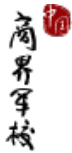# FIN-516
Financial Modeling in VBA
Fall Semester, Module 2, 2019-2020

Course Information

Instructor:
Fritz Koger, CFA, PhD
Office: PHBS Building, Room 752

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Office Hours: Mondays 10:30-11:30, or by appointment.

Teaching Assistant:
~~Teaching Assistant: Veronica, 张诗琪, Shiqi Zhang, 1701213153 in 2017 Finance~~
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~~TA Review Sessions: N/A~~

Classes:
Lectures: Monday and Thursday, 8:30 – 10:20
Venue: PHBS Building, Room 403 (Final Exam: Room 501)

Course Website:
N/A

Koger's Financial Modeling was selected for the Excellence Course Award by Peking University in2017.

1. Course Description

1.1 Context

Course overview:

This course is intended for the student who wishes to learn how to utilize financial theory in real world applications in a more profound manner. In Financial Modeling in VBA (***FMVBA***), students will learn and master Excel's user-defined capabilities. Such extensions include repetitive calculations lacking branches/loops captured via Excel's *Macros* as well as more advanced models using Excel's powerful programming language, **Visual Basic for Applications** (**VBA**), which allows for conditional branching and looping among other possibilities. Students of ***FMVBA*** will develop financial models in a breadth of topics. However, the focus of ***FMVBA*** will be on applications in which **VBA** is most valuable. In addition to conditional branching and looping, **VBA** is useful for modeling user-defined functions of multi-variables, e.g., Black-Scholes. Such calculations can be done more efficiently with user-defined functions, *especially* those ``buried'' inside other analyses. Indeed, more complex (i.e., multi-step) functions inside of repetitive calculations (e.g., Monte Carlo analysis) can really *only* be done via **VBA**. In short, whereas casual

Excel users do *not* need user-defined programs, such tools are indispensable for professional practitioners of finance.

Course Prerequisites: *Financial Modeling*. The professor is happy to consider any student's background on a case by case basis. Nonetheless, the professor reserves the right to screen students who have not yet taken it based on their background.

Furthermore, courses such as *Asset Valuation Theory, Corporate Finance*, and *Investments* are all helpful in preparing the student for **FMVBA**. Knowledge of computer programming is also helpful.

1.2 Textbooks and Reading Materials
Textbook of lecture notes: "*Financial Modeling in VBA*", by Koger, F., 60 RMB.

Additional References and Supplemental Textbooks:
Koger, F, "*Financial Modeling in Excel*", forthcoming in PKU Press.

Simon Benninga, "*Financial Modeling*", 3rd Ed., 2008, Massachusetts Institute of Technology, ISBN: 978-0-262-02628-4
Michael Rees, "*Financial Modeling in Practice*", 2008, Wiley Finance, ISBN: 978-0-470-99744-4.
Mary Jackson and Mike Staunton, "*Advanced Modelling in Finance using Excel and VBA*", 2001, Wiley Finance, ISBN-13: 978-0-471-49922-0.
John Charnes, "*Financial Modeling with Crystal Ball and Excel*", 2012, Wiley Finance, ISBN 978-1-118-17544-6.
Simon Benninga, "*Principles of Finance with Excel*", 2006, Oxford University Press, ISBN-13: 978-0-19-530150-2.
Isaac Gottlieb, "*Next Generation Excel, Modeling in Excel for Analysts and MBAs*", 2010, John Wiley and Sons, ISBN: 978-0-470-82473-3.
John Walkenbach, "*Microsoft Excel 2010 Power Programming with VBA*", 2010, Wiley Publishing, Inc., ISBN-978-0-470-47535-5

2. Learning Outcomes

2.1 Intended Learning Outcomes

Learning Goals	Objectives	Assessment
1. Our graduates will be effective communicators.	1.1. Our students will produce quality business and research-oriented documents.	
	1.2. Students are able to professionally present their ideas and also logically explain and defend their argument.	
2. Our graduates will be skilled in team work and leadership.	2.1. Students will be able to lead and participate in group for projects, discussion, and presentation.	
	2.2. Students will be able to apply leadership theories and related skills.	
3. Our graduates will be trained in ethics.	3.1. In a case setting, students will use appropriate techniques to analyze business problems and identify the ethical aspects, provide a solution and defend it.	
	3.2. Our students will practice ethics in the duration of the program.	
4. Our graduates will have a global perspective.	4.1. Students will have an international exposure.	
5. Our graduates will be skilled in problem-	5.1. Our students will have a good understanding of fundamental theories in	

solving and critical thinking.	their fields.	
	5.2. Our students will be prepared to face problems in various business settings and find solutions.	
	5.3. Our students will demonstrate competency in critical thinking.	

