



Financial Technology and digital innovation to modernise and develop curricula of Vietnamese and Philippines Universities

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MASTER IN FINTECH AND DIGITAL INNOVATION - MODULE SYLLABUS -



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1. Module details

Module Title	RISK ANALYSIS AND QUANTITATIVE ASSET ALLOCATION
Credits	
Hours	
N° of hours in presence	
N° of hours in distance learning	<i>At least 15</i>
Name of the leading institution	

2. Module description

The aim of the course is to address risk analysis and asset allocation issues using available quantitative methods and techniques. By focusing on foundational analytical tools, the course covers: general problems of asset allocation, strategic and tactical asset allocation, forecasting, estimation error in asset allocation, decision and performance analysis, return measures, VaR, cVaR, Sharpe ratio, and mean-variance portfolio optimization. The course also covers use of quantitative methods for analysis of risks related to finance, including: market risk, credit risk, operational risk, liquidity risk, settlement risk, volatility risk, regulation risk, and other types of financial risks. The methods and techniques include: modelling, descriptive statistics, sampling and estimation, hypothesis testing, correlation and regression analysis, Monte Carlo simulation, and optimization. The significant amount of time will be devoted to practical application of theories using real data and available analytic and optimization software.

3. Learning Outcomes

The course overall learning outcomes are:

Knowledge and Understanding:

- a. Demonstrates a critical understanding of the range of digital solutions in monetary systems (e.g. digital finance, InsurTech, etc.);
- b. Demonstrates a critical awareness of current, emerging and future issues for FinTech.

Application and Problem-Solving Abilities:

- a. Applies a significant range of specialist database and software operating, programming and other FinTech relevant skills;

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-efq](https://europa.eu/europass/en/european-qualifications-framework-efq)) :

- *Collect, manage, and analyze financial market data and to measure the risk of their investments;*
- *Apply foundational analytical and optimization tools to asset allocation;*
- *Critically compare, contrast and evaluate the different analytics techniques for applicability to identified problems;*
- *Determine optimal investment portfolio;*
- *Implement quantitative methods on large financial data sets;*
- *Reports, demonstrate and implement obtained risk analysis and asset allocation results.*

5. Module lessons

Lesson N.	1
Lesson title	Introduction to Financial Risk Management
Duration	1h
Specific objectives	Provide students the core concepts of risk management and assessment as well as financial risk categories
Topics	<ul style="list-style-type: none"> • Risk Management • Risk Assessment • Financial risks: market risk, credit risk, operational risk, liquidity risk, settlement risk, volatility risk, regulation risk, and other types of financial risks.

In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	

Lesson N.	2
Lesson title	Fundamentals of asset allocation
Duration	1h
Specific objectives	Provide students the knowledge about main phases and elements of asset allocation process
Topics	<ul style="list-style-type: none"> • Asset Management Objectives • Asset Classes • Approaches to Asset Allocation • Sources of Asset Risk and Return
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson • Self-evaluation test
Other supporting material	<p>Rasmussen, M. (2002). <i>Quantitative Portfolio Optimisation, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory</i>. Springer. (Chapters 1-3)</p> <p>Lumholdt, H. (2018). <i>Strategic and Tactical Asset Allocation</i>. Springer International Publishing. (Chapter 1)</p>

Lesson N.	3
Lesson title	Strategic, Tactical, and Dynamic Asset Allocation
Duration	1h
Specific objectives	Provide students understanding of asset allocation strategies and skills to create appropriate ones.
Topics	<ul style="list-style-type: none"> • Strategic Asset Allocation • Tactical Asset Allocation • Dynamic Asset Allocation
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Case Study
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	<p>Schneeweis, T., Crowder, G. B., & Kazemi, H. B. (2010). <i>The new science of asset allocation: risk management in a multi-asset world</i> (Vol. 551). John Wiley & Sons. (Chapter 5)</p> <p>Lumholdt, H. (2018). <i>Strategic and Tactical Asset Allocation</i>. Springer International Publishing. (Chapters 1,3)</p>

