

Annual Report 2010



RAFFAELE MARIO GIOR GHIGLIAZZA • GEE YU WILL LAM • MARIA ISABEL MUSSNICH PEDROSO • WEN HAO JONATHAN NG • SURAJ MOHAN (AMAR) SUJANANI • CHUNG FAI JOSIAH TAM • NATHANAEL EN MIEN TAN • IVAILO I. ARSOV • ANTOINE XAVIER BERTAGNA 🛛 JULIO ARMANDO CACHO-DIAZ 🖉 CASEY C. CARNATHAN 🗨 FLORA HUI-MAY CHAO 🗣 AKRATHOOD (PAUL) CHAREONWONGSAK • CAROLYN HSUEH-LIEN CHEN • GAETAN PHILIPPE CIAMPINI • HANO M. DAMME • SUJAY KUMAR DAVULURI • MERT C. GENC • GAUTAM P. GURURAJ • YING CHIAT HO • SYED ZAIN HODA • SANG HUN KANG • RUI XIONG KEE • TAE-KYOON THEO KIM • ALEXANDRA KATHERINE KNOOP • JOSHUA BARRY KUTIN • ANNE GABRIELLE LABOUREAU • JEAN-EMMANUEL CLEMENT LARRE • HUI FANG LEE • TZE HUI LIM • ADAM CHRISTOPHER LUTZ • BENDHEIM CENTER FOR FINANCE ALUMNI • NESTOR ALEJANDRO MACIAS • MICHAEL THEO-DORE MASSEY VINCENT MOISSINAC • JOHN D. NAUD • DAFNE RAMOS RUIZ • RAJASHEKAR (RAJA) REDDY • DANIEL L. SCHOENHERR • CHRISTOPHER MATTHEW SESTRIC • HONGKI CHRIS SHIU • ANDRES DAVID STECKL • SZE ING TAN • XU DA TAN • JORDANKA (JORI) VISOKOMOGILSKA • ALEX CHUAN WANG • MARC JAY WIZNIA • SUNG SOO YANG YEN TSE YAP • ZHI JIA YAP • SHENG QUAN ZHUANG • FAISAL AHMED • EDWIN AMONOO • SUMINORI ARIMA • BRADLEY AYRES • TAMER BAKICIOL • MAX BEGON-LOURS • YOUSSEF BENOMAR • BENJAMIN BEUGNIES • MATTHIEU BOISOT • JOACHIM BOKOBZA • COSTIN BONTAS • JEAN BOYER • NATALIA BUCCI • BRIAN BUNKER • LISA BUSCA-PINHEIRO • YIBIAO CHAI • ARGHYADIP CHAUDHURI • ANTOINE CHICHE • GABRIELA COHEN-NOFAL • NICOLAS COJOCARU-DURAND • MICHAEL COULON • CALIXTE DEVERDELON • ALESSIO DEVINCENZO • KAPIL DHINGRA • BOGDAN DOBRE • CELINE DUFTEL • JOSHUA DUNN • YIHAN FANG • GEORGE FONG • ANTHONY FUNG • ALBANE GARNIER • THIBAULT GERBALDI • MARIA GIDUSKOVA • ERIC GOLDLUST • ESTEBAN GOMEZ • DUYGU GOZELER • GABRIEL GRAY • ADOITO HAROON • MATTHEW HAYS • WILLIAM HESSERT • NITIN JAIN • MONISHA JAYAKUMAR • YINGMIN JIAN • YING JIANG • THOMAS JOHN • SOPHIE KAHN • AARON KATZ • SALIM KHAN • BOYAN OSTADINOV 9 GANESH LAKSHMINARAYANA 🛛 ALARO LARIO 🖣 YONGBAE LEE 🖣 JOHN LEUNG 🖉 DONGMEI LI 🖣 ADAM LICHTENSTEIN QIUWEI LIN • RUI LIU • DONGXU LU • FRANCOIS LU • TIMOTHY LU • ANDREW MCELROY • EVAN MEIKLEHAM • ASAD MERCHANT • ANSHUL MOHAN • DAN MORARU • DELWIN OLIVAN • TENGKOON ONG • EMEKA ONODUGO • FERNANDO OSTORNOL • THAYER PATTERSON • SRINIVAS PERI • JAMES PETSOULAKIS • MATTHIEU PHILIP • GUILLAUME RABATE • PENG REN • BELAL SABKI • RAYMOND SCANNAPIECO • MICHAEL SCHONGER • LILIAN SCHULZ • CHAD SHAMPINE • FAHAD SHAMS • RYAN SIMMONS • KAMALPREET SINGH • CHRISTIAN STASSEN • TONG SUN • SAMUEL SUNG • MINGXI TANG • XIAN TANG • THEO VANDERZEE • ANIL VARSANI • DARIO VILANI • DENNIS WALSH JIANGUO WANG • CHEE-YAN WONG • HAO WU • NEHA YADAV • JIN YAN • AARON YUNIS • HASHIM ZAMAN •

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# YACINE AÏT-SAHALIA Director's Introduction



# A RANDOM WALK DOWN 10 YEARS OF OUR PROGRAM

Ten years ago, we opened the doors of the old Dial Lodge to the Bendheim Center for Finance to fulfill the same mission we have today: to develop new courses and programs in finance that will afford exciting learning opportunities to Princeton students, and to establish a leading center for research in modern finance.

Adding fuel to this mission, we've ridden over the past 10 years a roller coaster of more financial innovation and volatility than in the previous quarter century. Jumps in financial markets kicked off 2000, followed by large drops after September 11, 2001. Then in 2002, the Internet bubble burst and an outbreak of accounting scandals contributed to a larger correction. The mid-2000s brought a new look at corporate governance of the exchanges, as well as automation and pricing enhancements made possible by new technology. In 2007, Asian volatility and a global sell-off created more turbulence, topped off by the subprime mortgage mess. Then in 2008, we saw the market enter an unprecedented period of deterioration after the fall of Lehman, which raised numerous questions about the ways markets and financial firms operate and interact.

Needless to say, given these dynamic market conditions, this continues to be one of the most exciting times for research and study of finance. And over these past 10 years, Princeton's existing finance curriculum has been expanded and improved with the introduction of the Undergraduate Certificate in Finance in 1999 and Master in Finance in 2001. We've steadily added new courses, ranging from venture capital, corporate finance and accounting, alternative investments and hedge funds, financial econometrics and "Wall Street 101" in the early days of our program to portfolio theory and asset management and cases in risk management and, more recently, the addition of courses on the rise of the Asian financial markets, history of financial crises, and regulation of international financial markets.

Center-affiliated faculty members continue to 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 Bendheim Center for Finance has been an ideal environment in which to conduct significant research in finance. It also has served 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, such as at our 10th Anniversary Conference this September, in which Federal Reserve Chair Ben Bernanke will return to campus to address faculty, students, alumni, and friends of the University.

Proximity to Wall Street and other important centers of private-sector financial research continues to provide an additional source of intellectual stimulation and interchange for the Bendheim Center for Finance, and in recent years we have seen outreach and partnership with firms and alumni as far-flung as London, Hong Kong, Shanghai, and beyond. Our students are able to explore both internships and permanent job opportunities in an increasingly wide variety of finance-related areas, which have expanded from a few large Wall Street investment banks at the inception of the program to jobs in firms of all sizes and types around the world. The Bendheim Center for Finance 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 for both undergraduate and master's research projects.

The scholars in the Bendheim Center for Finance 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 Bendheim Center for Finance.

The past 10 years have proven finance's importance to Princeton's continued success as an educational and research institution, given 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 has never been 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 the University 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 Bendheim Center for Finance.

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 will continue to enhance the education, training, and career opportunities of many of the world's best students for decades to come.

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Affiliated Faculty	21	26	29	31	34	34	34	33	31	33	32
	Visiting Faculty and Postdocs		5	7	8	6	5	6	9	13	11	15
	UCF Students	59	82	87	126	113	125	158	129	85	88	89
	MFin Students		25	10	8	9	19	27	32	30	19	25
	MFin Applications		217	299	243	200	296	418	425	660	591	601
	Conference Participants	29	66	58	65	75	85	95	50	107	110	108

#### THE CENTER BY THE NUMBERS

#### 2009-10 DEVELOPMENTS

#### FACULTY

The faculty has grown significantly over the past 10 years as we expanded our focus in finance and broadened our curriculum. While recruiting new faculty has been challenging, since the year 2000 we have added 11 full professors, 4 assistant professors, and 2 associate professors to our faculty roster.

This year JOSÉ SCHEINKMAN taught a new course, FIN 593: Financial Crises, which covered the use of economic theory and empirical evidence to study the causes of financial crises and the effectiveness of policy responses to them. Particular attention was given to some of the major economic and financial crises of the past century and to the crisis that began in August 2007.

In addition, a leading accounting professor, **ROMAN WEIL**, was hired to teach a new course, FIN 590: Financial Accounting, a survey of the concepts and techniques that non-managers use to hold the managers of organized human activity—chiefly corporations—accountable for the resources entrusted to them.

Over the past 10 years, the center's affiliated faculty members have received dozens of prestigious honors ranging from the Nobel Prize to the Fischer Black Prize. This year, MARKUS BRUNNERMEIER received a Guggenheim Fellowship for studying "Financial Frictions and the Macroeconomy." Over the past five years, four faculty members have received Guggenheim fellowships.

#### PH.D. STUDENTS

Seven students with finance interests received their Ph.D.'s in either economics or operations research and financial engineering in 2010 and accepted the following positions:

- YANG FENG: Columbia University, statistics department
- LAUREN HANNAH: Duke University, statistics department
- LEE LING: Oliver Wyman in New York
- FELIPE SCHWARTZMAN: Federal Reserve Bank in Richmond, Virginia, research department
- ZHOU YANG: Goldman Sachs Asset Management, Quantitative Investment Strategies
- KE YU: J. P. Morgan, New York Commodities Group
- ADAM ZAWADOWSKI: Boston University School of Management.

#### UNDERGRADUATE CERTIFICATE IN FINANCE

Now in its 12th year, the Undergraduate Certificate in Finance (UCF) continues to do extremely well, attracting record numbers of students. We enrolled 83 juniors from the Class of 2012. 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; '11, 89. This brings our total number of undergraduate students in the program (juniors and seniors) to 172 this year. We instituted grade requirements starting with the Class of 2008 in order to admit a smaller, more manageable number of students into the program. We awarded 63 Undergraduate Certificates in Finance at graduation this year.

The success of the program has been overwhelming, especially in light of our limited resources for senior thesis advising. When the large size of the UCF stretched our limited advising resources, we worked with the dean of the college to introduce tougher admission requirements in order to cap the size of the program at a more manageable level. Specifically, we now require a minimum B+ average in the three prerequisite courses (mathematics, statistics, and microeconomics), with a minimum grade of B 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 is 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.

TECK HSIEN HO 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 fifth 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 '83 Senior Research Prize was awarded for the second time to the graduating female senior with the highest GPA in UCF course work, NIHONG CHU.

