

ACSI 301: Theory of Interest

2018

Mathematical Interest Theory, Vaaler and Daniel, Chapters 1-9

Financial Mathematics, Solla, Chapters 1-4

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Course Description: An introduction to the mathematical theory of interest. Topics include money growth, investment return, annuities, arbitrage, interest rate sensitivity, and immunization.

Course Objectives: *Continue to learn mathematics used in the actuary profession.* The second test in the actuary field is Exam FM: Financial Mathematics. This tests your knowledge of the basic ways that money is invested, and the ways that investments are evaluated. ACSI 301 prepares you for this test, while covering the basics of financial mathematics including time value of money, annuities, loans, bonds, portfolios, options, and immunizations.

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply concepts of financial mathematics to calculating present and accumulated values
- Demonstrate proficiency in pricing, asset/liability management, and capital budgeting
- Synthesize partial financial information into a complete financial analysis
- Demonstrate the use of no-arbitrage concepts in financial mathematics
- Demonstrate proficiency of each of the learning objectives at the Society of Actuaries FM webpage

Required Reading:

Mathematical Interest Theory, Vaaler and Daniel

Financial Mathematics, Solla

Equipment: A Texas Instruments BA II Plus calculator or equivalent is required. The BA II Plus is recommended by the Society of Actuaries for the FM exam.

Attendance Policy: Regular attendance is expected. You must keep up with definitions! You are responsible for everything done in class. If you miss a class, e-mail or call me before class is over and explain why. **If you have two unexplained absences, you will be dropped from the course after a warning email is sent.**

I expect you to spend at least 12 hours of work each week inside and outside of class.

You should expect to spend more time on material that is difficult for you.

Academic Integrity: The college policy is fully supported. Tests and are closed notes, closed book. Homework assignments will be discussed in class, and you may always ask me for help. **Do not** collaborate on homework. No electronic devices are allowed in a test situation.

Co-Curricular: During the course of the semester, you must attend at least two approved co-curricular events. There are usually ten or so events in a semester, but do not procrastinate! For each, write a report with (1) a brief summary and (2) a discussion of something that interested you. Due within a week of the event. The event may be a part of the MCSP Conversation Series or an approved event of special interest to ACSI majors.

Study problems and homework: Problems from each chapter of the books will be assigned. Many of these will be turned in as part of the every-other-week homework assignment. Others are intended as preparation for the every-other-week tests. Start on these problems early and ask questions in class and in office hours!

Tests: Mastery based. Topics may be attempted at any time. Topic list and grading scale are given below. The exam is Friday, April 28, 2:00-5:00.

Make-ups: In case of sickness or scheduling conflicts, get in touch with me ASAP.

Grading: Homework and co-curricular count 20%. The exam and tests count 80% of the final average. Grades may be curved up based on extenuating circumstances.

A: 93-100 A-: 90-92 B+: 87-89 B : 83-86 B-: 80-82 C+: 77-79 C: 73-76 C-: 70-72
D+: 67-69 D: 63-67 D-: 60-62 F: 59 and below

Special Needs: located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library, provides reasonable accommodations to students with identified disabilities. Reasonable accommodations are provided based on the diagnosed disability and the recommendations of the professional evaluator. In order to be considered for disability services, students must identify themselves to the Office of Accessible Education Services. Students requesting accommodations are required to provide specific current documentation of their disabilities. Please contact Accessible Education Services, at 540-375-2247. If you are on record with Accessible Education Services as having academic or physical needs requiring accommodations, please schedule an appointment with Accessible Education Services soon. You need to discuss your accommodations before they can be implemented. Also, please note that arrangements for extended time on exams, testing, and quizzes in a distraction-reduced environment must be made at least one week *before every exam*.

Topics:

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|---------------------------|--------------------------------|
| 1. Simple Interest | 16. Annuities |
| 2. Compound Interest | 17. Amortized Loans |
| 3. Discount Functions | 18. Replacement of Capital |
| 4. Force of Interest | 19. Bonds |
| 5. Inflation | 20. Valuing a Bond |
| 6. Time Value of Money | 21. Callable Bonds |
| 7. Equations of Value | 22. Brokerage Accounts |
| 8. Investment Return | 23. Forward Contracts |
| 9. Yield Rates | 24. Commodity Futures |
| 10. Annuities | 25. Options |
| 11. Financial Instruments | 26. Derivative Instruments |
| 12. Perpetuities | 27. Price Options |
| 13. Loan Balances | 28. Convexity |
| 14. Annuities w/Payments | 29. Immunization |
| 15. Level Annuities | 30. Asset-Liability Management |

Grading Scale:

Master x topics, grade is $25 + 2.5 x$

Date	Topic	Sections	Notes
1/16	Introduction		
1/18	Simple Interest	Vaaler 1.3,1.4	Homework #1 due
1/20	Compound Interest	Vaaler 1.5,1.6	
1/23	Discount Functions	Vaaler 1.7-9	
1/25	Force of Interest	Vaaler 1.10-12	Homework #2 due
1/27	Inflation	Vaaler 1.14	
1/30	Time Value of Money	Solla Chapter 2	
2/1	TEST #1		
2/3	Equations of Value	Vaaler 2.2,2.3	
2/6	Investment Return	Vaaler 2.4,2.5	
2/8	Yield Rates	Vaaler 2.6,2.7	Homework #3 due

Date	Topic	Section	Notes
2/10	Annuities	Vaaler 3.2,3.3	
2/13	Financial Instruments	Solla, Chapter 3	
2/15	TEST #2		
2/17	Perpetuities	Vaaler 3.4,3.5	
2/20	Loan Balances	Vaaler 3.6,3.7	
2/22	Annuities w/Payments	Vaaler 3.8,3.9,3.11	Homework #4 due
2/24	Level Annuities	Vaaler 4.2,4.3	
2/27	Annuities	Vaaler 4.4-4.6	
3/1	TEST #3		
	SPRING BREAK		

Date	Topic	Section	Notes
3/13	Amortized Loans	Vaaler 5.2,5.3	
3/15	Replacement of Capital	Vaaler 5.4,5.5	
3/17	Bonds	Vaaler 6.2-6.4	Homework #5 due
3/20	Valuing a Bond	Vaaler 6.5,6.6	
3/22	Callable Bonds	Vaaler 6.7,6.9	
3/24	TEST #4		
3/27	Brokerage Accounts	Vaaler 7.1,7.2	
3/29	Forward Contracts	Vaaler 8.3	
3/31	Commodity Futures	Vaaler 8.5,8.6	Homework #6 due

Date	Topic	Section	Notes
4/3	Options	Vaaler 8.7,8.8	
4/5	Derivative Instruments	Solla Chapter 4	
4/7	TEST #5		
4/10	Price Options	Vaaler 8.8,8.10	
4/12	Convexity	Vaaler 9.2,9.3	
4/17	Immunization	Vaaler 9.4	
4/19	Asset-Liability Mgt	Solla Chapter 5	Homework #7 due
4/21	TEST #6		
4/24	Review for Exam		
4/28	FINAL EXAM		