

# Financial Risk Forecasting Introduction

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To accompany  
*Financial Risk Forecasting*  
FinancialRiskForecasting.com  
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# Financial risk forecasting

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# Practical Quantitative Methods in Finance

1. Theoretic concepts of risk
2. Time series models of the stochastic properties of asset prices
3. Methods for evaluating the quality of forecasts (backtesting)
4. Applications with observed financial data, for example, stock prices
5. A statistical programming language
6. Analysis of the outcomes with respect to the original objectives
7. Analysis of tail observations
8. Market risk regulations
9. Artificial intelligence, extremes and crises

# Material

- Essential reading
  1. Main Textbook: *Financial Risk Forecasting*, Wiley Finance, Jon Danielsson, 2011
  2. Code and R notebook on [FinancialRiskForecasting.com](https://FinancialRiskForecasting.com)
  3. These slides
- Further reading
  5. Peter Christoffersen, 2011, "Elements of Financial Risk Management", Academic Press; 2nd edition.
  6. Alexander J. McNeil, Rüdiger Frey, Paul Embrechts, 2015, "Quantitative Risk Management: Concepts, Techniques and Tools", Princeton Series in Finance.
  7. Ruey S. Tsay, 2011, "Analysis of Financial Time Series", 3rd Edition, Wiley.

# Book Overview

**Chapter 1** Financial markets, prices and risk

**Chapter 2** Univariate volatility modelling

**Chapter 3** Multivariate volatility models

**Chapter 4** Risk measures; volatility, Value-at-Risk (VaR), Expected Shortfall (ES)

**Chapter 5** Implementing risk forecasts

**Chapter 6** Analytical VaR for options and bonds

**Chapter 7** Simulation methods for VaR for options and bonds

**Chapter 8** Backtesting and stress testing

**Chapter 9** Extreme Value Theory

**Chapter 10** Endogenous risk

**Chapter 11** Financial regulations [not in *Financial Risk Forecasting* ]

**Chapter 12** Machine learning and artificial intelligence [not in *Financial Risk Forecasting* ]

## LSE course coverage

- We cover all Chapters except 9, Extreme Value Theory
- We cover all Sections in those chapters except Copulas in Chapter 1

# The Programming Language In This Course; R

- We *do not* assume you have any knowledge of programming
- But expect you are willing to learn a programming language
- Excel is useless for what we are trying to do here
- Four main software choices
  1. Matlab
  2. Python (Numpy)
  3. Julia
  4. R – what we use in this course
- Daily risk forecasts [extremerisk.org](http://extremerisk.org)
- For learning R, see links on [FinancialRiskForecasting.com/notebook](http://FinancialRiskForecasting.com/notebook)

# Financial Data Sources

See list on [FinancialRiskForecasting.com/notebook/Background/FinancialData](https://FinancialRiskForecasting.com/notebook/Background/FinancialData)

1. [EOD historical data](#)
2. [finance.yahoo.com](https://finance.yahoo.com)
3. [wrds.wharton.upenn.edu](https://wrds.wharton.upenn.edu) (CRSP)
4. Bloomberg
5. [db.nomics.world](https://db.nomics.world) – good economic data but not much financial data

With data you get what you pay for. The cheaper data sources will have errors and gaps in coverage. Bloomberg and WRDS are very reliable, but also very expensive.

LSE lectures are based on WRDS (see next slide).



# WRDS

- For this course, it is essential to register for a WRDS (Wharton Research Data Services) account. This is done by going to <https://wrds-www.wharton.upenn.edu/register/> and completing the requested details. In the department field, enter the module code to ensure easy authorisation by the Library, which is usually done within 2 working days. Do NOT write Department of Finance in the department field as this will delay the account authorisation due to procedures that have to be followed as part of LSE's contracts with suppliers. Once authorised by the Library, your WRDS account will expire on 20 June 2025.

## Pre-Requisites

- A solid understanding of statistics, including means, variances, skewness, kurtosis, distribution functions, probability densities, quantiles, conditional probability, conditional expectations, Bayes's rule
- Linear algebra, like in matrix multiplication
- Calculus, especially as applied to distributions
- Basic concepts of financial markets, such as types of assets, like equities, foreign exchange, fixed income assets and derivatives, as well as dividends and interest rates.
- Bonds and options, including the mathematical equations for getting their price