NATIONAL UNIVERSITY OF SINGAPORE

Department of Finance

FIN3130: Financial Modeling

Semester 2, 2016/2017

Instructor: **DR. LEE Hon Sing**
Office: **MRB BIZ1 7-75**
Telephone: **6516-5665**
E-mail: **honsing@nus.edu.sg**
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 on how to design and implement financial models in 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 as well.

Motivation

With the increasing sophistication in financial models, and the advance in IT, finance professionals and researchers increasingly need to perform basic financial modeling and data processing using the computer on their own. 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 consistently use for the rest of their career. Therefore it is not only crucial to learn how to implement financial models in the computer, but especially using the advanced tools and VBA in Excel as well. This subject complements 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 the 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 important perspective.

Learning Outcome

By the end of the course, students:
- learn of the four major classes of financial models and how to implement the models
- inherit a set of ready-to-go financial models which they can use in their professional or research work
- are able to design and put together financial models for analyzing and solving financial problems.
- are able to 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 sessions in a computer lab. In each session, the student will go through each financial model hands-on with the 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
3) access to NUS library's e-database (via the individual student's log in)

Flipped Classroom

The course will be delivered using the flipped classroom methodology. In the flipped classroom methodology, students are to learn their "lectures" at home and do their "homework" in class. This is detailed in the following points:
1) Students shall watch the videos and learn the lesson before the class session.
2) Each student will take an individual closed-book quiz at the start of each class.
3) Students will do worksheets in groups. The worksheets will cover the material of that week.

Advantages
1) Students can understand the lecture at their own time and pace.
2) Students have closer coaching by the instructor during class.
3) Students are trained in doing group work.
4) Students learn to take responsibility for their own learning, and develop the skills for life long learning.

Pre-requisite

ACC1002 Financial Accounting, FIN2004 Finance, and FIN3102 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
Total	**100**

Mid-Term Quiz

Date: Week of Feb 27 (In Class)
The mid-term quiz will be a 1.5 hour close-book practical test done in the computer lab. 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: Week of Apr 9 (In Class)
The final quiz will be a 1.5 hour close-book practical test done in the computer lab. 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 mid-term.

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 particular 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 feedback to the instructor comments and suggestions that may help the class to learn better.
- Students are to check the IVLE weekly for announcements.
- Please use the forum in IVLE exclusively for students' discussions
- Please use NUS e-mail for e-mail communications

Tentative Lesson Schedule:

Wk	Week Starting	Learning Outcome	Online Coverage	F2F Activities	Assign-ment & Assess-ment	Chapters
1	Jan 9	• **Basic Excel Functions** • **VBA1**	• Excel Functions • Data Tables • Some Excel Hints • VBA: Output to Cells	• First VBA pgm • Exchange Rate Table • Solver • Regression • Using IF's • Using Offset	**Group Project 1**	VBA notes SB: Ch. 33, 30, 35
2	Jan 16	• **Personal Finance** • **Corporate Financial Decisions** • **VBA2**	• Basic Time Value Models • The Financial Analysis of Leasing • The Financial Analysis of Leveraged Leases • Cash Flow Projection • VBA: For Next Loop 1	• VBA: Single For Next Loop • Loan Table • Balloon Loans • Retirement Planning • CPF returns • Leasing Decision Model • Leveraged Leasing Model • HDB Rental Returns • Cash Flow Projection	**Group Project 1**	SB: Ch 1, 6, 7
3	Jan 23	• **Stock Valuation** • **VBA3**	• Financial Statement Modeling • WACC estimation • Stock Valuation • VBA: For Next Loop 2	• VBA: Double For Next Loop • Circular Reference • Model: Cash as Plug • Model: Cash and Debt as Plug • Model: Constant Debt Ratio • Model: Constant Current Ratio • Valuing the Stock • Model: Operating Leverage • Model: Geographical Breakdown • Model: Discrete Re-capitalization • Model: Discrete Fixed Asset Increment	**Group Project 1**	SB: Ch. 3

