Ph.D. in economics from Princeton.

COURSES TAUGHT:

- ECO 418: Strategy and Information
- ECO 502: Microeconomic Theory
- ECO 514: Game Theory

UNDERGRADUATE STUDENTS ADVISED:

- Howard Deutsch, "On-campus Recruiting as a Two-sided Matching Problem or, How I Managed to Find a Job"
- Adam Nebesar, "Oil and War: New Methods for Estimating the Macroeconomic Effects of Oil Shocks, Using War in Iraq as a Case Study"

GRADUATE STUDENTS ADVISED:

- Attila Ambrus, "Coalitional Rationalizability"
- Daisuke Nakajima, "Essays on Auctions and the War of Attrition with the Allais Paradox"

REPRESENTATIVE PUBLICATIONS:

- "Bargaining, Reputation, and Equilibrium Selection in Repeated Games with Contracts," *Econometrica*, May 2007 (with D. Pearce).
 - "Bubbles and Crashes," *Econometrica* 71(1), 173–204, January 2003 (with M. Brunnermeier).
 - "Bargaining and Reputation," *Econometrica* 68(1), 85–117, January 2000 (with F. Gul).
 - "Information and Timing in Repeated Partnership," *Econometrica*, November 1991 (with P. Milgrom and D. Pearce).
 - "On the Theory of Infinitely Repeated Games with Discounting," *Econometrica* 56(2), 383–396, March 1988.
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YACINE AÏT-SAHALIA is the Otto A. Hack 1903 Professor of Finance and Economics and the director of the Bendheim Center for Finance. He was previously a professor at the University of Chicago's Graduate School of Business. He was named an outstanding faculty by *BusinessWeek's 1997 Guide to the Best Business Schools* and is the recipient of the 1997 Michael Brennan Award, and the 2003 Aigner Award. He is a past Sloan Fellow and Guggenheim Foundation Fellow. He is a fellow of the Econometric Society, the American Statistical Association, and the Institute of Mathematical Statistics, and a research associate for the National Bureau of Economic Research. He recently served as an editor of the *Review of Financial Studies*. He is currently editing the *Handbook of Financial Econometrics* with Lars P. Hansen. He received his Ph.D. in economics from the Massachusetts Institute of Technology in 1993 and his undergraduate degree from France's École Polytechnique.

COURSE TAUGHT:

- ECO 575/FIN 575: The Econometrics of Continuous-time Finance

GRADUATE STUDENTS ADVISED:

- Julio Cacho-Diaz, "Optimal Portfolio Choice in the Presence of Jumps"
- Dacheng Xiu, "Maximum-likelihood Estimation of Misspecified Microstructure Noise Models"
- Eren Yanik, "Investigating the Effect of the 'Carry Trade' on Turkey: Prospects and Threats"

REPRESENTATIVE PUBLICATIONS:

- "Testing for Jumps in a Discretely Observed Process," *Annals of Statistics* 37, 184-222, 2009 (with J. Jacod).
 - "Closed-form Likelihood Expansions for Multivariate Diffusions," *Annals of Statistics* 36, 906-937, 2008.
 - "Fisher's Information for Discretely Sampled Lévy Processes," *Econometrica* 76, 727-761, 2008 (with J. Jacod).
 - "Volatility Estimators for Discretely Sampled Lévy Processes," *Annals of Statistics* 35, 355-392, 2007 (with J. Jacod).
 - "Maximum Likelihood Estimation of Stochastic Volatility Models," *Journal of Financial Economics* 83, 413-452, 2007 (with R. Kimmel).
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ALEXANDRE D'ASPREMONT joined the Department of Operations Research and Financial Engineering in 2004. His research focuses on interest rate option pricing and risk management, applications of convex optimization to finance, statistics, and machine learning, and large-scale convex optimization in general. He received his undergraduate and graduate degrees from École Polytechnique and his Ph.D. from Stanford University. He is a member of the Institute for Operations Research and the Management Sciences and the Society for Industrial and Applied Mathematics.

COURSES TAUGHT:

- ORF 307: Linear Programming
- ORF 523: Nonlinear Programming

UNDERGRADUATE STUDENTS ADVISED:

- Tiffany Eng, "News or Noise: Text Classification of Financial News using Support Vector Machines"
- Andrew Lieu, "Interest Rate Model Calibration: An Analysis of Rank vs. Stability"
- Vidal Sadaka, "The Effect of Political Reforms on Interest Rates as Turkey Negotiates Accession to the European Union"

REPRESENTATIVE PUBLICATIONS:

- "Optimal Solutions for Sparse Principal Component Analysis," *Journal of Machine Learning Research*, 9, 1269-1294, July 2008 (with F. Bach and L. El Ghaoui).
- "Model Selection through Sparse Maximum Likelihood Estimation," *Journal of Machine Learning Research*, 9, March 2008, 485-516 (with O. Banerjee and L. El Ghaoui).
- "First-order Methods for Sparse Covariance Selection," *SIAM Journal on Matrix Analysis and Its Applications*,

30:1, 56-66, February 2008 (with O. Banerjee and L. El Ghaoui).

- "Static Arbitrage Bounds on Basket Option Prices," *Mathematical Programming, Series A*, 106:3, July 2006, 467-489 (with L. El Ghaoui).
 - "Interest Rate Model Calibration using Semidefinite Programming," *Applied Mathematical Finance* 10:3, September 2003, 183-213.
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DAVID BLAIR has been involved with the Bendheim Center for Finance since 2000. He previously held the post of director of corporate relations for the center. Prior to joining the center, he had been a managing director with Morgan Stanley and, prior to that, a partner in the law firm of White & Case. His responsibilities with the center include i) advising undergraduates and Master in Finance candidates on career issues, including the development of applied finance programs and interview enhancement techniques for the Master in Finance program and ii) developing and teaching special seminars and courses in applied finance. He received his undergraduate degree from Princeton and graduate degrees in law and business from Columbia University.

COURSES TAUGHT:

- FRS 130: Modern Financial Markets
 - Seniors Finance 101: Intro to the "Real World"
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ALAN BLINDER is the Gordon S. Rentschler Memorial Professor of Economics. He is also the co-director of the Center for Economic Policy Studies at Princeton University, which he founded in 1989. He is former vice chairman of the Board of Governors of the Federal Reserve System (1994-96) and before that was a member of President Clinton's original Council of Economic Advisers (1993-94). He also served briefly as deputy assistant director of the Congressional Budget Office in 1975. He is the vice chairman of Promontory Interfinancial Network, a director of the Council on Foreign Relations, and a member of the Economic Club of New York. Blinder was elected to the American Philosophical Society and the American Academy of Arts and Sciences and recently inducted into the American Academy of Political and Social Science as the 2009 John Kenneth Galbraith Fellow. He is the author or coauthor of 17 books and has written scores of scholarly articles on topics such as fiscal policy, monetary policy, and the distribution of income. He received his Ph.D. from the Massachusetts Institute of Technology.

COURSES TAUGHT:

- ECO 101: Introduction to Macroeconomics
- WWS 524: Domestic Macroeconomics: The Political Economy of Central Banking

REPRESENTATIVE PUBLICATIONS:

- "Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence," *Journal of Economic Literature*, December 2008 (with M. Ehrmann, M. Fratzcher, J. de Haan, and D. Jansen).
 - *Offshoring of American Jobs: What Response from U.S. Economic Policy?*, MIT Press, forthcoming in 2009 (with J. Bhagwati).
 - "Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence," *Journal of Economic Literature*, 910-945, December 2008 (with M. Ehrmann, M. Fratzcher, J. de Haan, and D. Jansen).
 - "Leadership in Groups: A Monetary Policy Experiment," *International Journal of Central Banking*, 117-150, December 2008 (with J. Morgan).
 - "Monetary Policy by Committee: Why and How?," *European Journal of Political Economy*, 23, 106-123, March 2007.
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MARKUS BRUNNERMEIER is the Edwards S. Sanford Professor of Economics. He is affiliated with the Bendheim Center for Finance and the International Economics Section. He is also a research associate at CEPR, NBER, and CESifo, and an academic consultant to the Federal Reserve Bank of New York. Brunnermeier was awarded his Ph.D. by the London School of Economics, where he was also affiliated with its Financial Markets Group. His research focuses on stock market bubbles, financial and liquidity crisis, hedge funds, as well as behavioral economics. He shows that bubbles persist because sophisticated traders prefer to ride a stock market bubble rather than go against it. His work on financial crisis and risk management studies the interaction between funding and market liquidity and “predatory trading” and explains why liquidity dries up when it is needed most. His research in behavioral finance proposes a shift away from the rational expectations paradigm toward “optimal expectations.” He is an associate editor of the *Journal of Finance* and the *Review of Financial Studies*, and is on the editorial board of the *Journal of Financial Intermediation*. He won various awards, including the Sloan Research Fellowship and the Smith-Breeden Prize for the best paper published in the *Journal of Finance*, 2004, and grants from the National Science Foundation, and he was selected for the Review of Economic Studies Tour. He recently won the 2008 Bernácer Prize.

COURSES TAUGHT:

- FIN 501: Asset Pricing I: Pricing Models and Derivatives
- ECO 525/FIN 525: Financial Economics

REPRESENTATIVE PUBLICATIONS:

- “Deciphering the 2007–08 Liquidity and Credit Crunch,” *Journal of Economic Perspectives*, forthcoming.
- “Market Liquidity and Funding Liquidity,” *Review of Financial Studies*, forthcoming, (with L. Pedersen).
- “Money Illusion and Housing Frenzies,” *Review of Financial Studies*, 21(1), 135–180.
- “Hedge Funds and the Technology Bubble,” *Journal of Finance*, 59(5), 2007–2034, 2004 (with S. Nagel). Smith Breeden Prize for the best article published in the *Journal of Finance*, 2004 (First Prize).
- “Bubbles and Crashes,” *Econometrica*, 71(1), 173–204, 2003 (with D. Abreu).

RENÉ CARMONA is the Paul M. Wythes '55 Professor of Engineering and Finance. As director of graduate studies of the Bendheim Center, he is responsible for the Master in Finance program. He joined Princeton University in 1995. He was granted the “Agregation” of mathematics (federal degree) in June 1969, and a “These d’Etat” in probability from the University of Marseille in June 1977. He was elected fellow of the Institute of Mathematical Statistics in 1984. He is a member of the Society for Industrial and Applied Mathematics, the Institute of Mathematical Statistics, and the Bachelier Finance Society. He was recently elected to the inaugural group of fellows of the Society for Industrial and Applied Mathematics (SIAM). His research interests center on stochastic analysis as applied to financial models and statistical analysis of financial data. He works on mathematical models for energy and emissions markets and computational methods for credit markets.

COURSES TAUGHT:

- ORF 505/FIN 505: Modern Regression and Time Series
- ORF 531/FIN 531: Computational Finance in C++
- ORF 557, 558: Stochastic Analysis Seminar

GRADUATE STUDENTS ADVISED:

- Albina Danilova, “Indifference Pricing for Weather Derivatives”
- Valdo Durreleman, “From Implied to Spot Volatility”
- Mike Ludkovski, “Monte Carlo Pricing of Energy Tolling Agreements”

RECENT PUBLICATIONS:

- *Indifference Pricing* (editor), Princeton University Press, forthcoming, 2008.
- *Interest Rate Models: An Infinite Dimensional Stochastic Analysis Perspective*, Springer Verlag, 2006.

- *Statistical Analysis of Financial Data in S-Plus*, Springer Verlag, Second Printing, 2006.
 - “Optimal Switching with Applications to Energy Tolling Agreements” (with M. Ludkowski).
 - “Gas Storage and Supply Guarantees: An Optimal Switching Approach” (with M. Ludkowski).
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PATRICK CHERIDITO is an assistant professor of operations research and financial engineering. He received his Ph.D. from ETH Zurich (Switzerland) in 2001 and visited universities in Vienna, Paris, Barcelona, and Pisa in the academic year 2001–02, before visiting the BCF in 2002–03. His research interests center on the theory of stochastic processes and their applications to finance. In the last year he has been working on the following research projects: Together with Damir Filipović (University of Munich) and Robert Kimmel (Bendheim Center), he worked on affine models for interest rates; with Mete Soner (Koc University in Istanbul) and Nizar Touzi (Crest in Paris), he studied the problem of hedging contingent claims under gamma constraints; and with Freddy Delbaen and Michael Kupper (both ETH Zurich), he studied dynamic risk measures.

COURSES TAUGHT:

- ORF 435: Financial Risk Management
- ORF 535: Financial Risk Management
- ORF 527: Stochastic Calculus and Finance
- ORF 558: Stochastic Analysis Seminar

UNDERGRADUATE STUDENTS ADVISED:

- Richard Apple, “How Deep Is the Hole? A Stochastic Analysis of the Pension Benefit Guaranty Corporation”
- Ceyda Dagdelen, “Risk Measures and Capital Requirements”
- Elizabeth Larkins, “The Wealth of Nations: An Analysis of the Correlation between United States Economic Indicators and the Probability of Default of Emerging Market Countries”
- Andrea Leewong, “The Stock Market Overreaction Mystery: Human Judgment Bias in Financial Decision-making”
- Joseph McConnell, “Optimal High School Sizes in Relation to School Demographics”
- Joseph Solomond, “Measuring Risk in Sectors of the S&P 500: Calculating VaR and Expected Shortfall Assuming Heavy Tailed Distributions”

GRADUATE STUDENT ADVISED:

- Andrew Moroz, “Determining the Minimum Super-replication Cost of a Contingent Claim under Delta and Gamma Constraints in Discrete Time”

RECENT PUBLICATIONS:

- “Composition of Time-consistent Dynamic Monetary Risk Measures in Discrete Time,” preprint (with M. Kupper).
 - “Monetary Risk Measures on Maximal Subspaces of Orlicz Classes,” preprint (with T. Li).
 - “Time-consistency of Indifference Prices and Monetary Utility Functions,” preprint (with M. Kupper).
 - “Second Order Backward Stochastic Differential Equations and Fully Non-linear Parabolic PDEs,” forthcoming in *Communications on Pure and Applied Mathematics* (with M. Soner, N. Touzi, and N. Victoir).
 - “Market Price of Risk Specifications for Affine Models: Theory and Evidence,” forthcoming in *Journal of Financial Economics* (with D. Filipović and R. Kimmel).
-

GREGORY CHOW is professor of economics and the Class of 1913 Professor of Political Economy, Emeritus. He was manager of economic research at the I.B.M. Thomas J. Watson Research Center from 1962–70, and director of the Econometric Research Program at Princeton from 1970–97. The program was renamed the Gregory C. Chow

Econometric Research Program in 2001. Chow is a member of the American Philosophical Society and of Academia Sinica and a fellow of the American Statistical Association and of the Econometric Society. He has served as associate editor or co-editor of the *American Economic Review*, *China Economic Review*, *International Economic Review*, *Journal of Economic Dynamics and Control*, *MOCT-MOST*, and the *Review of Economics and Statistics*. Chow's contributions to economics cover three main areas: econometrics, including the often used "Chow test" for parameter stability, the estimation of simultaneous stochastic equations, and criteria for model selection; dynamic economics, including spectral methods and optimal control methods for the analysis of econometric models and dynamic optimization under uncertainty to be solved by the method of Lagrange multipliers (in lieu of dynamic programming); and the Chinese economy, an institutional, theoretical, and quantitative approach to its study. He received his Ph.D. from the University of Chicago. He writes a column in *China Business News*, the leading economics and finance newspaper in China.

COURSES TAUGHT:

- ECP 379: The Chinese Economy
- ORF 571: Analysis of Environmental Problems

REPRESENTATIVE PUBLICATIONS:

- *China's Economic Transformation*. Oxford: Blackwell Publishers, second edition, 2007.
 - *Knowing China*. Singapore: World Scientific Publishing Co., 2004.
 - "A Time-series Analysis of the Shanghai and New York Stock Price Indices," *Annals of Economics and Finance*, 17–35, May 2003 (with C. Lawler).
 - *Dynamic Economics: Optimization by the Lagrange Method*. Oxford: Oxford University Press, 1997.
 - *China's Economics Education and Economic Reform*. Singapore: World Scientific Publishing Co., 2007 (in Chinese).
-

ERHAN ÇINLAR is the Norman J. Sollenberger Professor of Engineering in the Department of Operations Research and Financial Engineering. He came to Princeton University as a visiting professor of statistics in 1979–80. He is a fellow of the Institute of Mathematical Statistics, a fellow of INFORMS, an elected member of the International Statistical Institute, and the recipient of the Science Prize of TÜBİTAK. He has served as editor or associate editor of more than 12 journals on probability theory and its applications. His research interests center on martingales, Markov processes, stochastic differential equations, dynamic point processes, mass transport by stochastic flows, and their applications to mathematics of insurance and finance, reliability of complex systems, and modeling and estimation of natural hazards.

