Financial Technology and digital innovation to modeRnise and develop cUrricula of VietnameSe and Philippines UniversiTies

Project № 610256-EPP-1-2019-1-IT-EPPKA2-CBHE-JP

MASTER IN FINTECH AND DIGITAL INNOVATION
- MODULE SYLLABUS -

DELIVERABLE DESCRIPTION	
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1. Module details

Module Title	FINANCIAL ECONOMETRICS IN R/PYTHON
Credits	3 credit units
Hours	49.5 hours or 54 hours
N° of hours in presence	36 hours of asynchronous or blended delivery 13.5 or 18 hours of synchronous delivery
N° of hours in distance learning	36 hours asynchronous or blended delivery 13.5 or 18 hours of synchronous delivery
Name of the leading institution	Mapua University

2. Module description

This course builds on the introductory module and introduces basic programming in R/ to perform statistical analysis using the R Studio editor. You will apply your skills to empirical finance applications like stock market predictability using different factors from the literature. The module will also build on basic programming skills in Python to perform similar analysis but also as applied to financial modelling like options pricing and financial modelling.

3. Learning Outcomes

The course overall learning outcomes are:

Knowledge and Understanding:
a.   Demonstrates a critical understanding of technology-based banking concepts (e.g. digital banking, open banking, etc.);
b.   Demonstrates a critical understanding of the range of digital solutions in monetary systems (e.g. digital finance, InsurTech, etc.);
c.   Demonstrates understanding and awareness of emerging technological enablers in banking and finance (e.g. digitalisation, automation, machine learning, AI, etc.);

Application and Problem-Solving Abilities:
a.   Applies a significant range of specialist database and software operating, programming and other FinTech relevant skills;

b. Applies an integrated understanding of entrepreneurial dynamics, project and innovation management in the context of technology-based finance and banking (e.g. development of innovative products/ solutions?) could be research projects);

4. Module knowledge, skills and competencies (EQF*)

Moreover, at the end of this course, the student will be able to (*https://europa.eu/europass/en/european-qualifications-framework-eqf) :

- *apply financial econometrics methods using r/python*
- *apply linear and non-linear regression model in predicting global market price*
- *apply portfolio selection models for optimal asset allocation*
- *perform testing and validation of the developed models*

5. Module lessons

Lesson N.	1
Lesson title	Introduction to R/Python
Duration	18 hours (4.5 hours/week x 4 weeks)
Specific objectives	should be able to write simple program using r/python by importing data and library, and do basic statistical analysis for data visualization
Topics	• syntax and semantics and program structure of python and r programming • function • vectors and matrices • data frames • importing libraries and packages for data analysis • trading strategy • random variables and distribution • models of distribution
In presence activity	programming demonstration lecture discussion programming exercises

Distance learning type of learning object /task	• Audio/Video Lesson • Virtual classroom/ web-streaming conference • Lecture note • Case Study • Self-evaluation test
Other supporting material	• python/r programming IDE/tutorial • other related articles/textbooks/e-books

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Lesson N.	2
Lesson title	financial econometrics fundamentals and modelling
Duration	18 hours (4.5 hours/week x 4 weeks)
Specific objectives	to apply basic financial econometrics using R/Python and be able to develop prediction model and estimation
Topics	Possible topics to cover: • analysis of high-frequency price observations • arbitrage pricing theory • asset price dynamics • optimal asset allocation (mean-variance model and safety-first model) • cointegration • event study (cause-and-effect study) • nonlinear financial models such as autoregressive conditional heteroskedasticity • realized variance • fund performance analysis such as returns-based style analysis • tests of the random walk hypothesis • the capital asset pricing model • the term structure of interest rates (the yield curve) • value at risk • volatility estimation techniques such as exponential smoothing models and RiskMetrics
In presence activity	programming demonstration lecture discussion programming exercises

Distance learning type of learning object /task	• Audio/Video Lesson • Virtual classroom/ web-streaming conference • Lecture note • Self-evaluation test
Other supporting material	• Linear Models and Time Series Analysis – Wiley - Marc S. Paoelella • Inside Volatility Filtering – Wiley - Alireza Jahavari • python/r programming IDE/tutorial • other related articles/textbooks/e-books

Lesson N.	3
Lesson title	Financial Econometrics Project
Duration	13.5 hours (4.5 hours/week x 3 weeks) → 18 hrs (4.5 hours/week x 4 weeks)
Specific objectives	Be able to apply learnings from module 1 and 2 to come up with a research paper about Financial Econometrics Using R/Python.
Topics	Scheduled Topic Discussion with Each Student
In presence activity	Consultation with the faculty or professor
Distance learning type of learning object /task	● Audio/Video Lesson ● Virtual classroom/ web-streaming conference ● Lecture note ● Self-evaluation test
Other supporting material	• Conference Paper and or Journal Article templates • other related articles/textbooks/e-books