

**Algorithmic and High Frequency Trading**  
**Professor Alfonso Dufour**  
**COMPLETE MODULE DESCRIPTION**

<b>Module Provider</b>	ICMA Centre
<b>Number of credits</b>	10 [5 ETCS credits]
<b>Level</b>	7
<b>Terms in which taught</b>	Summer term module
<b>Current from</b>	2023/4
<b>Module Convenor</b>	Dr Alfonso Dufour
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<b>Summary module description</b>	Industry participants estimate that 70-80% of equity trades are executed through computers. Market-makers in fixed income and currency markets use algorithms to automatically adjust their quotes. This module reviews the current state of the trading industry and identifies aims, features, regulations, and limitations of three main groups of algorithmic trading strategies: market making, trade execution and statistical arbitrage. Practical seminars are used to demonstrate how to apply trading algorithms to high-frequency data.
<b>Aims</b>	Equip the students with a basic knowledge of algorithmic and high frequency trading strategies.
<b>Assessable learning outcomes</b>	By the end of the module, it is expected that the student will be able to: - explain the concepts of high frequency trading and algorithmic trading - identify the characteristic elements of alternative algorithmic trading strategies - solve simple trade execution problems and develop effective execution strategies
<b>Additional outcomes</b>	The module will offer the opportunity to develop tick-by-tick data management skills, learn how to use Pivot Tables and Solver in excel and acquire basic programming skills.
<b>Outline content</b>	<p><b>Lecture 1 – Algorithmic Trading</b> Evolution of automated trading; Automated orders (pegged orders, iceberg orders); Market making algorithms; Algorithms to execute large trades; Automatic trading decisions (statistical arbitrage); and Future trends (electronic executions for baskets of assets). Workshop 1: Insights for working with high-frequency data – features, seasonality, relevant variables, trends and common patterns.</p> <p><b>Lecture 2 – HFT</b> High frequency trading firms are the new market makers. HFT regulation (roles and obligations). Market-making. Main HFT firms (Virtu Financial, Citadel Securities, Two Sigma Securities, etc.) and their strategies. Workshop 2: Insights for developing auto quoting systems. Practice market-making strategies using an equity trading simulator.</p> <p><b>Lecture 3 – Algorithmic Execution Strategies</b></p>

	<p>Overview of popular trade execution algorithms: VWAP, TWAP, Volume in line (participation), Liquidity seekers (Tex, Guerrilla, etc.) and Optimal trade execution.          Workshop 3: Trading risk vs. impact cost: Using solver in Excel to optimise trade executions.</p> <p><b>Lecture 4 – VWAP Execution and performance measurement</b>          Developing and implementing the VWAP execution strategy: naïve VWAP vs. smart VWAP. Reviewing ITG VWAP strategy.          Workshop 4: Executing VWAP trades using Pivot Tables in Excel.</p> <p><b>Lecture 5 - Technical Analysis and Statistical Arbitrage Trades</b>          Introduction to technical analysis. Developing a trading strategy with automatic trading decisions. Assessing the performance of the strategy.          Workshop 5: Executing a statistical arbitrage trade.</p> <p><b>Lecture 6 – Revision</b></p>
<b>Global context</b>	Examples from and applications to international markets
<b>Brief description of teaching and learning methods</b>	<p>Lectures with presentation and discussion of concepts and real-world examples.          Workshops with practical applications to financial data.</p> <p>Note: this module may be delivered face-to-face either at the Ca' Foscari University of Venice, San Giobbe Campus (Italy) or in Reading (UK). If delivered in Venice, the module will be live-streamed and recorded for those students who wish to attend it from Reading.</p>
<b>Summative assessment- Examinations</b>	<p><b>Summative assessment- Coursework and in-class tests:</b>          1-hour multiple choice-test (30%) – to be held within 0-2 weeks after the final lecture</p> <p>Group project (70%) – The project has a limit of 2,500 words and the submission date will be 6-8 weeks after the final lecture.</p>
<b>Formative assessment methods</b>	Sample multiple-choice questions and seminar discussion.
<b>Penalties for late submission</b>	<p>Penalties for late submission on this module are in accordance with the University policy. Please refer to page 5 of the Postgraduate Guide to Assessment for further information:  <a href="http://www.reading.ac.uk/internal/exams/student/exa-guidePG.aspx">http://www.reading.ac.uk/internal/exams/student/exa-guidePG.aspx</a></p>
<b>Assessment requirements for a pass</b>	50% weighted average mark.
<b>Reassessment arrangements</b>	Re-submit project only.
<b>Additional Costs (specified where applicable)</b>	Required textbooks: £40