Lesson N.	4
Lesson title	Investment Objectives and Benchmark Selection
Duration	1h
Specific objectives	Provide students the knowledge about creating asset allocation policies through investment objectives identification and benchmark selection.
Topics	<ul style="list-style-type: none"> • Setting investment objectives

	<ul style="list-style-type: none"> • Benchmark Selection
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson • Self-evaluation test
Other supporting material	<p>Rasmussen, M. (2002). <i>Quantitative Portfolio Optimisation, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory</i>. Springer. (Chapter 8)</p> <p>Lumholdt, H. (2018). <i>Strategic and Tactical Asset Allocation</i>. Springer International Publishing. (Chapter 2)</p>

Lesson N.	5
Lesson title	Traditional Asset Allocation Techniques
Duration	1h
Specific objectives	Provides the students traditional and simple asset allocation techniques and their strengths and weakness
Topics	<ul style="list-style-type: none"> • Screening approach • Stratification approach • Bottom-up/top-down approaches • Thematic approaches
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Rasmussen, M. (2002). <i>Quantitative Portfolio Optimization, Asset Allocation and Risk</i>

	<i>Management: A Practical Guide to Implementing Quantitative Investment Theory.</i> Springer. (Chapter 9)
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Lesson N.	6
Lesson title	Measuring Risk
Duration	1h
Specific objectives	Provide students the knowledge about risk measures based on historical data and understanding how risk measurement affects asset allocation.
Topics	<ul style="list-style-type: none"> • Traditional Approaches to Risk Measurement • Classic Sharpe Ratio • Other Measures of Risk Assessment • Portfolio Risk Measures • Other Measures of Portfolio Risk Measurement • Value at Risk, Conditional Value at Risk
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson • Self-evaluation test
Other supporting material	Schneeweis, T., Crowder, G. B., & Kazemi, H. B. (2010). <i>The new science of asset allocation: risk management in a multi-asset world</i> (Vol. 551). John Wiley & Sons. (Chapter 2)

Lesson N.	7
Lesson title	Estimating Model Parameters
Duration	1h

Specific objectives	Provide students the knowledge about the process of estimation of inputs for a quantitative risk analysis and asset allocation models, and skills to estimate model parameters using software tools.
Topics	<ul style="list-style-type: none"> • Expected Return and Risk • The Capital Asset Pricing Model • Factor Models • Volatility and Correlation • Return Distributions (Risk Characterization)
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	<p>Rasmussen, M. (2002). <i>Quantitative Portfolio Optimization, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory</i>. Springer. (Chapter 7)</p> <p>Lumholdt, H. (2018). <i>Strategic and Tactical Asset Allocation</i>. Springer International Publishing. (Chapters 6,7)</p> <p>Excel help & learning, Excel help & learning - Microsoft Support</p>

Lesson N.	8
Lesson title	Modern portfolio theory - Markowitz Model
Duration	1h
Specific objectives	Provide students the knowledge about modeling portfolio optimization problem based on Modern portfolio theory (MPT) and skill to solve real problems.
Topics	<ul style="list-style-type: none"> • Description of the Datasets Considered for

	<p>MPT</p> <ul style="list-style-type: none"> • Mathematical model formulation • Portfolio optimization solution techniques and tools • Feasible portfolios and Mean-Variance Efficient Frontier • Diversification
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Problems solving
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson • Individual assignment
Other supporting material	<p>Braga, M. D. (2015). <i>Risk-based approaches to asset allocation: Concepts and practical applications</i>. Springer. (Chapter 2)</p> <p>Excel Solver Tutorial - Step by Step Easy to Use Guide For Excel's Solver, Excel Solver Tutorial - Step by Step Easy to use guide for Excel's Solver solver</p>