COURSES TAUGHT:

- ORF 309: Probability and Stochastic Systems
- ORF 526: Stochastic Modeling
- ORF 551/APC 521: Probability Theory
- ORF 554: Markov Processes

REPRESENTATIVE PUBLICATIONS:

- "Lyapunov Exponents of Poisson Shot-noise Velocity Fields," *Stochastic Processes and their Applications*, 94, 29–49, 2001 (with M. Caglar).
- "Spectral Expansion of the Occupation Measure for Birth and Death on a Flow," *Stochastic Processes and their Applications*, 74, 203–215, 1998 (with J. Kao).
- "Dispersion of Particle Systems in Brownian Flows," *Advances in Applied Probability*, 28, 53–74, 1996 (with C. Zirbel).
- "Mass Transport by Brownian Flows," in *Stochastic Models in Geosystems*, edited by S. A. Molchanov. *IMA Volumes in Mathematics and Its Applications*, Springer-Verlag, 1996 (with C. Zirbel).

- “Conditional Levy Processes,” *Computers and Mathematics*, 46, 993–997, 2003.
-

WENDELL COLLINS is director of corporate relations for the Bendheim Center for Finance. Before joining the center in 2007, she worked in Princeton’s Office of Development and Office of the Dean for Research. Before joining Princeton, Collins spent 11 years at Merrill Lynch in marketing, training, and business development, as well as serving in various management roles at Dow Jones and the Associated Press. Her responsibilities with the center include i) managing the Corporate Affiliates Program, which seeks support for the BCF from firms interested in finance and which works with corporations to build partnerships investigating financial topics of mutual interest, ii) advising undergraduates and Master in Finance candidates on career issues, including the development of applied finance programs and interview enhancement techniques for the Master in Finance program, and iii) facilitating the recruiting activities of corporate affiliates by coordinating on-campus recruiting presentations and organization of events at the BCF. She received her undergraduate degree from the University of North Carolina–Chapel Hill.

SAVAS DAYANIK is an assistant professor of operations research and financial engineering who came to Princeton in 2002. His research interests include applied probability, stochastic processes and modeling, optimal stopping, optimal stochastic control with applications to finance, investment decision analysis, and operations management. He completed his Ph.D. degree in operations research with concentration in applied probability at Columbia University in 2002. He received the first prize in the INFORMS 2002 George E. Nicholson Student Paper Competition and in the INFORMS 2005 Junior Faculty Interest Group Paper Competition. He was also selected as the recipient of the IMS 2006 Inaugural Richard L. Tweedie New Researcher Award.

COURSES TAUGHT:

- ORF 245: Fundamentals of Engineering Statistics
- ORF 417: Dynamic Programming
- ORF 526: Stochastic Modeling
- ORF 542: Controlled Markov Processes

UNDERGRADUATE STUDENTS ADVISED:

- Shern Frederick, “Ideal Damping Factor for Simulating Portfolio Returns: A Market-representative Approach”
- Neset Pirkul, “Insights into the Nature of Successful Acquisitions: An Empirical Approach”
- Todd Levy, “Buying and Selling Movies: An Analysis of the Hollywood Stock Exchange”
- Nishani Siriwardane, “Investment under Uncertainty: Optimal Strategies of CO2 Emitting Firms under the Kyoto Global Emissions Trading Market”
- Kevin Foster, “Your Team Is Going Broke! Now Switch to Variable Ticket Pricing. An Analysis of NBA Game Attendance to be used with Revenue Management Techniques”
- Nada Siddiqui, “Re-engineering Portfolio Theory: Optimizing the Diversification of Moet Hennessy-Louis Vuitton (LVMH)”
- Devaushi Singham, “The Option to Abandon as Applied to the Sequential Investment Problem”
- Carl Zhang, “Speculation, Liquidity, and Information: The Puzzle of Chinese B-shares”

GRADUATE STUDENTS ADVISED:

- Masahiko Egami
- Christian Goulding
- Semih S. Sezer
- Kazutoshi Yamazaki

REPRESENTATIVE PUBLICATIONS:

- “Optimal Multiple-stopping of Linear Diffusions,” *Mathematics of Operations Research*, 33:2, 446-460, 2008 (with R. Carmona).
 - “Index Policies for Discounted Bandit Problems with Availability Constraints,” *Advances in Applied Probability*, 40, 377-400, 2008 (with W. Powell and K. Yamazaki).
 - “Multisource Bayesian Sequential Change Detection,” *Annals of Applied Probability*, 18:2, 552-590, 2008 (with H. Poor and S. Sezer).
 - “Filling the Gap between American and Russian Options: Adjustable Regret,” *Stochastics*, 79:1-2, 61-83, 2007 (with M. Ludkovski).
 - “Compound Poisson Disorder Problem,” *Mathematics of Operations Research*, 31:4, 649-672, 2006 (with S. Sezer).
 - “On the Optimal Stopping Problem for One-dimensional Diffusions,” *Stochastic Processes and their Applications*, 107(2), 173-212, 2003 (with I. Karatzas).
-

JIANQING FAN is the Frederick L. Moore '18 Professor of Finance, and he joined the Department of Operations Research and Financial Engineering in 2003. As a specialist in statistics and financial econometrics, Fan received the 2000 Presidents' Award from the Committee of Presidents of Statistical Societies, recognizing the most outstanding statistician under age 40, and the 2007 Morningside Gold Medal of Applied Mathematics, given triennially to an outstanding applied mathematical scientist of Chinese descent under age 45. He was the president of the Institute of Mathematical Statistics, an international professional and scholarly society of 4,500 members. He is an elected fellow of the Institute of Mathematical Statistics, the American Statistical Association, and the American Association for the Advancement of Science. He has coauthored two books. He delivered a 45-minute talk at the 2006 Madrid International Congress for Mathematicians, a high honor in mathematical sciences. He serves as the coeditor of *Econometrics Journal* and an associate editor of the *Journal of the American Statistical Association*. He has served as the coeditor (in-chief) of *The Annals of Statistics* (2004-06), and an editor of *Journal of Multivariate Analysis* (1998-2000) and *Probability Theory and Related Fields* (2003-05). He earned his Ph.D. degree at the University of California-Berkeley. His research interests are financial econometrics, asset pricing, risk management, nonlinear time series, high-dimensional data analyses, nonparametric modeling, and computational biology.

COURSES TAUGHT:

- ORF 504/FIN 504: Financial Econometrics

UNDERGRADUATE STUDENTS ADVISED:

- David Laslett, “A Statistical Approach to Verbal Autopsies: Methods to Enhance Performance and Accuracy”
- Chiao Megan, “Determinants of Stock Market Returns in Emerging Markets”
- Laurissa Yee, “An Analysis of CDS Index Pricing”
- Shiriya Raghavan, “Comovements of High-yield Bonds and Equity of Firms under Varying Market Conditions”
- Collin McCarthy, “Greed in Corporate America”
- Stanley (Si-Cheng) Liu, “Is Big More Beautiful in Venture Capital Financing?”

GRADUATE STUDENTS ADVISED:

- Jelena Bradic
- Yang Feng
- Lei Qi
- Xin Tong
- Forrest Zhang

POSTDOCTORAL FELLOWS SUPERVISED:

- Shaojun Guo
- Yingying Li

- Rui Song
- Weiwei Wang

REPRESENTATIVE RECENT PUBLICATIONS:

- “Modelling Multivariate Volatilities via conditionally Uncorrelated Components,” *Journal of Royal Statistical Society B*, 70, 679-702 (with M. Wang and Q. Yao).
 - “Multi-scale Jump and Volatility Analysis for High-frequency Financial Data,” *Journal of American Statistical Association*, 102, 1349–1362, 2007 (with Y. Wang).
 - “Aggregation of Nonparametric Estimators for Volatility Matrix,” *Journal Financial Econometrics*, 5, 321–357, 2007 (with Y. Fan and J. Lv).
 - “A Selective Overview of Nonparametric Methods in Financial Econometrics” (with discussion), *Statistical Science*, 20, 317–357, 2005.
 - *Nonlinear Time Series: Nonparametric and Parametric Methods*, 570pp, Springer-Verlag, New York. Figures and Computer Programs, 2003 (with Q. Yao).
-

HARRISON HONG is the John Scully '66 Professor of Economics and Finance. He teaches courses in finance in the undergraduate, master, and Ph.D. programs. Before joining Princeton in 2002, he was on the faculty of the Graduate School of Business at Stanford University, most recently as an associate professor of finance. He received his B.A. in economics and statistics with highest distinction from the University of California–Berkeley in 1992 and his Ph.D. in economics from the Massachusetts Institute of Technology in 1997. His research has covered such topics as: behavioral finance and stock market efficiency; asset pricing and trading under market imperfections; social interaction and investor behavior; security analyst incentives and forecast biases; organizational form and mutual fund performance; and destabilizing arbitrage, socially responsible investing, and commodities pricing. His work has received numerous awards and grants, including two Fama-DFA *Journal of Financial Economics* paper prizes, paper prizes from the European and Western Finance Associations and the Social Investment Forum, and a National Science Foundation grant. He is on the editorial boards of the *Journal of Finance* and the *Journal of Financial Intermediation*. He was recently awarded the 2009 Fischer Black Prize by the American Finance Association

COURSES TAUGHT:

- ECO 462/FIN 515: Portfolio Theory and Asset Management
- ECO 525: Financial Economics I

UNDERGRADUATE STUDENTS ADVISED:

- Sean Mahon, “Credit Default Swaps as an Alternative Measure for Default Risk in Value and Growth Stocks”
- Flora Wu, “‘Picky but Sticky’ A Study of Socially Responsible Investors Analysis of Hydrogen Pumping on Stirred Tank Reactor Polymer Electrolyte Membrane Fuel Cell for Hydrogen Purification”

REPRESENTATIVE PUBLICATIONS:

- Asset Float and Speculative Bubbles,” *Journal of Finance*, June 2006 (with J. Scheinkman and W. Xiong).
 - “Simple Forecasts and Paradigm Shifts,” *Journal of Finance* 62, 1207–1242, 2007 (with J. Stein and J. Yu).
 - “Disagreement and the Stock Market,” *Journal of Economic Perspectives* 21 109–128, 2007 (with J. Stein).
 - “Do Industries Lead Stock Markets?,” *Journal of Financial Economics*, February 2007 (with W. Torous and R. Valkanov).
 - “Advisors and Asset Prices: A Model of the Origins of Bubbles,” *Journal of Financial Economics*, forthcoming (with J. Scheinkman and W. Xiong).
-

HAROLD JAMES, who holds a joint appointment as professor of international affairs in the Woodrow Wilson School and professor in the history department, studies economic and financial history and modern German history. He

was educated at Cambridge University (Ph.D. in 1982) and was a fellow of Peterhouse for eight years before coming to Princeton University in 1986. In 2004, he was awarded the Helmut Schmidt Prize for Economic History, and in 2005, the Ludwig Erhard Prize for writing about economics. He is chairman of the editorial board of *World Politics*.

COURSE TAUGHT:

- WWS 460: History of Financial Crises

GRADUATE STUDENTS ADVISED:

- Conor Healy, "Politics in a Tight Fix: The Role of Politics in Determining the Sustainability of Hard Exchange Rate Regimes"
- Klaus Veigel, "Politics of Stabilization in Argentina"

REPRESENTATIVE PUBLICATIONS:

- *The Deutsche Bank and the Nazi Economic War against the Jews*. Cambridge: Cambridge University Press, 2001.
- *The End of Globalization: Lessons from the Great Depression*. Cambridge: Harvard University Press (also available in Chinese, German, Greek, Japanese, Korean, and Spanish translations), 2001.
- *Europe Reborn: A History 1914-2000*. London: Longman/Pearson Education, 2003.
- *The Roman Predicament: How the Rules of International Order Create the Politics of Empire*. Princeton: Princeton University Press, 2006.
- *Family Capitalism: Wendels, Haniels and Falcks*. Cambridge: Harvard University Press, (also available in German: Munich, Verlag C.H. Beck), 2006.

JAKUB JUREK joined the faculty of the Department of Economics at Princeton University in July 2008, and teaches courses on fixed income and asset pricing. His research focuses on theoretical and empirical finance, and emphasizes the role of market structure in price formation. His recent research develops option-based methods for the valuation of collateralized debt obligations (CDOs) and models of market liquidity. Jakub holds an undergraduate degree in Applied Mathematics and a Ph.D. in Business Economics, both from Harvard University. Prior to entering graduate school, he worked in the quantitative equity strategy groups at Goldman Sachs and AQR Capital Management, LLC. He has also served as a consultant to Grantham, Mayo, van Otterloo, LLC, a Boston-based investment management company, and the Harvard Management Company.

COURSE TAUGHT:

- FIN 521: Fixed Income: Models and Applications

REPRESENTATIVE PUBLICATIONS:

- "The Economics of Structured Finance," *Journal of Economic Perspectives*, forthcoming (with J. Coval and E. Stafford).
- "Economic Catastrophe Bonds," *American Economic Review*, forthcoming (with J. Coval and E. Stafford).
- "The Price of Immediacy," *Journal of Finance* 63(3), June 2008 (with G. Chacko and E. Stafford).

DANIEL KAHNEMAN is a senior scholar at the Woodrow Wilson School of Public and International Affairs. He is also professor of psychology and public affairs, emeritus, at the Woodrow Wilson School, the Eugene Higgins Professor of Psychology Emeritus at Princeton University, and a fellow of the Center for Rationality at the Hebrew University in Jerusalem. Kahneman has held the position of professor of psychology at the Hebrew University in Jerusalem (1970–78), the University of British Columbia (1978–86), and the University of California-Berkeley (1986–94). He is a member of the National Academy of Science, the Philosophical Society, and the American Academy of Arts and Sciences, and a fellow of the American Psychological Association, the American Psychological Society, the Society of Experimental

Psychologists, and the Econometric Society. He has been the recipient of many awards, among them the Nobel Prize in Economic Sciences (2002), the Lifetime Contribution Award of the American Psychological Association (2007), the Grawemeyer Prize (2002), both jointly with Amos Tversky, the Warren Medal of the Society of Experimental Psychologists (1995), the Distinguished Scientific Contribution Award of the American Psychological Association (1982), and the Hilgard Award for Career Contributions to General Psychology (1995). Kahneman holds honorary degrees from numerous universities.

COURSES TAUGHT:

- PSY 101: Introduction to Psychology
- PSY 528/WWS 519: Negotiation, Persuasion, and Social Influence: Theory and Practice
- WWS 312/PSY 321: The Psychology of Decision Making and Judgment
- WWS 502: Psychology for Policy Analysis and Implementation
- WWS 515/PSY 529: Conceptions of the Human Agent: Implications for Policy

REPRESENTATIVE PUBLICATIONS:

- "Frames and Brains: Elicitation and Control of Response Tendencies," *Trends in Cognitive Sciences*, 11, 45–46, 2007 (with S. Frederick).
 - "Why Hawks Win," *Foreign Policy*, 158, 34–38, 2007 (with J. Renshon).
 - "Developments in the Measurement of Subjective Well-being," *Journal of Economic Perspectives*, 20, 3–24, 2006 (with A. Krueger).
 - "Anomalies: Utility Maximization and Experienced Utility," *Journal of Economic Perspectives*, 20, 221–234, 2006 (with R. Thaler).
 - *Choices, Values, and Frames*. New York: Cambridge University Press and the Russell Sage Foundation, summer 2000 (with A. Tversky).
-

PAUL KRUGMAN is the author or editor of dozens of books and several hundred articles, primarily about international trade and international finance. He is also nationally known for his twice-weekly columns in the *New York Times*. He was the Ford International Professor of International Economics at the Massachusetts Institute of Technology and has served on the staff of the U.S. Council of Economic Advisers. He was the recipient of the 1991 John Bates Clark Medal, an award given every two years by the American Economic Association to an economist under 40. He received his Ph.D. from the Massachusetts Institute of Technology. He holds a joint appointment with the economics department and the Woodrow Wilson School of Public and International Affairs.