Students earning the UCF are drawn from a wide cross-section of departments on campus, eight in total for the Class of 2010. 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. Thirteen UCF students received departmental prizes; 15 UCF students were elected to Phi Beta Kappa Society; 22 UCF students were elected to membership in Society of Sigma Xi; 13 UCF students were elected to membership in Tau Beta Pi national engineering honor society; and 43 UCF students received academic honors (14 cum laude, 18 magna cum laude, and 11 summa cum laude). Twenty-one of our UCF students earned certificates of proficiency from eight other departments or programs.



<sup>66</sup>The breadth of courses offered was a key highlight of the program. With the classes I took, I was able to experience what it was like to be both a Ph.D. student and an MBA student.<sup>99</sup>

FLORA CHAO LUTZ Financial Officer, International Finance Corporation of The World Bank Master in Finance, Class of 2004

#### MASTER IN FINANCE

The eighth full class of the center's Master in Finance (MFin) program graduated in June 2010 with 28 students. Reflecting the interdisciplinary nature of the Bendheim Center for Finance, 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. The center's faculty members 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.

> <sup>66</sup> The Master in Finance at the Bendheim Center for Finance not only provided me the tools to enter top financial institutions all over the world, but also opened many doors to valuable networking. Great experience for my career and personal life!<sup>97</sup>

> > MARIA ISABEL MÜSSNICH PEDROSO Itaú BBA, São Paulo, Brazil Master in Finance. Class of 2006

Years of continuous investment in the placement of our graduating students continue to pay off. The networking efforts of our director of corporate relations, the continued 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 2010 graduates. By the end of May 2010, 95 percent had accepted permanent employment in financial firms in the midst of a job market that continues to be extremely challenging. This year's graduates continued to interview late in the employment cycle, with offers coming in as late as May. In addition, all of our first-year students 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. In fact, we constantly hear from applicants that placement is one important reason we are their top choice for graduate studies.

Since 2003, our boot camp for incoming MFin students has become a permanent fixture of our program. The boot camp helps our students navigate career options and exposes them to the experiences of alumni now in the workplace. The camp provides a refresher of various finance topics, the types of careers for which the MFin degree prepares students, and networking and interviewing skills, including mock interviews with returning alumni.

The application season proceeded smoothly. The number of MFin applications was up slightly from 591 in January 2009 to 601 in January 2010 (the all-time high of 660 was in 2008). We interviewed 94 of the applicants and made 31 offers of admission (compared to 24 last year). We have continued to conduct interviews of the most promising subset of our applicant pool, a process that 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.

We had 25 acceptances (compared to 19 last year). Our selectivity rate continues to be extremely high, with our program admitting about 5 percent of its applicant pool. This is a much smaller percentage than our peer programs in quantitative finance (Carnegie Mellon University, Columbia University, Massachusetts Institute of Technology, New York University, Stanford University, University of California–Berkeley, University of Chicago, etc.), which typically admit around 25 percent of their applicant pool. Our rate is comparable to the most selective business schools. Our yield (80 percent this year) was also remarkably high, in the middle of our target of 23 to 27 incoming students, despite the absence in most cases of financial aid, which was limited to a total of three one-semester fellowships for one year among the 25 students.

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 keep the MFin program small, although we grew it slightly over the past few 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; and 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.



<sup>66</sup> Princeton combines a world-famous faculty with one of the most powerful alumni networks in finance. There is no other program that gives you this level of access to the leaders in finance, both in academia and in the industry.<sup>99</sup>

> CHAD SHAMPINE Currency Trader, Morgan Stanley Master in Finance, Class of 2003

#### FUNDRAISING

As in past years, 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 DAVID BLAIR '67, WILLIAM JANEWAY '65, and ALFRED HURLEY '75 for their generous gifts to the center.

Looking back, similar gifts from generous alumni have established conferences and symposia, enabled ongoing faculty development, provided scholarships to deserving young students, and refurbished physical spaces important for interaction both inside and outside the classroom.

As we had anticipated during the flush years, our Corporate Affiliates Program has slowed down due to the economic environment and the continued 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 long-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, Citigroup, Crédit Suisse, Goldman Sachs, and UBS/Prediction Company.

#### ADVISORY COUNCIL

Over the past 10 years, the center has relied on the help and advice of prominent alumni working in the financial sector. The ninth annual meeting of the Advisory Council took place on campus on May 6–7, 2010. 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.

7. MLIL

Yacine Aït-Sahalia Otto A. Hack '03 Professor of Finance and Economics Director, Bendheim Center for Finance August 2010



# 2009-10 FACULTY AND STAFF









# 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 the University of Oxford, 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* 75(3), May 2007 (with D. Pearce).
- "Bubbles and Crashes," Econometrica 71(1), January 2003 (with M. Brunnermeier).
- "Bargaining and Reputation," Econometrica 68(1), January 2000 (with F. Gul).
- "Information and Timing in Repeated Partnership," *Econometrica* 59(6), November 1991 (with P. Milgrom and D. Pearce).
- "On the Theory of Infinitely Repeated Games with Discounting," *Econometrica* 56(2), March 1988.

**YACINE AÏT-SAHALIA** is the Otto A. Hack '03 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 member 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* and edited 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

- Dacheng Xiu, "Maximum-likelihood Estimation of Misspecified Microstructure Noise Models"
- · Jia Li, "Testing for Jumps with Noisy High Frequency Data"

#### REPRESENTATIVE PUBLICATIONS

- "Nonparametric Transition-based Tests for Jump-diffusions," *Journal of the American Statistical Association* 104, 2009 (with J. Fan and H. Peng).
- "Estimating the Degree of Activity of Jumps in High Frequency Data," *Annals of Statistics* 37, 2009 (with J. Jacod).
- "Portfolio Choice with a Jump: A Closed Form Solution," *Annals of Applied Probability* 19, 2009 (with J. Cacho-Diaz and T. R. Hurd).
- "Closed-form Likelihood Expansions for Multivariate Diffusions," *Annals of Statistics* 36, 2008.
- "Fisher's Information for Discretely Sampled Lévy Processes," *Econometrica* 76, 2008 (with J. Jacod).

**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

- Tifany 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, July 2008 (with F. Bach and L. El Ghaoui).
- "Model Selection through Sparse Maximum Likelihood Estimation," *Journal of Machine Learning Research* 9, March 2008, (with O. Banerjee and L. El Ghaoui).
- "First-order Methods for Sparse Covariance Selection," *SIAM Journal on Matrix Analysis and Its Applications* 30:1, February 2008 (with O. Banerjee and L. El Ghaoui).
- "Static Arbitrage Bounds on Basket Option Prices," *Mathematical Programming*, Series A 106:3, July 2006, (with L. El Ghaoui).
- "Interest Rate Model Calibration using Semidefinite Programming," *Applied Mathematical Finance* 10:3, September 2003.

**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, 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. 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).
- "Leadership in Groups: A Monetary Policy Experiment," *International Journal of Central Banking*, December 2008 (with John Morgan).
- "It's Broke, Let's Fix It: Rethinking Financial Regulation," paper prepared for the *International Journal of Central Banking* conference, "The theory and practice of macro-prudential regulation," June 2010, forthcoming in an IJCB conference volume.
- "How Central Should the Central Bank Be?" Journal of Economic Literature, March 2010.

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 the Center for Economics and Policy Research, National Bureau of Economics Research, and the CESifo Group, 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 crises, hedge funds, financial regulation, and monetary economics, 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 research in behavioral finance proposes a shift away from the rational expectations paradigm toward "optimal expectations." He is or has been an associate editor of the American Economic Review, Journal of European Economic Association, Journal of Finance, Review of Financial Studies, and Journal of Financial Intermediation. He has won various awards, including the Sloan Research Fellowship and the Smith-Breeden Prize for the best paper published in *Journal of Finance*, 2004, and grants from the National Science Foundation, and he was selected for the Review of Economic Studies tour. He won the 2008 Bernácer Prize for his research on macroeconomics and finance and recently became a Guggenheim Fellow to study the impact of financial frictions on the macroeconomy.

#### 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* 23 (1).
- "Market Liquidity and Funding Liquidity," *Review of Financial Studies* 22(6) (with L. Pedersen).
- "Money Illusion and Housing Frenzies," Review of Financial Studies 21(1).
- "Hedge Funds and the Technology Bubble," *Journal of Finance* 59(5), 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), 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 for Finance, he is responsible for the Master in Finance program. He joined Princeton in 1995. He was granted the "Agregation" of mathematics (federal degree) in 1969, and a "These d'Etat" in probability from the University of Marseille in 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. Carmona was on sabbatical in 2009–10.

#### 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

#### RECENT PUBLICATIONS

- · Indifference Pricing (editor), Princeton University Press, 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. Ludkovski).
- "Gas Storage and Supply Guarantees: An Optimal Switching Approach" (with M. Ludkovski).

**PATRICK CHERIDITO** is an assistant professor of operations research and financial engineering. He received his Ph.D. from ETH Zurich in 2001 and visited universities in Vienna, Paris, Barcelona, and Pisa in the academic year 2001–02, before visiting the Bendheim Center for Finance 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: with Damir Filipovic (University of Munich) and Robert Kimmel (Ohio State University), 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"
- Phillip 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. Filipovic and R. Kimmel).

GREGORY CHOW is a professor of economics, emeritus, 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

- Interpreting China's Economy. World Scientific, 2010; (Chinese edition) Citic Press, 2010.
- · 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*, May 2003 (with C. Lawler).
- Dynamic Economics: Optimization by the Lagrange Method. Oxford: Oxford University Press, 1997.

**ERHAN ÇINLAR** is the Norman J. Sollenberger Professor of Engineering in the Department of Operations Research and Financial Engineering. He came to Princeton 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 TUBITAK. 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. He received the President's Award for Distinguished Teaching during the June 2010 Princeton Commencement ceremonies.

#### 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, 2001 (with M. Caglar).
- "Spectral Expansion of the Occupation Measure for Birth and Death on a Flow," *Stochastic Processes and Their Applications* 74, 1998 (with J. Kao).
- "Dispersion of Particle Systems in Brownian Flows," *Advances in Applied Probability* 28, 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, 2003.

**JIANQING FAN** is the Frederick L. Moore '18 Professor of Finance, and he joined the Department of Operations Research and Financial Engineering in 2003. His research interests are financial econometrics, asset pricing, risk management, nonlinear time series, high-dimensional data analyses, nonparametric modeling, and computational biology. 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; the 2007 Morningside Gold Medal of Applied Mathematics, given triennially to an outstanding applied mathematical scientist of Chinese descent under age 45; and the Guggenheim Fellowship in 2009. 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 talk at the 2006 Madrid International Congress for Mathematicians, a high honor in mathematical sciences. He serves as the co-editor of the *Econometrics Journal* and an associate editor of the *Journal of the American Statistical Association* and *Journal of Financial Econometrics*. He has served as the co-editor (in-chief) of the *Annals of Statistics* (2004–06), and an editor of the *Journal of Multivariate Analysis* (1998–2000) and *Probability Theory and Related Fields* (2003–05). He earned his Ph.D. from the University of California–Berkeley. He served as graduate faculty adviser to the Master in Finance students while René Carmona was on leave.

