UNIVERSITY OF WESTMINSTER

WESTMINSTER BUSINESS SCHOOL

PREDICTIVE ANALYSIS FOR DECISION MAKING

(7FNCE044W)

Module Handbook

WBS

Academic Year 2023/24 Semester 2

1. Module Organisation

Module Code: 7FNCE044W

Module Status: Core on MSc FinTech with Business Analytics

Dr Issam Malki
Module Leader
Room C370
Lectures and Seminars: Wednesday 9am – 12 noon (M310).
Email: i.malki@westminster.ac.uk
Office Hours: Tuesday 11:15 – 13:15 (Onsite/ online).

2. Teaching Plan[1]

Learning Week 1: (22/01) "Extending Linear Regression I". References: BK Ch8. ***Brooks Ch 5, Diebold Ch 4 and 8.***

***Seminar Activity*:** Seminar 1.

Learning Week 2: (29/01) "Extending Linear Regression II". References: References: BK Ch9, ***Brooks Ch 5, Diebold Ch 4 and 8.***

***Seminar Activity*:** Seminar 2.

Learning Week 3: (5/02) "Extending Linear Regression III". References: BK Ch10. ***Brooks Ch 5, Diebold Ch 4 and 8.***

***Seminar Activity*:** Seminar 3.

Learning Week 4: (12/02) "Endogeneity and Instrumental Variable Estimator I". References: ***Diebold Ch 10***, ***Brooks Ch 7.***

***Seminar Activity*:** Seminar 4.

Learning Week 5: (19/02) "Endogeneity and Instrumental Variable Estimator II". References: ***Diebold Ch 10***, ***Brooks Ch 7.***

***Seminar Activity*:** Seminar 5.

Learning Week 6: (26/02) "Modelling Time Series: Notation and Key Concepts ". References: ***Diebold Ch 11*- 12, *Brooks Ch 6.*** BK Ch 12.

***Seminar Activity*:** Seminar 6.

Learning Week 7: (4/03) "Modelling Time Series: ARMA Models I". References: ***Diebold Ch 11*- 12, *Brooks Ch 6.***

***Seminar Activity*:** Seminar 7.

Learning Week 8: (11/03) "Modelling Time Series: ARMA Models II". References: ***Diebold Ch 11*- 12, *Brooks Ch 6.***

[1] Chapters in bold italic are the recommended chapters.

***Seminar Activity*:** Seminar 8.

Learning Week 9: (18/03) "Modelling Non Stationary Time Series: Conditional Mean". References: ***Brooks Ch 8***.

***Seminar Activity*:** Seminar 9.

Learning Week 10: (25/03) "Modelling Non Stationary Time Series: Conditional Variance". References: ***Brooks Ch 9, Danielson Ch 4-5***

***Seminar Activity*:** Seminar 10.

Learning Week 11: (1/04) "Cointegration and Error Correction Mechanism". References: ***Brooks Ch 9***.

***Seminar Activity*:** Seminar 11.

Learning Week 12: (8/04) "Revision: ER Applications and Practice"

Note

1. *Hand-in Coursework deadline cannot be changes under any circumstances. Only an* ***electronic copy*** *of the Coursework must be submitted, use the link provided in blackboard to submit your coursework.*
2. *The topics and dates are indicative, some topics may require more time than others.*
3. *For Week 11: further topics refer to some optional topics that I wish to cover. The decision will be made based on how far we progress during the semester*.

3. Summary of the Module Content

This module is an advanced version of Business Analytics covered in semester 1. The main aim of this module to provide students with exposure to a more advanced and research-based models suitable to analysing big data within business and finance context. The module is designed to enhance students' understanding of the importance of adopting a series of sound methodological steps in a prediction exercise and to provide them with an artillery of modelling and prediction techniques along with hands-on experience in using them. The module covers a wide range of models including incremental response models, time series models and text analytics.

4. Module Aims

By the end of the module, the successful student will be able to:

1. Discuss the concept and methods of prediction analytics using the proper terminology.

2. Identify and properly state research problems related to prediction analytics in different business settings.

3. Critically discuss alternative prediction approaches and methods and choose the right prediction models for a prediction exercise, implement them, and prepare predictions.

