

Pricing of Financial Securities and Derivatives

Time: 4 hours

Final Exam 16.1.2014

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Calculator may be used

Minimum to pass:

1. Final exam only: min. 50 p

2. Midterm + Final exam: Midterm min 25p and theory section in Final Exam min 20p, altogether min 50p

PART I: Calculation (If you have passed the midterm then you can skip this. 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.)

- Assume the following pattern of one year forward rates calculated from the yields of zero-coupon bonds: the first year forward is 5% (equals the 1-year spot rate), second year forward rate is 7% and the third year is 8%. In addition to the zero coupon bonds investors also may purchase a 3-year corporate bond making annual payments of 60 with par value 1000.
 - What is the price of the coupon bond?
 - Under the expectations hypothesis, what is the expected realized compound yield of the coupon bond?
 - If you forecast the yield curve in 1 year to be flat at 7%, what is your forecast for the expected rate of return on the coupon bond for the one year holding period? (BKM 15.13) 20p
- Yields on short-term bonds tend to be more volatile than yields on long-term bonds. Suppose that you have estimated that the yield on 20-year bond changes by 10 basis points for every 15-basis-point move in the yield on 5-year bonds. You hold a 1 million portfolio on 5-year maturity bonds with a modified duration of 4 years and desire to hedge your interest rate exposure with T-bond futures, which currently have modified duration 9 years and sell at $F_0 = \$95$ (per 100 par value). How many contracts should you sell if the par value for each futures contract is 100,000? (BKM 20.15) 20p
- Assume a stock has a value of 100. The stock is expected to pay a dividend of 2 per share at year-end. An at-the-money European style put option with one-year maturity sells for 7. If the annual interest rate is 5%, what must be the price of a 1-year at-the-money European call option on the stock? (BKM 17.23) 10p

PART II: Theory

- Briefly explain the following words and expressions
 - Systemic risk
 - Current yield
 - Debenture bond
 - Hedge ratio
 - Protective put10p
- Briefly (no more than 10 lines / answer!) answer the following questions. Remember to explain your answers!
 - Oversight by large institutional investors or creditors is one mechanism to reduce agency problems. Why don't individual investors in the firm have the same incentives to keep an eye on management? (BKM 1.12)
 - Explain carefully why liquidity preference theory is consistent with the observation that the term structure of interest rates tends to be upward sloping more often than it is downward sloping? (Hull 4.17)
 - Give an intuitive explanation of why the early exercise of an American put becomes more attractive as the risk-free rate increases and volatility decreases? (Hull 10.13)
 - What is meant by the gamma of an option position? What are the risks in the situation where the gamma of a position is large and negative and the delta is zero? (Hull 18.5)
 - If the stock price falls and the call price rises, what has happened to the implied volatility? (BKM, 18.23) 20p

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

- Which are the three main methods for calculating the default probability for publicly traded debt (bonds), and why do the different methods produce different estimates on default probability? (Hull ch. 23) 10p
- Collateralized debt obligations (CDO): Explain the idea of creating CDO:s and how a CDO is structured using a simple example with 3 tranches? (Hull, 8.1) 10p

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

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