#### COURSES TAUGHT

- ORF 504/FIN 504: Financial Econometrics
- ORF 245: Statistics for Engineering and Scientists

#### UNDERGRADUATE STUDENTS ADVISED

- · Nihong Chu, "An Investigation of Factors Affecting Real Estimate Price in China"
- Paige Dyan Gillette, "Excessively Conservative Attitudes to Financial Instruments and Low-risk Hedging: A Contextual Model Proposed for the National Budget of Trinidad and Tobago"
- William Harvey, "The Attributes to Win Actions"

#### GRADUATE STUDENTS ADVISED

- · Yang Feng, "High-dimensional Learning and Nonparametric Modeling"
- Ke Yu, "High-frequency Data Based Asset Allocation and Dynamic Covariance Matrix Modeling"

#### POSTDOCTORAL FELLOWS SUPERVISED

- Han Xu
- Ning Hao

#### REPRESENTATIVE RECENT PUBLICATIONS

- "Option Pricing with Model-guided Nonparametric Methods," *Journal of American Statistical Association* 104, 2009 (with L. Mancini).
- "Modelling Multivariate Volatilities via Conditionally Uncorrelated Components," *Journal of Royal Statistical Society* B 70, 2008 (with M. Wang and Q. Yao).
- "Multi-scale Jump and Volatility Analysis for High-frequency Financial Data," *Journal of American Statistical Association* 102, 2007 (with Y. Wang).
- "Aggregation of Nonparametric Estimators for Volatility Matrix," *Journal of Financial Econometrics* 5, 2007 (with Y. Fan and J. Lv).
- Nonlinear Time Series: Nonparametric and Parametric Methods, 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's, 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 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

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

**HAROLD JAMES**, who holds a joint appointment as a professor of international affairs in the Woodrow Wilson School and a professor in the history department, studies economic and financial history and modern German history. He was educated at the University of Cambridge (Ph.D., 1982) and was a fellow of Peterhouse for eight years before coming to Princeton 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 chair 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 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.

- Europe Reborn: A History 1914–2000. London: Longman/Pearson Education, 2003.
- 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.

JAKUB JUREK joined the faculty of the Department of Economics at Princeton in 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. Jurek 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 served as a consultant to Grantham, Mayo, van Otterloo, LLC, a Boston-based investment management company, and the Harvard Management Company.

#### COURSES TAUGHT

- FIN 521: Fixed Income: Models and Applications
- FIN 595: Financial Economics I

#### UNDERGRADUATE STUDENTS ADVISED

- Hyuk Soo Han, "Do Stock Orders Flock Together? An Empirical Analysis of Order Arrival Rates using Hawkes' Self-ting Point Process"
- · Phoebe White, "Post-issuance Drift: Examining Price Dynamics of Municipal Bonds"

#### REPRESENTATIVE PUBLICATIONS

- "The Economics of Structured Finance," *Journal of Economic Perspectives* 23(1) (with J. Coval and E. Stafford).
- "Economic Catastrophe Bonds," *American Economic Review* 99(3) (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, 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) and 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, 2007 (with S. Frederick).
- "Why Hawks Win," Foreign Policy 158, 2007 (with J. Renshon).
- "Developments in the Measurement of Subjective Well-being," *Journal of Economic Perspectives* 20, 2006 (with A. Krueger).
- "Anomalies: Utility Maximization and Experienced Utility," *Journal of Economic Perspectives* 20, 2006 (with R. Thaler).
- *Choices, Values, and Frames.* New York: Cambridge University Press and the Russell Sage Foundation, summer 2000 (with A. Tversky).

**PAUL R. KRUGMAN** is a professor of economics and international affairs. He is the author or editor of dozens of books and several hundred articles, primarily about international trade and international finance. He is also internationally 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. In 2008, Krugman received the Nobel Prize in Economic Sciences. 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

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

**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 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 (1971), Phi Beta Kappa, and the Harvard Business School Alumni Achievement Award for 1984. He has served as the president of the American Finance Association. He received his Ph.D. from Princeton.

#### COURSES TAUGHT

- ECO 362: Financial Investments
- FRS 147: The Stock Market

#### UNDERGRADUATE STUDENTS ADVISED

- · Teong Jun, "Dynamic Indexing"
- · Adam Mikah Malin, "A Rational Theory of Options Backdating"
- · Gang Xu, "Momentum Effects in Chinese Stocks"

#### GRADUATE STUDENT ADVISED

• Nicholas Racculia, "An Economic Analysis of the Venture Capital Industry"

#### REPRESENTATIVE PUBLICATIONS

- "The Clustering of Extreme Movements: Stock Prices and the Weather," *Journal of Investment Management* 7:1, 2009 (with A. Saha and A. Grecu).
- "The Value Effect and the Market for Chinese Stocks," Emerging Market Review 10, 2009.
- The Elements of Investing, New York: Wiley, December 2009 (with C. Elles).
- 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].

**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 in 2005. He taught at the University of Pennsylvania from 1991 to 1998, first as an assistant and then as an associate professor. He joined the Yale University faculty as a professor of economics in 1998. Morris received his Ph.D. in economics from Yale in 1991.

#### REPRESENTATIVE PUBLICATIONS

- "Financial Regulation in a System Context," *Brookings Papers on Economic Activity*, 2009 (with 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).
- "Beauty Contests and Bubbles," *Review of Financial Studies* 19, 2006 (with F. Allen and H. Shin).
- "Central Bank Transparency and the Signal Value of Prices," *Brookings Papers on Economic Activity* 2, 2005 (with H. Shin).

**ULRICH MÜLLER** is an associate 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.

#### COURSE TAUGHT

• ECO 202: Statistics and Data Analysis for Economics

#### GRADUATE STUDENTS ADVISED

- Richard Chiburis
- · Philippe Petalas

#### 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).

**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. Mulvey was on sabbatical during the spring semester.

#### COURSES TAUGHT

· ORF 311: Optimization under Uncertainty

#### UNDERGRADUATE STUDENT ADVISED

• Teck Hsien Ho, "Regime Identification in Stock Markets and Its Application in Stochastic Portfolio Optimization"

#### GRADUATE STUDENTS ADVISED

- Mehmet Bilgili, "Regime Switching: Optimizing a Multi-strategy Hedge Fund via Dynamic Overlays"
- · 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"
- · Lorenzo Reus, "Forming a Portfolio of Investment Tactics"

#### REPRESENTATIVE PUBLICATIONS

- "Evaluating Style Investment: Does a Fund Market Defined along Equity Styles Add Value?" Feature article, *Quantitative Finance*, fall 2009 (with Woo Chang Kim).
- "An Enterprise Risk Management Model for Supply Chains," *Optimization and Logistics Challenges in the Enterprise*, Springer, 2009 (with H. G. Erkan).
- "Applying Stochastic Programming to the Defined Benefit Pension System," *Optimizing the Aging, Retirement and Pension Dilemma*, (eds. M. Bertocchi, S. Schwartz, W. Ziemba), Wiley 2009 (with Z. Zhang).
- "Linking Momentum Strategies with Single-Period Portfolio Models," *Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques*, Springer, 2009 (with W. Kim and M. Bilgili).
- "Assisting Defined-Benefit Pension Plans," *Operations Research* October 2008 (with K. Simsek, Z. Zhang, and F. Fabozzi).

**BIRGIT RUDLOFF** is an assistant professor of operations research and financial engineering. Her research interests include hedging, price bounds and risk measurement in markets with transaction costs, 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 IMPA in Rio de Janeiro and the technical university in Vienna before coming to Princeton in 2006.

#### COURSES TAUGHT

- ORF 535: Financial Risk Management
- 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

- "Set-valued Risk Measures with Random Transaction Costs," 2010, submitted for publication (with A. Hamel, F. Heyde).
- "Testing Composite Hypotheses via Convex Duality," 2010, forthcoming in *Bernoulli* (with I. Karatzas).
- "Coherent Hedging in Incomplete Markets," Quantitative Finance 9 (2), 2009.
- "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).

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 honoriscausa" of 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 beginning in 1997 the Alvin H. Baum Distinguished Service Professor of Economics. From 1987-88, 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
- FIN 593: Financial Crises

#### 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 (with L. Rogers).
- "Executive Compensation and Short-termist Behavior in Speculative Markets," *The Review of Economic Studies* 73, 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 the British Academy. He received his Ph.D. from the University of Oxford in 1988. He was on leave during the academic year 2009–10, serving as an adviser to President Lee Myung-bak of South Korea.

#### COURSES TAUGHT

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

#### REPRESENTATIVE PUBLICATIONS

- "Marking to Market: Panacea or Pandora's Box?" *Journal of Accounting Research* 46, 2008 (with G. Plantin and H. Sapra).
- "Beauty Contests and Iterated Expectations in Asset Markets," *Review of Financial Studies* 19, 2006 (with F. Allen and S. Morris).
- "Disclosure Risk and Price Drift," Journal of Accounting Research 44, 2006.
- "Disclosures and Asset Return," Econometrica 71, 2003.
- "Social Value of Public Information," *American Economic Review*, 52, 2002 (with S. Morris).

**CHRISTOPHER SIMS** has been a professor of economics at Princeton 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 served as president and as 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 U.S. Monetary Policy?" *American Economic Review* 96(1), 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, 2002.
- "The Precarious Fiscal Foundations of EMU," De Economist 147(4), 1999.
- "Error Bands for Impulse Responses," Econometrica 67(5), 1999 (with T. Zha).

**RONNIE SIRCAR** is a professor of operations research and financial engineering. He received his doctorate from Stanford University, and taught for three years at the University of Michigan in the Department of Mathematics before coming to Princeton. He has received continuing National Science Foundation research grants since 1998. He was a recipient of the E-Council Excellence in Teaching Award for his teaching in 2002, 2005, and 2006 and the Howard B. Wentz Jr. Junior Faculty Award in 2003. His research interests center on financial mathematics, stochastic volatility models, credit risk, asymptotic and computational methods, portfolio optimization and stochastic control problems, utility indifference valuation, and stochastic differential games.

#### COURSES TAUGHT

- ORF 335/ECO 364: Introduction to Financial Mathematics
- ORF 538: PDE Methods for Financial Mathematics
- ORF 575: Financial Engineering Seminar

#### GRADUATE STUDENTS ADVISED

- · Edmond Choi, "Credit Risk"
- · Andrew Ledvina, "Oligopolies and Stochastic Differential Games"
- Mike Stein, "Energy Markets"

#### REPRESENTATIVE PUBLICATIONS

- "Dynamic Bertrand Oligopoly," preprint, April 2010 (with A. Ledvina).
- "Games with Exhaustible Resources," to appear in *SIAM Journal on Applied Mathematics*, 2010 (with C. Harris and S. Howison).
- "Multiname and Multiscale Default Modeling," *Multiscale Modeling & Simulation* 7(4), 2009 (with J.-P. Fouque and K. Solna).
- "Exponential Hedging with Optimal Stopping and Application to ESO Valuation," *SIAM Journal on Control and Optimization* 48(3), 2009 (with T. Leung).
- "Optimal Static-dynamic Hedges for Exotic Options under Convex Risk Measures," Stochastic Processes and Their Applications 119(10), 2009 (with A. Ilhan and M. Jonsson).