4. Formulate managerial guidelines and make recommendations.

5. Use specialised software (Python/ R/ IBM SPSS Modeller/MATLAB/ EViews) to solve real world problems.

5. Learning Outcomes

On successfully completing this module students should be able to provide evidence of learning and skills development in the broad area of predictive analysis for decision making:

1. Have the required knowledge to understand the relevance of big data problems facing the Financial Services sector and become familiar with a variety of statistical, management science and predictive models that can easily be extended to other models and frameworks including artificial intelligence and machine learning based models.

2. Learn how to harness big data for finance applications.
3. Apply Business analytics tools to address financial services problems.

4. Source data and training sets to model behaviour using analytical (statistical) tools and make predictions to improve financial decision-making

6. Assessment

Students will have to show that they are able to fulfil the learning outcomes outlined earlier to successfully complete the module. This will be assessed through one piece of coursework and an empirical report.

The pass mark for the module is 50%. To pass overall, the overall total calculated from adding weighted marks in each assessment component must be 50% (If your mark for the module is between 40 - 49 you will be required to complete one or more referral assessments and your mark for these will be capped at 50%).

Unless explicitly indicated otherwise all coursework must be submitted electronically via Blackboard. In addition to the detail given below, further information may be posted onto the Blackboard site for the module.

Assessment rationale, methods and weightings

There are two summative assessments in this module: an individual coursework and a written empirical project. The aim is to develop skills and to assess that the students have achieved the learning outcomes for this module.

The individual coursework carries a 40% weighting. It will involve assessing the students understanding, and showing proficiency in applying theory and practice to a range of situations encountered or discussed during the lectures. The word limit is 2000 words.

The individual empirical report will carry a weighting of 60%. It will require utilising the Bloomberg database (or any other) in the Financial Markets Suite and advanced statistical software (Python, SPSS Modeler, MATLAB and EVIEWS) available in the computer lab, via direct download or appsanywhere (appsanywhere.westminster.ac.uk) as well as other library services to conduct an exploratory study of predictive analysis for decision making. Students will be expected to conduct desk research, review journal articles and carry out detailed analysis of a problem relevant at the time. The empirical report will be an individual effort with a word limit of 3000 words. The empirical report will assess students' achievement of the last two learning outcomes outlined above.

Assignment details and deadlines.

Further details will be posted in due course.

Component	Word Limit	Weighting	Deadline
Coursework	2000	40%	11/04/2024 at 1pm UK time
Empirical Report	3000	60%	09/05/2024 at 1pm UK time

Eligibility of students for an 'alternative assessment'

No alternative assignment is offered for this module.

Referencing requirements for assignments
Statements, assertions and ideas made in coursework should be supported by citing relevant sources. Sources cited in the text should be listed at the end of the assignment in a reference

list. Any material that you read but do not cite in the report should go into a separate bibliography. Unless explicitly stated otherwise by the module teaching team, all referencing should be in **Westminster Harvard** format. If you are not sure about this, the library provides guidance (available via the library website pages).

Submission Instructions: See Coursework and Empirical Report for further instructions.

Difficulties in submitting assignments on time

If you have difficulties for reasons beyond your control (e.g. serious illness, family problems etc.) that prevent you from submitting the assignment, make sure you apply to the Mitigating Circumstances board with evidence to support your claim as soon as possible. The WBS Registry or your personal tutor can advise on this.

Submitting your coursework - checks

You must include your name, student ID and word count on the first page of your assignment.

Unless indicated otherwise, coursework is submitted via Blackboard. On the Blackboard home page for the module, you will find a button on the menu called 'Submit Coursework'. Clicking this will take you to the submission link.

Note: *At busy times the coursework submission process may run slowly. To ensure that your submission is not recorded as a late submission, avoid submitting very close to the deadline.*

To submit your assignment:

- Log on to Blackboard at http://learning.westminster.ac.uk;
- Go to the Blackboard site for this module;
- Click on the 'Submit Coursework' link in the navigation menu on the left-hand side
- Click on the link for the assignment;
- Follow the instructions.

REMEMBER:

It is a requirement that you submit your work in this way. All coursework must be submitted by 13.00 (1.00 p.m.) UK time on the due date.

