

BT4016 Risk Analytics for Financial Services

Year 2023/2024 Semester 2

Thursday 12 – 2 pm

Lecturer: Asst Prof Frank Xing (L1, T4)

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Office hours: by appointment

Refer to <https://frank-xing.info/> for more information.

TA1: Joel Quek (T1, T3, T5)

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Office hours: TBD, by appointment.

TA2: Ding Yang (Non-teaching support)

Final exam date: 7 May 2024

Course Objective:

In this course, we will learn about the fundamentals of the financial markets and available instruments and apply the analytical tools to the areas of credit analytics and portfolio risk management. Instruction methods will include lectures, discussions, and peer to peer sharing of knowledge through presentations on specific topics.

Specific learning objectives of this course are as follows:

- Understand the fundamentals of financial risk management and financial instruments.
- Develop the competency in applying analytics for financial markets and services using analytical tools.
- Develop the know-how of building analytical models and applications with financial datasets.

Brief Course Syllabus by Topics:

1. Introduction to pricing and valuation models of stocks, bonds, options, and other derivatives.
2. Learning the risks and risk modeling for portfolio, bonds, options, and other derivatives.
3. Learning statistical tools for risk analytics.

Course Prerequisites:

BT2101 and BT2102

Recommended textbooks:

(BKM) Bodie, Z., Kane, A., & Marcus, A. J. (2012). *Investments 8/ 9 /10th Edition*. McGraw-Hill.

- This is probably the bible textbook of investment for undergraduate finance students. More than half of the lecture materials will be created based on materials from this textbook. At the same time, I will try to make the lecture slides self-sufficient for preparing the final exam. You are encouraged but are not required to buy/rent/download this book. The edition is not critical. Multiple versions of this book are available at the Hon Sui Sen library.

(PC) Christoffersen, P. *Elements of Financial Risk Management 2012* (**ebook available via NUS library**)

- VaR lectures are based on this textbook's chapters.

(JH) Hull, J. *Options, Futures, and Other Derivatives*.

- There is no need to buy this book for this module.
- This is probably the bible textbook of options for senior undergraduate or master students in finance or financial engineering.
- This book is more advanced than the first reference. Selected lecture slides (usually more advanced topics about options/futures/derivatives) will be created based on the content of this book.

Course Website and Communications:

Canvas will be the primary medium for course communications and materials distribution. I will post announcements, lecture notes, and other supplementary materials on Canvas. Please check the Canvas website frequently for any course updates.

Grading Policy:

The breakdown of the course grade is as follows:

Component	% of the score
Assignments (Two assignments)	20%
Practice Questions (Four Quizzes)	16%
Group Presentation (Presentation + Reflection)	24%
Final Exam	40%

Assignments (worth 20% of final grade)

During the semester, you will be required to complete two assignments that demonstrate your ability to apply the analytics tools learned from this class. The first assignment is due just after recess week and the second is due closer to the end of the semester

- A1: Market Risk Analysis of Equities
- A2: Credit Risk Assessment of Companies

For the assignment, we have decided that you will work in groups of 2-3 to make this easier – the workload of the assignment is not expected to be heavy – it is manageable to be done by an individual with the allocated amount of time. However, we expect that by allowing it to be done in mini-groups, it will facilitate discussion and critical thinking about the subject, as well as to lighten the workload for each individual so that they can focus on learning the coursework content.

The restriction behind the formation of pairs or groups of 3 for the assignment is that it should come from within your group for the presentation.

Practice Questions (worth 16% of final grade)

We will have about 4 sets of practice questions to help reinforce the material covered in class. These questions typically are more theoretical oriented (nothing about coding). PQs may be distributed shortly before class and solutions of these PQs will be released a week after.

Group Presentation: (worth 24% of final grade)

The Group Presentation component of this course is designed to encourage collaborative learning and to hone your presentation skills, critical thinking, and reflective abilities in the context of market, credit, and portfolio risk analysis. This component is twofold: the presentation itself and a subsequent reflection exercise.