Lesson N.	9
Lesson title	Risk-Based Approaches to Asset Allocation (1) - Risk Parity
Duration	1h
Specific objectives	Provide students the core concepts of risk parity strategies.
Topics	<ul style="list-style-type: none"> • The Theoretical Background and Argument for Risk Parity • The Naïve Risk Parity Strategy
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises

Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Braga, M. D. (2015). <i>Risk-based approaches to asset allocation: Concepts and practical applications</i> . Springer. (Chapter 3)

Lesson N.	10
Lesson title	Risk-Based Approaches to Asset Allocation (2) - Risk Parity
Duration	1h
Specific objectives	Provide students the knowledge of advanced risk parity strategies.
Topics	<ul style="list-style-type: none"> • The Optimal Risk Parity Strategy • Risk Parity Strategy and Leverage • Risk Parity Strategy and the Modern Portfolio Theory Framework
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Braga, M. D. (2015). <i>Risk-based approaches to asset allocation: Concepts and practical applications</i> . Springer. (Chapter 3)

Lesson N.	11
Lesson title	Risk-Based Approaches to Asset Allocation (3)
Duration	1h
Specific objectives	To provide students the knowledge about specific risk-based strategies mainly focused on

	benefits of diversification and skills to solve real problems using software tools.
Topics	<ul style="list-style-type: none"> • The Equally-Weighted Approach • The Global Minimum-Variance Approach • The Most Diversified Portfolio Approach
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson • Self-evaluation test
Other supporting material	<p>Braga, M. D. (2015). <i>Risk-based approaches to asset allocation: Concepts and practical applications</i>. Springer. (Chapter 4)</p> <p>Excel Solver Tutorial - Step by Step Easy to Use Guide For Excel's Solver, Excel Solver Tutorial - Step by Step Easy to use guide for Excel's Solver solver</p>

Lesson N.	12
Lesson title	Value-at-Risk (VaR)
Duration	1h
Specific objectives	Provide the students the core concepts and model of Value at Risk.
Topics	<ul style="list-style-type: none"> • Variance–Covariance VaR • Simulation of VaR • VaR Along the Efficient Frontier • Marginal Contributions to VaR
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises

Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Rasmussen, M. (2002). <i>Quantitative Portfolio Optimization, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory</i> . Springer. (Chapter 16)

Lesson N.	13
Lesson title	CVaR and EVT
Duration	1h
Specific objectives	Provide students the knowledge about extensions of Value-at-Risk
Topics	<ul style="list-style-type: none"> • Conditional VaR (CVaR) • Extreme Value Theory (EVT)
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Rasmussen, M. (2002). <i>Quantitative Portfolio Optimization, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory</i> . Springer. (Chapter 16)

Lesson N.	14
Lesson title	Optimal Hedging
Duration	1h

Specific objectives	Provide students the knowledge about an advanced derivative pricing methodology.
Topics	<ul style="list-style-type: none"> • Dynamic Hedging and Replication • Wealth Change Equations • Optimal Hedging Monte Carlo Method
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion • Exercises
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson
Other supporting material	Chatterjee, R. (2014). <i>Practical methods of financial engineering and risk management: tools for modern financial professionals</i> . Apress. (Chapter 5)

Lesson N.	15
Lesson title	Tracking Error and Information Ratio
Duration	1h
Specific objectives	Provide students the knowledge about errors in parameters estimation and the skills for examine portfolio tracking errors.
Topics	<ul style="list-style-type: none"> • Absolute vs. relative risk measures • Decomposing tracking error • Information Ratio • Active Management Value Added
In presence activity	<ul style="list-style-type: none"> • Lectures • Lecture discussion
Distance learning type of learning object /task	<ul style="list-style-type: none"> • Virtual classroom/ web-streaming conference • Lecture note • Audio/Video Lesson



Other supporting material

Rasmussen, M. (2002). *Quantitative Portfolio Optimization, Asset Allocation and Risk Management: A Practical Guide to Implementing Quantitative Investment Theory*. Springer. (Chapter 14)