If you submit your coursework late but within 24 hours or one 'working' day of the specified deadline, 10% of the overall marks available for that assessment will be deducted as a penalty for late submission, except for work which is marked in the range 40 – 49%, in which case the mark will be capped at the pass mark (40%).

If you submit your coursework more than 24 hours or more than one 'working' day after the specified deadline you will be given a mark of zero for the work in question.

The University's mitigating circumstances procedures relating to the non-submission or late submission of coursework apply to all coursework.

If you are unclear about this, speak to your class leader or module leader.

Academic integrity

What you submit for assessment must be your own current work. It will automatically be scanned through a text matching system to check for possible plagiarism.

Do not reuse material from other assessments that you may have completed on other modules. Collusion with other students (except when working in groups), recycling previous assignments (unless this is explicitly allowed by the module leader) and/or plagiarism (copying) of other sources all are offences and are dealt with accordingly. If you are not sure about this, then speak to your class leader.

Assessment criteria

Criterion	Weighting
	%
Coursework	
Demonstrate competence in the application of econometric models and techniques used to model and forecast risk and return.	25%
Critically evaluate modelling and forecasting results using appropriate analytical tools and knowledge of the applied models as well as link findings to financial decision making.	25%
Exam	
Critically evaluate models used in forecasting risk and returns emphasizing the strength and weaknesses of each as well as show awareness of recent developments in the literature.	25%
Demonstrate a solid understanding of the main challenges that face risk modellers in terms of theory, application and financial policy.	25%

Assessment General Threshold Criteria

The descriptions below are indicative of what is needed to merit a mark at a given level:

	Percentage	General Criteria
Distinction	90-100% (exceptional)	As below, with highly sophisticated level of theorization and innovative conceptualization or methodology
	80-89% (superior)	As below, with greater insight/originality and wider/deeper engagement with the literature
	75-79% (confident)	Authoritative grasp of conceptual context Insight or originality in way topic is conceptualized or developed Comprehensive integration of relevant literature/debates Advanced scholarly style (of publishable quality)
	70-74% (solid)	Strong grasp of conceptual context Insight in way topic is conceptualized or developed Good integration of relevant literature/debates Scholarly style (publishable with minor revisions)
Merit	65-69% (very good)	Good conceptual understanding Critical analysis using an appropriate range of sources Clarity and precision in presenting arguments
	60-64% (competent)	As above, with less depth and criticality
Pass	55-59% (promising)	As below, plus stronger on analysis
	50-54% (passable)	Basic grasp of essential concepts/theory/sources Some analysis/interpretation

		Reasonably clear and orderly presentation
Fail	45-49% (borderline fail)	Largely descriptive; limited interpretation; limited range of sources; lack of coherence and clarity
	40-44%	As above, with less interpretation
	30-39% (poor)	Descriptive, unfocused work, lacking in interpretative or conceptual dimension and use of sources
	0-29% (inadequate)	Incomplete or very poorly attempted work

University of Westminster Quality & Standards statement:

Plagiarism is a particular form of cheating. Plagiarism must be avoided at all costs and students who break the rules, however innocently, will be penalised. It is your responsibility to ensure that you understand correct referencing practices. As a University level student, you are expected to use appropriate references and keep carefully detailed notes of all your sources of material, including any material downloaded from the www.

Plagiarism is defined as submission for assessment of material (written, visual or oral) originally produced by another person or persons, without acknowledgement, in such a way that the work could be assumed to be your own. Plagiarism may involve the unattributed use of another person's work, ideas, opinions, theory, facts, statistics, graphs, models, paintings, performance, computer code, drawings, quotations of another person's actual spoken or written words, or paraphrases of another person's spoken or written words.

Plagiarism covers both direct copying and copying or paraphrasing with only minor adjustments:

- a direct quotation from a text must be indicated by the use of quotation marks (or an indented paragraph in italics for a substantive section) and the source of the quote (title, author, page number and date of publication) provided;
- a paraphrased summary must be indicated by attribution of the author, date and source of the material including page numbers for the section(s) which have been summarised.

7. Using your study time effectively

You have primary responsibility for your own learning. You will have a schedule of formal study where you will be working with academic staff and this is outlined later in this handbook.