COURSE TAUGHT:

- WWS 524: Advanced Macroeconomics: Domestic Policy Issues

REPRESENTATIVE PUBLICATIONS:

- *Currency Crises* (ed.), University of Chicago Press, 2000.
 - *Principles of Economics*, 2004 (with R. Wells).
 - *Microeconomics*, 2005 (with R. Wells).
 - *The Conscience of a Liberal*, 2007.
-

BURTON MALKIEL has been the Chemical Bank Chairman's Professor of Economics at Princeton since 1988. His research interests center on financial markets, asset pricing, and investment strategies. He is a regular op-ed page writer for the *Wall Street Journal*. He also serves on the boards of several financial and non-financial corporations. He has been awarded an Honorary Doctor of Humane Letters from the University of Hartford (June 1971), Phi Beta Kappa, and the Harvard Business School Alumni Achievement Award for 1984. He received his Ph.D. from Princeton

University.

COURSE TAUGHT:

- ECO 362: Financial Investments

UNDERGRADUATE STUDENTS ADVISED:

- Teong Jun, "Dynamic Indexing"
- Adam Mikah Malin, "A Rational Theory of Options Backdating"

GRADUATE STUDENT ADVISED:

- Yuhang Wang, "Institutional Ownership and the Efficiency of the Chinese A-Share Market"
- Michael Massey, "Analyses of the Efficiency of the Hong Kong Equity Markets"

REPRESENTATIVE PUBLICATIONS:

- *From Wall Street to the Great Wall*. New York: W.W. Norton & Co. December 2007 (with P. Taylor, J. Mei, and R. Yang).
 - *A Random Walk Down Wall Street*. New York: W. W. Norton & Co. 9th edition paperback, January 2007.
 - "Have Individual Stocks Become More Volatile?" *Journal of Finance*, February 2001 (with J. Campbell, M. Lettau and Y. Xu) [First Prize paper for the Smith Breeden Prizes for 2002].
 - "'New Paradigms' in Stock Market Investing," *European Financial Management* 14:1, January 2008, 118-126 (with D. Jun).
 - "The Clustering of Extreme Movements: Stock Prices and the Weather," *Journal of Investment Management* 7:1, 20-35, 2009 (with A. Saha and A. Grecu).
-

STEPHEN MORRIS is the Alexander Stewart 1886 Professor of Economics, and his work ranges from game theory to applied (microeconomic) theory to topics in financial economics. He joined Princeton University in 2005. He taught at the University of Pennsylvania from 1991 to 1998, first as assistant and then as (tenured) associate professor. He joined the Yale faculty as a professor of economics in 1998. Morris received his Ph.D. in economics from Yale University in 1991.

REPRESENTATIVE PUBLICATIONS:

- "Central Bank Transparency and the Signal Value of Prices," *Brookings Papers on Economic Activity* 2, 1–66, 2005 (with H. Shin).
 - "Beauty Contests and Bubbles," *Review of Financial Studies* 19, 2006 (with F. Allen and H. Shin).
 - "Optimal Communication," *Journal of the European Economics Association Papers and Proceedings* 5, 2007 (with H. Shin).
 - "Risk and Wealth in a Model of Self-fulfilling Currency Crises," *Journal of Monetary Economics* 54, 2007 (with B. Guimaeres).
 - "Financial Regulation in a System Context", forthcoming in *Brookings Papers on Economic Activity*, 2009 (with H. Shin).
-

ULRICH MÜLLER is an assistant professor in the Department of Economics. He received his Ph.D. in economics from the University of St. Gallen, Switzerland. His main research interest is time series econometrics. His recent work focuses on models with time varying parameters, and the development of econometric tools that are robust to correlations of largely unknown form. He was selected as an Alfred P. Sloan Research Fellow for 2008–11.

COURSES TAUGHT:

- ECO 202: Statistics and Data Analysis for Economics

GRADUATE STUDENT ADVISED:

- Philippe Petalas
- Richard Chiburis

REPRESENTATIVE PUBLICATIONS:

- "Valid Inference in Partially Unstable GMM Models," *Review of Economic Studies*, 2009 (with H. Li).
 - "Testing Models of Low-frequency Variability," *Econometrica*, 2008 (with M. Watson).
 - "The Impossibility of Consistent Discrimination between I(0) and I(1) Processes," *Econometric Theory*, 2008.
 - "Efficient Tests for General Persistent Time Variation in Regression Coefficients," *Review of Economic Studies*, 2006 (with G. Elliott).
 - "Tests for Unit Roots and the Initial Condition," *Econometrica*, 2003 (with G. Elliott).
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JOHN MULVEY is a professor of operations research and financial engineering. His research interests center on designing integrated financial planning systems for institutions, primarily pension plans and hedge funds, and wealthy individuals; developing optimal hedge fund strategies; combining financial optimization and stochastic models; stochastic optimization algorithms; and decentralized risk management. He was a finalist for the Edelman Prize for Towers Perrin-Tillinghast investment system in 1999. He received his Ph.D. in management from the University of California–Los Angeles.

COURSES TAUGHT:

- ORF 311: Optimization under Uncertainty
- ORF 534: Financial Engineering

UNDERGRADUATE STUDENTS ADVISED:

- Yiqiao Tang, "Sovereign Wealth Funds- An enterprise ALM approach"
- Yao Wang, "Lost Decade 1999-2009: The Case for Multi-Strategy Investment Management"
- Elaine Preston, "Multi-strategy Portfolio Mitigation in Response to Contagion and Volatile Market Environments"
- Boris Pivtorak, "Stock Pinning and Feedback Effects from Dynamic Hedging"
- Mykel Kulkarni, "Duration Based Investment and Fixed Mix Pension Fund Portfolios"

RADUATE STUDENTS ADVISED:

- Mehmet Bilgili, "Regime Switching: Optimizing a Multi-strategy Hedge Fund via Dynamic Overlays"
- Woo Chang Kim, "Dynamic Investment Strategies for Hedge Funds and Pension Plans: Discovering Patterns"
- Sally Lee-Ling, "A Synthetic Procedure for Generating Private Equity Returns"
- Astrid Prajogo, "Searching for Patterns in Equity Performance in the Agricultural and Energy Sectors"
- Mehmet Vural, "Developing Novel Overlay Strategies to Optimize Investment Performance"

REPRESENTATIVE PUBLICATIONS:

- "Constantly Rebalanced Portfolio: Is Mean-reverting Necessary?" in the *Encyclopedia of Quantitative Finance*, edited by R. Cont, John Wiley and Sons, Ltd., 2008.
- "Improving Equity Diversification via Industry-wise Market Segmentation," *Journal of Financial Transformation*, 2008.

- “Active Equity Managers in the U.S.: Do the ‘Best’ Follow Momentum Strategies?” *The Journal of Portfolio Management*, 2008.
- Assisting Defined-benefit Pension Plans,” *Operations Research*, Sept-Oct. 2008.
- “Improving Performance for Long-term Investors: Wide Diversification, Leverage, and Overlay Strategies,” *Quantitative Finance*, April 2007.

BIRGIT RUDLOFF is an assistant professor in operations research and financial engineering. Her research interests include hedging in incomplete markets with convex risk measures, portfolio optimization with risk constraints, mathematical finance, risk management, and convex analysis. She received her Ph.D. in mathematical finance from Martin-Luther University Halle-Wittenberg (Germany) in 2006 and visited the research institute IIMPA in Rio de Janeiro and the technical university in Vienna before coming to Princeton in 2006.

COURSES TAUGHT:

- ORF 435: Financial Risk Management
- ORF 515/FIN 503: Asset Pricing II: Stochastic Calculus and Advanced Derivatives
- ORF 569: Special Topics in Statistics and Operations Research: Risk Measure Theory

REPRESENTATIVE PUBLICATIONS:

- “Testing Composite Hypotheses via Convex Duality,” 2009, submitted (with I. Karatzas).
- “Coherent Hedging in Incomplete Markets,” forthcoming in *Quantitative Finance*.
- “Entropic Risk constraints for Utility Maximization,” *Festschrift in Celebration of Prof. Dr. Wilfried Grecksch’s 60th Birthday*, Chr. Tammer, F. Heyde (eds.), Shaker Verlag, 2008 (with J. Sass, R. Wunderlich).
- “Continuity and Finite-valuedness of Set-valued Risk Measures,” *Festschrift in Celebration of Prof. Dr. Wilfried Grecksch’s 60th Birthday*, Chr. Tammer, F. Heyde (eds.), Shaker Verlag, 2008 (with A. Hamel).
- “Convex Hedging in Incomplete Markets,” *Applied Mathematical Finance*, 14(5), 2007.

JOSÉ A. SCHEINKMAN joined Princeton as the Theodore Wells ’29 Professor of Economics in 1999. He received an M.S. in mathematics from the Instituto de Matemática Pura e Aplicada, Brazil, and an M.A. and a Ph.D. in economics from the University of Rochester. Scheinkman is a research associate of the National Bureau of Economic Research, a member of the National Academy of Sciences, a fellow of the American Academy of Arts and Sciences and of the Econometric Society, and a “docteur honoris-causa” from the University of Paris-Dauphine. He was named a fellow of the John Simon Guggenheim Memorial Foundation in 2007. From 1973 to 1998, Scheinkman taught at the University of Chicago, where he was from 1995 to 1998 the chair of the economics department, and since 1997 the Alvin H. Baum Distinguished Service Professor of Economics. From June 1987 to December 1988, he was vice president of the Financial Strategies Group at Goldman, Sachs & Co. He has been a visiting professor at College de France, Princeton University, University of Paris-Dauphine, E.H.E.S.S. (France), Instituto de Matemática Pura e Aplicada, and E.P.G.E. (Brazil). During 2002, he held a Blaise Pascal Research Chair (France). His current research interests are long-run risk, the determinants of liquidity, asset-price bubbles, and developing tools for empirical studies of asset markets.

COURSES TAUGHT:

- ECO 371/LAS 346: Topics in Country and Regional Economics: Latin American Economies
- ECO 502: Microeconomic Theory II
- ECO 525/FIN 595: Financial Economics I
- ECO 526: Financial Economics II

REPRESENTATIVE PUBLICATIONS:

- “Long Run Risks: An Operator Approach,” *Econometrica*, 2009 (with L. Hansen).
 - “Advisors and Asset Prices: A Model of the Origins of Bubbles,” *Journal of Financial Economics*, 2008 (with H. Hong and W. Xiong).
 - “Optimal Exercise of American Claims when Markets Are Not Complete,” *Finance and Stochastics* 11, 2007, 357–372 (with L. Rogers).
 - “Executive Compensation and Short-termist Behavior in Speculative Markets,” *The Review of Economic Studies* 73, 577–610, 2006 (with P. Bolton and W. Xiong).
-

HYUN SONG SHIN joined Princeton in 2006 as a professor of economics. Before coming to Princeton, he was a professor of finance at the London School of Economics. His recent research has focused on the current credit crisis and the role of risk management techniques and accounting rules in the crisis dynamics. His broader research interests are in financial economics, especially in issues related to disclosures, financial regulation, crises, and financial stability, issues on which he has advised central banks and policy institutions. He is a fellow of the Econometric Society and of the British Academy. He received his Ph.D. from Oxford University in 1988.

COURSES TAUGHT:

- ECO 363: Corporate Finance and Financial Institutions
- ECO 526: Financial Economics II

UNDERGRADUATE STUDENTS ADVISED:

- Jeffrey Bernstein, “Bargain Shopping?: An Empirical Analysis of Retail Industry LBOs’ Effect on Local Product Market Competition”
- Amara Suebsaeng, “Returns on Socially Responsible Investment Mutual Funds”
- Drew Woodbury, “Rise and Fall of Amaranth Advisors: Lessons for Risk Management”
- Elaine Wong, “Impact of Market Prices on Valuation: Case Study of the European 3G License Allocation”

GRADUATE STUDENTS ADVISED:

- Anastasia-Aggeliki Andrikogiannopoulou
- Ing-Haw Cheng
- Manoj Govil
- Justinas Pelenis

REPRESENTATIVE PUBLICATIONS:

- “Marking to Market: Panacea or Pandora’s Box?” *Journal of Accounting Research*, 46, 435–460, 2008 (with G. Plantin and H. Saprà).
 - “Beauty Contests and Iterated Expectations in Asset Markets,” *Review of Financial Studies*, 19, 2006, 719–752 (with F. Allen and S. Morris).
 - “Disclosure Risk and Price Drift,” *Journal of Accounting Research*, 44, 351–379, 2006.
 - “Disclosures and Asset Return,” *Econometrica*, 71, 105–133, 2003.
 - “Social Value of Public Information,” *American Economic Review*, 52, 1521–1534, 2002, (with S. Morris).
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CHRISTOPHER SIMS has been a professor of economics at Princeton University since 1999. He received his Ph.D. from Harvard University in 1968. He taught in the economics department of the University of Minnesota from 1969 to 1990, then moved to Yale University where he taught from 1990 to 1999. He is a member of the National Academy of Sciences and a fellow of the Econometric Society, for which he has also served as president and as a co-editor of *Econometrica*. He has intermittently served as an adviser, consultant, and visitor to several regional Federal Reserve Banks. He has worked on econometric methods, economic theory, and empirical work, mostly related to

macroeconomics and monetary policy.

REPRESENTATIVE PUBLICATIONS:

- “Were There Regime Switches in US Monetary Policy?” *American Economic Review*, 96(1), 54–81, March 2006.
 - “Implications of Rational Inattention,” *Journal of Monetary Economics*, 50(3), April 2003.
 - “The Role of Models and Probabilities in the Monetary Policy Process,” *Brookings Papers on Economic Activity*, 2, 1–60, 2002.
 - “The Precarious Fiscal Foundations of EMU,” *De Economist*, 147(4), 415–436, 1999.
 - “Error Bands for Impulse Responses,” *Econometrica*, 67(5), 1113–1156, 1999 (with T. Zha).
-

RONNIE SIRCAR is a professor of operations research and financial engineering. He received his doctorate in 1997 from Stanford University. He taught for three years at the University of Michigan in the Department of Mathematics before coming to Princeton. He has received National Science Foundation Research Grants and was a recipient of the E-Council Excellence in Teaching Award for his teaching spring term 2006, and the Howard B. Wentz Jr. Junior Faculty Award in 2003. His research interests center on stochastic models in finance, particularly for market volatility and credit risk; optimal control and hedging problems in incomplete markets; and valuation of employee stock options.

COURSES TAUGHT:

- ORF 335/ECO 364: Introduction to Financial Engineering
- ORF 538: Analytical and Computational Methods for Financial Engineering
- ORF 575: Financial Engineering Seminar: Credit Risk

CURRENT GRADUATE STUDENT:

- Siu-Tang Leung

REPRESENTATIVE PUBLICATIONS:

- “Accounting for Risk Aversion, Vesting, Job Termination Risk, and Multiple Exercises in Valuation of Employee Stock Options,” *Mathematical Finance*, 2008, forthcoming (with T. Leung).
 - “Exponential Hedging with Optimal Stopping and Application to ESO Valuation,” preprint, 2008 (with T. Leung).
 - “A General Framework for Evaluating Executive Stock Options,” *Journal of Economic Dynamics and Control*, 31(7), 2007 (with W. Xiong).
 - “Optimal Static-dynamic Hedges for Exotic Options under Convex Risk Measures,” preprint, 2008 (with A. Ilhan and M. Jonsson).
 - “Optimal Investment with Derivative Securities,” *Finance and Stochastics*, 9(4), 2005 (with A. Ilhan and M. Jonsson).
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KENNETH STEIGLITZ, the Eugene Higgins Professor of Computer Science, received his doctorate in 1963 from New York University and has been teaching at Princeton ever since. He is a fellow of the IEEE (1981), a fellow of the ACM (1997), and a recipient of the Technical Achievement Award of the Signal Processing Society (1981), the Signal Processing Society Award (1986), the IEEE Centennial Medal in 1984, the School of Engineering Distinguished Teacher Award in 1997, and the IEEE Third Millennium Medal in 2000. His current research interests are in agent-based modeling of markets, auctions, and computing using soliton collisions.

