GX411

OLLSCOIL NA hÉIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2002

SEMINAR IN FINANCIAL ECONOMICS II (EC411)

4th B.Sc. in Financial Mathematics and Economics

Professor H. Dixon
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TIME ALLOWED: 2 Hours

INSTRUCTIONS - PLEASE READ CAREFULLY

Sections	No. of Questions to be attempted	Total number of marks
A	3 out of 5	150

Attempt the correct number of questions in each section: If you attempt MORE THAN the correct number indicate clearly those questions which you wish to be graded. If you make no such indication the appropriate number of lowest-numbered questions of those you answered will be graded.

Write your Name, Student Number and Examination Number on each answer book.

The use of calculators is permitted - programmable calculators may not be used.

SECTION A

Instructions: Answer THREE questions.
Each question is worth 50 marks.

1. **(a)** Put-call parity is an important relationship between a European call and put option for a non-dividend-paying stock.
Explain clearly how this relationship is derived.

(b) European call and put options on Nokia stock have a strike price of€20 and an expiration date in three months. Each sells for€3.
The risk-free interest rate is 10% per annum with continuous compounding, the current stock price is €19, and a €1 dividend is expected in one month.

Write out the new relationship for put-call parity with dividends.
Use this to identify the arbitrage opportunity, if any, open to a trader in the above case.

(c) Three put options on Boots plc stock have the same expiration date and strike prices of £45, £50, and £55. The market prices are £2, £4, and £5.50, respectively.

When is it appropriate for a trader to purchase a butterfly spread?
Explain how a trader can create a butterfly spread in Boots stock given the above information.
Construct a table showing the profit from the strategy.
For what range of stock prices would the butterfly spread lead to a loss?

2. Answer either question (a) OR (b)

(a) 'Given the three available alternative hedging strategies – physical storage, long-dated forward contracts, and stack-and-roll, Metallgesellschaft's (MGRM) choice of the last of these was quite appropriate. Since, while the hedging programme did expose the firm to a number of significant risks – basis, rollover, and funding risks – the strategy was fundamentally sound, only to be terminated prematurely.'
Discuss.

(b) In the last six years, a number of financial institutions have suffered very large losses trading derivatives. Two of the most high profile cases involved so-called 'rogue traders', namely Nick Leeson (Barings) and John Ruznak (AIB-Allfirst).

It has been argued that each of these losses reflected fundamental deficiencies in the management of the financial institutions rather than the inherent riskiness of the underlying derivatives.
Do you agree? Explain your answer as fully as possible.

3. **(a)** (i) Outline two reasons why hedging using futures contracts works less than perfectly in practice.

(ii) The problems identified in (i) give rise to basis risk. Define this concept. Explain why a short hedger's position improves when the basis strengthens unexpectedly and worsens when the basis weakens unexpectedly.

(b) A London-based fund manager has a portfolio worth £60 million with a beta of 0.75. The manager is concerned about the performance of the market over the next two months and plans to use three-month futures on the FTSE 100 to hedge the risk.

The current level of the FTSE 100 is 5150, one futures contract is on 250 times the index, the risk-free rate is 5% p.a. with continuous compounding, and the dividend yield on the index is 2.5% per annum.

(i) Write out the theoretical relationship for the futures price. Calculate its value in the above case.

(ii) What position should the fund manager take to eliminate all exposure to the market over the next two months?

(iii) Suppose that the fund manager wishes to change the portfolio's beta to 0.45. What position should the manager now take?

(iv) Based on your strategy in part (ii), calculate its effects on the fund manager's returns if the level of the FTSE 100 in two months is 4,900 and 5,500.

4. **(a)** Explain fully the no-arbitrage approach to valuing a European call option using a one-step binomial option-pricing model.

(b) Assume a stock price is currently €110, and in the next year, it will either rise by 20% or fall by 15%. The risk-free interest rate is 8% per annum.

What is the probability that the stock price will rise?
What is the price of a European call option with a strike price of €110 that expires in one year?

(c) For the situation considered in part (b), what is the value of a one-year European put option with a strike price of €110?

Verify that the European call and put prices verify put-call parity.

(d) Based on the data in part (b), suppose that the European call option expires in two years and that the stock price can move up 20% or fall 15% in each year.
Write out the two-step binomial tree for this call option and use this to calculate its current price. Use no-arbitrage arguments.

5. (a) Economists have a strong intuition that fundamentally identical assets must sell at identical prices because of the workings of arbitrage. However, evidence suggests that this is not always the case.

Explain clearly, using examples, whether you believe that *noise trader risk* is a good explanation of price divergences between fundamentally identical securities. Assume that arbitrageurs invest their own money.

(b) Outline the main features (i.e. assumptions and structure) of the Shleifer (2000) model of noise-trader behaviour.

(c) In the Shleifer (2000) noise-trader model, the equation which determines the equilibrium stock price, p_t, is given by:

$$p_t = 1 + \frac{\mu(\rho_t - \rho^*)}{1+r} + \frac{\mu\rho^*}{r} - (2\gamma)\frac{\mu^2\sigma_p^{\ 2}}{r(1+r)^2} \qquad (1)$$

where μ = the proportion of investors who are noise traders, r = the risk-free real interest rate, γ = the coefficient of absolute risk aversion, σ^2 = the variance of noise-trader misperceptions, and ρ_t = random variable, normally distributed with mean ρ^* and variance σ^2.

Explain in detail each of the significant terms in equation (1).

(d) Friedman (1953) and Fama (1965) argue that noise traders who affect prices earn lower returns than the arbitrageurs they trade with, and so economic selection works to weed them out.

Is this argument valid? What alternative possibilities exist? Explain your answer.