2.2 Course specific objectives

FMVBA will spend a small amount of time (up to 20% of course time) introducing topics. However, most financial concepts utilized in this course are presumed previously known. Otherwise, the remaining 80% of *FMVBA* introduces the power of **VBA,** including macros.

The course is practical in nature. Upon completion of the course, the student will be fluent in not only Excel and financial modeling, but also Macros (which generate VBA code) and **VBA** directly. Such fluency will position him/her very well for essentially any introductory financial job. The student will also have a nice tool kit of many real world financial models across a very broad range of topics. This combination of fluency of financial modeling via **VBA** and portfolio of models will prove invaluable during both interviews with potential employers as well as execution of finance-related employment tasks.

The professor has two primary goals: arm the student with
(1) many practical financial Excel models and
(2) programming knowledge of Excel, its Macros (which generate VBA code used in repetitive calculations) and direct programming in **VBA** in order to develop his/her own models as the need arises in his/her professional and personal life.

Each student is required to possess a laptop equipped with Excel and **VBA**.

FMVBA is very "hands-on", with most of the grade determined via demonstration of building models per: (1) group (homework) projects, and (2) a final exam. Group membership numbers six (6) and will be determined by the students themselves by the fourth lecture. (The professor is happy to assign groups to those students who prefer not to choose their own group members.) The purpose of group homeworks/projects is to reinforce and to extend the student's knowledge regarding models built during lectures.

The final exam will be easier if you have actively participated in the group projects. Otherwise, the final exam will likely be beyond the student's capability.

2.3 Assessment/Grading Details

Course Guidelines: There are two overarching themes: the professor's aims are to (1) be as fair as possible to everyone, and (2) create the optimal learning environment for everyone. The professor firmly believes that treating individuals differently is inherently unfair. Thus, everyone will be treated the same.

The student's final grade will be

20% (Professor's Subjective Evaluation)
+ 30% (Average of student's Group Project Scores*)
+ 50% (Individual Exam Score).

*Group Peers' Subjective Evaluation: Each student will self-select into groups of six (6) students. (The professor will assign any student to a group who chooses not to self-select.) Evaluations from each student's group peers will be done during the final week of the module. *NO HUMAN BEING OTHER THAN THE PROFESSOR WILL SEE ANY STUDENT'S EVALUATIONS; NOT EVEN THE TA*. These evaluations will factor into the "Average of student's Group Project Scores". So a student who receives his/her proportional weight from his peers' evaluations will have a factor of 100%. A student who receives more (less) than his/her proportional weight will have a factor greater (less) than 100%.

EXAM: If the student has actively participated in all project work, if the student has attended all lectures, if the student has kept up with textbook lecture readings, and if the student has studied carefully any lecture notes provided by the professor, then the exam will be straightforward. *Otherwise, the student will likely be incapable of negotiating it*.

EXAM GUIDELINES: Please review carefully the guidelines. *If the student is uncomfortable with these, then the student should not take this course*. The professor will grade that which is handed in on time. The final exam will be completed in Excel along with its extensions. The exam is performed via computer, and the professor will grade that which is saved onto the student's USB (thumb) drive. If the student can NOT confidently work quickly and efficiently and save his/her work afterward on a USB drive, then he/she should NOT take the course. The student who chooses to take the exam with inferior equipment does so at his\her own peril.