COURSES TAUGHT:

- COS 444: Electronic Auctions
- COS 323: Computing for the Physical and Social Science

- COS 576: Nonstandard Computation
- FRS 119: Beyond Silicon: The Future(s) of Computers

UNDERGRADUATE STUDENTS ADVISED:

- Daniel Hayes-Patterson, "Introducing Traders to an Agent-based Minimal Economy: creating a Platform for Collaborative Research in Economic Agent-based Simulation"
- Christopher Chan, "A Java Library Implementation of the Gold-food Economic Model in Repast and MASON" (Part I); "An Agent-Based Model of a Minimal Economy" (Part II)
- Avigail Kifer, "Syndication or Collusion? Cooperation in Auctions with Financially Constrained Buyers"

REPRESENTATIVE PUBLICATIONS:

- *Snipers, Shills, and Sharks: eBay and Human Behavior*, Princeton University Press, 2007.
- "Proton Trapping and Transfer with Solitons,"
- "Proton Trapping and Transfer with Solitons," *Phys. Rev. A* 79, 021802[®], February 2009.
- "Quantum Theory of Manakov Solitons," *Phys. Rev. A* 71, 053805, 1–10, May 11, 2005 (with D. Rand and P. Prucnal).
- "The Spite Motive and Equilibrium Behavior in Auctions," *Contributions to Economic Analysis & Policy*, 2(1), Article 5, 2003 (with J. Morgan and G. Reis).

LARS SVENSSON is on leave from Princeton University and is deputy governor of Sveriges Riksbank, the central bank of Sweden. He joined the economics department in the fall of 2001. He had been a professor of international economics at the Institute for International Economic Studies, Stockholm University, since 1984. He has published extensively in scholarly journals on monetary economics and monetary policy, exchange rate theory and policy, and general international macroeconomics. He has lectured and visited at universities, central banks, and international organizations in many countries. He is a member of the Royal Swedish Academy of Sciences, a member of Academia Europae, a foreign member of the Finnish Academy of Science and Letters, a foreign honorary member of the American Academy of Arts and Sciences, a fellow of the Econometric Society, a research associate of the National Bureau of Economic Research, a research fellow of the Centre for Economic Policy Research, London, and a fellow of the European Economic Association. He was a member of the Prize Committee for the Alfred Nobel Memorial Prize in Economic Sciences through 2002 and its chair from 1999–2001. Before his appointment as deputy governor, he was active as an adviser to the Riksbank and he also regularly consulted for international, U.S., and Swedish agencies and organizations. In 2000–01, he undertook a review of monetary policy in New Zealand, commissioned by the New Zealand government. In 2002, he chaired a committee evaluating monetary policy in Norway. He was also a member of the Academic Advisory Board and the Monetary Policy Advisory Panel of the Federal Reserve Bank of New York. He received his Ph.D. in economics from Stockholm University.

COURSES TAUGHT:

- ECO 200: Advanced Principles of Economics: Concepts and Applications.
- ECO 504: Macroeconomic Theory II
- ECO 522: Advanced Macroeconomic Theory
- ECO 554: International Monetary Theory and Policy II

REPRESENTATIVE PUBLICATIONS:

- "Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank," *American Economic Review*, 97, 474–490, 2007 (with O. Jeanne).
- "Time Consistency of Fiscal and Monetary Policy: A Solution," *Econometrica* 74, 193–212, 2006 (with M. Persson and T. Persson).

- “Implementing Optimal Policy through Inflation-forecast Targeting,” in Ben S. Bernanke and Michael Woodford (eds.), *The Inflation-Targeting Debate*, University of Chicago Press, 19–83, 2005 (with M. Woodford).
 - “Indicator Variables for Optimal Policy,” *Journal of Monetary Economics*, 50, 691–720, 2003 (with M. Woodford).
 - “What Is Wrong with Taylor Rules? Using Judgment in Monetary Policy through Targeting Rules,” *Journal of Economic Literature*, 41, 426–477, 2003.
-

ROBERT VANDERBEI has been a professor in the Department of Operations Research and Financial Engineering since 1999, for which he is currently the chair. His research interests focus on algorithms for nonlinear optimization and their application to problems arising in engineering and science. Application areas of interest focus mainly on inverse Fourier transform optimization problems and action minimization problems with a special interest in applying these techniques to the design of NASA’s terrestrial planet finder space telescope. He is an associate editor for *Optimization in Engineering* and *Mathematical Programming*. He is a member of the American Mathematical Society, Society for Industrial and Applied Mathematics, Institute for Operations Research and the Management Sciences, Mathematical Programming Society, SPIE, and the American Astrophysical Society. He received his Ph.D. in applied mathematics from Cornell University in 1981.

COURSES TAUGHT:

- ORF 307: Optimization
- ORF 522: Linear Optimization

REPRESENTATIVE PUBLICATIONS:

- “Interior-point Methods for Nonconvex Nonlinear Programming: Jamming and Numerical Testing,” *Mathematical Programming*, 2003 (with H. Benson and D. Shanno).
 - “Two-mirror Apodization for High-contrast Imaging,” *Astrophysical Journal*, 599, 695–701, 2003 (with W. Traub).
 - “Circularly Symmetric Apodization via Starshaped Masks,” *Astrophysical Journal*, 590, 593–603, 2003 (with D. Spergel and N. Kasdin).
 - “Frontiers of Stochastically Nondominated Portfolio,” *Econometrica*, 71(4), 2003 (with A. Ruszczyński).
 - *Linear Programming: Foundations and Extensions*, Kluwer Academic Publishers, 2nd edition, 2001.
-

ERIK VANMARCKE is a professor of civil and environmental engineering. He received his doctorate from the Massachusetts Institute of Technology in 1970 and joined the faculty, remaining there until 1985. At MIT, he was the Gilbert W. Winslow Career Development Professor and served as director of the Civil Engineering Systems Methodology Group. He held visiting appointments at Harvard University, the Technical University of Delft (the Netherlands), and the University of Leuven (Belgium), his undergraduate alma mater, and was the Shimizu Corporation Visiting Professor at Stanford University. His principal expertise is in risk assessment and applied systems science. He authored *Random Fields: Analysis and Synthesis*, published by the MIT Press, and recently reprinted in the MIT Classics Series, and extended this work to modeling space-time processes and complex systems. He won several research prizes of the American Society of Civil Engineers and chaired its Council on Disaster Risk Management. He was awarded a Senior Scientist Fellowship from the Japanese Society for the Promotion of Science and is a foreign member of the Royal Academy of Arts and Sciences of Belgium.

COURSES TAUGHT:

- CEE 360 and 548: Risk Assessment and Management
- CEE 558: Random Fields and Random Media

UNDERGRADUATE STUDENTS ADVISED:

- Geoffrey Adamson, "Catastrophic Risk of Florida Landfalling Hurricanes: The Effect of El Nino on Financial Engineering Applications"
- Lisa Kamran Bilir, "Comparing Costs under Uncertainty as a Guide for Public Policy: An Application of Markov Chains to Region-based Water Management in California"
- Andrew Brett, "The Impact of Hurricane Mitigation on the Costs of Extreme Events"

GRADUATE STUDENTS ADVISED:

- Nan Ding, "Enterprise Risk Management: Applications in Software Development and Data Security"
- Mark Dobossy, "Reliability Analysis of Self-centering Steel Frames Subjected to Strong Earthquake Ground Motions"

REPRESENTATIVE PUBLICATIONS:

- "Hedging and Fox Strategies for Reducing Risks in Infrastructure Systems," *Natural Hazards Review*, 7(3), 2006 (with C. Taylor).
 - "Quantum-physics-based Probability Models with Applications to Reliability Analysis," Chapter 16 in *Engineering Design Reliability Handbook*, eds. Nikolaidis, Ghiocel, and Singhal, CRC Press, 2005.
 - *Infrastructure Risk Management Processes: Natural, Accidental, and Deliberate Hazards*. Monograph No. 25, Council on Disaster Risk Management and Technical Council on Lifeline Earthquake Engineering. Published by ASCE, 2005 (ed., with C. Taylor).
 - *Acceptable Risk Processes: Lifelines and Natural Hazards*. Monograph No. 21, Council on Disaster Reduction and Technical Council on Lifeline Earthquake Engineering. Published by the American Society of Civil Engineers. (ed., with C. Taylor).
 - *Random Fields: Analysis and Synthesis*. The MIT Press, Cambridge, MA and London, England, ISBN 0-262-22026-1, 1983; reprinted in MIT Press Classics Series, 2004.
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MARK WATSON is a professor of economics and public affairs in the Department of Economics and the Woodrow Wilson School. His research interests include econometrics, macroeconomics, and forecasting. He is a research associate at the National Bureau of Economic Research and a fellow of the Econometric Society. He has received the Galbraith Award for Graduate Teaching in 1986 and the McGraw Center Graduate Mentoring Award in 2008. He holds a Ph.D. in economics from the University of California–San Diego, and his past credentials include posts at Northwestern University and Harvard University.

COURSES TAUGHT:

- ECO 517: Econometric Theory I
- ECO 518: Econometric Theory II

UNDERGRADUATE STUDENT ADVISED:

- Mauricio Sanchez De La Paz

REPRESENTATIVE PUBLICATIONS:

- "Heteroskedasticity-robust Standard Errors for Fixed Effect Panel Data Regression," *Econometrica*, January 2008, Vol. 76, No. 1, 155–174 (with J. Stock).
 - "Testing Models of Low-frequency Variability," *Econometrica*, forthcoming (with U. Müller).
-

WEI XIONG is professor of economics in the Department of Economics. His research interests center on speculative bubbles, financial market crisis, and behavioral finance. His recent papers provide a framework to analyze speculative behavior of investors and its implications for stock price dynamics and managerial incentives. His earlier papers

analyze the contagion and market liquidity during crisis periods. He is currently working on dynamic bank runs, agency frictions in financial markets, and asset pricing with heterogeneous beliefs. He received his Ph.D. from Duke University in 2001. He is a research associate of the National Bureau of Economic Research and the finance editor of *Management Science*.

COURSES TAUGHT:

- ECO 465/FIN 522: Futures, Options, and Financial Derivatives
- ECO 525/FIN 595: Financial Economics I
- FIN 5500: Math Camp for MIF Students

UNDERGRADUATE STUDENTS ADVISED:

- Ishna Berry, "An Evaluation of Moral Hazard and Regulatory Response during the S&L Crisis"
- Andrew Husby, "Determinants of Monthly Cross-border U.S. Equity Flows: Expected Returns and Past Return Shocks"
- Matthew Popper, "Hedging Debt with Equity during Liquidity Crises: Is the Merton Model Still Effective?"
- William Wachter, "The Cross-market Impacts of Chinese Share Reform"

REPRESENTATIVE PUBLICATIONS:

- "Heterogeneous Expectations and Bond Markets," *Review of Financial Studies*, forthcoming (with H. Yan).
- "What Drives the Disposition Effect? An Analysis of a Long-standing Preference-based Explanation," *Journal of Finance*, 2009 (with N. Barberis).
- "Advisors and Asset Prices: A Model of the Origins of Bubbles," *Journal of Financial Economics*, 2008 (with H. Hong and J. Scheinkman).
- "Executive Compensation and Short-termist Behavior in Speculative Markets," *Review of Economic Studies*, 2006 (with P. Bolton and J. Scheinkman).
- "Investor Attention, Overconfidence, and Category Learning," *Journal of Financial Economics*, 2006 (with L. Peng).

VISITING FACULTY

During the academic year 2008–09, the BCF welcomed the following visiting faculty:

DARIUSH ASHRAFI is a retired executive who was a partner of Ernst & Young in their New York office, serving many of their international clients, until 1990. During the next 10 years he was the chief financial officer and a member of the board of directors of two companies that were taken public during his tenure. Both companies were listed on the NYSE after their IPO. His final position before retiring was the president and chief operating officer of Schein Pharmaceutical, Inc., one of the largest generic pharmaceutical companies in the United States. He is an inactive CPA licensed in New York and has both engineering and business degrees from the Massachusetts Institute of Technology. He visited the BCF as a lecturer during the fall term.

COURSE TAUGHT:

ECO 207: Introduction to Financial and Managerial Accounting

JEAN-CHRISTOPHE de SWAAN visited Princeton during the spring semester to teach a joint undergraduate and graduate course on Asian capital markets. He taught a similar class at Yale University in the fall of 2008. He was between May 2005 and November 2008 a senior investment professional and Principal at Sansar Capital, one of the largest global long-short equities Asia-dedicated hedge funds, which he joined before inception. Prior to Sansar, he spent 5 years in McKinsey & Company's Corporate Finance practice in New York and Singapore. He has recently published a lead article on the future of hedge funds in *Caijing*, China's pre-eminent financial magazine. He received his B.A. from Yale University in Political Science, an MPhil in International Relations from the University of Cambridge, and a Masters in Public Policy from Harvard University's Kennedy School of Government. He is a Member of the Council on Foreign Relations.

COURSE TAUGHT:

FIN 592: The Rise of Asian Capital Markets

LARS HANSEN visited Princeton fall term of 2008. He became established in the 1980s as the leading contributor to the development and application of rigorous estimation and testing methods for financial data. His 1982 paper on Generalized Methods of Moments fundamentally altered the way that empirical research is done in finance and macroeconomics. This new methodology led him, with Ken Singleton, to make one of the pioneering contributions to what became known as the "equity premium puzzle." He continues to be a prolific researcher. He is part of a team investigating how long-run risk tradeoffs are encoded in asset prices. Hansen has also collaborated with others to develop models in which investors guard their investments against possible model misspecification, which they have shown are reflected in security market values and contribute to price dynamics. Professor Hansen is a member of the National Academy of Sciences and American Academy of Arts and Sciences, and a fellow of the Econometric Society. Hansen is a former John Simon Guggenheim Memorial Foundation Fellow and Sloan Foundation Fellow. Since 1981 Hansen has served on the faculty of the University of Chicago's Department of Economics, where he was the former director of graduate studies and chairman. He is the recipient of the 2006 Erwin Plein Nemmers Prize in Economics from Northwestern University, a Faculty Award for Excellence in graduate teaching from the University of Chicago, and co-winner of the Frisch Medal from the Econometric Society. Currently he is editing the *Handbook of Financial Econometrics* with Yacine Ait-Sahalia.

DARIUS PALIA is the Thomas A. Renyii Chair in Banking and a professor in finance and economics at Rutgers Business School. His research is generally in empirical corporate finance (with a focus on corporate governance) and on financial institutions. During 2008, he visited the Bendheim Center, where he taught the valuation and security analysis course to both master and undergraduate students. He has published extensively in the top academic journals and is widely cited by other academic studies. Palia has a Ph.D. in finance from New York University. Prior to joining Rutgers, he was on the faculty of Columbia University for many years, and has also been a visiting faculty member at the University of Chicago and University of California–Los Angeles.

COURSE TAUGHT:

ECO 469/FIN 570: Valuation and Security Analysis

LIN PENG is an associate professor of Finance at Zicklin School of Business, Baruch College, City University of New York. Prof. Lin Peng's research covers the area of asset pricing, behavioral finance, market microstructure and corporate governance. She has examined the effect of investor attention on asset prices, time-varying comovements and financial market anomalies. She also studied the relation between risk and return, market structure design and price efficiency, and the role of financial intermediaries on market liquidity. She is currently working on executive compensation and managerial manipulation. Her research has been published in leading economics and finance journals including *American Economic Review*, *Journal of Financial Economics* and *Journal of Financial and Quantitative Analysis*. She has presented her papers at numerous conferences and academic institutions. Her research won many research grants including the Eugene-Lang junior faculty research fellowship and the Institute for Quantitative Research in Finance (Q-Group) Research Award. Professor Peng received her Ph.D. in Finance from Duke University.

HUNTLEY SCHALLER received his Ph.D. from MIT. His research has focused primarily on the interaction between the real and financial sides of the economy, including work on investment, asset prices, the stock market, learning, financial market imperfections, monetary policy, the capital stock, corporate governance, inventories, acquisitions, bubbles, and the effect of taxes. His work has been published in leading journals in economics and finance, including the *American Economic Review*, *Journal of Monetary Economics*, and *Journal of Financial Economics*. He has been a visiting professor at Princeton University (1994-95, 2008-09), MIT (2002-03), Harvard University (2009), and the Institute for Advanced Studies (Vienna). He is a professor in the Department of Economics at Carleton University.