Alongside your scheduled studies, your private or 'independent' study is very important. This is the time that you spend learning without direct supervision from, or contact with, a member of teaching staff and this makes up a large part of your studies. It is likely to include background reading, preparation for seminars or tutorials, follow-up work, wider practice, the completion of assignments, revision and so on. Some independent study may be structured for you as a key part of your learning, but it also is the additional study you choose to undertake to further improve your learning.

To summarise, in general your study activity will break down into:

1. **Scheduled contact/activity time** (such as lectures, classes, tutorials, workshops, supervisions and other directed activities)

2. **Structured independent study** (such as reading and preparing for scheduled learning activity)

3. **Module and course-based wider study** (such as reading the business media, employability activities, personal tutoring activity)
4. **Assessment** (working on coursework and/or preparing for and taking tests/exams)

This is a 20 credit module. You should be putting in 10 hours of study time for every credit so you should plan to commit 200 hours over the duration of the module and its assessment.

Below is an indicative split of study time for this module:

Learning and Teaching Activity Type	**Category**	**Hours***
Lecture	Scheduled	24
Class	Scheduled	24
Workshop	Scheduled	0
Total Scheduled Contact/Activity Hours		**48**
Structured independent study	Independent	44
Module and course-based general study	Independent	36
Working on and taking assessments	Independent	72
Total Independent Study Hours		**152**
Total Learning and Teaching Hours		**200**

*These hours are indicative only and may be subject to change. They also indicate what would be typical. Your particular study needs may vary.

If you are unclear on any aspect of making the best use of your study time on this module, speak to your class leader or the module leader.

Study – professional practice

- Arrive for taught activities in good time. We will aim to start on time so that we can finish on time. If you do enter late, enter quietly to avoid disturbing others.
- Participate constructively, presenting own ideas and critiquing those of others in a respectful & supportive manner.
- Read and act on Blackboard announcements & emails in a timely manner; ensure your SRS contact details are current; write all emails in a formal business style.
- Please do not phone, text or message during taught activities.
- If you wish to record a class please confirm this with the tutor beforehand.
- **THE KEY – follow the WBS Professional Principles (see last page).**

8. Reading and Key Learning Resources

Books:

1. Efron, B., and Hastie, T. (2021). *Computer Age Statistical Inference: Algorithms, Evidence and Data Science*. Cambridge: Cambridge University Press.

2. Diebold, F. X. (2019). *Econometric Data Science: A predictive Modelling Approach*. Online Manuscript. Available at: https://www.sas.upenn.edu/~fdiebold/Teaching104/Econometrics.pdf

3. Bekes, G., and Kezdi, G. (2020). *Data Analysis for Business, Economics, and Policy*. Cambridge: Cambridge University Press.

4. Danielsson, J. (2011) Financial Risk Forecasting: The Theory and Practice of Forecasting Market Risk, with Implementation in R, MATLAB, Python. New Jersey: John Wiley.

5. Zaki, M. J., and Meira, W. (2020). *Data Mining and Machine Learning*: *Fundamental Concepts and Algorithm*. Cambridge: Cambridge University Press.

6. Dean, J. (2014). *Big data, data mining and machine learning*. New Jersey: John Wiley & Sons.

7. Shah. C. (2020). *A hands – on introduction to data science*. Cambridge: Cambridge University Press.

8. Cameron, J., Hurn, S. et al. (2020). Financial Econometric Modelling. Oxford University Press.

9. Brooks, C. (2014) Introductory Econometrics for Finance, Cambridge University Press.

10. Kreinovich, V., Sriboonchitta, S., and Chakpitak, N. (2018). *Predictive Econometrics and Big Data.* Cham: Springer.

11. Wendler, T., and Grottrup, S. *Data Mining with SPSS Modeler*: *Theory, Excercises and Solutions.* Gewerbestrass: Springer.

12. Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press.

Useful Online Resources

Diebold's resources:

https://www.sas.upenn.edu/~fdiebold/Textbooks.html

Danielson's resources

https://www.financialriskforecasting.com/

Brook's resources:

https://www.cambridge.org/gb/academic/subjects/economics/finance/introductory-econometrics-finance-3rd-edition?format=PB&isbn=9781107661455

WBS Professional Principles