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**Consultation Hrs:** By appointment through email

## Course Objective

This course has the following objectives:

- 1) provides students with an appreciation of the theories and methodologies of financial modeling.
- 2) trains students to apply finance theories to solve various problems in financial management, investments, portfolio management, and risk management.

This objective is achieved by teaching how to design and implement financial models on the computer, with Excel as the main tool. It covers four classes of models: Corporate Finance models, Portfolio Models, Option-Pricing Models, and Bond Models. It also covers simulation, some numerical methods, and VBA programming.

## Motivation

With the increasing sophistication of financial models, and the advance in IT, finance professionals and researchers increasingly need to perform basic financial modeling and data processing using the computer independently. Among the software used for such purposes, Microsoft Excel stands out as the default standard. Some finance professionals, for instance from investing banking, would go to the extent of recognizing Microsoft Excel as the single software that they would have to use for the rest of their career consistently. Therefore, it is not only crucial to learn how to implement financial models on the computer, but especially to use advanced tools and VBA in Excel as well. This subject complement and enhances the other finance modules currently offered in the following ways:

- 1) concretizes the theoretical finance theories into implementable methods. This enhances the practical ability of finance students.
- 2) prepares the students for financial modeling work, including model design, sourcing for data, model programming, and debugging.
- 3) discusses the concept of efficiency and effectiveness when implementing financial models. This would be the only module that discusses such an important perspective.

## Learning Outcome

By the end of the course, students:

- learn the four major classes of financial models and how to implement the models
- build a set of ready-to-go financial models which they can use in their professional or research work
- can design and put together financial models for analyzing and solving financial problems.
- can critique and improve on the efficiency and effectiveness of financial models.

## Mode of Teaching

The course will be delivered as a series of 13 three-hour seminars/workshops in a seminar room. In each session, the student will go through each financial model hands-on with their computer as they are covered in class. Thus, each computer needs to have

- 1) Microsoft Excel (the latest version), with the Solver add-on and Visual Basic for Applications add-on.
- 2) internet access.

## Pre-requisite

ACC1701 Accounting for Decision-Makers, FIN2704 Finance, and FIN3702 Investment Analysis and Portfolio Management.

## Reference Text

(SB) Financial Modeling, by Simon Benninga, MIT Press, 4th Edition, 2014, ISBN: 978-0262027281.

## Assessment

This is a 100% CA course. The weight distribution for different components is as follows:

Mid-Term	30
Final Quiz	30
Project	30
Class Participation	10
<b>Total</b>	<b>100</b>

## Group Project

Students shall form into groups of five to work on a group project. The project shall involve valuing a listed company using fundamental analysis (covered in lesson 3). It consists of 5 parts. Part 1 values the company using a simple Pro Forma, calibrated to obtain the current market price. Part 2 values the company using the by-parts methodology. Part 2a calibrates the model to obtain the current market price, while part 2b implements the group's fundamental analysis conclusions to obtain a target price. The group then presents a buy/sell/hold recommendation. The deadline for parts 1 and 2 is Friday at 12 pm noon on the 8<sup>th</sup> week. Part 3a studies the drivers of the business model and structures the fundamental analysis based on the drivers. Part 3b implements the beliefs of the "MD" to obtain the buy/sell/hold recommendation required by the "MD". Part 4 does sensitivity analysis and simulations by varying the drivers to perform risk analysis on the stock price. Part 5 presents group reflection on the course. The deadline for parts 3, 4, and 5 is Friday at 12 pm noon of the reading week.

## Mid-Term Quiz

Date: Lesson 7 (In Class)

The mid-term quiz will be a 2-hour open-book practical test done through Examsoft. This quiz covers lessons 1 to 6. It will be held during class hours. Students are to make sure that they are available to sit for the mid-term.

## Final Quiz

Date: Lesson 13 (In Class)

The final quiz will be a 2-hour open-book practical test done through Examsoft. This quiz covers lessons 7 to 12. It will be held during class hours. Students are to make sure that they are available to sit for the final quiz..

### **Other points to note**

- **Attendance:** Since this is a 100% CA course, students must not miss more than 2 classes (not including absence due to medical (accompanied by medical certificates) or compassionate reasons). Violators will be heavily penalized or may even fail the entire module.
- **CA Attendance:** Students who miss any CA component will receive zero marks for that component. Absentees due to medical (accompanied by medical certificates) or compassionate reasons may be given a substitute form of assessment.
- Students are encouraged to always give feedback to the instructor comments and suggestions that may help the class to learn better.
- Students are to check the Canvas frequently for announcements.
- Please use the forum in Canvas exclusively for students' discussions
- Please use NUS e-mail for e-mail communications

### **Academic Honesty & Plagiarism**

Academic integrity and honesty are essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is 'the practice of taking someone else's work or ideas and passing them off as one's own' (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubts, you should consult your instructor.