O. GRIFFITH SEXTON was, until 1995, a managing director of Morgan Stanley and director of the corporate restructuring group within the firm's financing and advisory services department. Sexton graduated from Princeton University in 1965. Following six years of service as an aviator in the U.S. Navy, he attended the Stanford Graduate School of Business, where he received his MBA. He joined Morgan Stanley in 1973 and spent his career there involved in a broad range of the firm's financing and advisory activities. In 1995, Sexton became an active advisory director of Morgan Stanley. Also in 1995, he became an adjunct professor at Columbia University's Graduate School of Business, teaching two courses in the subject of corporate finance. In 2000, he became a visiting lecturer at Princeton University. Sexton is a member of the board of directors of Morgan Stanley and is a director of Investor AB, a publicly traded company based in Stockholm, Sweden, and of two other privately held companies.

COURSE TAUGHT:

ECO 464/FIN 519: Corporate Restructuring

ROSSEN VALKANOV is an associate professor of finance in the Rady School at the University of California, San Diego. Dr. Valkanov received his Ph.D. in economics from Princeton University. In 1999, he became an assistant professor of finance at UCLA's Anderson School of Management where he remained until his appointment at UC San Diego. From 2001-2004 he served as an assistant professor of finance at the University of California, Berkeley's Haas School of Management, teaching summer courses for the master's program in financial engineering. He is a member of many professional organizations including the American Finance Association, the American Economic Association, the Econometric Society and the Bachelier Society. Dr. Valkanov's main research interests are in the areas of financial econometrics, empirical asset pricing, portfolio choice and monetary economics. He teaches finance courses for the FlexMBA and the Full-Time MBA programs at the Rady School.

COURSES TAUGHT:

ECO462/FIN 515: Portfolio Theory and Asset Management

ECO491/FIN 591: Cases in Financial Risk Management

VISITING FELLOWS

The BCF welcomed the following visiting fellows during the academic year 2008–09:

GORAZD BRUMEN is a Ph.D. candidate at the University of Zurich, Switzerland. He spent the spring term of 2008 at the Bendheim Center as a visiting student research collaborator under the supervision of professors Markus Brunnermeier and Yacine Aït-Sahalia. He worked on contagion issues in structural network models and merger decisions arising from them. Part of his work deals with quantitative issues in credit risk models. Brumen was also at Princeton for the fall term 2008.

YINGYING LI graduated from the University of Chicago in August 2008 with a Ph.D in Statistics. She spent the 2008-2009 academic year at the Bendheim Center as a postdoctoral research fellow and lecturer. She worked with Professors Yacine Aït-Sahalia and Jianqing Fan on methods of analyzing high-frequency financial data. After the Bendheim Center visit, Yingying Li will join the Business School at Hong Kong University of Science and Technology (HKUST).

YUKI SATO is a 4th-year PhD student at the London School of Economics, where he is also affiliated with the Financial Markets Group and the Paul Woolley Centre for the Study of Capital Market Dysfunctionality. He spent the spring term of 2009 at the Bendheim Center as a visiting student research collaborator under the supervision of professors Markus Brunnermeier and Hyun Song Shin. He worked on theories of asset bubbles in relation to the fund managers' reputational concerns.

GRADUATING PH.D. STUDENTS

Ph.D. students in the Bendheim Center for Finance are admitted through the Department of Economics, the Department of Operations Research and Financial Engineering, or the Program in Applied and Computational Mathematics. Four Ph.D. students graduated in 2009.

DANTE AMENGUAL received his Ph.D. in economics. His thesis studied latent variables models in econometrics with applications to stochastic volatility models. He accepted a position as an assistant professor of economics at CEMFI in Madrid.

FRANCESCO BIANCHI received his Ph.D. in Economics. His thesis is titled "Three Essays in Microeconometrics." He accepted a position as an Assistant Professor at Duke University.

ING-HAW CHENG received his Ph.D. in Economics. His thesis, "Essays in Corporate Governance and Capital Markets," studies how corporate fraud arises through interactions in corporate governance at competing firms, and how capital market conditions affect corporate policies. He accepted a position as an Assistant Professor of Finance at the University of Michigan's Ross School of Business.

KONSTANTIN MILBRADT received his Ph.D. in Economics. His thesis dealt with financial market frictions and focused on the incentives of financial institutions in the face of regulatory or contractual frictions. He accepted a position as Assistant Professor at MIT, Sloan School of Business.

SEMINARS

CIVITAS FOUNDATION FINANCE SEMINARS

Each week, the Bendheim Center for Finance organizes a seminar in which academics are invited to present their latest research to the faculty and graduate students of the center. The seminar usually meets on Wednesdays, 2:50–4 p.m., in the Bendheim Center for Finance classroom.

FALL 2008

September 17

Michael Brennan, University of California, Los Angeles

“Tranching and Rating”

September 24

Sudipto Bhattacharya, London School of Economics

“Control Rights over Intellectual Property: Corporate Venturing and Bankruptcy”

October 1

Ing-Haw Cheng, Princeton University

“Corporate Governance Spillovers”

October 8

Konstantin Milbradt, Princeton University

“Trading and Valuing Toxic Assets”

October 15

Dimitris Papanikolaou, Northwestern University

“Investment-specific Technological Change and Asset Prices”

October 22

Dante Amengual, Princeton University

“The Term Structure of Variance Risk Premia”

November 3-5

John Campbell, Harvard University

PRINCETON LECTURES IN FINANCE

“Risk and Return in Stocks and Bonds”

November 12

Kenneth Singleton, Stanford University

“Estimation and Evaluation of Conditional Asset Pricing Models”

November 19

Lars Hansen, University of Chicago

“Modelling the Long Run: Valuation in Dynamic Stochastic Economies”

December 3

Lubos Pastor, Chicago Graduate School of Business

“Are Stocks Really Less Volatile in the Long Run?”

December 10

Tobias Moskowitz, Chicago Graduate School of Business

“Value and Momentum Everywhere”

Spring 2009

February 24

Nick Barberis, Yale

February 25

Lin Peng, Princeton University

"Managerial Incentives and Stock Price Manipulation"

March 4

Thomas Phillipon, New York University

March 11

Rossen Valkanov, University of California, San Diego

March 25

Department-wide Seminar

Markus Brunnermeier, Princeton University

April 1

Guillaume Plantin, LBS

April 8

Raghu Rajan, University of Chicago

April 15

Hongjun Yan, Yale University

April 22

Marcus Opp, University of California, Berkeley

April 29

Pietro Veronesi, University of Chicago

May 6

Emmanuel Farhi, Harvard University

FINANCE PH.D. STUDENT WORKSHOP

Each week, the Bendheim Center for Finance organizes a seminar for its Ph.D. students and faculty in which preliminary research ideas are presented internally. The seminar usually meets on Tuesdays, noon–1:20 p.m., in the Bendheim Center for Finance library.

SPRING 2009

March 3

Yuki Sato (LSE)

"Ranking Tournament among Fund Managers and the Persistence of Bubbles"

Wei Xiong

"Dynamic Bank Runs" (with Zhiguo He)

March 24

Felipe Schwartzman

"Financial Shocks and Productivity"

March 31

Justinas Pelenis

"Using Parametric Volatility Estimates in Realized Variance Forecasting"

Peter Koudijs (Pompeu Fabra)

"The Boats That Did Not Sail - Evidence on the Sources of Asset Price Volatility from an 18th Century Natural Experiment"

April 7

Alice Hsiaw

"Goal-setting, Social Comparisons, and Self-control"

April 14

Jia Li

"Testing for Jumps in Noisy High Frequency Data" (with Yacine Ait-Sahalia and Jean Jacod)

Dong Beom Choi

"Liquidity, Firesale, and Crashes"

April 21

Ing-Haw Cheng

"Yesterday's Heroes" (with Harrison Hong and Jose Scheinkman)

Hyun Soo Choi

"Heterogeneous Belief and Forward Premium Puzzle"

April 28

Huntley Schaller (Carleton University)

"Risk and Discount Rates"

Zhou (Joe) Yang

"Volatility and Predatory Trading"

May 5

Axel Simonsen

"Effects of U.S. Shocks on the Canadian Economy using a DSGE Model" (with Bruno Lund)

Dacheng Xiu

"High Frequency Covariance Estimates with Noisy and Asynchronous Data"

May 12

Andrew Robinson

"Securitization, Agency, and Price Discipline"

Ana Babus (Cambridge University)

"Strategic Relationships in Over-the-counter Markets"

FALL 2008

September 23

Adam Zawadowski: "Entangled Financial Systems"

September 30

DeForest McDuff: "Identifying City Substitutes: Observable Similarity and Home Price Correlation"

October 14

Francesco Bianchi: "Rare Events and the Cross Section of Asset Returns"

November 11

Felipe Schwartzman: "Internal Finance, External Finance and Financial Crises"

Dacheng Xiu: "QMLE of Volatility/Covariance using High Frequency Data"

November 18

Marianne Andries: "Social Responsibility: The Impact on Asset Prices"

Jialin Yu: "The Chinese Warrants Bubble"

December 2

Huntley Schaller: "The Macroeconomic Effect of Sentiment"

CONFERENCES

During the past year, the Bendheim Center for Finance organized the following conferences and events on campus.

THE PRINCETON LECTURES IN FINANCE

Each year, the BCF organizes a series of public lectures. The Princeton Lectures in Finance are delivered by a leader in the field of finance. The author is invited to the BCF to deliver the contents of his or her book in the form of three two-hour lectures to the center's faculty and students. The lectures form the basis of a book to be subsequently published by Princeton University Press.

The 2008 Princeton Lectures in Finance were given by John Campbell of Harvard University on the topic of "Risk and Return in Stocks and Bonds."

NOVEMBER 3

Lecture 1: "Estimating the Equity Premium"

NOVEMBER 4

Lecture 2: "Consumption Risk in Long-term Asset Markets"

NOVEMBER 5

Lecture 3: "Stocks, Bonds, and the Flight to Quality"

FOURTH CAMBRIDGE-PRINCETON CONFERENCE

This conference, the fourth in the series, brought together faculty from Princeton's Bendheim Center for Finance and the Cambridge Endowment for Research in Finance, thanks to generous support from William H. Janeway '65.

The conference took place on September 19-20, 2008, in Lecture Theatre 2, Judge Business School, University of Cambridge.

FRIDAY, SEPTEMBER 19

Session Chair: John Eatwell

Andreas Pick (joint with Hashem Pesaran), "Forecasting Random Walks under Drift Instability"

Discussant: Jianqing Fan

Birgit Rudloff (with Jörn Sass), "Utility Maximization under Risk Constraints"

Discussant: Chris Rogers

Session Chair: Yacine Aït-Sahalia

John Eatwell (with Tarik Mouakil), "Notes on Liquidity"

Discussant: Wei Xiong

Jianqing Fan (with Jingjin Zhang and Ke Yu), "Asset Allocation with Gross Exposure Constraints for Vast Portfolios"

Discussant: Paolo Zaffaroni

SATURDAY, SEPTEMBER 20

Session Chair: Michael McKenzie

René Carmona (with Max Fehr, Juri Hinz, and Arnaud Porchet), "Emissions Market Models"

Discussant: David Newbery

Chris Rogers (with Angus Brown), "Contracting for Optimal Investment with Risk Control"

Discussant: Yuliy Sannikov

Session Chair: Bill Janeway

Michael Dempster (with Elena Medova and Ke Tang), "Determinants of Commodity Prices and Convenience Yields"

Discussant: René Carmona

Yuliy Sannikov, "Learning in Dynamic Incentive Contracts"

Discussant: Nicos Savva

Session Chair: José Scheinkman

Michael McKenzie (with Bill Janeway), "Venture Capital Fund Performance and the IPO Market"

Discussant: Jakub Jurek

Wei Xiong (with Zhiguo He), "Delegated Asset Management and Market Segmentation:

Discussant: Bill Janeway

Ana Babus, "the Formation of Financial Networks"

Discussant: José Scheinkman

Jakub Jurek, "Crash-neutral Currency Carry Trades"

Discussant: Michael McKenzie

IMPLIED VOLATILITY

Every year, the Bendheim Center for Finance organizes a concentrated conference on a specific topic, alternating between themes in mathematical finance and in financial econometrics. In 2009, the conference theme will be a topic in financial econometrics.

This conference took place on October 10-11, 2008 at the Hyatt Regency Hotel in Huntington Beach, California. The conference organizers were Yacine Aït-Sahalia and René Carmona. Robert Engle was the conference dinner speaker. Other speakers and their topics included:

Peter Christoffersen: "Forward-looking Betas"

Jakub Jurek: "Crash-neutral Currency Carry Trades"

David Bates: "Stock Market Crash Risk, 1926-2006"

Bruno Dupire: "Functional Itô Calculus and Robust Implied Volatility Hedge"

Roger Lee: "Implied Volatility, Realized Volatility, and Mileage"

Robert Engle: "Implied Volatility Correlations"

Jean Jacod (with Philip Protter): "Models for Option Prices: No-arbitrage and Completeness"

Sergey Natodchiy (with René Carmona), "Local Volatility Dynamic Models"

Martin Schweizer: "Which Implied Volatilities?"

Jean-Pierre Fouque (with Knut Solna and Ronnie Sircar): "Multinomial and Multiscale Default Modeling"

Dante Amengual: "Market-based Estimation of Stochastic Volatility Models"

Peter Carr: "Mix N Match Market Making"

Jim Gatheral: "Further Developments in Volatility Derivatives Modeling"

Michael Tehranchi: "Implied Volatility at Long Maturities"

Peter Friz: "On the Black-Scholes Implied Volatility at Extreme Strikes"

Liuren Wu: "Disentangling Short-run and Long-run Dependence between Stock Index and Index Volatilities"

Kris Jacobs (with P. Christoffersen and S. Heston): "The Shape and Term Structure of the Index Option Smirk: Why Multifactor Stochastic Volatility Models Work so Well"

Dilip Madan: "Pricing and Hedging Basket Options to Acceptable Levels of Risk"

THE PROMISE OF SOCIALLY RESPONSIBLE INVESTING

The Danish Ministry of Economic and Business Affairs and the Bendheim Center for Finance jointly hosted this conference which took place on November 14-15, 2008 at Princeton University. The purpose of the conference was to bring together academics, policy makers and practitioners from around the world to debate and lay out a vision for generating new and practically applicable knowledge regarding the business case for and broader societal value of Socially Responsible Investment (SRI). SRI aims to maximize returns on investment by integrating social, environmental and ethical considerations into the strategic investment models of investors. The conference was highly interactive, in the spirit of a roundtable format. The organizers were Harrison Hong, Carsten Ingerslev, Christina Wolfeld Gehring, Ole Kirkelund, and Flora Wu. The following people participated: Michael Dithmer, Bas Rüter, Jason Tyler, Jason Scott, Justin Lahart, Mark Kramer, Joshua Margolis, Raymond Fisman, Tom Rotherham, Lars

Rohde, Carl Rosén, Henrik Syse, Alan Blinder, Roland Benabou, Jon Elster, Augustin Landier, Antony Bugg-Levine, Alain Belda, Jean Tirole, Per Rasmussen, José Scheinkman, Donald MacDonald, Robert Massie, Matthew Kotchen, Vinay Nair, Brad Barber, James Gifford, Colin Melvin, Ulrika Hasselgren, David Lando, Peter Webster, and Geoffrey Heal.

5th Oxford-Princeton Workshop on Financial Mathematics & Stochastic Analysis

March 27-28, 2009

This workshop is held approximately every eighteen months as an opportunity for leading groups of researchers in, primarily, mathematical and computational finance from Oxford University and Princeton University to collaborate and interact. Speakers included, René Carmona, Paul Glasserman, Vicky Henderson, Sam Howison, Hanqing Jin, Jakub Jurek, Dmitry Kramkov, Michael Monoyios, John Mulvey, Jan Obloj, Christoph Reisinger, Ramon van Handel, Wei Xiong, and Xunyu Zhou. The workshop was organized by Ronnie Sircar and Vicky Henderson.

UNDERGRADUATE CERTIFICATE IN FINANCE

In 1999, the Bendheim Center for Finance started offering an Undergraduate Certificate in Finance (UCF) to Princeton undergraduates. The certificate program in finance has four major components:

- First, there are prerequisites in mathematics, economics, and probability and statistics, as necessary for the study of finance at a sophisticated level. These prerequisite courses are to be completed during the freshman and sophomore years. Students then apply at the end of their sophomore year.
- Second, two required core courses, during the junior year, provide an integrated overview and background in modern finance.
- Third, students are required to take three elective courses.
- Fourth, a significant piece of independent work must relate to issues or methods of finance. This takes the form of a senior thesis or for non-ECO or ORF majors only, if there is no possibility of finance content in their senior thesis or junior paper, a separate, shorter piece of independent work is required instead.