> **Presentation (16% of final grade):** Each group, consisting of five students, will select a topic from a curated list and develop a five-minute presentation to educate peers on a specific risk analysis concept. The presentation should succinctly cover the main points, incorporating case studies or examples where applicable, and engage the audience with interactive elements. This exercise will test your ability to distill complex information into concise, impactful messaging and to work effectively as a team.

It is entirely possible that some groups will end up with only four students due to course enrolment numbers. We also reserve the right to randomly allocate unassigned students to existing groups.

> **Critical Reflection Exercise (8% of final grade):** Following the presentations, each group will craft a reflective analysis of the topics presented by their peers for the week which they are not presenting. This reflection, limited to 500 words per topic, will highlight the key learnings and provide constructive feedback on the presentations. This exercise is intended to deepen your understanding of the material presented by your peers and to enhance your analytical and feedback skills.

Both components of the Group Presentation will be assessed on content accuracy, clarity of communication, teamwork, visual and delivery effectiveness, time management, and the depth of the reflective exercise. This holistic approach ensures that you not only gain knowledge but also the skills to critically evaluate and communicate complex risk analysis concepts.

Final Exam: (worth 40% of final grade)

The final exam is tentatively open-book. The exam includes multiple choice and open ended questions. Final exam will be only about conceptual and theoretical analysis.

Tentative Lesson Plan

Note: This is a living document subject to change.

	Date	Topic	Textbook references	Things to do /due	Tutorial Plan
1	18/1	Course overview - Risk and Return	BKM: Ch 5 [MA12]		
2	25/1	Portfolio Theory and CAPM	BKM: Ch 6-9 [KP14][MH52]	Presentation Outline released	
3	1/ 2	Equity Market Valuation and Market Risk	BKM: Ch 10,11,18 [XF19][HW94]	Form teams for group project before end of the week	T1 – Introduction to Stocks and Financial Markets
4	8/2	Value at Risk and Expected Shortfall (I)	[MA12b]	PQ1	T2 – Working with CAPM regressions
5	15/2	Value at Risk and Expected Shortfall (II)	[ZY17]	List of presentation topics released. Teams to indicate preference for presentation topic	T3 – Introduction to basic VaR calculations
6	22/2	Fixed Income Securities and Interest Rate Risk	BKM: Ch. 14,15	Assignment I release. PQ2	T4 - VaR II: Expected Shortfall and Backtesting
Recess week					
7	7/3	Credit Risk	[DR23]		T5 – Portfolio Optimization
8	14/3	Student Presentations – Market/Portfolio Risk Topics		Assignment Part I due at end of week	T6 – YTM and Rate of Returns
9	21/3	Student Presentations – Credit Risk Topics		PQ3/ Assignment II release	T7 – Credit Risk and Derivatives
10	28/3	Well Being Day	–	Critical Reflections Due	–
11	4/4	Options I	BKM: Ch.20 JH Ch.10-11		T8 – Options I
12	11/4	Options II	BKM: Ch.21 JH Ch.12-14	Assignment II due at end of week	T9 – Options II
13	18/4	Hedging and other derivatives		PQ4	TBD

Practice Questions Coverage

PQ1: Week 1-2 material

PQ2: Week 3-5 material

PQ3: Week 6-7 material

PQ4: Week 11 to Week 12 material

The practice questions will be launched for 72 hours ON Friday 12 noon to Monday 12 noon. They will be administered on Luminus in the form of quizzes. The TAs or the professor will not be providing help or hints to the questions during the period of the quizzes.

We will post the solutions of the practice questions some time after the quiz.

Segregation of roles for TA's in this module

Joel Quek (T1, T3, T5) – tutorial sessions, content enquiries, consultations on content
Ding Yang – Assisting with grading in the module

Other resources

These resources may be helpful for those interested in finance.

- Yahoo Finance: <http://finance.yahoo.com>: Good source for historical financial data.
- Financial Times: <http://www.ft.com>: Good for news and weekly surveys on investments, banking, finance, etc.
- Wall Street journals: <http://www.wsj.com>: Good for keeping aware of daily events.
- The Economist: News and coverage of economic and financial topics with a strong international focus.
- <http://www.mscibarra.com>: Contains historical monthly equity returns for market indices