Professor's Subjective Evaluation: This is based in part, on his/her punctuality, attendance, classroom behavior, attitude, preparedness, etc… Per PHBS policy, if he/she is absent 6 (or more) lectures, then he/she *automatically fails* the course. Letting the professor know in advance of a tardiness or absence is not only does not excuse it, but the professor prefers not to receive such emails or texts. The number of absences is independent of whether or not they are approved by the University or HSBC Business School. (The professor does *not* distinguish between approved or unapproved absences.) Also, the professor does *not* sign PHBS forms related to the student's planned absence(s).

To minimize classroom disruptions, the professor strongly urges the student to be punctual. All announcements are made at the beginning of class, making punctuality all the more important. If you miss a lecture, you are responsible for material covered. *Secure information missed from a fellow student*, not from the professor.

Disturbing class lectures will negatively impact the student's subjective evaluation. Talking during class, having a cell phone ring, etc… are disturbances that are unacceptable. These rules are designed to optimize the learning environment for all students.

2.4 Academic Honesty and Plagiarism

This class will be conducted in full accordance with PKU's policies regarding academic integrity. Anyone caught cheating will be punished as severely as the school permits.

On group projects, each group is to work independently of other groups. Whereas it is OK for students between different groups to consult each other, each group's deliverable should be independently developed. Simply copying one group's project by another group will result in penalties for *both* groups. For the final (individual) exam, no consultation between students is allowed. The final (individual) exam is to be solely developed by each individual, with no assistance of any kind from any other person. Again, policies are designed with fairness in mind.

Educational Norms and Expectations: The student is responsible for material covered in any class. If a student misses a class, he/she should retrieve lecture notes from a classmate.
It is in the student's best interest to *read any assigned material BEFORE the lecture*. That way, the student will find the lecture period to be much more productive.

Suggestions for improving the course: The professor is committed to making this course as good as possible. If the student has suggestions to improve the course, he/she should inform the professor, *IN PRIVATE*. (During a lecture is *not* the appropriate time for such feedback, as there is no time during the lecture for such discussions.) The course is obviously for the student's benefit, not the professor's. So any feedback is greatly appreciated and is seriously considered.

Add/Drop the Course: Per PHBS policy, the student is not allowed to add or drop this course after the first week.

Any issue not specifically addressed here will be handled at the discretion of the professor.

It is important for a student's effort and credit to be recognized through class assessment. Credits earned for a student work due to efforts done by others are clearly unfair. Deliberate dishonesty is considered academic misconducts, which include plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis.

All assessments are subject to academic misconduct check. Misconduct check may include reproducing the assessment, providing a copy to another member of faculty, and/or communicate a copy of this assignment to the PHBS Discipline Committee. A suspected plagiarized document/assignment submitted to a plagiarism checking service may be kept in its database for future reference purpose.

Where violation is suspected, penalties will be implemented. The penalties for academic misconduct may include: deduction of honour points, a mark of zero on the assessment, a fail grade for the whole course, and reference of the matter to the Peking University Registrar.

For more information of plagiarism, please refer to *PHBS Student Handbook*.