Now in its 11th year, the Undergraduate Certificate in Finance continues to do extremely well, attracting record numbers of students. We enrolled 78 juniors from the Class of 2011. In previous years, the numbers were as follows: Class of '00: 61, '01: 82, '02: 85, '03: 122, '04: 113, '05: 126, '06: 158, '07: 154, '08: 105; '09: 120; '10: 79. This brings our total number of undergraduate students in the program (juniors and seniors) to about 157 this year. We instituted grade requirements starting with the Class of 2008 in order to admit a more manageable number of students into the program.

Students earning the certificate are drawn from a wide cross-section of departments on campus, testifying both to the interdisciplinary flavor of the program and its wide appeal. The breakdown by major is given in the following two tables.

Class of 2009: Total number of certificates awarded: 88 (31 to women or 35 percent)

Major	Number of students
Archeology	1
Chemistry	4
Computer Science	3
Economics	28
Electrical Engineering	4
History	4
Mathematics	5
Mechanical and Aerospace Engineering	1
Operations Research and Financial Engineering	26
Physics	1
Politics	2
Sociology	1
Woodrow Wilson School	8

Class of 2010: Total expected number of certificates to be awarded: 79 (22 to women or 28 percent)

Major	Number of students
Chemical and Environmental Engineering	1
Chemical Engineering	3
Computer Science	4
Economics	24
Electrical Engineering	4
History	1
Mathematics	8
Mechanical and Aerospace Engineering	1
Molecular Biology	1
Music	1
Near Eastern Studies	1

Operations Research and Financial Engineering	18
Philosophy	1
Physics	1
Politics	2
Psychology	1
Slavic Languages and Literatures	1
Sociology	1
Woodrow Wilson School	5

DEPARTMENTAL PRIZES, HONORS, AND ATHLETIC AWARDS TO UCF 2009 STUDENTS

UCF students continue to receive a high proportion of the prizes awarded by their respective departments. This year, UCF students received a combination of departmental prizes, honors, and athletic awards; 10 UCF students received departmental prizes (one receiving three prizes); one UCF student received three athletic awards; 12 UCF students were elected to Phi Beta Kappa Society; 31 UCF students were elected to membership in Society of Sigma Xi; 10 UCF students were elected to membership in Tau Beta Pi National Engineering Society; and finally 52 UCF students received academic honors (21 cum laude, 20 magna cum laude, and 11 summa cum laude). 34 of our UCF students earned Certificates in Proficiency from 14 other departments/programs.

In addition, UCF students are an extremely talented subgroup of the already high-achieving Princeton classes. They continue to receive a high proportion of the prizes awarded by their respective departments.

VALEDICTORY ORATION

The Undergraduate Valedictory Oration was given this year by Holger Staude, one of our UCF recipients. This honor is awarded by faculty vote to one of the highest-ranking candidates for bachelor degrees. Special qualifications as well as scholastic standing are taken into account when awarding this honor.

11 UCF STUDENTS RECEIVED 12 DEPARTMENTAL PRIZES AND HONORS

Susan Butler, *Class of 1939 Princeton Scholar Award*
 Holger Staude, *Class of 1939 Princeton Scholar Award*
 Michael, Ryan, *American Studies*
 Vittal Kadapakkam, *Birch Family Prize*
 Katie Ko, *Leigh Buchanan Bienen and Henry S. Bienen Senior Thesis Prize*
 Holger Staude, *Daniel L. Rubinfeld '67 Prize in Empirical Economics*
 Shuo Zhang, *Senior Thesis Prize in Finance*
 Brian Greeley, *Senior Thesis Prize in Finance (second)*
 Holger Staude, *Halbert White '72 Prize in Economics*
 Andrei Brasoveanu, *Peter Greenberg '77 Prize*
 Yao Wang, *Ahmet S. Cakmak Prize*
 Jonathan Lange, *Kenneth H. Condit Prize*

12 UCF STUDENTS WERE ELECTED TO PHI BETA KAPPA SOCIETY

Kadir Annamalai (ELE), Susan Butler (ECO), Derek Edwards (CHM), Vittal Kadapakkam (ECO), Babur Khwaja (ECO), Kent Kim (ECO), Fang Rui (ORF), Holger Staude (ECO), Yintao Sun (ORF), Yao Wang (ORF), Yuhang Wang (ECO), and Axel Wehr (WWS).

31 UCF STUDENTS WERE ELECTED TO MEMBERSHIP IN SOCIETY OF SIGMA XI

Andrei Brasoveanu (MAT), Vicki Chen (CHM), Megan Chiao (ORF), Derek Edwards (CHM), Kevin Fan (ORF), Lucy He (ORF), Mingrui Jiang (ORF), Michael Kowal (ORF), Jonathan Lange (ORF), Jennifer Lee (ORF), Si-Cheng Liu (ORF), John Love (ORF), Ekaterina Mamyshev (ORF), Kenton Murray (COS), David Petrovics (MAE), Shriya Raghavan (ORF), Aruna Raghuraman (ORF), Barbara Rauber (CHM), Fang Rui (ORF), Matthew Russell (ORF) Evan Sadler (MAT), Emil Siriwardane (ORF), Andrew Sowa (ORF), Aishwarya Sridhar (ELE), Yintao Sun (ORF), Yiqiao Tang (ORF), Mark Ungerer (ORF), Yao Wang (ORF), Karen Winterhof (ORF), Shengyang Wu (CHM), and Laurissa Yee (ORF).

10 UCF STUDENTS WERE ELECTED TO MEMBERSHIP IN TAU BETA PI NATIONAL ENGINEERING SOCIETY

Lucy He (ORF), Jonathan Lange (ORF), Ekaterina Mamyshev (ORF), Fang Rui (ORF), Matthew Russell (ORF), Emil Siriwardane (ORF), Aishwarya Sridhar (ORF), Yintao Sun (ORF), Yao Wang (ORF), and Karen Winterhof (ORF).

1 UCF STUDENT RECEIVED 3 ATHLETIC AWARDS

Michael Maag, *The William Winston Roper Trophy*, *The Rosengarten Cross County Award* (varsity cross country), and *The Bonthron Trophy* (track)

SENIOR THESIS AND INDEPENDENT PROJECTS OF THE CLASS OF 2009

This table shows the senior thesis and independent project titles from the Undergraduate Certificate in Finance Class of 2009.

Daniel Adler	HIS	Real Bills, Gold, and Money: Federal Reserve Policymaking, 1920-1933
Kadir Annamalai	ELE	Corporate Risk Management for Non-financial Firms
Sonia Bhaskar	ELE	Energy Efficiency in Cooperative CDMA Networks: Relay Selection
Andrei Brasoveanu	MAT	Stock Option Pricing with Stochastic Volatility
Mikhael Breiterman-Loader	ORFE	Reduced Form Pricing Model for Certified Emission Reduction Credits
Susan Butler	ECO	Bias and Expertise in Securities Arbitration
Peter Capkovic	ECO	Angels or Demons: An Empirical Study of Hedge Funds' Influence on the Interest Rate Swaps Market
Michael Cardella	ECO	No Big Deal: Risk Aversion and Violations of Expected Utility Theory in "Deal or No Deal"
Charles Cater	MAT	Refining Rational Expectations Equilibria: Existence of Nash Equilibria in Borrowing
Philip Chacko	ELE	The US As a net Exporter of Energy by 2050?
Vicki Chen	CHM	The Effects of Government Subsidies on the Moral Hazard of HPV Vaccine and Cervical Cancer Screening
Sisi Chen	ECO	Carry Trades: Capturing the Returns Through a Modified Fama-French Model
Michelle Chen	WWS	Does the Rule of Law Matter? Re-examining the Law-growth Relationship in China
Megan Chiao	ORFE	Determinants of Stock Market Returns in Emerging Markets
Alexandra Cristea	WWS	Financial Planning and Stress in the Context of Poverty
Alexander D'Amato	SOC	The Electoral Implications of Ex-felon Disenfranchisement
Harsha Dante	ECO	Information-Based Environmental Policy: The Toxics Release Inventory and Corporate Social Performance
Brandon Denham	HIS	The IMF, International Debt, and Corrupt Socialism: Finance and the Breakup of Yugoslavia
Mark Doramus	WWS	Filling the Void: Grievances in Eastern Congo and the Rebellion of Laurent Nkunda
Derek Edwards	CHM	Value-at-risk During the 07-09 Financial Crisis
Kevin Fan	ORFE	Combining Topic Features with Text Classification for Predicting Abnormal Returns Using News Articles

Carling Giedt	ORFE	Exercise Patterns of Executive Stock Options: An Empirical Analysis
Rachel Goodwin	ECO	Effects of Dividend Policy on the Information Efficiency of Stock Prices
Brian Greeley	ECO	The Elimination of the Uptick Rule: Effects on Short Sales, Prices, Volatility, and Potential Market Manipulation
Roger Gu	ECO	The Impact of Corruption on International Market Valuation
Olivia Hamilton	ECO	Drivers & Limitations of Service Offshoring: An Empirical Analysis of the Shift of Jobs to India
Daniel Hayes- Patterson	COS	Introducing Traders to an Agent-based Minimal Economy: Creating a Platform for Collaborative Research in Economic Agent-based Simulation
Lucy He	ORFE	Help is on the Way: Dynamic Optimization of the Emergency Medical Services System in the City of Philadelphia
Paul Jacobs	COS	Stochastic Neural Networks for Stock Market Predictions: Summary
Jonathan Jacobs	HIS	The Early Hedge Fund Industry: Rise, Fall, and Revival
Natacha Jamar	ECO	U.S. Presidential Candidates: International Stock Market Movers and Shakers?
Mingrui Jiang	ORFE	How Much is the 'Golden Route' Worth: Valuation of Hu-Ning Expressway
Vittal Kadapakkam	ECO	The Long and Short of Price Reactions: Value-relevance and Its Impact on Post-earnings Announcement Drift
Stephen Kerns	ECO	Experience Enhances Returns...But do Venture Capitalists Reap the Benefits? An Investigation of Venture Capital Returns and Serial Entrepreneurs
Babur Khwaja	ECO	Assessing the Islamic Character of Sukuk
Kent Kim	ECO	Credit Crunches, Liquidity Risk and Corporate Spreads
Katie Ko	WWS	Identity and Innovation: A Taiwanese Perspective of Promoting Companies' Global Growth and Integration
Michael Kowal	ORFE	Volatility Trading: An Analysis of Strategies under Various Market Scenarios
Jonathan Lange	ORFE	An Analysis of the Effects of News on Stock Returns using Support Vector Machines
James Lavelle	ECO	On the Expiration of the IPO Lockup Agreements
Seunghyup Lee	MAT	Optimal Dynamic Portfolio Choice in the Market with Arbitrage Opportunities
Jennifer Lee	ORFE	Patterns of Fuel-efficient Truck Fleet Driving and Routing: Analysis of GPS Data from the 2008 Oil Bubble
Si-Cheng Liu	ORFE	Size Matters: Is Big More Beautiful in Venture Capital Financing?

John Love	ORFE	Empirical Analysis of Deviations from Option Market Prices using Stochastic Volatility Models
Chen Lu	ARC	Improving Portfolio Performance for Mid-term Investors using Single-period Optimization Strategies
Michael Maag	ECO	The Pro-cyclical role of Rating Agencies
Aseem, Mahajan	POL	Understanding the Effects of Behavioral Trends on a Terror Futures Market
Ekaterina Mamyshev	ORFE	R&D and Stock Markets: Modeling Prices and Predicting Crises
Lily Miao	ECO	The Behavior of Individual Investors and Its Impact on Realized Equity Returns
Kevin Mulcahy	ECO	Social Preferences and Investor Reactions
Kenton Murray	COS	Dubai Lightweight Crude Oil and International Four Month Interbank Interest Rates
Renee Park	PHY	Hedge fund Replication
David Petrovics	MAE	Variable Drag Element Applied on a Vertical Axis Wind Turbine for Improved Performance
Samuel Powell	ORFE	Economics of the Nuclear Renaissance
Christopher Pozzi	ECO	Corporate Governance and Firm Value: The Case of the American M&A Market 1990-2008
Shriya Raghavan	ORFE	Comovements of High-yield Bonds and Equity of firms under Varying Market Conditions
Aruna Raghuraman	ORFE	Behavior of the Base Correlation Skew in CDSs during the Subprime Crisis
Barbara Rauber	CHM	Curing Type I Diabetes with Engineered Embryonic Stem Cells: Market Size and Economic Cost/Benefit Analysis
Fang Rui	ORFE	U.S. Ethanol Industry: Efficiency, Profitability and Possible Side Effects
Matthew Russell	ORFE	Long-term Performance and Option Pricing of Leveraged ETFs
Michael Ryan	POL	Why Proposed Minimum Payout Requirements for the Endowments of Wealthy Universities Miss the Point
Evan Sadler	MAT	High Frequency Sampling in Bandit Problems with Dynamically Changing Reward Distributions
Ralph Schaefer	HIS	Deconstructing Department Stores: How Investment Banks Befriended and Homogenized America's Department Store Industry
Devjoy Sengupta	WWS	Reimagining Affordable Housing in the New Jersey Highlands Region
Kevin Shiau	ECO	Overreaction and Market Behavior in the Greater China Region
Emil Siriwardane	ORFE	Panic on Wall Street: An Implied Volatility Analysis of the Financial Crisis of 2008

Kyle Smith	ECO	Land as Leverage: A Cross-metropolitan Investigation of Home Valuation and Macroeconomic Fundamentals
Andrew Sowa	ORFE	New Techniques for Modeling Random Noise in the Lognormal Stock Price Model
Aishwarya Sridhar	ELE	The New Dawn of Solar Energy: Techno-commercial Perspectives on Photovoltaics
Holger Staude	ECO	The Impact of the Clean Air Interstate Rule of 2005 on Electric Utilities: Evidence from the Stock Market
Yintao Sun	ORFE	Utilizing Wind: Optimal Wind Farm Placement in the United States
Yiqiao Tang	ORFE	Asset Allocation for Sovereign Wealth Funds
Daniel Tso	ECO	Regional Household Debt Burden and House Price Response to Wealth Shocks
Stephanie Tzeng	ORFE	Agent-based Computational Economics and the Banking Sector
Mark Ungerer	ORFE	Endogenous and Exogenous Shocks to a Social System: Tracking Artist Page View and Album Sales
Suneil Vallabh	MAT	A Self-Contained Exploration and Derivation of the Black-Scholes Option Pricing Model
Yuhang Wang	ECO	Asset Pricing in the China A-share Stock Market: An Empirical Study of the Relationship between Institutional Investor Holdings and Stock Performance
Yao Wang	ORFE	Lost Decade: 1999-2008: The Case for Multi-strategy Investment Management
Su Wang	WWS	One China: Nationalism, Separatism, and the Chinese Government
Frances Ward	ECO	First-Class Pricing: The Effect of Collateral Redeployability on Secured Debt Spreads
Axel Wehr	WWS	Natural Gas Market Liberalization and Eu-Russia Relations: Consequences for Europe's Energy Security
Alec Williams	WWS	The Optimal U.S. Defense Policy Toward China
Karen Winterhof	ORFE	Your Oil Highness: The Summer When Crude Was King - An Analysis of the Crude Oil Bubble of 2008
Shengyang Wu	CHM	Implied Volatility Curves of American and European Options Following the Crash of 2008
Sarah Xue	ECO	An Analysis of Flow in Chinese Mutual Funds
Laurissa Yee	ORFE	Credit Default Swap Indices: The Feedback Effect on Single-name Credit Spreads
Sajid Zaidi	ECO	Has the Divestment Movement Had an Effect on American Companies Doing Business in Israel?

MINI-COURSE ON FINANCIAL MODELING, VALUATION, AND ANALYSIS USING EXCEL, VBA, AND C++

This seven-session, not-for-credit, mini-course taught students the fundamentals of constructing financial models in

Microsoft Excel, VBA, and C++. It is designed to provide real experience in applying financial concepts to valuation models and to teach the basic mechanics involved in financial modeling. In the process, students should be better able to recognize the intuition behind financial concepts that they have already been taught in other finance courses.

