

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): ORBS7220 Risk and Portfolio Management (3,3,0)

Course Aims: This course introduces the fundamental concepts of financial derivatives and portfolio risk measurement and management. Students will learn why both firms and individual investors should learn how to measure and manage risk. The first part of the course overviews on some common financial derivative instruments and their natures, how they can be used for investment and hedging purposes, and how they can be priced. The second part of the course gives the students an insight into how a business can identify the risk components, measure its loss exposures and select appropriate tools for the management risks. We shall detail the types of risks that firms are exposed to, and the costs and benefits associated with risk management. We examine the popular Value-at-Risk (VAR) and Expected Shortfall (ES) framework to help us estimate the risk exposure of firms. The third part of the course discusses about the portfolio measurement, management and portfolio performance evaluation. To highlight the practical relevance of the course materials we shall discuss a number of real-word case studies about industrial development throughout the course.

Prerequisite: No

Prepared by: Michael Ng, Ming Ham Yip

Remark: This course is delivered by staff of HKBU.

Course Intended Learning Outcomes (CILOs):

Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
1	Explain the application of probability theory and stochastic processes in financial modelling
2	Apply Modern Portfolio Theory to construct optimal portfolio of investments
3	Apply hedging techniques to hedge a portfolio against various kinds of market risks
4	Analyze minimum capital required for managing market risks

Teaching & Learning Activities (TLAs):

CILO	TLAs will include the following:
1,2,3,4	Lectures with rigorous mathematical discussions and concrete examples. The lecturer will constantly ask questions in class to make sure that the majority of students are following the teaching materials.
1,2,3,4	Assignments to monitor both students' learning and mastering of the taught materials. In addition, common mistakes will also be addressed and analyzed.

Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Assignments	40%	all	Assignments are designed to measure students' understanding of the theory, techniques, and applications of risk and portfolio management. Assignments are conducted to monitor the students' understanding of the theory, techniques and skills taught in the class. This may involve, but not limited

				to, in-class discussions of rigorous technical problems and their solutions.
2	Final Examination	60%	all	Final Examination is designed to see how far students have achieved their intended learning outcomes especially in the knowledge domain. Students should have a thorough understanding of the knowledge and apply them correctly in different context to do well in the exam.

Course Intended Learning Outcomes and Weighting:

Content	CILO No.	Teaching (in hours)
1. Introduction	1	3
2. Probability Theory and Stochastic Processes	1	3
3. Modern Portfolio Theory	2	6
4. Managing Risk with the Greek Letters	3	6
5. Interest Rate Risk and Volatility Risk	3	9
6. Value-at-Risk and Expected Shortfall	1,4	12

Textbook:

1. John C. Hull, *Risk Management and Financial Institutions*, Wiley, 4th edition, 2015.

References:

1. John L. Maginn, Donald L. Tuttle, Jerald E. Pinto and Dennis W. Mcleavey, *Managing Investment Portfolios*, Wiley, 3rd edition, 2007.
2. Anthony Saunders and Linda Allen, *Credit Risk Measurement*, Wiley, 2nd edition, 2002.
3. J. Elton, J. Gruber, J. Brown and N. Goetzmann, *Modern Portfolio Theory and Investment Analysis*, John Wiley & Sons Ltd, 2006.
4. Justin London, *Modeling Derivatives Applications*, Financial Times Press, 2007.

Course Content in Outline:

<u>Topic</u>	<u>Hours</u>
I. Introduction	3
A. Risk management by financial institutions	
B. Trading in financial markets	
C. Risk management challenges	
II. Probability Theory and Stochastic Processes	3
A. Probability theory	
B. Stochastic processes	
C. Time series models	
III. Modern Portfolio Theory	6
A. Risk and return	
B. Efficient frontier	
C. Capital asset pricing model	
IV. Managing Risk with the Greek Letters	6
A. Delta	
B. Gamma	
C. Vega	
D. Theta	
E. Calculating Greek letters	
V. Interest Rate Risk and Volatility Risk	9
A. Management of net interest income	
B. Types of interest rates	
C. Duration	
D. Convexity	
E. Nonparallel yield curve shifts	
F. Implied volatilities	
G. Monitoring daily volatility	
H. The GARCH model	
VI. Value-at-Risk and Expected Shortfall	12
A. Definition of VaR	
B. Calculation of VaR	
C. Drawbacks of VaR	
D. Expected shortfall	
E. Coherent risk measures	
F. Historical simulation	
G. Extreme value theory	

(Approved by the Science Faculty Board Meeting by circulation in August 2024)

(Approved by the Department Management Committee on 7 August 2024)

(Approved by the Science Faculty Board Meeting 31 October 2023)

(Approved by the Department Management Committee on 5 September 2023)