**DAVID SRAER** joined the faculty at the Department of Economics at Princeton University in 2009 and teaches courses in corporate finance for the master's and the Ph.D. programs. He received his B.S. in applied mathematics and economics from École Polytechnique in 2001 and his Ph.D. in economics from the Toulouse School of Economics in 2007. His research has covered topics such as: the role of collateral value on firms' investment decisions; the importance of family ownership for corporate behavior; the impact of retail investing on idiosyncratic volatility; and the role of dissent in organizations. Sraer is an associate editor for the *Journal of the European Economic Association* and has served as ad hoc referee for leading journals in both economics and finance.

#### COURSES TAUGHT

- ECO 526: Corporate Finance
- FIN 502: Corporate Finance and Financial Accounting.

#### UNDERGRADUATE STUDENTS ADVISED

- · David Knopf, "Lines of Credit and Financing Constraints"
- Ben Kung, "The Dynamics between Payout and Reinvestment Decisions: Corporate Dividend and Capital Expenditure Responses to the Bush Administration's 2003 Dividend Tax Cut"

#### REPRESENTATIVE PUBLICATIONS

- "Performance and Behavior of Family Firms: Evidence from the French Stock Market," *Journal of the European Economic Association* 5 (4), June 2007 (with D. Thesmar).
- "Optimal Dissent in Organizations," *The Review of Economic Studies* 76, 2009 (with A. Landier and D. Thesmar).

**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 Institute of Electrical and Electronics Engineers (1981), a fellow of the Association for Computing Machinery (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 (1984), the School of Engineering Distinguished Teacher Award (1997), and the IEEE Third Millennium Medal (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

#### UNDERGRADUATE STUDENTS ADVISED

These student projects were part of an ongoing project called EOS (Economics via Object-oriented Simulation); see http://eos.cs.princeton.edu.

- Anthony M. DeLuise Jr., "Validating EOS: Developing a Micro-validated Baseline for the Economics via Object-oriented Simulation Framework"
- Michael Adelson, "Extending EOS: Developing and Understanding a Stable Baseline for the Economics by Object-oriented Simulation (EOS) Framework"
- · Chris Rucinski, "EOS: Developing a General Agent-based Economic Simulation"
- · Ye "Cody" Wang, "Agent-based Computational Economics: Building Beyond MinSim"

#### REPRESENTATIVE PUBLICATIONS

- "Soliton-guided Phase Shifter and Beam Splitter," Phys. Rev. A 81, March 2010.
- "Proton Trapping and Transfer with Solitons," *Phys. Rev. A* 79, 021802R, February 2009 (with D. Rand).
- Snipers, Shills, and Sharks: EBay and Human Behavior, Princeton University Press, 2007.
- "Quantum Theory of Manakov Solitons," *Phys. Rev. A* 71, May 2005 (with D. Rand and P. Prucnal).
- "The Spite Motive and Equilibrium Behavior in Auctions," *Contributions to Economic Analysis & Policy*, 2(1), 2003 (with J. Morgan and G. Reis).

**ROBERT VANDERBEI** has been a professor in the Department of Operations Research and Financial Engineering since 1999 and 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, 2003 (with W. Traub).
- "Circularly Symmetric Apodization via Starshaped Masks," *Astrophysical Journal* 590, 2003 (with D. Spergel and N. Kasdin).
- "Frontiers of Stochastically Nondominated Portfolio," *Econometrica* 71(4), 2003 (with A. Ruszczynski).
- 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 has held visiting appointments at Harvard University, Technical University of Delft (the Netherlands), and University of Leuven (Belgium), his undergraduate alma mater, and he 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 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 Niño 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, MIT Press, Cambridge, Mass., and London, England, ISBN 0-262-22026-1, 1983; reprinted in MIT Press Classics Series, 2004.

**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. He was on leave in academic year 2009–10.

#### 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 (with Ulrich Müller), *Econometrica* 76(5), September 2008.

**WEI XIONG** is a professor of economics in the Department of Economics. His research interests center on capital market imperfections. His earlier papers cover speculative bubbles induced by heterogeneous beliefs and short-sales constraints, effects of stock price bubbles on managerial incentives and firm investment, asset market contagion, limited investor attention, non-standard investor preferences, and asset pricing with heterogeneous beliefs. He is currently researching financial crises driven by dynamic coordination problems between creditors, bubbles and short-term credit booms, delegated asset management, and financialization of commodities markets. 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 S500: 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*, 2010 (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 2009–10, the Bendheim Center for Finance welcomed the following visiting faculty:

**TURAN BALI** visited Princeton during the fall and spring semesters. He is the David Krell Chair Professor of Finance at the City University of New York (CUNY). After receiving a Ph.D. from this university, he held a joint position at the finance department of Baruch College and at the Ph.D. program in economics at CUNY. His interests are generally in empirical asset pricing, financial derivatives, and risk management, with a number of applications to time-series econometrics and statistics of stochastic processes. Recently, he also worked on options' implied volatility, skewness, and higher-order moments, with special emphasis on asset pricing.

#### COURSE TAUGHT

• ECO 465/FIN 522: Options and Futures

**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 2008. From 2005–08, he was a senior investment professional and principal at Sansar Capital, one of the largest global long-short equities Asiadedicated hedge funds, which he joined before inception. Prior to Sansar, he spent five years in McKinsey & Company's corporate finance practice in New York and Singapore. He recently published a lead article on the future of hedge funds in *Caijing*, China's preeminent 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 master's 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

**MICHAEL GIBSON** visited Princeton during the spring semester. He came to the University from the Board of Governors of the Federal Reserve System. His fields of interest are risk management, financial markets, and corporate finance. He received his Ph.D. in economics from the Massachusetts Institute of Technology.

#### COURSE TAUGHT

• FIN 591: Cases in Financial Risk Management

**MARC HALLIN** was a visiting research scholar in the operations research and financial engineering department and the Bendheim Center for Finance for the spring and fall semesters. He spent most of his career at the Mathematics Department of the Université libre de Bruxelles. His research interests are in non- and semiparametric inference, the asymptotic theory of statistical experiments, and time series analysis. A fellow of the Institute of Mathematical Statistics and the American Statistical Association, he is member of the Classe des Sciences of the Royal Academy of Belgium.

#### COURSES TAUGHT

- ORF 504: Financial Econometrics
- · ORF 565: Empirical Processes and Asymptotic Statistics

**JEAN JACOD** visited Princeton during the spring semester. He is a professor in the faculty of mathematics of Université Pierre et Marie Curie (Paris-6). After receiving a Ph.D. from this university, he held a position at the École des Mines de Paris in the geostatistics department, then was professor at Rennes and École Polytechnique (Paris), and then at Paris-6 since 1983. His interests are generally in stochastic processes and stochastic integration, with a number of applications to mathematical finance and to statistics of stochastic processes. Recently, he also worked on high-frequency statistics, with special emphasis on financial applications.

#### COURSE TAUGHT

• ECO 575: Topics in Financial Economics

**ASANI SARKAR** was a visiting lecturer in the Department of Economics and taught courses in finance in the undergraduate and master programs. He is also a research officer with the Federal Reserve Bank of New York. He has been a visiting assistant professor of finance at Columbia University and was on the faculty of the School of Business at the University of Illinois–Urbana/Champaign. He received his Ph.D. in economics from the University of Pennsylvania in 1990. His research has covered such topics as: limits to arbitrage, evaluations of the Fed's liquidity programs during the crisis, market liquidity and funding liquidity globally, stock co-movements around index additions, and macro announcement effects. His work has been published in numerous journals such as the *Journal of Finance* and the *Review of Financial Studies*.

#### COURSE TAUGHT

• ECO 462/FIN 515: Portfolio Theory and Asset Management

#### UNDERGRADUATE STUDENTS ADVISED

- Liutong Li, "The Earnings Announcement Effect in the Chinese Stock Markets: A Semistrong Test of the Efficient Market Hypothesis"
- Tiffany Liu, "Executive Compensation during Financial Crises: Comparing Finance and Other Industries"
- Alaap Parikh, "Liquidity-adjusted Asset Pricing in the Global Environment: Evidence from Depositary Receipts"
- Joshua Rosner, "Non-default Risks in Corporate Bonds: An Empirical Analysis of the Corporate Bond/Credit Default Swap Basis during the Subprime Crisis"
- Daniella Turenshine, "The Effect of Being Socially Responsible on the Returns of a Mutual Fund"

#### REPRESENTATIVE PUBLICATIONS

- "The Microstructure of Cross Auto-correlations," *Journal of Financial and Quantitative Analysis*, forthcoming (with T. Chordia and A. Subrahmanyam).
- "Market Sidedness: Insights into Motives for Trade Initiation," *The Journal of Finance* 64(1), February 2009 (with R. Schwartz).
- "Fifteen Minutes of Fame? The Market Impact of Internet Stock Picks," *Journal of Business* 79(6), November 2006 (with P. Antunovich).
- "An Empirical Analysis of Stock and Bond Market Liquidity," *Review of Financial Studies* 18(1) Spring 2005 (with T. Chordia and A. Subrahmanyam).
- "Diversification Benefits of Emerging Markets Subject to Portfolio Constraints," *Journal of Empirical Finance* 10, February 2003 (with Z. Wang and K. Li).

**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 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, he 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. Sexton is a member of the board of directors of Morgan Stanley, and he 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

**MICHAEL SOTIROPOULOS** visited the Department of Operations Research and Financial Engineering during the spring semester as a visiting lecturer. He is the global head of algorithmic trading quantitative research at Bank of America Merrill Lynch. His group focuses on market microstructure and systematic trading research and development. Sotiropoulos joined Bank of America in 2004 as an equity derivatives quant after spending three years at Bear Stearns in the same role. He was head of equities quantitative research in 2008, prior to moving to algorithmic trading. He has a Ph.D. in theoretical physics from Stony Brook University. Prior to joining the finance industry, he taught and worked in quantum field theory and particle physics at the University of Southampton, England, and at the University of Michigan.

**ROMAN WEIL** visited Princeton during the spring semester. He is the V. Duane Rath Professor Emeritus of Accounting at the University of Chicago Booth School of Business. His research interests are in financial accounting, forensic accounting, regulation, financial literacy, and corporate governance. He received his Ph.D. in economics from GSIA/Tepper of Carnegie Mellon University.