4	Jan 30	• **Matrices** • **Excel Array Functions** • **Portfolio Models using Solver** • **VBA4**	• Matrices • Using Array Functions and Formulas • Portfolio Models: Introduction • VBA: If Then Else 1	• VBA: If-the-else: positive and negative beta • VBA: If-the-else: stock buy-sell strategy • Practice on Matrix Computations • Computing portfolio return and variance • Analyze portfolio with SIA and Sheng Siong • GMVP via Solver • GMVP without Short Sales	**Group Project 2**	SB: Ch. 2, 31, 34, 8
5	Feb 6	• Portfolio Models using Formulas • VBA5	• Efficient Portfolios When There Are No Short-Sale Restrictions • Alternative Variance-Covariance Matrix • Efficient Portfolios without Short Sales • VBA: If Then Else 2	• VBA: If-the-else: income tax • Computing GMVP • Computing MVP given return • Computing Market Portfolio • Computing Efficient Frontier via formulas • GMVP without Short Sales • MVP given return without Short Sales • Efficient Frontier without Short Sales • Alternative Var-Cov Matrices	**Group Project 2**	SB: Ch. 8, 9, 10
6	Feb 13	• Other Portfolio Models • VBA6	• Black Litterman Model • VaR • VBA: Do While, Do Until Loops	•VBA: Some useful Math Functions •VBA: Random Walk •VBA: Matching stock prices by date •Black Litterman Model •Black Litterman Model alternative usage •VaR for STI	**Group Project 2**	SB: Ch. 12
	Feb 20	**Recess Week**				
7	Feb 27	**Quiz 1**	**No online lessons**	**Practical Quiz 1 (1.5 hrs)** Information from the Web		SB: Ch. 41
8	Mar 5	• **VBA7**	•VBA: User-Defined	•VBA: Select-Case	**Group**	SB: Ch. 36,

		• Option pricing Models: Black Scholes	Functions with VBA • VBA: Variable Types • VBA: Select Case Statement • Introduction to Options • The Black-Scholes Model	• VBA: Function: Transaction cost • VBA: Function: stock price from Gordon Super Normal Growth Model • VBA: Variable Types • Implied Volatility • Structured Product 1: Principal Protection + Participation in the upside • Structured Product 2: the Up-Up and Away product	**Project 3**	37, 13, 15
9	Mar 12	• Option Pricing Models: Simulation • VBA8	• VBA: Arrays • Generating Random Numbers • Modeling the Stock Price and option valuation • VBA: Simulation	• VBA: your first array • VBA: using array to compute income tax • VBA: using array to compute portfolio management • VBA: simulating dice rolls • VBA: producing random numbers • VBA: Modeling the stock price	**Group Project 3**	SB: Ch. 39. 16, 19
10	Mar 19	• Option Pricing Models: Simulation	• Using Monte Carlo Methods For Option Pricing • Intro to Monte Carlo Methods • Option Pricing Models: Simulation	• VBA: Valuing the Call and Put Option through simulation • VBA: Modelling with sub periods • VBA: Valuing the Asian Call Option • VBA: Valuing the Barrier Call Options • VBA: Valuing the Basket Option	**Group Project 3**	SB: Ch. 29, 18
11	Mar 26	• Option Pricing Models: Simulation • Option Pricing Models: Binomial • VBA10	• Binomial Option-Pricing Model • VBA: Forms	• VBA: Using Forms • Simulating investment returns • Binomial Option Pricing: Vanilla Options • Binomial Option Pricing: Structured Products • Law of Large Numbers	**Group Project 3**	SB: Ch. 23, 22, 17
12	Apr 2	• Bond Modeling	• Duration	• Pricing a risky bond	**Group**	SB: Ch. 25-

			• Immunization Strategies • Modeling the Term Structure Calculating Default-Adjusted Expected Bond Returns	• Modeling the Yield Curve • Computing Par Yield • Computing Duration • Bond Immunization	**Project 3**	28
13	Apr 9			**Practical Quiz 2 (1.5 hrs)**		