

## One-Day In-House Course

# Assessing Factor Models with Random Matrix Theory

### DESCRIPTION

This 1-day course teaches Random Matrix Theory, a tool that allows to determine the optimal number of factors and to discriminate between factors with explanatory power and factors with predictive power.

Participants will learn the basics of Random Matrix Theory and will acquire a working knowledge of how to apply the theory to enhance the forecasting power of their factor models. In particular, participants will learn how to:

- Compute the signal-to-noise ratio of factor models
- Use Random Matrix Theory to understand the factor structure of cross correlations of returns
- Use Random Matrix Theory to understand the factor structure of auto cross correlations of returns
- Select factor models with the most explanatory power
- Select factor models with optimal forecasting power

During the class, participants will learn how to apply the above techniques to a large universe of stocks. For demonstration purposes, we will use the Russell 1000 and simulations.

Participants will receive the Matlab programs used to perform simulations and illustrations.

### PROGRAM

#### What's new in linear factor analysis?

- State-of-the-art theory of approximate linear factor models
- Estimation of the benchmark PCA-based factor model of the Russell 1000
- The sample distribution of factors
- Confidence bands of factors for the Russell 1000

#### Information Theory & Random Matrix Theory

- Information Theory applied to factor models
- Random Matrix Theory applied to linear factor models
- The signal-to-noise ratio of factor models
- Free probabilities

#### Market factor structure

- How many factors in our universe? (we will examine the Russell 1000)
- The cross-correlation factor / idiosyncratic structure of the Russell 1000
- The auto cross-correlation factor / idiosyncratic structure of the Russell 1000
- Dynamic vs static factors

#### Determining the optimal model

- In-sample vs out-of-sample properties of factor models
- Assessing the explanatory power of factors
- Assessing the forecasting power of factors
- Determining the optimal factor model

## **RECOMMENDED READING**

Bai and Ng, *Large Dimensional Factor Analysis*, Now Publishers Inc., 2008.

## **PROFILE OF THE LECTURER**

Sergio Focardi is a partner of The Intertek Group and consults and trains on quantitative methods in equity portfolio management. Sergio is a member of the Editorial Board of the *Journal of Portfolio Management* and co-author of the CFA Institute's recent monograph *Challenges in Quantitative Equity Management* (Fabozzi, Focardi and Jonas, May 2008) as well as the Institute's *Trends in Quantitative Finance* (2006) and of the award-winning books *Financial Modeling of the Equity Market* (Fabozzi, Focardi and Kolm, Wiley, 2006) *The Mathematics of Financial Modeling and Investment Management* (Focardi and Fabozzi, Wiley, 2004) and, more recently, *Financial Econometrics* (Rachev, Mittnik, Fabozzi, Focardi and Jasic, Wiley, 2007).

Sergio has implemented long-short equity portfolio selection applications based on dynamic factor analysis. His research interests include the econometrics of large equity portfolios and the modeling of regime changes.

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