#### COURSE TAUGHT

• FIN 590: Financial Accounting
# **VISITING FELLOWS**

The Bendheim Center for Finance welcomed the following visiting fellows during the academic year 2009–10:

**RUIJUN BU** visited Princeton during the spring semester. He received his Ph.D. from the University of Liverpool and is a lecturer in financial econometrics at the Management School. While at Princeton, he worked with Yacine Aït-Sahalia to develop non-linear multivariate models based on Reducible Stochastic Differential Equations (R-SDEs).

**GEORGE HYLDEN** visited Princeton during the spring semester as a visiting student research collaborator. He came from the University of Cambridge in the United Kingdom and worked under the supervision of Markus Brunnermeier. His research focused on deriving the reversed stylized factors on options and portfolios under extreme events in the context of risk management and the empirical application to the dotcom bubble and bust, as well as the subprime boom and crisis.

# STAFF

**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 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 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.

# COURSE TAUGHT

• FRS 178: Modern Financial Markets

# UNDERGRADUATE STUDENT ADVISED

• Jessica Seigel, "Anticipatory Financial Contagion: An Empirical Analysis of U.S. Stock Market Spillovers to East Asia during the Financial Panic of 2007–2008"

**WENDELL COLLINS** is the 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 the University, 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 center 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, iii) facilitating the recruiting activities of corporate affiliates by coordinating on-campus recruiting presentations and organization of events at the center, and iv) promoting and organizing special events involving alumni and advisory council members. She received her undergraduate degree from the University of North Carolina–Chapel Hill.

#### **ELLEN DIPIPPO**

Undergraduate Administrator

# **PHYLLIS FAFALIOS**

Department Manager (retired in 2010 after 31 years of service to Princeton University)

# **KAREN NEUKIRCHEN**

Graduate Administrator

# JESSICA O'LEARY

Department Manager



# PH.D. STUDENTS Graduating 2009-10







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. Seven Ph.D. students graduated in 2010.

**YANG FENG** received his Ph.D. from the operations research and financial engineering department. His thesis was titled "High Dimensional Statistical Learning and Nonparametric Modelling." He was hired as an assistant professor in the Department of Statistics at Columbia University.

**LAUREN HANNAH** received her Ph.D. from the operations research and financial engineering department. She has accepted a postdoctoral position in the statistics department at Duke University.

**LEE LING** received her Ph.D. from the operations research and financial engineering department. She has accepted a position at Oliver Wyman in New York City.

**FELIPE SCHWARTZMAN** received his Ph.D. from the economics department. His research has focused on the impact of financial shocks and financial frictions on production decisions. His job market paper was titled "Time to Produce and Emerging Market Crises." He accepted a position in the research department at the Federal Reserve Bank in Richmond.

**ZHOU YANG** received his Ph.D. from the operations research and financial engineering department. He accepted a position in the Quantitative Investment Strategies group at Goldman Sachs Asset Management.

**KE YU** received his Ph.D. from the operations research and financial engineering department. His dissertation was titled "High Frequency Data Based Asset Allocation and Dynamic Covariance Matrix." He accepted a position at J. P. Morgan in its New York Commodities Group.

**ADAM ZAWADOWSKI** received his Ph.D. from the economics department. His dissertation was titled "Essays in Finance" and analyzed the effects of financial frictions and heterogeneities on financial stability and asset prices. His first chapter showed why mandatory counterparty insurance or a central clearinghouse is needed in order to improve stability of the over the counter derivatives market. Zawadowski is an assistant professor of finance at Boston University School of Management.



# 2009-10 SEMINARS AND CONFERENCES







# **CIVITAS FOUNDATION FINANCE SEMINARS**

Each week, Bendheim Center for Finance organizes a seminar in which academic experts 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 2009

#### September 30

Sanjeev Arora, Princeton University "Computational Complexity and Information Asymmetry in Financial Products"

#### October 6

Liran Einav, Stanford University "Contract Pricing in Consumer Credit Markets"

October 7 Adam Zawadowski, Princeton University "Entangled Financial Systems"

#### October 21

Lars Lochstoer, Columbia University "Limits to Arbitrage and Hedging: Evidence from Commodity Markets"

#### October 28

Bilge Yilmaz, University of Pennsylvania, Wharton School "Communication, Consensus, and Control"

### SPRING 2010

### March 3

Daniel Paravisini, Columbia University "Public Information and Coordination: Evidence from a Credit Registry Expansion"

#### March 10

Stefan Nagel, Stanford University "Evaporating Liquidity"

# March 24

Bruce Carlin, University of California– Los Angeles "Libertarian Paternalism, Information Sharing, and Financial Decision-making"

### March 30

Camelia Kuhnen, Northwestern University (*with Behavioral Economics*) "Affective Learning Systems Independently Contribute to Accumulation of Assets and Debt"

### April 1

Department-wide Seminar Patrick Kehoe, Princeton University "Asset Market Frictions in International Macroeconomics"

#### November 16

Mikhail Chernov, London Business School "Disasters Implied by Equity Index Options"

November 18 Lars Hansen, University of Chicago "Risk Price Dynamics"

#### December 2

Lasse Pedersen, New York University, Stern School of Business "Margin-based Asset Pricing and Deviations from the Law of One Price"

# December 9

Amir Sufi, University of Chicago, Booth School of Business "Household Finance and the 2002 to 2009 Macroeconomic Cycle"

#### December 16

Patrick Bolton, Columbia University "A Unified Theory of Tobin's q, Corporate Investment, Financing, and Risk Management"

#### April 7

Effi Benmelech, Harvard University "Negotiating with Labor under Financial Distress"

#### April 14

Paul Tetlock, Columbia University "Does Public Financial News Resolve Asymmetric Information?"

# April 21

Lauren Cohen, Harvard Business School and National Bureau of Economic Research "Do Powerful Politicians Cause Corporate Downsizing?"

# April 28

Bengt Holmstrom, Massachusetts Institute of Technology "Financial Crises and the Optimality of Debt in Liquidity Provision"

#### May 5

Pierre Collin-Dufresne, Columbia University "On the Relative Pricing of Long Maturity S&P 500 Index Options and CDX Tranches"

# 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, 12:30–1:30 p.m., in the Bendheim Center for Finance library.

# FALL 2009

# September 29

Thomas Eisenbach "Optimal Liquidity Risk" Christophe Spaenjers, Tilburg University "Ex Post: The Investment Performance of Collectible Stamps"

# October 13

Felipe Schwartzman "The Price of Time: Time to Production and the Real Effect of Financial Shocks" Adam Zawadowski "Uncertainty and Liquidity Hoarding in Credit Networks"

# November 24

Jeffrey Wurgler, New York University "The Psychology of Pricing in Mergers and Acquisitions"

# December 1

Dong Beom Choi "Shadow-bank Run and Excessive Risk Sharing" Andrew Robinson "Contracting Externalities and Mortgage Rate Reset"

# SPRING 2010

# February 16

Jia Li

"Small Jumps in Noisy High Frequency Data: A Local-tocontinuity Theory"

# March 2

Karen Lewis, University of Pennsylvania, Wharton School "Differences on Opinion in an International Financial Market Equilibrium"

# March 9

Zhou Yang "Risk-preference vs. Time-preference in Strategic Wealth Spending" Jean-Francois Kagy "On the Use of Credit Risk Models in Macro Stress Testing"

# March 23

Martin Schmalz and Thomas Eisenbach "Dynamic Risk Inconsistency"

# April 6

Andrew Robinson "Home Price Dynamics and the Credit Channel" Weicheng Lian "Financial Intermediation and Housing"

# December 8

Dacheng Xiu "Non-Gaussian Quasi-maximum Likelihood Estimation of GARCH Models" Sergey Zhuk "CEO Compensation and Market Risk"

# December 15

Anastasia Andrikogiannopoulou "Estimating Risk Preferences: Evidence from Online Sports Betting" Ricardo Gambirasio "Debt Management at the Zero Bound: Long-term Debt as a Commitment to Inflate"

# April 13

George Hylden, University of Cambridge "The Reversed Stylized Facts on Options" Dong Beom Choi "Risk Sharing, Financial Fragility, and Liquidity Evaporation"

# April 20

Dacheng Xiu "Volatility and Correlation Estimation using High Frequency Data" Adam Zawadowski "The Consumption of Active Investors and Asset Prices"

# May 4

Thomas Eisenbach "Optimal Liquidity Risk and Aggregate Uncertainty" Felipe Schwartzman "Liquidity Shocks and Firm Decisions"

# May 11

Max Bruche, Centro de Estudios Monetarios y Financieros "Walking Wounded or Living Dead?"

# FIFTH CAMBRIDGE-PRINCETON CONFERENCE

This conference, the fifth 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 18–19, 2009, at the Bendheim Center for Finance.

# SESSION SCHEDULE

# Friday, September 18

Session Chair: Bill Janeway Amir Amel-Zadeh (with Geoff Meeks) "Bank Failures, Market-to-market, and the Financial Crisis" Discussant: Hyun Shin

Harrison Hong (with Ing-Haw Cheng and José Scheinkman) "Yesterday's Heroes: Compensation and Creative Risk-taking" Discussant: Sule Alan

Session Chair: Chris Rogers Andreas Park (with Hamid Sabourian) "Herding and Contrarian Behavior in Financial Markets" Discussant: Wei Xiong

Hyun Shin (with J. Danielson and J. Zigrand) "Risk Appetite and Endogenous Risk" Discussant: John Eatwell

#### Saturday, September 19

Session Chair: Jianqing Fan Elena Medova "Individual Asset Liability Management" Discussant: Harrison Hong

John Mulvey "Dynamic Portfolio Theory: The Role of Replication Strategies for Private Equity" Discussant: Michael Dempster Session Chair: John Eatwell Vanessa Smith (with Nikolaos Demiris) "On the Epidemic of Financial Crises" Discussant: Yacinie Aït-Sahalia

Yacine Aït-Sahalia (with Julio Cacho-Diaz and Roger Laeven) "Modelling Financial Contagion with Mutually Exciting Jump Processes"

Discussant: Mardi Dungey

Session Chair: José Scheinkman Sule Alan "Do Disaster Expectations Explain Household Portfolios?" Discussant: Jakub Jurek

Markus Brunnermeier (with Martin Oehmke) "Maturity Rat Race" Discussant: Ana Babus

Tianhui Michael Li (with L. C. G. Rogers) "A Doubly Bayesian Approach to the Equity Premium Puzzle" Discussant: Jianqing Fan

Ronnie Sircar (with C. Harris and S. Howlson) "Games with Exhaustible Resources" Discussant: Chris Rogers

# PRINCETON-HUMBOLDT FINANCE WORKSHOP 2009

# PERCEIVING AND MEASURING FINANCIAL RISK: CREDIT, ENERGY, AND ILLIQUIDITY

This conference was held in Sherrerd Hall on October 30–31, 2009, and was organized by Jianqing Fan.

