## **FIN7028 Advanced Financial Data Analytics**

## 📌 Introduction

Statistics is the science of **uncertainty and variation**.  This course is about the statistics used in the Advanced analysis of time-series data used for economic and financial problems. This course aims to teach students to apply time series financial econometrics techniques sensibly in the context of real-world empirical problems.

## 📣 Module Coordinator

Your module coordinator is Barry Quinn ([b.quinn@qub.ac.uk](mailto:b.quinn@qub.ac.uk)).

## 🔎 Module Contents

Aims to deepen participants' understanding of financial predictions and decision-making by exploring the revolutionary impact of combining econometrics, Bayesian methods, and machine learning in financial analytics.  This course integrates machine learning, classical financial time series econometrics, and Bayesian methods to tackle complex financial problems characterised by uncertainty and conflicting objectives. It does this by covering:

**Financial Markets as Predictive Systems**: It emphasises understanding market prices as reflections of predictions about future asset payoffs and risks, highlighting the predictive nature of financial markets

**Classical Econometrics in Finance**: Covers traditional financial time series models such as ARIMA and GARCH, acknowledging their strengths in historical data analysis and noting limitations with complex modern datasets.

**Bayesian Methods for Financial Analytics**: Introduces Bayesian methods for their probabilistic approach, enabling the incorporation of prior knowledge and continuous updating with new data, which is crucial for adapting to dynamic financial markets.

**Machine Learning's Role:** Explores the role of machine learning in processing large datasets and accurately modelling the complexities of financial markets, complementing traditional econometrics and Bayesian approaches.

**Theoretical Foundations**: Discusses machine learning and Bayesian methods' foundational principles, including overparameterisation, regularisation, and probabilistic modelling, to tackle high-dimensional data and uncertainty.

**Synergy of Approaches**: Highlights the comprehensive toolkit formed by combining econometrics, Bayesian methods, and machine learning to address the intricacies of financial markets effectively.

**Growth Mindset in Learning Financial Analytics**: Advocates for adopting a growth mindset for learning advanced financial data analytics, emphasising embracing challenges, persisting through setbacks, leveraging criticism, and finding lessons in others' success.

**Benefits of a Growth Mindset**: Details the advantages of a growth mindset, such as improved performance, resilience, collaboration, adaptability, and a long-term focus on sustainable learning habits.

**Developing a Growth Mindset**: Offers practical suggestions to foster a growth mindset, including setting clear goals, tracking progress, seeking new learning opportunities, engaging with peers, and viewing mistakes as learning opportunities.

**Empowering Learners**: The course is designed to equip participants with the necessary insights and tools to navigate the sophisticated realm of financial analytics, encouraging a lifelong commitment to learning and development in the field.

[Follow this link to access all the course materials](https://canvas.qub.ac.uk/courses/25549/pages/please-read-carefully)

## ⭐ What are my learning outcomes?

1. We are rethinking econometrics as a science of uncertainty and variation.
2. Understanding and exploiting the stylised facts of financial data to make more intelligent economic predictions.
3. The appropriate use of dashboard analytics in advanced financial data analytics.
4. Introduction to open science principles of advanced financial data analytics. (see skills)
5. Learn to be experimental, iterative, curious, and resilient in analytic practices.
6. Work independently or in groups towards an empirical goal.

## 🏅 How will my skills be enhanced?

This module will help you to develop the following skills:

1. Introduction to the “tidy” data principles of Hadley Wickham in Posit.
2. Introduction to literate programming using the [“tidyverse” programming style guide](https://style.tidyverse.org).
3. Introduction to cloud computing using [Posit Professional Products](https://rstudio.com/products/team/).
4. Introduction to reproducible research using [open-source scientific and technical publishing system](https://quarto.org) and git version control.
5. Introduction to [interactivity](https://quarto.org/docs/interactive/) in advanced financial data analytics.
6. The ability to work independently to glean meaning from noisy financial data.

## ✅ How will the module be assessed?

Assessment of this module will comprise:

|  |  |  |
| --- | --- | --- |
| **Assessment Type** | **Weight (%)** | **Description** |
| Assignment | 50 | Critical Essay |
| Computer Practical | 50 | Computer-based exam |

## 📚 Self-Study

* How videos are provided for step-by-step guides to analytics task
* Interactive analytics tutorials have been created
* Students will use R statistical programming and have access to state-of-the-art cloud computing [Posit Cloud](https://www.rstudio.com/products/cloud/) technologies via the [Q-RaP (Queen's management school Remote Analytics Platform)](https://www.quinference.com/qrap/).

## 📝 Additional Guidance

* Weekly one-to-one coding clinics
* The companion live textbook is written specifically for this course (for in-detail course material)

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