Undergraduate Certificate in Finance and Master in Finance students were strongly encouraged to attend. It was possible to take the first four sessions separately from the last three.

In the first three sessions, students gained a proficiency in Microsoft Excel and its use as a tool for rigorous financial analysis. They also were presented with certain commonly accepted methodologies of presentation in the areas of financial analysis and valuation. As a result of this class, students should be better able to construct a variety of financial analyses such as projections and valuations. This valuable skill will be applicable in areas as diverse as investment analysis, government service, and financial management of nonprofit organizations. Online tutorials in Microsoft Excel were provided.

The next three sessions introduced financial modeling using C++. This was particularly useful for students who enrolled in ORF 531/FIN 531: Computational Finance in C++ during the spring semester, which is highly recommended for all Master in Finance students. The final session introduced VBA.

The sessions took place from 8–10 p.m., in the Friend Center, Room 009, on November 17, 19, and 24 and December 1, 3, 8 and 10. The course was taught by Sujay Davuluri.

MASTER IN FINANCE

The distinctive feature of our Master in Finance program is its strong emphasis on financial economics in addition to financial engineering and computational methods. Graduates of our program have a solid understanding of the fundamental quantitative tools from economic theory, probability, statistics, optimization, and computer science, all of which are becoming increasingly vital in the financial industry. To a greater degree than at any time in the past, there now exists a body of knowledge that is widely agreed to be essential for the proper analysis and management of financial securities, portfolios, and the financial decisions of firms. A driving force behind these developments is a lively exchange of ideas between academia and the financial industry, a collaboration that is the closest parallel in the social sciences to the academic-private sector interactions routinely seen in engineering and the applied sciences.

The Master in Finance program prepares students for a wide spectrum of careers in the financial industry, ranging from quantitative trading, risk management, and financial engineering to quantitative asset management and macroeconomic and financial forecasting. The program does not require prior work experience, although it can be a plus. The BCF provides extensive career assistance to students, including help with internships and job placement, through its own staff. Our placement record has been excellent. The program has a small number of merit-based fellowships (in the form of a fraction of the full year's tuition cost) that we grant to our top applicants.

The curriculum is designed to be completed in four terms. Admission letters will specify the expected program length. Individual meetings between students admitted into the program and the director of graduate studies will determine, on the basis of courses previously completed at Princeton or another institution, which courses need to be taken. This flexible format allows exceptionally well-prepared students to complete the program in as little as one academic year. The program is designed to be completed on a full-time basis. Classes are taught during the day, and full-time students take four or five courses per term. Given the logistics, the only possibility for part-time enrollment would be for students who already work in the Princeton area and who would be able to attend class during the day. Part-time students are expected to take a minimum of two classes per term, and a maximum of four years (eight terms) to finish the program. All students are subject to an annual review of academic progress.

Princeton's master's program draws upon the combined strength of a variety of departments at Princeton, including the Department of Economics, the Department of Operations Research and Financial Engineering, the Department of Computer Science, and others. The program has two major course components. First, required core courses will provide (1) the prerequisite skills in mathematics, economics, and probability and statistics necessary for the study of finance at a sophisticated level and (2) an integrated introduction to modern financial analysis. Second, a wide range of elective courses, drawn from many departments, will allow students to tailor the program to fit their own

needs and interests. These courses will permit a range of opportunities for specialization and in-depth study of topics of interest to the student. Finally, the required summer internship is meant to provide additional practical experience in addressing real-world finance issues.

ADMISSION REQUIREMENTS

The Master in Finance program is designed both for students with mathematical (or quantitative fields such as physics or engineering) training, who want to make finance their main field of application, and for students with an economics or business background, who want to acquire the quantitative skills essential for a well-rounded training in finance. In either case, students must have an interest in, and be able to handle the combination of, economic analysis, mathematics, econometrics, and computer science that are pervasive in modern finance. An intensive two-week refresher course covering the relevant probability, statistics and mathematics topics, as required for the core courses, is offered prior to the beginning of classes in the fall. In addition, we organize in September for every incoming class a three-day “boot camp” with industry professionals where various career issues are reviewed and help is provided (including resume-writing, one-on-one videotaped interview sessions, interviewing techniques, etc.).

Applicants must take either the GRE or the GMAT. Applicants whose native language is not English and who have not received their undergraduate education in the United States must take the TOEFL or the IELTS exam.

STATISTICS ON THE ADMISSION PROCESS

ADMISSION

	Application	Offers	Acceptances
January '04	200	19	9
January '05	296	31	19
January '06	418	47	27
January '07	425	49	32
January '08	660	40	30
January '09	591	24	19

HIGHEST DEGREE BEFORE APPLYING TO PRINCETON'S M.FIN.

	Bachelor	Master	Ph.D.
January '04	85%	15%	1%
January '05	60%	35%	5%
January '06	66%	30%	4%
January '07	68%	28%	4%
January '08	72%	26%	2%
January '09	75%	23%	2%

APPLICANT PROFILE: GENDER AND AGE

	Female	Male	Median Age
January '04	29%	71%	24
January '05	26%	74%	26
January '06	29%	71%	25
January '07	31%	69%	23
January '08	31%	69%	24
January '09	36%	64%	24

APPLICANT PROFILE: GRE SCORES MEAN (MEDIAN)

	Analytical	Quantitative	Verbal
January '04 Applicants	714 (810)	776 (790)	554 (560)

September '04 Entering Class	768 (780)	786 (800)	609 (620)
January '05 Applicants	705 (745)	781 (800)	547 (580)
September '05 Entering Class	765 (765)	789 (800)	642 (640)
January '06 Applicants	4.47 (4.5) (new test)	781 (800)	568 (580)
September '06 Entering Class	5.1 (5) (new test)	786.5 (800)	647.5 (655)
January '07 Applicants	4.44 (4.5)	786.77 (800)	563.75 (570)
September '07 Entering Class	4.75 (5)	795.39 (800)	600.38 (630)
January '08 Applicants	4.18 (4)	786.43 (800)	553.09 (560)
September '08 Entering Class	4.67 (5)	788.43 (800)	573.75 (570)
January '09 Applicants	4.17 (4)	787.19 (800)	566.05 (580)
September '09 Entering Class	4.58 (4.5)	795.79 (800)	606.32 (610)

PROGRAM REQUIREMENTS

The program requirements consist of six core courses and 10 elective courses (see list below), with the following provisions:

- At least five of the elective courses must be at the level 500 or higher.
- At least five of the elective courses must be taken from List 1 below.
- The program can be completed in one or two years; most complete it in two. Individual meetings between students admitted into the program and the director of graduate studies will determine, on the basis of courses previously completed at Princeton or another institution, which courses need to be taken.
- Students must maintain an overall grade average of B or better as well as earn a passing grade in all core and elective courses.
- Audited courses cannot be used to fulfill the program's requirements.
- While no master's thesis is required, students interested in independent research may work with a Bendheim Center-affiliated faculty member on a topic relevant to finance, and by enrolling in the appropriate courses (FIN 560/561), they can receive academic credit equivalent to one or two elective courses (thereby reducing the number of required electives).

CORE COURSES

The core courses of the Master in Finance program provide students with analytical fundamentals of modern finance, both theoretical and empirical. The organization of the core courses for students entering the program is:

- Financial Economics—ECO 362 (fall) and FIN 502 (spring)
- Asset Pricing—FIN 501/ORF 514 (fall) and ORF 515/FIN 503 (spring)
- Statistics and Econometrics—ORF 505/FIN 505 (fall) and ORF 504/FIN 504 (spring)

ELECTIVE COURSES

In addition to core courses, which provide a broad survey of topics and techniques of modern finance, the program offers students the opportunity to choose among a variety of elective courses. Some of these courses have prerequisites or require permission of the respective instructors.

LIST 1: FINANCE APPLICATIONS COURSES

- FIN 515: Portfolio Theory and Asset Management
- FIN 516: Topics in Corporate Finance, Corporate Governance, and Banking
- FIN 517: Venture Capital and Private Equity Investment
- FIN 518: International Financial Markets
- FIN 519: Corporate Restructuring, Mergers, and Acquisitions
- FIN 521: Fixed Income: Models and Applications
- FIN 522: Options, Futures, and Financial Derivatives
- FIN 523: Forecasting and Time Series Analysis
- FIN 560: Master's Project I

- FIN 561: Master's Project II
- FIN 567: Institutional Finance, Trading and Markets
- FIN 568: Behavioral Finance
- FIN 570: Valuation and Security Analysis
- FIN 591: Cases in Financial Risk Management
- FIN 592: The Rise of Asian Capital Markets
- ECO 414: Introduction to Economic Dynamics
- ECO 525/FIN 595: Financial Economics I
- ECO 526/FIN 596: Financial Economics II
- ECO 575/FIN 575: Topics in Financial Economics
- ORF 527: Stochastic Calculus and Finance
- ORF 530: Statistical Analysis of Large Financial Datasets
- ORF 531/FIN 531: Computational Finance in C++
- ORF 534/FIN 534: Financial Engineering
- ORF 535/FIN 535: Financial Risk Management
- ORF 538: Analytical and Computational Methods of Financial Engineering
- ORF 555: Fixed Income Models
- ORF 569: Special Topics in Statistics and Operations Research
- ORF 574: Special Topics in Investment Science
- WWS 451: Special Topics in Public Affairs: Regulation of International Financial Markets

LIST 2: GENERAL METHODOLOGY FOR FINANCE

- APC 350: Introduction to Differential Equations
- APC 503: Analytical Techniques in Differential Equations
- APC 518/ORF 518: Applied Stochastic Analysis and Methods
- CEE 513: Introduction to Finite-element Methods
- CEE 532: Advanced Finite-element Methods
- CEE 548: Risk Assessment and Management
- CHE 508: Numerical Methods for Engineers
- CHE 530: Systems Engineering
- COS 318: Operating Systems
- COS 323: Computing for the Physical and Social Sciences
- COS 333: Advanced Programming Techniques
- COS 423: Theory of Algorithms
- COS 425: Database Systems
- COS 432: Information Security
- COS 436: Human-computer Interface Technology
- COS 444/ECO 444: Electronic Auctions
- COS 461: Computer Networks
- ECO 418: Strategy and Information
- ECO 501: Microeconomic Theory I
- ECO 502: Microeconomic Theory II
- ECO 503: Macroeconomic Theory I
- ECO 504: Macroeconomic Theory II
- ECO 511: Advanced Economic Theory I
- ECO 512: Advanced Economic Theory II
- ECO 513: Advanced Econometrics: Time Series Models
- ECO 517: Econometric Theory I
- ECO 518: Econometric Theory II

- ECO 519: Advanced Econometrics: Nonlinear Models
- ECO 521: Advanced Macroeconomic Theory I
- ECO 522: Advanced Macroeconomic Theory II
- ECO 523: Public Finance I
- ECO 524: Public Finance II
- ECO 531: Economics of Labor
- ECO 541: Industrial Organization and Public Policy
- ECO 551: International Trade I
- ECO 552: International Trade II
- ECO 553: International Monetary Theory and Policy I
- ECO 554: International Monetary Theory and Policy II
- ELE 591: High-tech Entrepreneurship
- MAE 305/MAT 301: Mathematics in Engineering I
- MAE 306/MAT 302: Mathematics in Engineering II
- MAE 503: Basic Numerical Methods for Ordinary and Partial Differential Equations
- MAT 301/MAE 302: Mathematics in Engineering I (ODE, PDE)
- MAT 305: Mathematical Programming
- MAT 591 & MAT 592: Applied Partial Differential Equations
- MAT 594/APC 584 Wavelets: Applications of Wavelets in Mathematics and Other Fields
- ORF 307: Optimization
- ORF 311: Optimization under Uncertainty
- ORF 401: Electronic Commerce
- ORF 474: Special Topics in Operations Research and Financial Engineering
- ORF 522: Linear Optimization
- ORF 523: Nonlinear Optimization
- ORF 524: Statistical Theory and Methods
- ORF 526: Stochastic Modeling
- ORF 542: Controlled Markov Processes
- ORF 547: Dynamic Programming
- ORF 548: Large-scale Optimization
- ORF 549: Stochastic Programming
- ORF 551: Probability Theory
- ORF 553: Stochastic Differential Equations
- ORF 554: Markov Processes

TRACKS

Elective courses can be chosen according to either individual needs and preferences, or to conform to one of the suggested tracks, listed below. It is not necessary for a student to designate or complete a particular track to satisfy the master's requirements; the tracks listed below are merely illustrations of coherent courses of study that students might choose. Beyond the tracks listed below, we offer a number of electives in corporate finance, dealing with the choice and financing of investment projects, firms' determination of dividend policy, optimal capital structure, financial reorganization, mergers and acquisitions, start-up financing, deal structure, incentive design, valuation of high-risk projects, initial public offerings, etc. However, we believe that our students' comparative advantage lies in other areas encompassed within the modern investment bank such as asset management, risk management, derivatives pricing and trading, fixed income analytics, and other areas where a quantitative background in theoretical and practical aspects of modern finance is essential.

FINANCIAL ENGINEERING AND RISK MANAGEMENT

Financial engineers design and evaluate products that help organizations manage risk-return tradeoffs. Financial engineering is no longer limited to quantitative traders and derivatives specialists, and is now used widely throughout

the private sector for purposes including hedging foreign currency exposures, financing real investment, and managing real and financial risks. The aim of this track is to provide students with the background they need to be leaders and innovators in this growing field. The track includes courses in dynamic programming and stochastic control, financial economics, optimization under uncertainty, probability, and stochastic calculus and computational finance. Special attention is given to the development of the efficient computational techniques that are needed in “real-time” computing environments. In addition, students can elect to focus on the computer-based technologies that are becoming increasingly important in finance, such as the design of efficient trading systems, algorithms, interfaces, large databases, and the security of computer networks. Several courses provide students with the opportunity to acquire practical experience. In particular, full-time students will have the opportunity to work in a small group on actual financial engineering problems under the joint guidance of a faculty member and a high-level industry practitioner.

QUANTITATIVE ASSET MANAGEMENT AND MACROECONOMIC FORECASTING

Highly-trained financial specialists are increasingly utilized in the fields of portfolio management and macroeconomic forecasting. Among the quantitative tools used in this area are analysis of earnings revisions, “attribute” screening, and quantitative forecasting methods. Quantitative techniques are widely employed to control portfolio risk and to establish portfolios balanced with different assets (stocks, bonds, real estate, etc.) so as to minimize the variance of returns. Finally, major asset managers, commercial banks, life insurance companies, securities firms, etc., all employ financial economists to formulate strategies consistent with the expected performance of the macroeconomy; required skills include expertise in applied time series analysis and an understanding of the major statistical macroeconomic models.

FINANCIAL TECHNOLOGIES TRACK

Computer-based technologies, such as algorithms, efficient trading systems, large databases, multimedia and Web interfaces, parallel processing, and the security of computer networks, are becoming increasingly important in finance. The continued development of e-commerce, the growth of computer-based trading, and the renewed emphasis on risk management in all firms are creating a new competitive environment in which increasing the speed and lowering the costs of trading and other financial operations become essential components of success. This track gives students access to the latest tools and techniques of computer science and computational methods applied to finance.

SEMINARS AND COMPUTING ENVIRONMENT

Students are involved in regular seminars offered by academic researchers and industry representatives, and they will have the opportunity to participate in collaborative projects in some of the elective courses. The Financial Engineering Laboratory (equipped with financial data feeds, personal computers, and workstations) has been set up to facilitate such projects. The program provides a standardized computing environment based on Mathematica, Matlab, S-Plus, and Microsoft Office. Computational skills are taught in a series of workshops and in a course on computational finance in C++.

SOME COURSE DESCRIPTIONS

ECO 362: Financial Investments

This course surveys the field of investments with special emphasis on the valuation of financial assets. Issues studied include how portfolios of assets should be formed, how to measure and control risk, how to evaluate investment performance, and how to test alternative investment strategies and asset pricing models.

FIN 501: Asset Pricing I: Pricing Models and Derivatives

This course provides an introduction to the modern theory of asset pricing. Topics include: no arbitrage, Arrow-Debreu prices and equivalent martingale measures, security structure and market completeness, mean-variance analysis, Beta-pricing, CAPM, and introduction to derivative pricing.