# PARTICIPANTS, SESSIONS, AND TOPICS

Session Chair: Yacine Aït-Sahalia "Financial Engineering on Weather and Emissions" Wolfgang Haerdle "Shape Invariant Modeling and Risk Patterns in Brain Analysis" René Carmona "Pricing Options on CO2 Emissions" Brenda Lopez "Pricing of Temperature Risk"

Session Chair: Vladimir Spokoiny "Financial Econometrics I" Yacine Aït-Sahalia "Jump Clustering in Financial Markets" Lei Qi "Non-Gaussian QMLE for GARCH Models"

Session Chair: Ostap Okhrin "Financial Risk, Liquidity, and Integration" Markus Brunnermeier "Co-var" Ulrich Horst and Gokhan Cebiroglu "Hidden Liquidity and the Optimal Use of Iceberg Orders" Wei Xiong "Index Investing and the Financialization of Commodities"

Session Chair: Jianqing Fan "Nonparamatric Estimation and Model Selection" Melanie Schienle "Nonparametric Estimation of Individual Risk Behavior in Euler Equations" Vladimir Spokoiny "Saddle Point Model Selection" Michael Kupper "Risk Preferences and Their Robust Representations" Session Chair: Ronnie Sircar "Risk Control and Hedging" Patrick Cheridito "Equilibrium Pricing in Incomplete Markets under Translation Invariant Preferences" Santiago Moreno "Risk Minimization via Catalogues in a Multiagency, Multiagent Model" Birgit Rudloff "Hedging and Pricing under Transaction Costs"

Session Chair: Santiago Moreno "Financial Mathematics" Ronnie Sircar "Games with Exhaustible Resources" Peter Kratz "Optimal Liquidation in Dark Pools" Gregor Heyne "Cross Hedging with Stochastic Correlation"

Session Chair: René Carmona "Statistical Methods in Finance" Ostap Okhrin "Time-varying Hierarchical Archimedean Copulae and Their Applications" Song Song "Bootstrap Partial Linear Quantile Regression with Confidence Bands"

Session Chair: Wolfgang Haerdle "Financial Econometrics II" Dacheng Xiu "Quasi-Maximum Likelihood Estimation of Volatility with High Frequency Data" Jianqing Fan "Risk Assessment and Asset Allocation with Gross Exposure Constraints for Vast Portfolios"

# FRONTIERS IN FINANCIAL ECONOMETRICS

This conference was co-hosted by the National Centre for Econometric Research (Queensland University of Technology) and the Bendheim Center for Finance. The conference was held on September 25–26, 2009, in the Bendheim Center for Finance classroom. The purpose of the conference was to bring together researchers working on financial econometrics.

# **FRIDAY, SEPTEMBER 25**

Session Chair: Anthony Hall Jean Jacod (with T. Hayashi and N. Yoshida) "Estimation of Volatility with Irregular and Random Sampling" Ken Lindsay "Quasi-maximum Likelihood Estimation of the Parameters of Continuous Stochastic Processes" Jianqing Fan (with Yingying Fan) "Testing and Detecting Jumps Based on a Discretely Observed Process" Session Chair: Wei Xiong Susan Thorp (with Annastiina Silvennoinen) "Commodity, Stock, and Bond Correlations in Calm and Crisis: Evidence from Smooth Transition Models" Andrew Patton (with Michela Verardo) "Does Beta Move with News? Systematic Risk and Firm-Specific Information Flows" Vlad Pavlov "Business Cycles and Stock Market Recoveries" Session Chair: Eric Renault Gael M. Martin (with Catherine S. Forbes and Simone Grose) "Modeling and Predicting Volatility and its Risk Premium: A Bayesian Non-Gaussian State Space Approach" Wei Xiong (with Ke Tang) "Index Investing and the Financialization of Commodities" Mathieu Rosenbaum

"On the Microstructural Hedging Error"

# SATURDAY, SEPTEMBER 26

Session Chair: Jean Jacod Eric Renault (with Prosper Dovonon) "GMM Overidentification Test with First Order Underidentification" Vance Martin (with Yoshihiko Nishiyama and John Stachurski) "A General Hypothesis Test for Stationary Markov Processes" Yongmiao Hong (with Yoon-Jin Lee) "A General Approach to Testing Nonlinear Time Series Models via Generalized Spectrum" Session Chair: Vance Martin Stan Hurn "Forecasting Spikes in Electricity Prices" Renee Fry (with Mardi Dungey and Vance Martin) "Crisis Transmission and Contagion: Which Test to Use?" Yacine Aït-Sahalia (with Julio Cacho-Diaz, Ton Hurd, and Roger Laeven) "Financial Crises and Mutually Exciting Jumps" Session Chair: Stan Hurn Mardi Dungey (with Lyudmyla Hyozdyk) "Bivariate Jump Tests: Evidence from the U.S. Treasury Bond and Futures Markets" Jakub Jurek (with Joshua Coval and Erik Stafford) "The Pricing of Investment Grade Credit Risk during the Financial Crisis" Viktor Todorov (with Tim Bollerslev) "Estimation of Jump Tails" Session Chair: Jianqing Fan Adam Clements "Semi-parametric Forecasting of Realized Volatility" Annastiina Silvennoinen "Determining the Dimension of a Conditional Correlation GARCH Model with Common Dynamics" Daniel Smith "The Stochastic Equicorrelation Mode"

# WORKSHOP ON FINANCIAL ECONOMETRICS

This workshop was organized by Yacine Aït-Sahalia and held on April 23–24, 2010, at the Fields Institute for Research in Mathematical Science in Toronto, Canada. Topics included high-frequency econometric and statistical methods for jump processes, volatility measurement, and market microstructure noise and low-frequency methods to estimate and calibrate derivative pricing models and likelihood-based inference.

# DISTINGUISHED LECTURE SERIES

April 21–23

Darrell Duffie Dean Witter Distinguished Professor of Finance at the Graduate School of Business, Stanford University "Dark Markets"

# WORKSHOP SESSIONS

Friday, April 23

Lars Hansen, University of Chicago "Nonlinear Filtering and Learning Dynamics"

Allan Timmerman, University of California– San Diego "What Is the Shape of the Risk-return

Relation?"

Rossen Valkanov, University of California– San Diego "Robust Measure of Time-varying Skewness at Short and Long Horizons"

Jialin Yu, Columbia University "Option Value of Cash"

Distinguished Lecture Series Darrell Duffie, Stanford University Lecture #3: "Dark Markets"

Robert Engle, New York University "Long Term Skewness and Systemic Risk"

Eric Renault, University of North Carolina– Chapel Hill "A Structural Autoregressive Conditional Duration Model"

Gael Martin, Monash University "Optimal Probabilistic Forecasts for Counts"

Yacine Aït-Sahalia "Modeling Financial Contagion using Mutually Exciting Jump Processes"

Kaddour Hadri, Queen's, Belfast Management School

"Modelling Multivariate Interest Rates using Time-varying Copulas and Reducible Nonlinear Stochastic Differential Equations"

Liuren Wu, Baruch College, New York "A Multifrequency Theory of the Interest Rate Term Structure" Haitao Li, University of Michigan "Exploring Statistical Arbitrage Opportunities in the Term Structure of CDS Spreads"

Suzanne Lee, Georgia Institute of Technology "Jumps and Information Flow in Financial Markets"

Giovanni Urga, Cass Business School, London "Identifying Jumps in Financial Assets with a Comparison between Nonparametric Jump Tests"

Yingying Li, Hong Kong University of Science and Technology "Studying the Leurage Effect Record on

"Studying the Leverage Effect Based on High-frequency Data"

Roberto Reno, University of Siena "Nonparametric Leverage Effects"

Eckhard Platen, University of Technology Sydney

"Empirical Properties of a Well Diversified Global Stock Index"

Marco Bonomo, Getulio Vargas Foundation "Generalized Disappointment Aversion, Volatility Long-run Risk, and Asset Prices"

Robert Kimmel, Ohio State University "On Estimation of Risk Premia in Linear Factor Models"

Joon Park, Indiana University "Asymptotic Theory of Maximum Likelihood Estimator for Diffusion Model"

Stan Hurn, Queensland University of Technology Business "Quasi-maximum Likelihood Estimation of the Parameters of Multivariate Diffusion"

Osnat Stramer, University of Iowa "Bayesian Inference of Discretely Sampled Markov Processes with Closed-form Likelihood Expansions" Paul Schneider, Warwick Business School "Transition Density Approximations for Multivariate Affine Jump Diffusion Processes"

Andrew Lo, Massachusetts Institute of Technology "WARNING: Physics Envy May Be Hazardous to Your Wealth"

Jianqing Fan "Vast Volatility Matrix Estimation using High Frequency Data for Portfolio Selection"

Viktor Todorov, Northwestern University "Estimation of Jump Tails"

Zhibiao Zhao, Penn State University "Nonparametric Model Validations for Hidden Markov Models with Applications in Financial Econometrics" Jean Jacod, Pierre et Marie Curie "Testing for Functional Relationships between Log-price and Volatility"

George Tauchen, Duke University "The Realized Laplace Transform of Volatility"

Jia Li

"A Local-to-continuity Theory for the Preaveraging Method"

Nour Meddahi, Le Centre Interuniversitaire de Calcul de Toulouse

"The Economic Value of Realized Volatility"

Dacheng Xiu "Quasi-maximum Likelihood Estimation of Volatility with High Frequency Data"



# 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, a separate, shorter piece of independent work if there is no possibility of finance content in their senior thesis or junior paper.

We enrolled 83 juniors from the Class of 2012. 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; '11, 89. This brings our total number of undergraduate students in the program (juniors and seniors) to about 172 this year. 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 2010

Total number of certificates awarded: 63 (17 to women or 27 percent)

Major	Number of Students
Chemical Engineering	2
Computer Science	2
Economics	26
Electrical Engineering	4
English	1
History	1
Mathematics	3
Music	1
Near Eastern Studies	1
Operations Research and Financial Engineering	13
Philosophy	1
Physics	3
Politics	1
Woodrow Wilson School of Public and International Affairs	4

# CLASS OF 2011

Total expected number of certificates to be awarded: 89 (27 to women, or 30 percent)

Major	Number of Students
Chemical and Biological Engineering	1
Computer Science	4
Economics	33
Ecology and Evolutionary Biology	1
Electrical Engineering	2
English	1
Geosciences	1
History	2
Mathematics	2
Molecular Biology	2
Operations Research and Financial Engineering	27
Philosophy	4
Physics	2
Politics	1
Psychology	2
Spanish	1
Woodrow Wilson School of Public and International Affairs	3

