

Midterm Exam

Fall 2011

Econ 180-367

Closed Book.

Formula Sheet Provided. Calculators OK.

All questions carry equal marks.

Time Allowed: 2 hours

1. Sue's utility function is $\exp(-2W) / 2$ where W is her wealth, measured in thousands of dollars. Sue has no wealth to start.
 - (a) What is Sue's coefficient of risk aversion?
 - (b) Sue is offered a gamble that gives \$1000 ($W = 1$) with probability 0.25 and 0 otherwise. What is the certainty equivalent of this gamble for Sue?
2. Suppose that there are two stocks (GE and IBM) and a riskfree asset.

Mike's utility function is $U = E(r) - \frac{1}{2}\sigma^2$ where $E(r)$ is the expected portfolio return and σ^2 is the portfolio variance. Mike maximizes his utility function and invests 10% of his wealth in the risk-free asset, 75% in GE and 15% in IBM.

John's utility function is $U = E(r) - \frac{A}{2}\sigma^2$ for some constant A (John's coefficient of risk aversion). John maximizes his utility function and invests 40% of his wealth in the risk-free asset.

 - (a) What fraction of his wealth does John invest in GE?
 - (b) What is the numerical value of the coefficient A in John's utility function?
3. Three loans are pooled into a collateralized debt obligation. Each loan pays \$1000 if it does not default and zero otherwise. The senior tranche of the collateralized debt obligation pays the first \$1000, the mezzanine tranche pays the next \$1000 and the equity tranche pays the last \$1000. The risk-free interest rate is zero.
 - (a) Suppose that each of the loans defaults with probability 10% and the defaults are independent of each other (so that the probability of all three loans defaulting is 0.1%). Charlotte is a risk-neutral investor. How much will she pay for the senior tranche of the CDO?
 - (b) Now suppose that either all the loans default or else none do. The probability of all the loans defaulting is 10%. Now how much will the risk-neutral Charlotte pay for the senior tranche of the CDO?
4.
 - (a) In March 2000, 3Com announced that at the end of the year it would give their shareholders 1.5 shares in Palm for each 3Com share they owned. After this announcement, the price of Palm was \$95.06 per share. The price of 3 Com was \$81.11. If you were a long-term investor eager to exploit arbitrage opportunities, what *exactly* would you have done in response to this configuration of share prices?
 - (b) Explain the key provision of the Glass-Steagall act, repealed in 1999.
 - (c) What is the difference between *physical settlement* and *cash settlement* of a credit default swap contract?

5. Consider the following data for a one-factor economy. All portfolios are well diversified.

Portfolio	Expected Return	Beta
A	12%	1.2
B	?	1
F	6%	0

- (a) According to APT, what is the expected return on portfolio B?
 (b) As is usual in a factor model, the expected value of the factor was zero. However, suppose that the factor ended up being 1%. What would the return on portfolio B be?
6. Consider a bond with two years to maturity, semiannual coupons, a coupon rate of 4% per year, and a face value of \$1000. So the holder of the bond receives four coupons: in 6 months, 12 months, 18 months and 24 months (along with the principal value in 24 months' time). Suppose that the yield to maturity is 6% (semi-annual compounding).
 (a) Find the price of the bond.
 (b) Find the duration of the bond.
7. (a) Today, the one-year Treasury yield is 0.4 percent, the two-year Treasury yield is 0.6 percent, and the three-year yield is 0.8 percent. All of these numbers are annual interest rates with annual compounding. If the Expectations Hypothesis is correct, what is the expected one-year Treasury yield **one** year from today?
 (b) What is a Treasury Strip?
8. (a) Suppose that Pfizer earnings are 2 dollars per share, and the retention rate is 70%. Earnings are forecast to grow at a 4 percent annual rate forever. The excess of the market return over the risk-free rate is 2 percent. Pfizer has a beta of 2. The risk-free rate is 1 percent. According to the CAPM what is the required return for Pfizer shares?
 (b) Under the circumstances in (a), according to the dividend discount model, what is the market price of Pfizer shares?
 (c) Consider two shares. Share X has a high retention rate, share Y has a low retention rate. Which would you expect to have faster dividend growth, and why?

Solutions

1. Sue's coefficient of risk aversion is 2. The certainty equivalent solves

$$\frac{\exp(-2W)}{2} = 0.25 * \frac{\exp(-2 * 1)}{2} + 0.75 * \frac{\exp(-2 * 0)}{2} = 0.4088$$

$$\therefore \exp(-2W) = 0.78383$$

$$\therefore -2W = -0.24356$$

$$\therefore W = 0.12178$$

The certainty equivalent is \$121.78. Note that the utility function would make more sense if there were a minus in front of it, but the question can still be answered given the utility function as is.

2. By the separation result, all investors must have 5 times more in GE than in IBM. So John invests 50% of his wealth in GE (and 10% in IBM). The weight invested in the risky

portfolio is $\frac{E(r_p) - r_f}{A\sigma_p^2}$. Mike invested 90% in the risky portfolio and had a coefficient of

risk aversion of 1. So $\frac{E(r_p) - r_f}{\sigma_p^2} = 0.9$. So

$$\frac{E(r_p) - r_f}{A\sigma_p^2} = \frac{0.9}{A} = 0.6 \Rightarrow A = 1.5$$

3. (a) The expected payoff from the senior tranche is \$999.00. So Charlotte will pay \$999.00.

(b) Now the expected payoff is \$900.

4. (a) You would buy 1 share in 3Com and short 1.5 palm shares. Shorting the 1.5 Palm shares gives you $1.5 * 95.06 = \$142.59$. Buying the 3 Com share costs \$81.11. The 3 com share will give you 1.5 shares in Palm to cover the short position. You are left with \$61.48 and the remaining value of the 3 Com shares.

(b) The Glass-Steagall act enforced a separation between commercial banks, that took deposits, and investments banks, that were allowed to own shares. Each bank had to do either one or the other, but not both. Its repeal in 1999 allowed for universal banks to be formed.

(c) Physical settlement means that the buyer of credit protection gets to sell a defaulted bond to the seller of protection for full face value. Cash settlement means that the buyer of credit protection receives a payment from the seller of protection equal to the difference between what the defaulted bond is trading for and its full face value.

5. (a) 11 percent, and (b) 12 percent.

$$6. P = \frac{20}{1.03} + \frac{20}{1.03^2} + \frac{20}{1.03^3} + \frac{1020}{1.03^4} = 962.83$$

$$\text{Duration} = \left(\frac{20}{1.03}\right) \frac{1}{P} * 0.5 + \left(\frac{20}{1.03^2}\right) \frac{1}{P} * 1 + \left(\frac{20}{1.03^3}\right) \frac{1}{P} * 1.5 + \left(\frac{1020}{1.03^4}\right) \frac{1}{P} * 2 = 1.94$$

7. The one-year forward rate is $\frac{1.006^2}{1.004} - 1 = 0.008$. So the forward rate is 0.8 percent, and so the expected rate in one year is 0.8 percent. A Treasury Strip is a coupon or principal

payment from a Treasury security that trades as a separate financial instrument. It is in effect a zero-coupon bond.

8. (a) The required return is 5 percent.

(b) Dividends are \$0.60 per share. So the price per share is $\frac{0.6 * 1.04}{0.05 - 0.04} = \62.40

(c) Share X should have a higher growth rate, because this firm is reinvesting earnings which will allow it to have more profits in the future.