Additional guidance is available at:

<https://www.nus.edu.sg/registrar/administrative-policies-procedures/undergraduate/acceptance-record#NUSCodeofStudentConduct>

Online Module on Plagiarism:

[https://libguides.nus.edu.sg/copyright\\_essentials\\_teaching\\_learning\\_research/plagiarism](https://libguides.nus.edu.sg/copyright_essentials_teaching_learning_research/plagiarism)

**Tentative Lesson Schedule:**

<b>Wk</b>	<b>Learning Outcome</b>	<b>Lesson</b>	<b>F2F Activities</b>	<b>Assignment &amp; Assessment</b>	<b>Chapters</b>
1	<ul style="list-style-type: none"> <li>• Basic Excel Functions</li> <li>• VBA1</li> </ul>	<ul style="list-style-type: none"> <li>• Excel Functions</li> <li>• Data Tables</li> <li>• Some Excel Hints</li> <li>• VBA: Output to Cells</li> </ul>	<ul style="list-style-type: none"> <li>• First VBA pgm</li> <li>• Exchange Rate Table</li> <li>• Solver</li> <li>• Regression</li> <li>• Using IF's</li> <li>• Using Offset</li> </ul>		VBA notes SB: Ch. 33, 30, 35
2	<ul style="list-style-type: none"> <li>• Personal Finance</li> <li>• Corporate Financial Decisions</li> <li>• VBA2</li> </ul>	<ul style="list-style-type: none"> <li>• Basic Time Value Models</li> <li>• The Financial Analysis of Leasing</li> <li>• The Financial Analysis of Leveraged Leases</li> <li>• Cash Flow Projection</li> <li>• VBA: For Next Loop 1</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: Single For Next Loop</li> <li>• Loan Table</li> <li>• Balloon Loans</li> <li>• Retirement Planning</li> <li>• CPF returns</li> <li>• Leasing Decision Model</li> <li>• Leveraged Leasing Model</li> <li>• HDB Rental Returns</li> <li>• Cash Flow Projection</li> </ul>		SB: Ch 1, 6, 7
3	<ul style="list-style-type: none"> <li>• Stock Valuation</li> <li>• VBA3</li> </ul>	<ul style="list-style-type: none"> <li>• Financial Statement Modeling</li> <li>• WACC estimation</li> <li>• Stock Valuation</li> <li>• VBA: For Next Loop 2</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: Double For Next Loop</li> <li>• Circular Reference</li> <li>• Model: Cash as Plug</li> <li>• Model: Cash and Debt as Plug</li> <li>• Model: Constant Debt Ratio</li> <li>• Model: Constant Current Ratio</li> <li>• Valuing the Stock</li> <li>• Model: Operating Leverage</li> <li>• Model: Geographical Breakdown</li> <li>• Model: Discrete Re-capitalization</li> <li>• Model: Discrete Fixed Asset Increment</li> </ul>	Group Project	SB: Ch. 3
4	<ul style="list-style-type: none"> <li>• Matrices</li> <li>• Excel Array Functions</li> <li>• Portfolio Models using Solver</li> <li>• VBA4</li> </ul>	<ul style="list-style-type: none"> <li>• Matrices</li> <li>• Using Array Functions and Formulas</li> <li>• Portfolio Models: Introduction</li> <li>• VBA: If Then Else 1</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: If-the-else: positive and negative beta</li> <li>• VBA: If-the-else: stock buy-sell strategy</li> <li>• Practice on Matrix Computations</li> <li>• Computing portfolio return and variance</li> <li>• Analyze portfolio with SIA and Sheng</li> </ul>		SB: Ch. 2, 31, 34, 8