FIN 502: Corporate Finance and Financial Accounting

This course covers the basics of financial statements, the analysis and recording of transactions, and the underlying concepts and procedures. In addition, a more detailed study of some aspects of financial accounting that have widespread significance is undertaken, such as inventories, long-term productive assets, bonds and other liabilities, stockholders equity, and the statement of changes in financial position. The course provides students with the skills

necessary to become informed users of financial statements. Problem sets emphasize an ability to interpret and analyze financial statement disclosures.

FIN 515: Portfolio Theory and Asset Management

This course covers a number of advanced topics related to asset management and asset pricing, including mean-variance analysis, CAPM, APT, market efficiency, delegated money management, stock return predictability, bubbles and crashes, social interaction and investor behavior, security analysts and investor relations, and mutual fund performance and organization.

FIN 516: Topics in Corporate Finance, Corporate Governance, and Banking

The course covers agency and control issues in corporate finance such as managerial compensation, the role of corporate boards, takeovers, leveraged buyouts, and bankruptcy. It also studies the role of banks and other intermediaries' activities in facilitating investment and promoting sound corporate governance.

FIN 518: International Financial Markets

This course studies the assets and institutions of international financial markets. A key difference between these markets and others is the role of exchange rates relating the value of two or more national currencies. The course studies the market-making institutions, the market conventions, and market practices. It also studies the interrelationships between different assets and their pricing, trading, and use by corporations.

FIN 519: Corporate Restructuring, Mergers, and Acquisitions

This course examines some of the most popular restructuring options available to corporate managers and will construct a framework to evaluate the implications they may have to shareholder value.

FIN 521: Fixed Income: Models and Applications

This course deals with the valuation for fixed-income securities. Topics include: (i) interest rate contracts: zero-coupon bonds, coupon bonds, floating rate notes, yields, forwards and futures, swaps, options, caps, swaptions; (ii) arbitrage free pricing in discrete time: Vasicek model, Ho-Lee model, Black-Derman-Toy model; (iii) introduction to continuous-time fixed income modeling: Black model, Heath-Jarrow-Morton; (iv) applications of arbitrage free models to pricing of interest rate contracts; (v) credit risk; and (vi) mortgage-backed securities.

FIN 522: Options, Futures, and Financial Derivatives

The objective of this course is to study the essential techniques of pricing financial derivatives. These techniques include the Black-Scholes formula (awarded 1997 Nobel prize in economics), binomial tree method, and risk-neutral valuation method. We will also discuss extensively the trading strategies associated with financial derivatives for different purposes and potential problems that can arise in the application of financial derivatives. This course is technical by nature and requires extensive use of calculus, statistics, and Excel spreadsheet programming.

FIN 560/561: Master's Project I and II

Under the direction of a Bendheim-affiliated faculty member, students carry out a master's project and write a report.

FIN 567: Institutional Finance, Trading and Markets

This course studies financial institutions and focuses on the stability of the financial system. It covers important theoretical concepts and recent developments in financial intermediation, asset pricing under asymmetric information, behavioral finance and market microstructure. Topics include market efficiency, asset price bubbles, herding, liquidity crisis, risk management, market design, and financial regulation.

FIN 568: Behavioral Finance

This course will present models that are psychologically more realistic than the standard "rational actor" model. About 30 percent of the course will be devoted to economics, 70 percent to finance. Applications to economics will include decision theory, happiness, fairness, and neuroeconomics. Applications to finance will include theory and evidence on investor psychology, predictability of the stock market and other markets, limits to arbitrage, bubbles and crashes, experimental finance, and behavioral corporate finance.

FIN 570: Valuation and Security Analysis

This is a specialized corporate finance course. The objective is to teach valuation methods. The course uses accounting and finance concepts for valuing firms and covers the necessary corporate finance concepts with an equal mix of theory and application. Topics include financial statement analysis, capital budgeting methods, estimating cash

flows, estimating various costs of capital, valuation of projects, valuation of companies and security valuation, LBOs, mergers and acquisitions, valuing a drug licensing opportunity, the initial public offering valuation, and valuation of strategic and real options.

FIN 591: Cases in Financial Risk Management

This course examines the concept of risk and its mitigation, and how the ideas can be applied in the practice of risk management for financial and non-financial companies. The basic toolkit draws on economics, probability theory and statistics, and they are integrated with more advanced concepts drawn from portfolio choice, derivative securities and dynamic hedging. Overall aim of the course is to demonstrate how the main concepts have practical applications.

FIN 592: The Rise of Asian Capital Markets

This course explores the increasing weight of Asia in global equity financial markets and its implications, and frames the discussion in the macroeconomic context of the globalization of financial markets and the evolution of the global monetary system. Course puts particular emphasis on concepts of economic development, market efficiency, and corporate governance. Discussions combine analysis of historical trends and recent data and events with insights from practical experience in Asian equity markets. Course also explicitly considers the policy decisions faced by the US and Chinese governments relative to existing global imbalances.

ECO 525/FIN 595: Financial Economics I

This course covers asset pricing in competitive markets in which traders have homogeneous information. Empirical tests of asset-pricing models and associated “anomalies” are also surveyed. Measures of riskiness and risk aversion, intertemporal asset-pricing models, dynamic portfolio choice, option pricing and the term structure of interest rates, corporate investment and financing decisions, and taxation are studied.

ECO 526/FIN 596: Financial Economics II

This course studies theories and empirical evidence regarding financial markets and institutions that focus on asymmetric information, transaction costs, or both; and rational expectation models of asset pricing under asymmetric information, dynamic models of market making, portfolio manager performance evaluation, principal-agent models of firm managerial structure, takeover bids, capital structure, and regulation of financial markets.

ECO 575/FIN 575: Topics in Financial Economics

This course is intended for Ph.D. students who have already completed the year-long Ph.D. sequence in finance (ECO 525 and 526) and who intend to write their dissertation in finance. Topics vary by year, focusing on recent developments in the field.

ORF 504/FIN 504: Financial Econometrics

This course covers econometric and statistical methods as applied to finance. Topics include measurement issues in finance, predictability of asset returns and volatilities, value at risk and extremal events, linear factor pricing and portfolio problems, intertemporal models of the stochastic discount factor and generalized method of moments, vector autoregressive and maximum likelihood methods in finance, risk neutral valuation in discrete time, estimation methods for continuous-time models, volatility smiles and alternatives to Black-Scholes, and nonparametric statistical methods for option pricing.

ORF 505/FIN 505: Modern Regression and Time Series

This course examines linear and mixed effect models, nonlinear regression, nonparametric regression and classification, time series analysis: stationarity and classical linear models (AR, MA, ARMA), nonlinear and nonstationary time-series models, state space systems, and hidden Markov models and filtering.

ORF 515/FIN 503: Asset Pricing II: Stochastic Calculus and Advanced Derivatives

This course begins with an overview of basic probability theory and covers the elements of stochastic calculus and stochastic differential equations that are widely used in derivatives modeling, pricing, and hedging. Topics include Brownian motion, martingales, and diffusions and their uses in stochastic volatility; volatility smiles; risk management; interest-rate models; and derivatives, swaps, credit risk, and real options.

ORF 531/FIN 531: Computational Finance in C++

The intent of this course is to introduce the student to the technical and algorithmic aspects of a wide spectrum of computer applications currently used in the financial industry, and to prepare the student for the development of new applications. The student will be introduced to C++, the weekly homework will involve writing C++ code, and the

final project will also involve programming in the same environment.

ORF 534/FIN 534: Financial Engineering

This course surveys central topics in the area of financial engineering and multi-period financial planning systems. It covers pricing methodologies integrated with financial planning systems and linking asset and liability strategies to maximize surplus wealth over time. We model the organization as a multi-stage stochastic program with decision strategies.

ORF 535/FIN 535: Financial Risk Management

This course is about measuring, modeling, and managing financial risks. It introduces the variety of instruments that are used to this effect and the methods of designing and evaluating such instruments. Topics covered include risk diversification, planning models, market and nonmarket risks, and portfolio effects.

ORF 538: Analytical and Computational Methods for Financial Engineering

This course introduces analytical and computational methods that are common in financial engineering problems. It is aimed at Ph.D. students and advanced M.A. students who have studied stochastic calculus. The focus is on uses of partial differential equations: their appearance in pricing financial derivatives, connection with Markov processes, and occurrence as Hamilton-Jacobi-Bellman equations in stochastic control problems, and analytical, asymptotic, and numerical techniques for their solution.

ORF 555/FIN 555: Fixed Income Models

This course is an introduction to continuous-time models for the arbitrage-free pricing of interest rate derivatives. Topics include primitives of the bond market and the relation between their dynamics, short rate models, the Heath-Jarrow-Morton methodology and related consistency problems, LIBOR market models, affine term structure models, and risk of default.

MASTER IN FINANCE PLACEMENT

Our program has continued to enjoy excellent success with 95% of our 2009 graduates being placed in finance industry jobs and 100% internship placement. The candidates for the Master in Finance get support and assistance with their post-graduate career planning from a coordinated program of resources, including Princeton's Office of Career Services and the BCF's Directors of Corporate Relations, Wendell Collins and David H. Blair. They also benefit from support from our Corporate Affiliates and Advisory Council.

OUR GRADUATES WILL BE PURSUING THEIR CAREERS AT:

Aleph One
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Banking Regulation and Supervision Agency, Turkey
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OUR FIRST-YEAR STUDENTS HAVE OBTAINED SUMMER INTERNSHIPS AS FOLLOWS:

Bloomberg Global Data Systems
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BTG Pactual
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Citigroup Global Markets
Citigroup Hong Kong
DTE Energy
Goldman Sachs, London and Asia Pacific
Group One
InsiderScore
JPMorgan Chase
Morgan Stanley
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PSE&G Trading
UBS

FELLOWSHIPS AWARDED

The Gerhard R. Andlinger '52 Graduate Fellowship in Finance was awarded to Jean Boyer. Jean came to us from the École Polytechnique in France, interned as a researcher with Goldman Sachs in London during the summer of 2008, and has accepted a position with Morgan Stanley.

The Bendheim Graduate Fellowships in Finance were awarded to Benjamin Beugnies, Brian Bunker and Hao Wu. Benjamin came to us from Ecole Centrale Paris and interned at BNP Paribas. Brian received his B.A. with highest distinction and honors from the University of North Carolina at Chapel Hill and interned at Bloomberg this year. Hao received his B.S. in Economics & Mathematics, summa cum laude from Stony Brook, University and previously worked as an Assistant Economist in the Research Department of the Federal Reserve Bank of New York and held a summer internship at InsiderScore.

MFIN MATH CAMP/BOOT CAMP

For the fourth year, the Bendheim Center conducted a two-week “math camp” program, August 25–September 5, taught by Professor of Economics Wei Xiong. The purpose of the math camp is to enrich the finance mathematics background of the incoming students so that they are ready for the mathematical rigors of the program.

Following math camp, we continued our three-day “boot camp” program, which was developed for the incoming students prior to the beginning of classes in September. The camp focuses on a refresher of various finance topics, the types of careers for which the MFin degree prepares students, and some useful information on interviewing and networking skills. Boot camp presenters included the BCF faculty, MFin alumni, and speakers from the financial services industry. This program was very well received by the incoming students, particularly those who would have to begin interviewing for permanent jobs less than six weeks after starting the program. In September 2008, the program’s agenda was as follows:

Saturday, September 6

Welcome and Overview of Program	Yacine Ait-Sahalia, Rene Carmona
Interviewing and Networking Best Practices	Wendell Collins and David Blair
Structure of Modern Investment Bank	David Blair
Panel Discussion and Mock Interviews	Bendheim Alumni Casey Carnathan,

Theo Kim, Nestor Macias, Chad Shampine
Amar Sujanani

Monday, September 8

Operational Risk Management

William Beatty, Goldman Sachs

Careers in Fixed Income

John Massad, BlackRock

Overview of Career Resources

Kathleen Mannheimer, Tony Chiapetta, Amy
Pszczolkowski, Career Services

Economics and Finance Library Resources

Todd Hines

Risk and Quantitative Analysis,

Tobias Falk, Credit Suisse

Understanding your Strengths Career Workshop

David Collins, C3 Intelligence

Quantitative Strategies and Modeling

Joe Langsam and Eric Pan,
Morgan Stanley IDEAS

Tuesday, September 9

Graduate School Orientation

Networking Lunch and Overview of Markets

Lehman Brothers Panel

Proprietary Trading

Kian Esteghamat, JPMorgan Chase

Endowment Investing

Andy Golden, PRINCO

ADVISORY COUNCIL

The Advisory Council for the Bendheim Center is comprised of a group of distinguished leaders in the financial industry. The council meets on campus once a year. In 2008, the meeting took place on May 22–23. We continued our format of including a dinner the night before the morning meeting to enable the council members to exchange ideas in a more informal setting.

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CORPORATE AFFILIATES PROGRAM

The annual Corporate Affiliates Program offers companies an opportunity to build a significant relationship with the BCF faculty and students. Corporate affiliates gain a strong presence and visibility in the BCF, interact with faculty and students, learn about important faculty research, and secure a competitive recruiting advantage.

2008-09 PARTNERS

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Citadel Investments Group

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Morgan Stanley

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BENEFITS

- Annual Report of the BCF
- Opportunity to advertise internships and employment opportunities to both Undergraduate Certificate in Finance (approximately 225 in 2008–09) and Master in Finance students (46 in 2008–09)
- Opportunity to use the BCF facilities to host recruiting events
- Access to the BCF director of corporate relations as a resource for recruiting
- Recognition in the publicly disseminated materials of the BCF, including the center's reports and website, which both list corporate affiliates, as well as a hyperlink to each member's website
- Access to all research authored by the center's affiliated faculty within the academic year
- Access to BCF faculty for internal or client presentations or for sponsored research
- Opportunity to work with BCF faculty and staff to create customized training programs and to design and access distance-learning courses and events such as special lectures and conferences
- Invitation to deliver a guest lecture on campus or to participate as a presenter at BCF-sponsored conferences
- Invitation and two reserved seats for all public events hosted by the center

GIFT OPPORTUNITIES

Early in 1998, a \$10 million gift from the Lowenstein Foundation enabled Princeton to launch the Bendheim Center for Finance. To establish the University as a national resource for innovative thinking on finance and finance-related topics, the BCF brings together leading experts in teaching and scholarship in financial economics. But to realize this vision, significant support beyond the generous Bendheim gift is needed for faculty, curriculum development, and facilities. True excellence in financial economics requires a critical mass of finance researchers, approaching the size of a finance department in a leading business school, as well as important educational initiatives in a state-of-the-art setting.

ACADEMIC PERSONNEL

Endowed Professorships (five committed, two additional needed)

To support the appointment of a distinguished senior faculty member

\$4,000,000

Endowed Visiting Professorship (one needed)

To support a distinguished senior visitor who provides expertise in a particular area of study

\$2,000,000

Postdoctoral Fellows (one needed)

\$1,500,000

Junior Faculty Fellow (one committed, one additional needed)

\$1,500,000

FELLOWSHIPS

Graduate Fellowships (three committed, seven additional needed)

To support a new generation of scholars concentrating in finance

\$250,000

SUPPORT OF FINANCIAL RESEARCH AND TEACHING

Research and Course Development Funds

Endowed funds to support research and course development

\$50,000 min.

PHYSICAL SPACE

Director's Office

\$100,000

Graduate Student Suite

\$100,000

ACKNOWLEDGMENTS 2008–09

Princeton University gratefully acknowledges those whose generosity continues to make the Bendheim Center for Finance possible.

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NONDISCRIMINATION STATEMENT

In compliance with Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and other federal, state, and local laws, Princeton University does not discriminate on the basis of age, race, color, sex, sexual orientation, gender identity, religion, national or ethnic origin, disability, or status as a disabled or Vietnam-era veteran in any phase of its employment process, in any phase of its admission or financial aid programs, or other aspects of its educational programs or activities.

The vice provost for institutional equity and diversity is the individual designated by the University to coordinate its efforts to comply with Title IX, Section 504 and other equal opportunity and affirmative action regulations and laws. Questions or concerns regarding Title IX, Section 504 or other aspects of Princeton's equal opportunity or affirmative action programs should be directed to the Office of the Vice Provost for Institutional Equity and Diversity, Princeton University, 205 Nassau Hall, Princeton, NJ 08544 or (609) 258-6110.

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In the Nation's Service and in the Service of All Nations

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