

**PART I: Calculation** (If you have passed the midterm you can skip this part. You may try to increase your points from the midterm in which case the better result of those two will be credited in the final grading.)

1. You have borrowed \$30,000 on margin to buy shares in a listed company, which is now selling at \$40 per share. Your account starts at the initial margin requirement of 50%. The maintenance margin is 35%. Two days later, the stock price falls to 35 per share. **10p**
  - a) Will you receive a margin call?
  - b) How low can the price of the shares fall before you receive a margin call?
  - c) If you do not want to invest more money, how many shares would you have to sell to get back to the initial margin debt level if the share price suddenly drops to \$28?
  
2. A newly issued bond pays its coupon once a year. It's coupon rate is 5%, it's maturity is 20 years, and YTM is 8%.
  - a) Find the holding period return for a one year investment period if the bond is selling at YTM of 7% by the end of the year.
  - b) Find the realized compound return yield for a 2-year holding period assuming that, 1) you sell the bond after two years, 2) the bond yield is 7% at the end of the second year, and 3) the coupon can be reinvested for one year at a 3% interest rate. **15p**
  
3. A four-month European call option on a dividend-paying stock is currently selling for \$5. The stock price is \$64, the strike price is \$60, and a dividend of \$0.80 is expected in one month. The risk-free interest rate is 12% per annum for all maturities. What opportunities are there for an arbitrageur? Set up the strategy and calculate the profits. **15p**

**PART II: Theory**

1. Briefly explain the following words and expressions
  - a) Zero-coupon yield curve (zero curve)
  - b) Repo
  - c) Margin call
  - d) Gamma-neutral portfolio
  - e) Embedded option **10p**
  
2. Briefly (no more than 10 lines / answer!) answer the following questions. Remember to explain your answers!
  - a) Compare two yields for a (default-free) zero coupon bond: the stated yield to maturity and the realized compound yield to maturity. Is the realized compound yield higher, lower or are the yield the same? Why?
  - b) Why does a loan in the repo market involve very little credit risk?
  - c) Suppose that the spot price of the euro is currently \$1.30 and the futures price is \$1.33. Is the interest rate higher in the US or the euro zone?
  - d) Explain carefully how the value of credit default swap is calculated? (Hull, pp 524-525)
  - e) Give two reasons that the early exercise of an American call option on a non-dividend-paying stock is not optimal. The first reason should involve the time value of money. The second reason should apply even if interest rates are zero. **20p**

**When answering the following two essay-type questions, start with a table of contents!**

3. Arguments for and against hedging in non-financial companies. (Hull, 3.2) **10p**
  
4. Credit risk mitigation techniques in derivatives trading. What kinds of clauses are used in derivative trading contracts to mitigate counterparty credit risk? Explain how they work. (Hull 23.8) **10p**

$$p = \frac{e^{r\Delta t} - d}{u - d}, \quad c = S \times N(d_1) - Xe^{-rT} \times N(d_2), \quad d_1 = \frac{\ln(S/X) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$p = Xe^{-rT} \times N(-d_2) - S \times N(-d_1), \quad d_2 = d_1 - \sigma\sqrt{T}$$