SIMON FRASER UNIVERSITY
Beedie School of Business Administration
Take home Final Examination

BUS 419 19-2
Advanced Derivative Securities

Academic Honesty: This assignment is individual work. Students are required to follow requirements of S10.01 (see class web page).

Rules for Submitting Final Exam: Answers to questions are to be typed (except for equations), single spaced, of length 1 page ***each*** for all questions, 8"x11" standard paper, with 1" margin and type point not less than 12. (This assignment is typed in 12 point.) For questions with multiple parts, answer all parts of the question. Violations will be subject to deductions. Assignment is due in my office no later than 10:30AM on Fri. Aug. 16, 2019.

DO ALL FOUR QUESTIONS (Do all parts of each question)

1. Compare and contrast the risk management practices for all firms from the in-class presentations: i) financial firm -- RBC; ii) the airlines (SIA, LUV, AA); iii) the oil and gas sector (CPG, PPL, CNQ). Be sure to identify and contrast the risk management techniques, risk reporting techniques; accounting methods; and, the amount and type of derivative security usage. In addition, provide an assessment of the risk management strategies.

2. a) Outline the continuous time derivation of the Black-Scholes option pricing model. What key assumptions are being made to derive the results?
b) What are the limitations of applying the Black-Scholes option pricing model to actual options prices for: i) dividend paying stocks; ii) a different distributional assumption for stock prices; and, iii) commodity futures contracts? [Hint: Provide formulas and explanation.]

3. **CHOICE QUESTION: DO EITHER**
a) A long stock position can be "protected" by buying a put. How can the payoff on this portfolio of a stock and option be replicated using "dynamic hedging" strategies involving portfolios which combine only stock and bond positions? (Hint: Be sure to identify the difference between path dependent and path independent strategies.)
b) Are forward prices unbiased predictors of future spot prices? [Hint: Assuming mean-variance agents, derive an expression for the optimal speculative position size.] What happens to this position as the sensitivity of the agent to risk diminishes? Based on this, what can you conclude about the equilibrium in a market dominated by risk-neutral speculators?

OR

a) Describe the various forms of portfolio insurance. How would these various forms of portfolio insurance perform in the face of discontinuous movements in equity prices during: i) the October 1987 market break; and, ii) the collapse of Sept. 2008- March 2009?

b) Derive a "closed-form" expression (i.e., a formula) for the risk-minimizing hedge ratio. In what sense is this ratio an optimal hedge ratio? How is your answer affected if the commodity being hedged is undetermined at the time the hedge is "put on", e.g., a wheat farmer hedging the expected income to be generated by a crop which has just been planted.

4.a) Assuming European options on non-dividend paying stocks, **state the exact formulas** for the delta, gamma and theta for a **purchased** (long) position in: i) a strangle spread (X for put less than for X call, same T); ii) a butterfly using calls (3 different X and same T); and, iii) a vertical spread using puts (different X and same T).
b) Using the parameters: $S = 53$; $r = 0.041$; $\sigma = 0.38$; $T = 0.58$ if each spread is constructed to be **delta neutral** and have the **same initial value** (the value of the positions, V^*, is the same), then calculate the relative gamma and theta of the spread positions and explain the reasons for the differences in the Greeks? [Hint: Provide copy of program used to calculate results; this does **not** count against the 1 page requirement.]

BONUS: (5 points)
Under what conditions will an American call option on a dividend paying stock be exercised early? When will an American put on non-dividend paying stock be exercised early?