

SIMON FRASER UNIVERSITY
Faculty of Business Administration

Midterm Examination

BUS 417
Security Analysis

05-3

Rules for Submission: Answers to questions are to be typed, single spaced, of maximum length 1 page **each** for all questions, with 1" margins and type point not less than 12. (This assignment is typed in 12 point.) Violations will be subject to deductions. Assignments are due in class Nov. 1, 2005. Be sure to answer all parts of each question selected.

REQUIRED QUESTION. 25 pts. (10 points for part a and 15 points for part b)

- a) Nicholas Bernoulli (1709) was quoted as saying: "I notice that the value of (life annuity) incomes is not correctly calculated by supposing that the return will last as many years as someone is supposed to live". Explain the rationale for Bernoulli's statement. Is it possible for the value of a life annuity to be greater than the value of a term annuity with term to maturity equal to the duration of life?
- b) Contrast the solutions to the life annuity valuation problem developed by de Witt, Halley and de Moivre. Be sure to explain: the connection of the pricing formulas to pricing using discounted expected value; and, to identify the limitations for each of the solutions.

SELECT 2 of 3 QUESTIONS 30 pts. each (15 points for each part)

1. "Classical immunization strategies, which explicitly assume parallel yield curve shifts, cannot in theory be expected to provide immunization when the yield curve shifts (are nonparallel)... However, these conditions readily generalize to conditions that insure immunization against any given yield curve shift assumption. Unfortunately, these conditions are not compatible in general. That is, immunization against a given type of shift will often create exposure to other types of shifts, causing immunization to fail as other shifts are realized."

a) Explain how the classical immunization conditions can be adapted and improved to provide estimates of the degree of immunization risk associated with non-parallel yield curve shifts.

b) Comment on the implications of this statement for asset and liability management of fixed income portfolios. In your answer, be sure to identify and discuss "classical immunization strategies".

2.a) "For a callable bond, it is inappropriate to use modified duration (and convexity) because the expected cash flow changes as the yield changes....A change in interest rates will affect the price volatility of the noncallable bond component depending on the duration of the noncallable bond. It will also affect the price of the embedded call option."

Explain how the option adjusted duration measure is derived and how this measure and the option adjusted convexity measure can be used in the analysis of callable bonds.

B) An important drawback of "traditional yield spread analysis" is the "failure to take into account future interest rate volatility that would affect the expected cash flow" of a fixed income security. What is option adjusted spread analysis and how does this technique correct for this limitation of traditional yield spread analysis in the valuation of bonds with embedded option features? Once the option adjusted spread has been determined, how can the cost of option be calculated? What are some important pitfalls of option adjusted spread analysis?

3.a) Explain this statement: "...the larger the convexity on a portfolio, the less the value of the portfolio rises over time if the interest rate remains unchanged." What are the implications of this result for the asset/liability managers seeking to control interest rate risk? (Hint: In your answer be sure to address the tradeoff between time value and convexity.) Is it true that "the cost of a higher convexity is a lower yield"?

b) "Whether the bond market moves up or down, high-convexity portfolios will always outperform low-convexity portfolios of equal duration and yield." Explain the argument supporting this statement. What factors would tend to undermine this position?

REQUIRED NUMERICAL AND DEFINITIONS QUESTION (15 points, 5 points for each part, please show calculations where relevant)

a) You are in the Vancouver market for a house. Your effective all-in market borrowing rate for a house mortgage from a chartered bank is 6%. One of the houses you are considering purchasing has an assumable \$300,000, 4 year mortgage at 3.5%, with a 24 year amortization. The asking price on the house is \$600,000. What is the value of the concessionary financing for this house?

b) Assuming arithmetically declining death rates and an interest rate of 4%, what is the modified duration of a life annuity for a 30 year old person that cannot live beyond 100 years.

c) Define the following: i) non-specific sinking fund with a funneling provision; ii) joint life annuity; iii) investment grade bond; iv) income trust; v) bond covenant.