3. Topics, Teaching and Assessment Schedule

Lec.	Dates	Lecture Topics	Chapters/ Sections	Projects/ Comments
1	11/20 Fri	Install Developer tab from Options, and install optimal VBE Option settings from with VB Editor Tools Options; macro-enabled workbooks; VBA Example: Bond yield, duration, convexity; Run program ``PriceDurConv'' (not time to review code); Functions; ``For Loops'' via factorial function; **1LB FMVBA Factorial For Loop CODE.docx;** **1LA FMVBA Bond YTM Dur Conv.xlsm**	1 13 2 16.1 – 16.2 22.1	Distribute Textbooks; Review Syllabus;
2	11/24 Tues	Reference styles (A1 Vs. R1C1) VBA code protocol; Toolbars: Standard, Edit, Debug; recording Macros (goal seek, data table, copy/paste); functions calling functions via combination function of factorial function; **2L FMVBA Recursion Combination CODE.docx**	20.1 28 18.1 – 18.3 17.1 16	
3	11/27 Fri	``Do Loops'' (While, Until statements) and ``For Loops'' **3L FMVBA Factorial Loops CODE.docx;** **3LB FMVBA Loops Subs Call Subs CODE.docx**	23, 22.1	
4	12/1 Tues	SUBs calling SUBs (one Sub calling previous six); Immediate & Locals & Watches windows debug via stepping (step: into, out of, over; run to cursor); Dynamic arrays **4L FMVBA Bonds Arrays Template.xlsm**	15.3 18 14.1	Team Compositions Due 20:00
5	12/4 Fri	Scope of functions; passing arguments; SUBs; nested ``For Loops''; **5L FMVBA Calling Subs Scopes.docx**	Finish 14 15	Review Project #1
6	12/8 Tues	Numerical Methods (e.g., project IRR) **6L FMVBA NPV IRR Subs Num Meths Template.xlsm**	5	
			Sat. 12/12	**Project #1 due 20:00**
7	12/11 Fri	Absolute reference Vs. relative reference; A1 Vs. R1C1; Placing formulas into cells via VBA; VBA Goal Seek; data tables in VBA; FormulaArray; **7L 8LA FMVBA Formulas Reference Style Mode Template.xlsm**	20 26 3	
8	12/15 Tues	Continue **7L 8LA FMVBA Formulas Reference Style Mode Template.xlsm;** Solver; **8L FMVBA 2 NPV Solver FormulaArray Template.xlsm**	26 3.7	
			Sat. 12/19	**Project #2 due 20:00**
9	12/18 Fri	Constrained optimization (Solver) inside loops: optimal risky-asset portfolio frontier; **9L FMVBA Solver Loops Eff Portfs Template.xlsm** (illustrate lines of code saved via ``**9LB FMVBA Solver Loops Eff Portfs 22 CODE.docx''**)	Finish 17 22 6 6	
10	12/22 Tues	Branching: IF lines and blocks; Select case; GoTo statement; Nested Loops **10L FMVBA Select Case IF Blocks Nested For and IF.docx**	21	
11	12/25	Options' portfolio payoff at expiration;	9	

	Fri	**11L FMVBA Port Profit Expn Nested Loops SELECT Template.xlsm.** (Include alternative styles: A1 Vs. R1C1) (illustrate lines of code saved via ``**11LB FMVBA Port Profit Expn Nested Loops Select 22 CODE.docs**'')			
12	12/29 Tues	Arrays and Nested loops (e.g., binomial model of stock prices; European options; American options); Whiteboard presentation; **12L FMVBA Arrays Loops Amer Opts Template.xlsm**	8		
				<mark>Sat. 1/02</mark>	<mark>Project #3 due 20:00</mark>
13	1/5 Tues	Monte Carlo Analysis; **13L FMVBA Monte Carlo Estimate of Pi Template.xlsm**	9		
14	1/6 Wed	Path dependent options; **14L FMVBA Arrays Loops Path Dept Opts Template.xlsm** Begin Range object; **14LB FMVBA Range Vs Variables CODE.docs**	10 24		
				<mark>Sat. 1/09</mark>	<mark>Project #4 due 20:00</mark>
15	1/8 Fri	Range object; **15L FMVBA Range Object Vs. Variables Template.xlsm**	24		
16	1/12 Tues	Functions and arrays; **16LA FMVBA Functions and Arrays Template.xlsm** Collections of objects; For Each…Next loops; **16LB FMVBA For Each Template.xlsm**	4 25		
17	1/15 Fri	More on collections and For Each..Next loops; **17LA FMVBA Regressions** **17LB FMVBA More ForEach Demos**	25		
18	1/19 Tues	Additional possible topics as time permits: More on macros (Ch. 17); With blocks (Ch. 22); MsgBox; InputBox; data validation (Ch. 19); personal macro workbook; Variables scope and declarations (Ch. 14); Miscellaneous functionality; Miscellaneous;			
	Fri., Jan. 22	**Final Exam**			

Additional Topic Possibilities.

gold mine using Monte Carlo analysis; correlated random variables in VBA; more on generating random variables and their distributions

Cholesky decompositions;

Replication of portfolios of options (via stocks and bonds) when the options do not exist;

Liability immunization via bond portfolios;

Bond expected return calculations via multi-period credit rating transition matrices;

Financial Modeling in VBA, Koger, F.

Brief Contents