

SoFiE Summer School, Chicago

Machine Learning and Finance: The New Empirical Asset Pricing

July 23-27, 2018

University of Chicago Campus, Chicago, IL

Organizing Committee

- Professor Bryan Kelly, Yale School of Management, **Lecturer** in the Summer School
- Professor Dacheng Xiu, Booth School of Business, University of Chicago, **Lecturer** in the Summer School
- Professor Per Mykland, Director, Stevanovich Center for Financial Mathematics

Sponsors

- Stevanovich Center for Financial Mathematics, University of Chicago
- Becker Friedman Institute for Economics, University of Chicago
- Society for Financial Econometrics (SoFiE)

Dates

Start date: Monday, July 23, 2018 at 12pm (noon)

End date: Friday, July 27, 2018 at 12pm (noon)

The summer school will include:

- Monday through Friday: three hours of lectures per day
- Tuesday, Wednesday, Thursday afternoons: three hours of selected presentations by participants.

Applications

Your application should include a full **CV** and a **motivation letter** of half a page (up to 200 words) explaining why attending this Summer School would be helpful to your research/work.

Applicants are strongly encouraged to present some of their own work during the afternoon sessions. If you'd like to present during the summer school, please submit a **paper or a long abstract** along with your application. All topics in empirical asset pricing, financial econometrics, quantitative finance, and machine learning are acceptable. Preference will be given to topics that are in line with the theme of the summer school. Papers/presentations will be selected by the organizing committee.

Registration

Once you receive an email confirming your participation, you'll be asked to:

- Submit your payment for the Summer School (which includes attending classes, lunches, and social events)
- Show proof of membership to SoFiE

Timeline

- March 1- 31, 2018 Submit your application to attend the summer school
- April 1-15, 2018 Selection Committee reviews applications
- April 15-30, 2018 Applicants receive email notifications re. applications
- June 15, 2018 Deadline to register
- July 22, 2018 Early arrival (optional)
- July 23-27, 2018 Summer school

Summer School Fees

- \$250 for students
- \$500 for early career academics
- \$1,500 for professionals

Please note: all selected participants are expected to be members of SoFiE, the [Society for Financial Econometrics](#).

Title

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Outline

Lecture 1: Introduction to empirical asset pricing: a summary of the literature on two mainstream topics.

Lecture 2: (Classical) econometric toolkits in asset pricing: predictive regressions, two-pass (Fama-MacBeth) regressions, stochastic discount factor approach, testing, and their limitations.

Lecture 3: Latent Factor approach to the cross-section of expected returns: from characteristics to risk exposures.

Lecture 4: Latent Factor approach to the cross-section of expected returns: a three-pass approach to risk premia estimation.

Lecture 5: Expected returns: PCA, PLS, and other linear models.

Lecture 6: Expected returns: from nonparametric to trees and neural nets.

Lecture 7: Curses of data mining: data snooping bias, multiple testing concerns, omitted variable bias, taming the factor zoo.

Lecture 8: Data mining beyond structured data: text as data.

Reading List

Bai, J. and S. Ng (2002). Determining the number of factors in approximate factor models. *Econometrica* 70, 191–221.

Bai, J. (2003). Inferential Theory for Factor Models of Large Dimensions. *Econometrica* 71 (1), 135–171.

Cochrane, J. H. (2009). *Asset Pricing*:(Revised Edition). Princeton university press.

Connor, G. and R. A. Korajczyk (1986). Performance measurement with the arbitrage pricing theory: A new framework for analysis. *Journal of Financial Economics* 15(3), 373–394.

Connor, G. and R. A. Korajczyk (1988). Risk and return in an equilibrium APT: Application of a new test methodology. *Journal of Financial Economics* 21(2), 255–289.

Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33(1), 3–56.

Fama, E. F. and K. R. French (2015). A five-factor asset pricing model. *Journal of Financial Economics* 116(1), 1–22.

Feng, G., Giglio, S. W. and Xiu, D. (2017). Taming the Factor Zoo. Technical report, University of Chicago.

Giglio, S. W. and Xiu, D. (2016). Inference on risk premia in the presence of omitted factors. Technical report, University of Chicago.

Gospodinov, N., R. Kan, and C. Robotti (2014). Misspecification-Robust Inference in Linear Asset-Pricing Models with Irrelevant Risk Factors. *The Review of Financial Studies* 27(7), 2139–2170.

Gu, S., Kelly, B., and Xiu, D. (2018). Empirical Asset Pricing via Machine Learning. Technical report, University of Chicago.

Harvey, C. R., Y. Liu, and H. Zhu (2016). ...and the Cross-Section of Expected Returns. *The Review of Financial Studies* 29 (1), 5 - 68.

Kelly, B. and S. Pruitt (2013). Market expectations in the cross-section of present values. *The Journal of Finance* 68(5), 1721–1756.

Kelly, B. and S. Pruitt (2015). The three-pass regression filter: A new approach to forecasting using many predictors. *Journal of Econometrics* 186(2), 294–316.

Kelly, B., S. Pruitt, and Y. Su (2017). Characteristics are risk exposures. Technical report, University of Chicago.

Stock, J. H. and M. W. Watson (2002a). Forecasting Using Principal Components from a Large Number of Predictors. *Journal of the American Statistical Association* 97(460), 1167–1179.

Stock, J. H. and M. W. Watson (2002b). Macroeconomic Forecasting Using Diffusion Indexes. *Journal of Business & Economic Statistics* 20(2), 147–162.