# DEPARTMENTAL PRIZES, HONORS, AND ATHLETIC AWARDS TO UCF 2010 STUDENTS

# 13 UCF STUDENTS RECEIVED 16 DEPARTMENTAL PRIZES AND HONORS

Paul Boswell, John Martyn Warbeke 1903 Prize in Metaphysics and Epistemology	Yuhong Liu, Applied and Computational Mathematics Independent Project Prize; Central
Nihong Chu, Kathleen Traynor '83 Senior Research Prize	Jersey Section, American Institute of Chemical Engineers Award for Overall Excellence in Chemical
Hyuk Soo Han, Senior Thesis Prize in Finance	Engineering; Kathleen Traynor '83 Senior Research
Teck Hsien Ho, Birch Family Prize; Dr. Frank S.	Prize
Castellana Prize in Operations and Research and	Michael Pizer, G. David Forney Jr. Prize
Financial Engineering	Lena Qiu, Lieutenant John A. Larkin Jr. Memorial
Mary Kate Holman, Senior Thesis Prize in	Prize
Economics	Rajib Quabili, Kusaka Memorial Prize in Physics
Christina Ilvento, Calvin Dodd MacCracken Senior	Yu Xiang, Kenneth H. Condit Prize
Thesis/Project Award	Tiffany Yeh, Senior Thesis Prize in Economics
	Jessica Zhou, Ahmet S. Cakmak Prize

# 15 UCF STUDENTS WERE ELECTED TO PHI BETA KAPPA SOCIETY

Seda Arca (ORF) David Benjamin (ELE) Paul Boswell (PHI) Nihong Chu (ORF) Brandon Hemmelgarn (ECO) Teck Hsien Ho (ORF) Christina Ilvento (COS) Yuhong Liu (CHE) Michael Pizer (ELE) Kenneth Tay (MAT) Dimitrios Vlachos (ORF) Yu Xiang (ORF) Sheng Xu (ORF) Tiffany Yeh (ECO) Jessica Zhou (ORF)

# 22 UCF STUDENTS WERE ELECTED TO MEMBERSHIP IN SOCIETY OF SIGMA XI

Seda Arca (ORF) Arjun Arora (CHE) Laura Bai (COS) David Benjamin (ELE) Andrew Bogorad (PHY) Nihong Chu (ORF) Jason Chua (ORF) Fletcher Heisler (ORF) Tech Hsien Ho (ORF) Christina Ilvento (COS) Kevin Kuang (ORF) Sara Oon (ORF) Sun-You Park (ORF) Michael Pizer (ELE) Rajib Quabili (PHY) Kenneth Tay (MAT) Katherine Thompson (ELE) Ilya Trubov (ORF) Dimitrios Vlachos (ORF) Yu Xiang (ORF) Sheng Xu (ORF) Jessica Zhou (ORF)

# 13 UCF STUDENTS WERE ELECTED TO MEMBERSHIP IN TAU BETA PI NATIONAL ENGINEERING HONOR SOCIETY

Seda Arca (ORF) Arjun Arora (CHE) David Benjamin (ELE) Nihong Chu (ORF) Tech Hsien Ho (ORF) Christina Ilvento (COS) Yuhong Liu (CHE) Michael Pizer (ELE) Ilya Trubov (ORF) Dimitrios Vlachos (ORF) Yu Xiang (ORF) Sheng Xu (ORF) Jessica Zhou (ORF)

# **1 UCF STUDENT RECEIVED A NATIONAL SCIENCE FOUNDATION AWARD**

Daniel Lieber '08 (MOL)

# SENIOR THESES AND INDEPENDENT PROJECTS OF THE CLASS OF 2010

This table shows the senior thesis and independent project titles from the UCF Class of 2010.

Seda Arca	ORF	Dealing with "Friction": Hedging and Superhedging in the Presence of Transaction Costs
Arjun Arora	CHE	Towards Effective Risk Management of Geologic Carbon Sequestration: An Assessment of the Relevance of Geochemical Reactivity to Leakage Risk
Dan Arm	ECO	Economic Serendipity: Israel's Readiness for the Second Coming
Laura Yu Bai	COS	Genetic Algorithms in Agent-based Simulations over Stock Market Data
David Benjamin	ELE	Commercialization of Holographic Data Storage Technology
William Beuttenmuller	ECO	Neither a Borrower nor a Lender Be: Three Empirical Models of the Credit Crisis of 2007–2008
Andrew Bogorad	РНҮ	An Application of Quantum Perturbation Theory of Behavioral Finance
Paul Boswell	PHI	Hard Choices: What to Do with Incomplete Preferences
Michael Chou	ECO	A Comparison of Economic Factors influencing the Taiwanese and U.S. Life Insurance Markets
Nihong Chu	ORF	An Investigation of Factors Affecting Real Estate Price in China
Jason Chua	ORF	Estimating the Risk and Return of Private Equity Investments
Mary Fan	MUS	An Overview of Investor Behavior, Financial Decision Making, and Their Impact on Markets
Anastassia Fedyk	MAT	Predicting Earnings Forecast Errors
Hyuk Soo Han	ECO	Do Stock Orders Flock Together? An Empirical Analysis of Order Arrival Rates Using Hawkes' Self-exciting Point Process
Fletcher Heisler	ORF	Language Processing Techniques for Text Classification: With Applications to the Analysis of Financial News Leading to Trading Strategies
Brandon Hemmelgarn	ECO	The Effect of Exchange Traded Funds on the Comovement of Sectors with Their Constituent Stocks
Teck Hsien Ho	ORF	Regime Identification in Stock Markets and Its Applications in Stochastic Portfolio Optimization
Mary Kate Holman	ORF	The Market Effects of CEO Turnover Announcements: The Impact of Firm Performance and Sector
Kevin Huang	ECO	Central Bank Balance Sheet Expansion: An Analysis of Effects on Financial Markets during Times of Crisis
Christina Ilvento	COS	Analyzing Run-length Patterns in American Stock Price Changes
Phoebe Jin	ECO	The Impact of Changing Temperature on the Profits of Electric Utilities: Empirical Evidence from the Eastern U.S.
Thomas Kontchou	PSY	Debiasing Decision-making: The Effects of Expertise in Attenuating a Linguistically-primed Bias in a Risky Financial Decision Task

Kevin Kuang	ORF	Interest Rate Derivatives Pricing: Risk Neutral Trees
Benjamin Kung	ECO	The Dynamics between Payout and Reinvestment Decisions: Corporate Dividend and Capital Expenditure Responses to the Bush Administration's 2003 Dividend Tax Cuts
Maxwell Kurz	ECO	Assessing the 21st-century China and U.S. Economic Balance: An Event Study on the Impact of Sino-American Economic and Political Announcements on the U.S. Treasury Market
David Levit	WWS	Innovation Finance and the Development of High-technology Industries in the Russian Federation
Arthur Levy	HIS	The 1970 Foreign Bank Secrecy Act: The Balance between Enforcing American Law and Disturbing World Trade
Shuo Li	ECO	Privatization of State-owned Enterprises-analysis of Post-IPO Liquidation of State-owned Shares in China
Yuhong Liu	CHE	Optimal Allocation of Computational Resources for Pricing American Call Options
Christopher Lumry	WWS	Countering Terrorist Financing: Change since 9-11, and Further Need for Improvement
Gregory Mayer	ELE	Ameliorating CDO Market Transparency and the Effect on Transaction Costs and Valuation
Brandon McGinley	POL	The Faults of the National Banking System and the Founding of the Federal Reserve
Daniel Melum	ECO	The Value of International Diversification during a Boom and a Recession
Grayce Mei	ECO	Investing in Money on Walls: The Impact of Wealth in the Art Market
Joseph Montalbano	ECO	Executive Incentives and Restrictions on Equity Unloading
Yang Mou	ECO	Short-sale Bans and Stock Prices
Amit Mukherjee	ECO	Risk, Reward, and Time Preference: Cigarette Smoking and the Wage Conundrum
Farah Naim	NES	Financial Analysis of Reconstruction Projects in Afghanistan: Case Studies of the First Microfinance Bank and Roshan Telecommunications
Sara Oon	ORF	Sovereign Wealth Funds: Their Performance in Global Financial Markets and Its Implications for Regulatory Controls
Sun-You Park	ORF	Modeling Locational Spreads of Natural Gas Spot Prices: Impact of Pipeline Capacity, Gas Flow, Temperature, and Storage Level
Rohit Patil	ECO	Bans, Banks, and Bailouts: An International Perspective on the 2008 Financial Crisis
Yingzhi Peng	MAT	A Study on the Relationship between Prices of Copper Futures and Less Liquid Base Metal Futures on LME, 2005–2010
Nikhil Pereira-Kamath	ECO	Inter-firm Partnerships and the Determinants of Acquisitions within the Biopharmaceutical Industry
Michael Pizer	ELE	Identifying and Trading Mean Reverting Portfolios
Lena Qiu	WWS	Beggar-thy-neighbor No More: Implications of the Asian Financial Crisis for Trade Liberalization Strategies
Rajib Quabili	PHY	A Study of Momentum Effects in the Shanghai Stock Exchange
Adan Rubin	ENG	Factors Driving the Returns of Emerging Market Equity Indices

Conor Sutherland	ECO	How Does Tax Structure Affect Aggregate Growth and Investment?
Kejia Tang	ECO	Lay Off the CEO? An Empirical Analysis of the Effects of Layoffs and CEO Turnover on Firm Performance
Kenneth Tay	MAT	Maximizing Expected Logarithmic Utility in a Regime-switching Model with Inside Information
Katherine Thompson	ELE	Commercial Feasibility of Optical Sensing Technology
Ilya Trubov	ORF	Option-implied Market Sentiment
Dimitrios Vlachos	ORF	Stochastic Analysis of Number Games with Jackpots and Sales Forecasting Models for Lottery Operators
Eric Vreeland	ECO	Is Two Really Better Than One? The Effects of Syndication and Location on Entrepreneurial Success
Phoebe White	ECO	Post-issuance Drift: Examining Price Dynamics of Municipal Bonds
Yu Xiang	ORF	Relative Pricing of Options and Defaultable Bonds under Stochastic Volatility
Gang Xu	ECO	Momentum Effects in Chinese Stocks: Can Momentum Add to Size and Value Effects?
Changqing Xu	WWS	The Rise of "China, Inc."? Political Economy of Chinese Mergers and Acquisitions in the United States
Sheng Xu	ORF	Returns and Risks of the Chinese Stock Market: A Discrete State Hidden Markov Model Approach
Tiffany Yeh	ECO	Riches to Rags: Causes and Consequences of Downward Mobility
Richard Zhang	ECO	The Impact of Equity Markets on Corporate Governance of European Soccer Clubs
Yuchen Zhang	ECO	Who's Spending on Fun in America? An Analysis of Leisure Expenditure and Time Use with a Focus on the Effects of Age, Education, and Race
Jessica Zhou	ORF	20 Percent Wind Generation and the Energy Markets



# **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 strategies, 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 Bendheim Center for Finance 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 (a) the prerequisite skills in mathematics, economics, and probability and statistics necessary for the study of finance at a sophisticated level and (b) 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 training in mathematical or quantitative fields such as physics or engineering 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 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, which 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 options 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 (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) exam. Applicants whose native language is not English but who have received their undergraduate education in an Englishspeaking country do not have to submit these scores. Non-native English speakers who graduate with an undergraduate degree from an institution whose language of instruction is English but not in an English-language country must submit scores from either of these tests. All requirements are based on undergraduate education regardless of any graduate education. The Graduate School does not offer waivers of this requirement.

