SIMON FRASER UNIVERSITY
Faculty of Business Administration

Midterm Examination

BUS 417 15-2
Security Analysis

Rules for Submission: Answers to questions in Part I 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. Both a) and b) parts have to be contained within one page.) Violations will be subject to deductions. There is no page constraint for questions in Part II. Assignments are due in class, Fri., July 3, 2015. Be sure to answer all parts of each question.

PART I. ESSAY QUESTIONS. 20 pts. per question -- 10 pts. each for a) and b).

1. a) Discuss the early history of life contingency valuation, from Roman times to the 16th century. Be sure to discuss: the role of life contingencies in municipal and state finance; and, the role of religion in determining the method of security contracting.
b) Contrast the solutions to the life annuity valuation problem developed by de Witt, Halley and de Moivre. Be sure to identify relevant assumptions used to obtain the solutions and to explain the connection of each life annuity pricing formula to pricing using discounted expected value.

2.a) "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 and the connection to the classical immunization strategy. What factors would tend to undermine the validity of the statement?
b) 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 asset/liability managers seeking to control interest rate risk for the fixed income portfolio of a life insurance company or pension fund? Is it true that "the cost of a higher convexity is a lower yield"? (Hint: In your answer be sure to address the tradeoff between time value and convexity.)

3. a) Describe the evolution of security analysis from 1900 to the present. In your answer be sure to identify seminal contributions to the different approaches to the subject and to provide an overview of the essential elements of these possible approaches.
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? How does this technique correct for the “failure” 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 using option adjusted spread analysis to value mortgage backed securities and other collateralized debt obligations?

PART II: NUMERICAL, MATHEMATICAL AND DEFINITIONS QUESTIONS
CHOOSE 2 of 3 (40 points total; 20 points per question; 10 points each for a) and b) parts)

1.a) ***Derive*** the Macaulay duration for: a perpetuity; a term annuity; and, a par bond.
b) Using the life annuity duration formula assuming arithmetically declining survival rates, calculate the Macaulay duration of a life annuity for a 66 year old person that cannot live beyond 100 years with an interest rate of 5%. (Hint: It is possible to use a 'discrete' derivative.)

2.a) You are in the Vancouver market for a house. Your effective all-in market borrowing rate for a 4 year term house mortgage from a chartered bank is 4.14%. One of the houses you are considering purchasing has an assumable $625,000, 4 year mortgage at 2.69%, with a 22 year amortization. The asking price on the house is $800,000. What is the value of the concessionary financing for this house?
b) Assuming arithmetically declining survival rates, calculate the duration of a term annuity using the expected duration of life as the term to maturity.

3.a) You are about the retire at age 65 and expect to achieve a 5% return on your invested capital over the full length of your retirement. What level of initial investment capital do you require to ensure a $70,000 per year income until age 100? If you start your retirement with $1 million dollars, plan to have income of $80,000 per year and expect to achieve a 3% return on invested capital, how many years will pass before your funds are exhausted? How do your answers to the previous two questions change if the expected return is 7.5%?
b) Explain how to use a Taylor series expansion to approximate the function:

$$f[x] = \frac{1}{1 - x}$$

where the Taylor series is evaluated with an initial starting $x = a$ value of ½ . (Hint: evaluate and plot the first, second and third order expansions and provide an expression for the limiting solution.)