STERN SCHOOL OF BUSINESS
NEW YORK UNIVERSITY

MATHEMATICS OF INVESTMENT
STAT-GB.2309.30/STAT-UB 27.01

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COURSE SYLLABUS

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COURSE SYLLABUS

A. Course Outline

The course is a mathematical treatment of the methods used in the evaluation of fixed income securities. It is a course, which will enhance the student’s mathematical understanding of Debt Instruments. The course will discuss the mathematical foundations of such fixed income instruments as mortgages and bonds. The mathematical aspects will be applied to various applied topics, such as mortgage refinance, yield rates on automobile leasing agreements, present value of structured settlements, the effects of interest rate variation on the price of bonds, and debt immunization. Several cases will be assigned.

B. Required Readings


Reading 1 should be purchased from the NYU Bookstore. Reading 2 will be distributed during the first class meeting.
C. **Course Topics**

1. The measurement of interest and discount with applications to Treasury Securities.

2. Equations of value, including the determination of term and the interest rate of investment.

3. Basic annuities with level payments, with applications to real estate mortgages and refinance strategies.

4. General annuities, including varying payments, with applications to structured settlements in lawsuits.

5. Loan amortization schedules and sinking funds.

6. Bond evaluation and pricing.

7. Automobile Leasing.

8. Determination of yield rates and rates of return.

9. The term structure of interest rates.

10. Duration and convexity with applications to the measurement of interest rate risk and the volatility of fixed income Instruments such as mortgages and bonds and debt immunization.
### D. Allocation of Readings to Topics

<table>
<thead>
<tr>
<th>TOPIC NUMBERS</th>
<th>TOPIC</th>
<th>READINGS</th>
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</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>Measurement of interest and equations of Value</td>
<td>B: Chapter 1: All.</td>
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<tr>
<td>3 and 4</td>
<td>Basic and General Annuities</td>
<td>B: Chapter 2: All except Sections 2.4.2 and 2.4.3.</td>
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<td>5</td>
<td>Loan amortization</td>
<td>B: Chapter 3: All except Section 3.1.5 and 3.4. C: Pages 36 - 38.</td>
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<td>6</td>
<td>Bond evaluation and pricing</td>
<td>B: Chapter 4: All except Section 4.3.2. C: Pages 8 – 10, 39, 40.</td>
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<td>7</td>
<td>Automobile Leasing</td>
<td>C: Pages 10 - 11, 49 – 51.</td>
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<tr>
<td>8</td>
<td>Determinations of yield rates and rates of return</td>
<td>B: Chapter 5: All except Sections 5.1.4, And 5.3.</td>
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<td>9</td>
<td>Term structure of interest rates</td>
<td>B: Chapter 6: 6.1 and 6.3.1</td>
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<td>10</td>
<td>Duration, convexity, and interest rate risk with applications to bond pricing and debt immunization.</td>
<td>B: Chapter 7: Sections 7.1 and 7.2. C: Pages 12 - 34, 41, 42.</td>
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E. **Calculator**

You should have a small, hand held calculator which has a $y^x$ key for use during assignments and examinations. A calculator with financial functions, including computation of yield rates, would be very helpful.

F. **Basis for Grade**

There will be a midterm and final examination and weekly homework assignments. The final will count for 50% of the grade; the midterm will count for 30% of the grade, and the homeworks will count for 20% of the grade.

G. **Prerequisites**

1. Two Semesters of Undergraduate Calculus, or

2. Permission of the Instructor

**Note:**

Students should have knowledge of basic calculus. Problems using calculus will be assigned. However, the midterm and final examinations will not test the student’s knowledge of calculus and examination problems will not require the use of calculus.