			<ul style="list-style-type: none"> <li>Siong</li> <li>• GMVP via Solver</li> <li>• GMVP without Short Sales</li> </ul>		
5	<ul style="list-style-type: none"> <li>• Portfolio Models using Formulas</li> <li>• VBA5</li> </ul>	<ul style="list-style-type: none"> <li>• Efficient Portfolios When There Are No Short-Sale Restrictions</li> <li>• Alternative Variance-Covariance Matrix</li> <li>• Efficient Portfolios without Short Sales</li> <li>• VBA: If Then Else 2</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: If-the-else: income tax</li> <li>• Computing GMVP</li> <li>• Computing MVP given return</li> <li>• Computing Market Portfolio</li> <li>• Computing Efficient Frontier via formulas</li> <li>• GMVP without Short Sales</li> <li>• MVP given return without Short Sales</li> <li>• Efficient Frontier without Short Sales</li> <li>• Alternative Var-Cov Matrices</li> </ul>		SB: Ch. 8, 9, 10
6	<ul style="list-style-type: none"> <li>• Other Portfolio Models</li> <li>• VBA6</li> </ul>	<ul style="list-style-type: none"> <li>• Black Litterman Model</li> <li>• VaR</li> <li>• VBA: Do While, Do Until Loops</li> </ul>	<ul style="list-style-type: none"> <li>•VBA: Some useful Math Functions</li> <li>•VBA: Random Walk</li> <li>•VBA: Matching stock prices by date</li> <li>•Black Litterman Model</li> <li>•Black Litterman Model alternative usage</li> <li>•VaR for STI</li> </ul>		SB: Ch. 12
	<b>Recess Week</b>				
7	<b>Quiz 1</b>	<b>Practical Quiz 1 (2 hrs)</b>			SB: Ch. 41
8	<ul style="list-style-type: none"> <li>• VBA7</li> <li>• Option pricing Models: Black Scholes</li> </ul>	<ul style="list-style-type: none"> <li>•VBA: User-Defined Functions with VBA</li> <li>•VBA: Variable Types</li> <li>•VBA: Select Case Statement</li> <li>•Introduction to Options</li> <li>•The Black-Scholes Model</li> </ul>	<ul style="list-style-type: none"> <li>•VBA: Select-Case</li> <li>•VBA: Function: Transaction cost</li> <li>•VBA: Function: stock price from Gordon Super Normal Growth Model</li> <li>•VBA: Variable Types</li> <li>•Implied Volatility</li> <li>•Structured Product 1: Principal Protection + Participation in the upside</li> <li>•Structured Product 2: the Up-Up and Away product</li> </ul>		SB: Ch. 36, 37, 13, 15
9	<ul style="list-style-type: none"> <li>• Option Pricing Models: Simulation</li> <li>• VBA8</li> </ul>	<ul style="list-style-type: none"> <li>•VBA: Arrays</li> <li>•Generating Random Numbers</li> <li>•Modeling the Stock Price and option valuation</li> <li>•VBA: Simulation</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: your first array</li> <li>• VBA: using array to compute income tax</li> <li>• VBA: using array to compute portfolio management</li> <li>• VBA: simulating dice rolls</li> <li>• VBA: producing random numbers</li> </ul>		SB: Ch. 39. 16, 19

			<ul style="list-style-type: none"> <li>• VBA: Modeling the stock price</li> </ul>		
10	<ul style="list-style-type: none"> <li>• Option Pricing Models: Simulation</li> </ul>	<ul style="list-style-type: none"> <li>• Using Monte Carlo Methods For Option Pricing</li> <li>• Intro to Monte Carlo Methods</li> <li>• Option Pricing Models: Simulation</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: Valuing the Call and Put Option through simulation</li> <li>• VBA: Modelling with sub-periods</li> <li>• VBA: Valuing the Asian Call Option</li> <li>• VBA: Valuing the Barrier Call Options</li> <li>• VBA: Valuing the Basket Option</li> </ul>		SB: Ch. 29, 18
11	<ul style="list-style-type: none"> <li>• Option Pricing Models: Simulation</li> <li>• Option Pricing Models: Binomial</li> <li>• VBA10</li> </ul>	<ul style="list-style-type: none"> <li>• Binomial Option-Pricing Model</li> <li>• VBA: Forms</li> </ul>	<ul style="list-style-type: none"> <li>• VBA: Using Forms</li> <li>• Simulating investment returns</li> <li>• Binomial Option Pricing: Vanilla Options</li> <li>• Binomial Option Pricing: Structured Products</li> <li>• Law of Large Numbers</li> </ul>		SB: Ch. 23, 22, 17
12	<ul style="list-style-type: none"> <li>• Bond Modeling</li> </ul>	<ul style="list-style-type: none"> <li>• Duration</li> <li>• Immunization Strategies</li> <li>• Modeling the Term Structure</li> <li>• Calculating Default-Adjusted Expected Bond Returns</li> </ul>	<ul style="list-style-type: none"> <li>• Pricing a risky bond</li> <li>• Modeling the Yield Curve</li> <li>• Computing Par Yield</li> <li>• Computing Duration</li> <li>• Bond Immunization</li> </ul>		SB: Ch. 25-28
13	<b>Quiz 2</b>	<b>Practical Quiz 2 (2 hrs)</b>			