# STATISTICS ON THE ADMISSION PROCESS

# ADMISSION

	Applications	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
January '10	601	31	25

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

	Bachelor	Master	Ph.D.
January '04	85%	14%	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%
January '10	78%	20%	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
January '10	39%	61%	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)	795.74 (800)	606.32 (610)
January '10	Applicants	4.01 (4)	788.34 (800)	566.63 (570)
September '10	Entering Class	4.42 (4.5)	798.95 (800)	597 (590)

# **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.
- 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 for Finance-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. Core courses for students entering the program are:

- · 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	FIN 567: Institutional Finance, Trading, and
Management	Markets
FIN 516: Topics in Corporate Finance,	FIN 568: Behavioral Finance
Corporate Governance, and Banking	FIN 570: Valuation and Security Analysis
FIN 517: Venture Capital and Private Equity	FIN 590: Financial Accounting
Investment	FIN 591: Cases in Financial Risk Management
FIN 518: International Financial Markets	FIN 592: The Rise of Asian Capital Markets
FIN 519: Corporate Restructuring, Mergers,	FIN 593: Financial Crises
and Acquisitions	ECO 414: Introduction to Economic Dynamics
FIN 521: Fixed Income: Models and	ECO 525/FIN 595: Financial Economics I
Applications	ECO 526/FIN 596: Financial Economics II
FIN 522: Options, Futures, and Financial	ECO 575/FIN 575: Topics in Financial
Derivatives	Economics
FIN 523: Forecasting and Time Series Analysis	ORF 527: Stochastic Calculus and Finance
FIN 560: Master's Project I	ORF 530: Statistical Analysis of Large Financial
FIN 561: Master's Project II	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

# 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 424: Interacting with Data 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 503: Basic Numerical Methods for Ordinary and Partial Differential Equations MAT 301/MAE 305: Mathematics in Engineering I (ODE, PDE) MAT 302/MAE 306: Mathematics in Engineering II 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 often 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 riskreturn tradeoffs. Financial engineering is no longer limited to quantitative traders and derivatives specialists, and it 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

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++.

# SELECT 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 Center for Finance-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 590: Financial Accounting**

A survey of the concepts and techniques that non-managers use to hold the managers of organized human activity—chiefly corporations—accountable for the resources entrusted to them. Alerts students to the judgments and assumptions that regulators and managers make in that process, even when the managers wish to report honestly. Explores the methods that the managers of resources can (and often do) use to lie about their actual performance. While this course aims to make you a sophisticated user, not producer, of financial statements, you must master some record keeping procedures and vocabulary in order to be the boss, not the servant.

#### 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. The 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. The 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. The course also explicitly considers the policy decisions faced by the U.S. and Chinese governments relative to existing global imbalances.

#### FIN 593: Financial Crises

This course uses economic theory and empirical evidence to study the causes of financial crises and the effectiveness of policy responses to them. Particular attention is given to some of the major economic and financial crises of the past century and to the crisis that began in August 2007.

# 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 yearlong 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 percent of our 2010 graduates being placed in finance industry jobs (with just one student yet to be placed) and 100 percent internship placement. The candidates for the Master in Finance receive support and assistance with their postgraduate career planning from a coordinated program of resources, including Princeton's Office of Career Services and the Bendheim Center for Finance's directors of corporate relations, Wendell Collins and David Blair. They also benefit from support from our Corporate Affiliates Program and Advisory Council.

# OUR GRADUATES WILL BE PURSUING THEIR CAREERS AT:

Bank of America Merrill Lynch, Hong Kong Bank of Colombia, Bogota Bank of Montreal Trading Desk-Commodities, Chicago BNP Paribas, New York City Boston Consulting Group, New York City BTG Pactual, New York City Cenario Capital Management, New York City CICC, Beijing, Investment Banking Citi Quantitative Strategies, New York City Citigroup Global Markets Asia, Hong Kong Development Bank of Singapore, Singapore Fortress Investment Group, New York City GIC, Singapore Goldman Sachs Asset Management, New York and London

Goldman Sachs Equity Derivatives, Hong Kong HSBC London, Structured Products J. P. Morgan Management Associate Program, New York City Kepos Capital, New York City Ministry of Finance, Paris Ministry of Finance, Singapore Morgan Stanley Interest Rates Derivatives Trading, New York City Price Waterhouse Coopers, London Shanghai Stock Exchange Square Consulting, Chicago UBS, London

# OUR FIRST-YEAR STUDENTS HAVE OBTAINED SUMMER INTERNSHIPS AT:

BNP Paribas Sales and Trading, New York City Citigroup Global Markets, Financial Strategies, New York City Credit Suisse M&A, Singapore Goldman Sachs Asset Management, London Goldman Sachs Securities, New York City Goldman Sachs Asia Pacific Investment Banking, Hong KongJ. P. Morgan, Fixed Income Sales and Trading, New York CityMorgan Stanley Fixed Income Sales and Trading, New York City

# FELLOWSHIPS AWARDED

The Gerhard R. Andlinger '52 Graduate Fellowship in Finance was awarded to BOUCHRA EZZAHRAOUI. Ezzahraoui came to Princeton from the French École Nationale de la Statistique et de l'Administration Economique (ENSAE), where she majored in applied mathematics to statistics, economics, and finance. She interned at Goldman Sachs in its securities division in New York City.

The Bendheim Graduate Fellowship in Finance was awarded to YIBIAO CHAI. Chai came to Princeton from Fudan University in Shanghai, where he majored in computer science, and then École Polytechnique in France, where he specialized in applied mathematics. He has accepted a position in corporate equity derivatives structuring with HSBC London.

# MFIN MATH CAMP/BOOT CAMP

For the fifth year, the Bendheim Center for Finance conducted a two-week "math camp" program, August 31–September 11, taught by Xing Hu. 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 Master in Finance degree prepares students, and some useful information on interviewing and networking skills. Boot camp presenters included the Bendheim Center for Finance faculty, Master in Finance alumni, and speakers from the financial services industry. This program was 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 2009, the program's agenda was as follows:

# **SATURDAY, SEPTEMBER 12**

Introduction and Career DevelopmentPanel DiscusOverview—Wendell Collinson CareersStructure of Modern Investment Bank—Practices—David BlairItau BBA; 0Do's and Don'ts: A Short Guide to EmploymentNestor MatEtiquette and Networking Best Practices—Credit SuisWendell Collins and David BlairMock IntervThe Recruiting Landscape—Chris Resto,GETCO

# **MONDAY, SEPTEMBER 14**

- Interest Rate Products Electronic Trading— Isaac Chang, Vice President, Goldman Sachs Portfolio Management, U.S. Fixed Income—
- John D. Naud, Director, Citadel Career Services Presentation—Amy L.
- Pszczolkowski and Anthony Chiapetta Economic and Finance Library Resources— Todd Hines
- Risk Strategy and Quantitative Analysis—Tobias Falk, Director, Credit Suisse

# **TUESDAY, SEPTEMBER 15**

Princeton Investment Company—Andy Golden,<br/>PresidentSymons, Vice President, Global Head of<br/>Quantitative Finance Recruitment; and<br/>Stefanie Wade, Associate, Quantitative<br/>Finance RecruitmentPanel from Morgan Stanley IDEAS—<br/>Joe Langsam, Managing Director, Global<br/>Head of Modeling; Eric Pan, Executive<br/>Director, Fx Desk Strategist; LeightonSymons, Vice President, Global Head of<br/>Quantitative Finance Recruitment; and<br/>Stefanie Wade, Associate, Quantitative<br/>Finance RecruitmentInterest Rate Structuring—Cyril de Lambilly,<br/>Director, BNP Paribas, New YorkDirector, BNP Paribas, New York

Panel Discussion among Recent Graduates on Careers in Finance and Job Search Best Practices—Maria Isabel Müssnich Pedroso, Itau BBA; Chad Shampine, Morgan Stanley; Nestor Macias, J-MAC Capital; Amar Sujanani, Credit Suisse; and Theo Kim, PRINCO Mock Interviews with Roundtable Participants

- J. P. Morgan Fixed Income Strategy—Anthony Heading, M.D.
- Opportunities in Financial Engineering and Market Strategy—Terry Benzschawel, M.D., and Arnold Miyamoto, M.D., Citi



# ADVISORY COUNCIL AND SUPPORTERS



# **ADVISORY COUNCIL**

The Advisory Council for the Bendheim Center for Finance is made up of a group of distinguished leaders in the financial industry. The council meets on campus once a year. In 2010, the meeting took place on May 6–7. 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.

# COUNCIL MEMBERS

**Gerhard R. Andlinger** *Chairman of the Board* Andlinger & Company, Inc.

**Hamid Biglari** *Vice Chairman* Citicorp

**John C. Bogle** *President* Bogle Financial Markets Research Center Vanguard

**Richard H. Bott** Vice Chairman (retired) Morgan Stanley Investment Banking Division

John L. Cecil Chairman and Chief Executive Officer Eagle Knolls Capital

**Christopher A. Cole** *Managing Director* Goldman, Sachs & Co.

Howard E. Cox Jr. General Partner Greylock Management Corporation

**David A. DeNunzio** Vice Chairman, Mergers and Acquisitions Crédit Suisse

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**John K. Hepburn** Advisory Vice Chairman Morgan Stanley & Co. Kenneth Hersh Chief Executive Officer NGP Energy Capital Management

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**Heidi G. Miller** *Executive Vice President and Chief Executive Officer* JPMorgan Chase

Jeffrey M. Peek (Chair) Former Chief Executive Officer and Chairman of the Board of Directors CIT Group Inc.

Jerome H. Powell Managing Partner for North America Global Environment Fund

**Lynn Bendheim Thoman** *Co-president* Leon Lowenstein Foundation

# **CORPORATE AFFILIATES PROGRAM**

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

# 2009-10 PARTNERS

Barclays Capital Citadel Investments Group Citigroup Crédit Suisse Goldman Sachs J. P. Morgan Morgan Stanley Prediction Company, LLC (subsidiary of UBS)

# BENEFITS

- · Annual Report of the Bendheim Center for Finance
- Opportunity to advertise internships and employment opportunities to both Undergraduate Certificate in Finance and Master in Finance students
- · Opportunity to use the Bendheim Center for Finance facilities to host recruiting events
- Access to the Bendheim Center for Finance director of corporate relations as a resource for recruiting
- Recognition in the publicly disseminated materials of the Bendheim Center for Finance, including the center's reports and website, which both list corporate affiliates, as well as a hyperlink to each member's website
- Access to research authored by the center's affiliated faculty within the academic year
- Access to Bendheim Center for Finance faculty for internal or client presentations or for sponsored research
- Opportunity to work with the center's 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 Bendheim Center for Finance-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 Leon 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 Bendheim Center for Finance 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 minimum

# PHYSICAL SPACE

Director's Office \$100,000

Graduate Student Suite \$100,000
# **ACKNOWLEDGMENTS 2009-10**

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

### INDIVIDUAL SPONSORS

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